Project design document form

(Version 10.1)

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

BASIC INFORMATION	
Title of the project activity	*BK Energia Itacoatiara Project* (hereafter referred to simply as *BK Project*) – THIRD CREDITING PERIOD – (CDM ref. 0168)
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	6.6
Completion date of the PDD	06/05/2019
Project participants	BK Energia Itacoatiara Ltda Precious Woods Holding Ltd Foundation myclimate - The Climate Protection Partnership
Host Party	Brazil
Applied methodologies and standardized baselines	AMS I.D: Grid connected renewable electricity generation version 18 AMS-III.E.: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment version 17
Sectoral scopes linked to the applied methodologies	Scope 1, energy industries (renewable-/non-renewable sources). Scope 13, waste handling and disposal.
Estimated amount of annual average GHG emission reductions	47,029 tCO2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project generates electricity with a thermoelectric power plant (see picture below) using wood waste from an FSC[1] certified forest and a wood processing company in the city of Itacoatiara, in the State of Amazonas, Brazil. The electricity is generated with a high-pressure boiler (42 bar – 420° C) and a multiple stage condensing steam turbine coupled with a 9 MW_{elt} generator. The power plant replaces several diesel generators and supplies the local grid of the town of Itacoatiara (approx. 80,000 inhabitants) in a region supplied by 100% diesel fuelled electrical electricity generators.

Figure 1: The BK Energia Itacoatiara Plant generating renewable electricity from biomass

Thus the general objective of the BK Project is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to the environmental, social and economic sustainability by increasing renewable energy's share of the total Brazilian (and the Latin America and the Caribbean region's) electricity consumption. The specific objectives are

(1) to generate electricity for the Itacoatiarian grid (in scope) and the sawmill Mill (out of scope) by renewable wood substituting fossil fuels.

(2) to dispose the wood waste in a useful manner by incinerating it instead of putting it on a landfill and leaving it for decay and composting.

The Power Plant is owned and run by BK Energia Ltda. It is fuelled by wood waste from the mill and the forest of Mil Madeiras Preciosas Ltda., which is a subsidiary of Precious Woods Holding Ltd. Precious Woods has set ecological and social standards in tropical forestry and received a number of environmental awards for its efforts. In 1997, Precious Woods became the first company in the Amazon to receive FSC certification for environmentally friendly and socially responsible forest management..

[1] The Forest Stewardship Council (FSC) is an international non-profit organization, founded in 1993 to support environmentally appropriate, socially beneficial, and economically viable management of the world's forests.

Beyond the reduction of GHG emissions, the project also benefits to the environment by using wood waste from a FSC certified forest. The power plant uses latest technology, double cyclones ensure a low level of air emissions.

Being an indigenous and cleaner source of electricity the project will also provide an important contribution to the local environment, improve the supply of electricity and contribute to the regional economic development. As a local, small-scale biomass power plant, in contrast with the conventional diesel fired plants, the project provides further transmission and distribution benefits including:

- Increased reliability, shorter and less extensive outages
- Lower reserve margin requirements
- Improved power quality
- Reduced lines losses
- Reactive power control
- Mitigation of transmission and distribution congestion, and
- Increased system capacity with reduced T&D investment.

Additional social benefits of the project are related to local job creation and a better income distribution in the region. Also, FSC ensures that social standards in mill and forest are high. The local municipality benefits from lower expenditures as it has decreased diesel imports. This funding may therefore be spent in health and education, which will directly benefit the local population.

A.2. Location of project activity

Country: Brazil
State: State of Amazonas
City: Itacoatiara

The project is located in the north region of Brazil, state of Amazonas, municipality of Itacoatiara, which is a city with 78,425 inhabitants and 8,892 km² of territorial extension (IBGE, 2004). Geographical coordinates are: latitude 03° 08' 35" South, longitude 58° 26' 39" West. The city is located at the bank of the Amazon River, 240 kilometres east of Manaus, the capital of the state of Amazonas (See below).

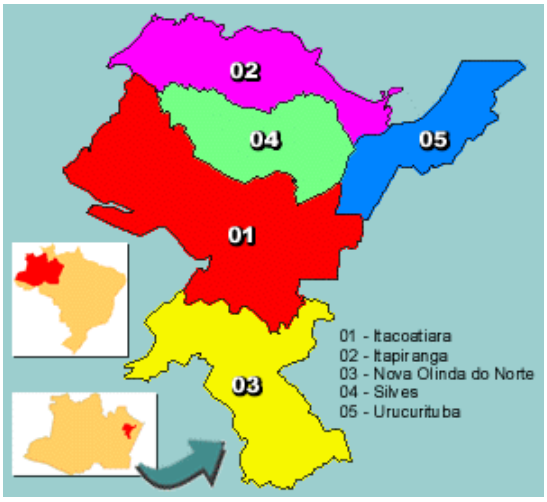

Figure 2 - Political division of Brazil showing the Amazonas State and the city of Itacoatiara (Sources: Encyclopaedia Britannica, 2003 and City Brazil, 2005)

A.3. Technologies/measures

The power plant uses direct combustion technology, the most widely known option for electricity generation and/or heat production from biomass. It burns biomass with excess air and produces steam. The steam is used to produce electricity in a Rankine cycle (a heat engine with a vapor power cycle).

It consists of a high pressure boiler (42 bar – 420° C) and a multiple stage condensing steam turbine coupled with a 9 MW_{el} generator. The project replaces diesel generation and covers around 70% of the electricity demand in the city of Itacoatiara.

Specification of components and measurement equipments follows:

- Turbine manufactured by Dresser-Rand, model ET1HB7, serial number ET-103, rated capacity 9,000 KW_{el} (10,000 KVA) at 5,000 rpm;
- Boiler manufactured by Equipalcool, model 45 V-2-S, serial number 059-01, feed water temperature 105 ^{o}C, rated capacity 45,000 kg/h of steam at 42 kgf/cm^2 and 420 ^{o}C, biomass residues (wood chips) fuelled, LHV efficiency 85.7%;
- Electrical generator manufactured by Toshiba, type TABL RCC, serial number 0110371000, rated capacity 10,000 kVA at 13.8 kV, 60 Hz;
- Scale 1 (the one used to weight the total of wood waste entering the boiler) manufactured by Toledo, model 9270, Maximum capacity 50t/h; serial number 02092000083, precision class 0.02%;
- Scale 2 (the one used to weight wood waste coming from outside) manufactured by Toledo, model 820, Capacity 60t, Precision Class III[2];
- Two emergency diesel generators, manufactured by Caterpillar, Model 3412, Installed Capacity 545 kW and 455 kW.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	BK Energia Itacoatiara Ltda.	No
Switzerland	Precious Woods Holding Ltd.	No
Switzerland	Foundation myclimate - The Climate Protection Partnership	No

[2] Precision Class for this type of equipment is defined by the National Institute of Metrology - INMETRO (from the Portuguese *Instituto Nacional de Metrologia, Normalização e Qualidade Industrial). Please refer to INMETRO's Directive #236 dated 22/12/1994.*

The project operator is BK Energia Itacoatiara Ltda..and therefore responsible for all activities related to the project management, registration, monitoring, measurement and reporting.

A.5. Public funding of project activity

This project does not receive any public funding and it is not a diversion of ODA

A.6. History of project activity

The proposed project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA) and the proposed CDM project activity is not a project activity that has been deregistered. The project has started in 2002.

The project is not a CPA that has been excluded from a registered CDM PoA and there is no other CDM project in the city of Itacoatiara.

A.7. Debundling

According to tool Assessment of debundling for smale scale project activities version 04.0, debundling is defined as the fragmentation of a large project activity into smaller parts.
A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The PPs confirm that none of the above mentioned conditions is applicable to the project activity, thus it shall be considered as a small scale CDM project activity.

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

Component 1, electricity-generation:

- AMS - I.D – Grid connected renewable electricity generation (version 18)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 2)
- Project and leakage emissions from biomass (version 2.0).
- Tool to calculate the emission factor for an electricity system (version 05.0)

Component 2, methane-emissions-avoidance:

- AMS-III.E. – Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment (version 17)
- Emissions from solid waste disposal sites (version 07.0)
- Attachment C of appendix B - General guidance on leakage in biomass project activities, version 03.

- Procedures for Renewal of the crediting Period of a Registered CDM Project Activity and its Annex 1

- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (version 3.0.1).

- Project and leakage emissions from transportation of freight version 01.1.0

B.2. Applicability of methodologies and standardized baselines

The BK Itacoatiara Project is a small scale project activity and falls under the categories I.D and III.E, since the project activity complies with the following applicability conditions:

Regarding AMS-I.D.:

1. *This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:*
   - *(a) Supplying electricity to a national or a regional grid; or*
   - *(b) Supplying electricity to an identified consumer facility via national/regional grid trough a contractual arrangement such as wheeling.*

The project activity consists of a thermo power plant fuelled with renewable biomass. It displaces electricity from fossil fuel fired generating units. It supplies electricity to the city grid of Itacoatiara (more than 20 MW capacity[3]), which is still isolated from the Brazilian Interconnected Grid.

The project activity solely uses renewable biomass for electricity generation. As recommended by the methodology, to demonstrate the compliance of the project with this applicability condition the provisions of Annex 18, EB 23 – *Definition of renewable biomass*, were assessed as further detailed below.

The forth condition of the above mentioned Annex is applicable, which is:

The biomass is a biomass residue and the use of that biomass residue in the project activity does not involve a decrease of carbon pools, in particular dead wood, litter or soil organic carbon, on the land areas where the biomass residues are originating from.

The biomass combusted for generating electricity is wood waste of the sawmill. The wood input of sawmill comes from sustainably and well managed forests certified to the world-wide leading standard for sustainable forestry FSC (www.fsc.org). Thus, the original source of the biomass is renewable ensured by sustainable forestry, which cannot decrease carbon pools in the forest.

Also, the residue is classified as a biomass residue since it is a residue from forestry related industry (as per footnote 2 of the Annex 18). As further detailed below in section B.4., the biomass residues from sawmill would be, in the absence of the CDM, dumped creating methane emissions. This condition is going to be prevented by the project activity as the biomass residues are being used for energy generation under the CDM

2. *Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in appendix .*

Amongst the situations presented in the appendix of the methodology, the first project type applies. Hence, methodology AMS-I.D is applicable to the proposed project activity.

[3] The local utility power plant alone possesses an installed capacity of 20,640 MW as authorized by the ANEEL Decree #4069, dated 31/10/2008, available in Portuguese at http://www.aneel.gov.br/cedoc/dsp20084069.pdf, accessed on 06/04/2011.

3. *This methodology is applicable to project activities that (a) install a Greenfield plant; (b) involve a capacity addition in (an) existing plant(s); (c) involve a retrofit of (an) existing plant(s); (d) involve a rehabilitation of (an) existing plant(s)/unit(s) or (e) involve a replacement of (an) existing plant(s).*

The project activity is a new renewable energy power plant at a site where there was no renewable energy power plant operating (Greenfield plant). Before the project plant became operational prior to the implementation of the project activity, Itacoatiara municipality was supplied with electricity solely from thermo power plant fuelled with fossil fuel.

4. *Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:*
   - *The project activity is implemented in an existing reservoir with no change in the volume of reservoir;*
   - *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2;*
   - *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.*

Not applicable. The project activity consists of a thermo power plant fuelled with renewable biomass.

5. *If the new unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.*

Not applicable. The project activity does not possess a non-renewable unit. In addition, the system does not co-fire fossil fuels in order to generate electricity.

6. *Combined heat and power (co-generation) systems are not eligible under this category.*

Not applicable. The project activity is not a co-generation system.

7. *In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.*

Not applicable. The project activity does not add renewable energy generation units at an existing renewable power generation facility.

8. *In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.*

Not applicable. The project activity neither involves a retrofit nor a modification of the existing facility.

9. *In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored.*

Not applicable. The project activity is not a landfill gas, waste gas, wastewater treatment pro agro-industries projects.

10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.

The tool "Project and leakage emissions from biomass version 2.0" states that it is applicable if biomass residues are consumed in a CDM project activity in the next options:

(a) Procured by the project proponents; or

(b) The result of an agro-industrial process under the control of the project proponents.

The biomass combusted for generating electricity is wood waste of the sawmill MIL. The wood input to any sawmill comes from sustainably and well managed forests certified to the world-wide leading standard for sustainable forestry FSC (www.fsc.org). Thus, the original source of the biomass is renewable ensured by sustainable forestry, which cannot decrease carbon pools in the forest.

The wood waste comes from the mill and the forest of Mil Madeiras Preciosas Ltda., which is a subsidiary of Precious Woods Holding Ltd (Project Participant).

Regarding AMS-III.E.:

1. *This project category comprises measures that avoid the production of methane from biomass or other organic matter that:*
   (a) *Would have otherwise been left to decay under clearly anaerobic conditions throughout the crediting period in a solid waste disposal site without methane recovery, or*
   (b) *Is already deposited in a waste disposal site without methane recovery.*

The biomass residues used to generate electricity are residues from the mill located next to the power plant. In the absence of the proposed project activity these residues would have otherwise been left to decay under anaerobic conditions throughout the crediting period without methane recovery. Therefore, **option (a)** above applies.

2. *Due to the project activity, decay of the wastes of type referred to in paragraph 1(a) and/or 1(b) above is prevented through one of the following measures:*
   (a) *Controlled combustion;*
   (b) *Gasification to produce syngas/producer gas;*
   (c) *Mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB). An example of a mechanical/thermal treatment process is the pelletization of wood particles.*

The proposed project activity consists of generating electricity using biomass residues. Hence, option (a) above applies.

3. *The produced RDF/SB shall be used for combustion either on site or off-site.*

Not applicable. The proposed project activity does not produce RDF/ SB .

4. *In the case of stockpiles of wastes baseline emission calculations as described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" shall be adjusted. Stockpiles can be characterised as waste disposal sites that consist of wastes of a homogenous nature with similar origin (e.g., rice husk, empty fruit bunches of*

oil palm, sawmill waste, etc.). Paragraph 22 provides specific instructions for the calculation of baseline emissions where the baseline is stockpiling of the waste.

Before the project activity the residues were partly left to decay in stockpiles. In this sense the provisions of paragraph 22 were applied to the baseline emissions calculation. For details please refer to B.6.1.

5. *Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.*

The emission reductions by the proposed project activity for its third crediting period were estimated taking into account the average consumption of biomass residues of the plant during the last three years of operation. The result is that the emission reductions during this period will be less than 60 ktCO_2e annually. For details on how the calculations were done, please refer to the spreadsheet attached to the PDD. Also, for the justifications of the values used in the calculations of the emission reductions, please refer to sections B.6.1. and B.7.2. of the PDD.

6. *Where in the baseline usually there is a reduction in the amount of waste through regular open burning or removal for other applications, the use of the methodological tool to "Emissions from solid waste disposal site" shall be adjusted to take account of this burning or removal in order to estimate correctly the baseline emission.*

Not applicable. In the baseline scenario the waste was not burned or removed for other utilisations.

7. *The project activity does not recover or combust methane unlike AMS-III.G. Nevertheless, the location and characteristics of the disposal site in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.*

The project activity does not recover or combust methane. The location and characteristics of the disposal site are known and discussed in section B.3. and B.4.

8. *If the project activity involves combustion, gasification or mechanical/thermal treatment of partially decayed waste mined (i.e., removed) from a solid waste disposal site in addition to freshly generated waste the project participants shall demonstrate that there is adequate capacity of the combustion, gasification or mechanical/thermal treatment facility to treat the newly generated wastes in addition to the partially decayed wastes removed from the disposal site. Alternately justifications for combusting, gasifying or mechanically/thermally treating the partially decayed wastes instead of the newly generated wastes shall be provided.*

Not applicable. In the 3rd crediting period the project activity only uses fresh biomass residues.

9. *If the combustion facility, the produced syngas, producer gas or RDF/SB is used for heat and electricity generation within the project boundary, that component of the project activity may use a corresponding methodology under Type I project activities.*

The combustion facility is used for electricity generation within the project boundary. The corresponding methodology AMS-I.D. (V17) is used.

10. In case of RDF/SB production, project proponents shall provide evidence that no GHG emissions occur, other than biogenic CO_2, due to chemical reactions during the thermal treatment process for example limiting the temperature of thermal treatment to prevent the occurrence of pyrolysis and/or the stack gas analysis.

Not applicable. The proposed project activity does not produce RDF/ SB.

11.In case of gasification, the process shall ensure that all the syngas produced, which may contain non-CO_2 GHG, will be combusted and not released unburned to the atmosphere. Measures

to avoid physical leakage of the syngas between the gasification and combustion sites shall also be adopted.

Not applicable. The project activity does not use gasification.

12. In case of RDF/SB processing, the produced RDF/SB should not be stored in such a manner as resulting in high moisture and low aeration favouring anaerobic decay. Project participants shall provide documentation showing that further handling and storage of the produced RDF/SB does not result in anaerobic conditions and do not lead to further absorption of moisture.

Not applicable. The project activity does not process RDF/ SB.

13. In case of RDF/SB processing, local regulations do not constrain the establishment of RDF/SB production plants/thermal treatment plants nor the use of RDF/SB as fuel or raw material.

Not applicable. The project activity does not process RDF/ SB.

14. During the mechanical/thermal treatment to produce RDF/SB no chemical or other additives shall be used.

Not applicable. The project activity does not process RDF/ SB.

15. In case residual waste from controlled combustion, gasification or mechanical/thermal is stored under anaerobic conditions and/or delivered to a landfill emissions from the residual waste shall to be taken into account using the first order decay model (FOD) described in AMS-III.G.

The residual waste from controlled combustion – *i.e.* ash – is deposited in a landfill near the plant. The stockpiles have depths of less than 2 meters. Therefore, it can be considered that the ashes are not deposited in an anaerobic condition, and consequently, no methane is generated from its deposition.

B.3. Project boundary, sources and greenhouse gases (GHGs)

Boundary for component 1: electricity generation from renewable resources:

According to AMS-I.D..(V18), 18. *"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".* This is the power plant of BK Energia (project power plant) as well as two diesel oil fired power plants connected to Itacoatiara regional grid, located in Amazonas State, north region of Brazil.

Boundary for component 2: avoidance of methane emissions

According to AMS-III.E. (V17), 21. *"The project boundary are the physical, geographical sites*:

(a) *Where the solid waste would have been disposed or is already deposited and the avoided methane emission occurs in absence of the proposed project activity*:" This was an area of 8 hectares next to the mill (see map below). Here, the wood waste was stored in the pre-project activity between the years 1997-2002. This waste was collected and burnt in the plant during 2002-07. The areas are cleared and re-cultivated now.

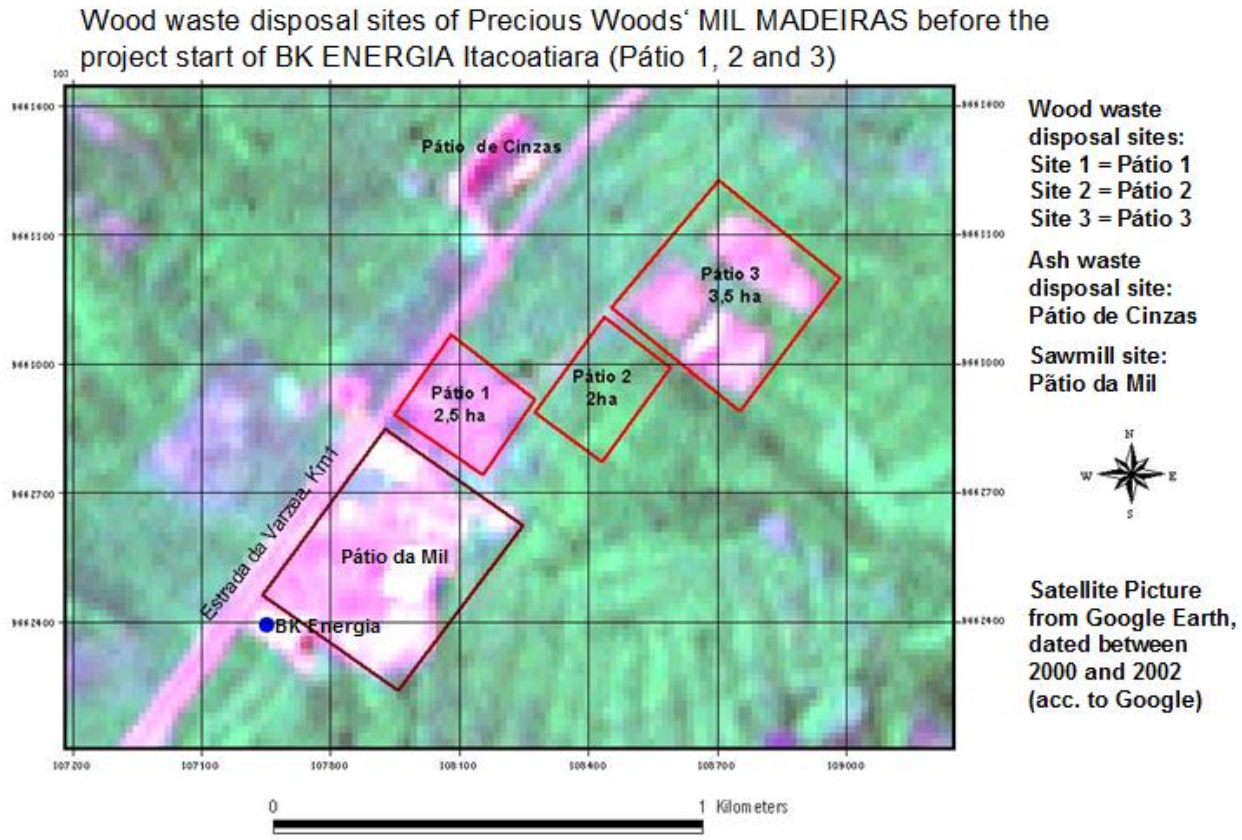

Figure 3: Wood waste disposal sites before the start of the project activity

"(b) Where the treatment of biomass through controlled combustion, gasification or mechanical/thermal treatment takes place": this is the boiler of the power plant.

"(c) Where the final residues of the combustion process will be deposited (this parcel is only relevant to controlled combustion activities)": the landfill for the ash of the boiler (see map, Patio 3).

"(d) And in the itineraries between them, where the transportation of wastes and combustion residues and/or residues of gasification and mechanical/thermal treatment process occurs": For MIL, the transportation is the conveyor belt between the saw mill and the silo before the boiler. Other transport is the disposal of the boiler ash to the landfill in 1.3 km distance.

Source		GHG	Included?	Justification/Explanation
Baseline	Source 1 Electricity generation from fossil fuels	CO_2	Yes	Main source of emissions of the Baseline's thermoelectric power plant
		CH_4	No	Conservative
		N_2O	No	Conservative
	Source 2: Methane emissions from biomass (wood waste) that would have otherwise been left to decay under clearly anaerobic conditions	CO_2	No	Conservative
		CH_4	Yes	Main source of emissions of anaerobic conditions of wood waste left to decay
		N_2O	No	Conservative
Project activity	Source 1: Transportation of freight	CO_2	Yes	Main source of emissions due to transportation of combustion residues and final waste from controlled burning disposal site
		CH_4	No	Conservative
		N_2O	No	Conservative
	Source 2: Consumption of diesel for generating electricity	CO_2	Yes	Main source of emissions through back-up diesel consumption of the project activity
		CH_4	No	Conservative
		N_2O	No	Conservative

B.4. Establishment and description of baseline scenario

For component 1: electricity generation from renewable resources:

Description: The project activity delivers electricity to the isolated grid of the city of Itacoatiara. That electricity would have been otherwise generated operating grid-connected fossil fuel power plants (diesel generators). They provided 100% of the electricity to the city before the implementation of the project activity. Thus, the baseline scenario is electricity from fossil fuel only.

Development: AMS-I.D. Version 6 was applied in the first crediting period and version 17 was applied for the second crediting period. Now Version 18 is valid (V18). It defines that "*the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid. […] The baseline emissions are the product of electricity generated multiplied by the grid emission factor. This factor is (a) the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system". OR (b) The weighted average emissions (in t CO_2/MWh) of the current generation mix."* The latter approach was chosen. Due to the revised methodology the revised baseline is now subject to annual monitoring of different parameters.

For component 2: methane avoidance

Description: The project activity also avoids the methane emissions from biomass (wood waste) that would have otherwise been left to decay under clearly anaerobic conditions throughout the crediting period in a solid waste disposal site without methane recovery. The biomass is used in controlled combustion for electricity generation instead of being disposed. This component will use the baseline listed in Type III.E, as defined in Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Development: AMS-III.E. Version 6 was applied in the first crediting period which is now withdrawn and version 16 in the second crediting period. The latest approved version of the respective consolidated methodology is Version 17. Version 6 did encompass solid waste disposal sites in accordance with the IPCC Guidelines and the waste scenario "Unmanaged-shallow solid waste disposal site" was chosen for the calculations. Version 17 keeps those scenarios referring to the "Emissions from solid waste disposal sites" (V7) and introduces specific rules for stockpiling. Thus the baseline scenario need to be re-considered and clarified (requested by DOE).

The pre-project scenario between 1997 (when the open burning of the wood waste was legally stopped) and 2002 was a mixture of storing in a landfill and open stockpiling as far as the space around the mill and the designated disposal areas allowed to do so. Consequently, the PDD of the first crediting period describes the practice after 1997 as landfill (last § of A.2., B.4., D1. and E.1) and as open field stockpiles (A.2., A.4.3, B.4., D.3., F.1.). Table 5 in Annex 4 says "stockpiles/ landfill".

The map in section B3 shows the waste disposal area of approx. 8 ha, also the following pictures:

Figure 4: stockpiling practice before project activity on the designated waste disposal sites in MILL

Figure 5: landfill practice with compacting and levelling (before project activity) in the designated waste disposal sites in MILL

Also, how the hypothetical disposal scenario during the second and first crediting period would have been unfolded:

(1) The "fresh" wood waste from the saw mill that was eliminated during the second crediting period accounts 663,163 tonnes (see biomass monitoring of 2nd crediting period) and the first crediting period accounts 660,725 tonnes (see biomass monitoring of 1st crediting period. Given the empirical measured fact of having 1.14 tonnes per m^3 wood waste (see Appendix 7 for source), the waste volume was 1,161,306 m^3 (1st and 2nd crediting period). The waste disposal truck of BK Energia that hauls the wood ash waste today employs a standard container of 36 m^3 (8m length * 2.50m width * 1.80m height). 32,258 hypothetical truckloads in the 1st and the 2nd second crediting period will be necessary and 16,129 for the 3rd crediting period).

(2) Open stockpiling means that truckload per truckload of waste is dumped next to each other without compacting (by Loader or Bulldozer). In a conservative calculation approach, the truckload would cover the same area on the ground as in the truck dump itself (usually it will be 20-30% more). Hence, an area of 2.50 m width and 8m length is covered by the wood waste pile, in total 20 m^2. Adding up this area of approx. 11,500 truckloads would have required the space of about 23 ha from 1997-2002 to store the wood waste in an open-stockpiling-only scenario. Hence, hypothetical 65 ha during the 1st and 2nd crediting period, and another 32 ha during the 3rd crediting period, in total, the disposal scenario "Stockpiling only" would require an 120 ha of clear cutting forest around the mill until the end of the 3rd crediting period (see table below).

(3) The map in section B3 shows that there were only 8 ha were available as designated waste disposal site. This area could absorb a maximum of 164,160 tons in open stockpiling technique which shows the following table. Hence, before the project activity there must have been compacting practiced to reduce the wood waste by a twelfth (with the information for 1st and 2nd crediting period) in order to be able to keep the area of 8 ha of designated wood waste disposal site.

Table 1: Calculation of space necessary for open stockpiling only in absence of the project activity

Total waste generated	**In tons:**	**in m^3:**	**in**	**in area m^2**	**in area ha**

			truckloads		
in 1st and 2nd crediting period (from monitoring reports)	1,323,888	1,161,306	32,258	645,170	64.5
between 1997-2002*	471,946	413,988	11,500	229,993	23.0
* estimated as 5/7 of the waste of the 1st crediting period as no monitored data is available					
reverse calculation stockpiling only based on 8 ha	**In area ha**	**in area m²**	**in truckloads**	**in m³:**	**in tons:**
	8	80,000	4,000	144,000	164,160

This calculation shows that there must have been practiced a combination of partly stockpiling and partly landfilling (with compacting) the wood waste before the start of project activity. During the first crediting period it would have been necessary to continue and even increase landfilling/ compacting due to the large amounts of waste. To dispose those quantities only by open stockpiling would mean to clear cut 65 ha (33 ha for 2nd CP and 32 ha for 1st CP) of adjacent tropical forest in addition the 23 ha for the time before the project activity started. Until the end of the 3rd crediting period 120 ha of forest clear cutting would be necessary for stockpiling the waste only

Additionally, industrial practice from remote saw mills in the tropical forests show that usually an unmanaged landfill approach is chosen: A mixture of stockpiling, compacting once or twice per month when the designated area is full and eventually burning (which is prohibited in Amazon region). The approach of MIL shows a similar conduct: MIL managed to store approx. 470,000 tons on an area of 8 ha between 1997-2002. As the table above shows, only 164,000 could be disposed with open stock piling (approx. a twelfth), therefore the wood waste must have been compacted by MIL about eleven twelfth to be able to store it on 8 ha of land.

In conclusion, the combination of landfilling/compacting and open stockpiling is classified as an "*unmanaged shallow waste site under 5 meters*". Therefore as baseline scenario paragraph 21 of version 16 of AMS-III.E. should be applied. However, due to the request of the DOE, the "stockpiling only" practice is applied as most conservative approach to calculate emission reductions (as prescribed in paragraph 5 and from 29 to 34 of version 17 of AMS-III.E.) until there is no clearer evidence shown by the project participants about the wood waste disposal practice in absence of the project activity.

B.5. Demonstration of additionality

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In the next paragraphs, it is reflected the definition and conclusions laid out in the project for the first crediting period request by the DOE.

The project fulfils all the "additionality" prerequisites (see application of the "tool for the demonstration and assessment of additionality[4]", hereafter referred to simply as "additionality tool," below) demonstrating that it would not occur in the absence of the CDM.

The "additionality tool" shall be applied to describe how the anthropogenic emissions of GHG are reduced below those that would have occurred in the absence of the Itacoatiara Project. The

[4] *Tool for the demonstration and assessment of additionality.* UNFCCC, CDM Executive Board 16th Meeting Report, 22 October 2004, Annex 1.

additionality tool provides a general step-wise framework for demonstrating and assessing additionality. These steps, numbered from 0 to 5, include:

0. Preliminary screening
1. Identification of alternatives to the project activity
2. Investment analysis AND/OR
3. Barrier analysis
4. Common practice analysis
5. Impact of CDM registration

The application of the additionality tool to the Itacoatiara Project follows.

Step 0. Preliminary screening based on the project start date:

a) **Project Start date:** The beginning of the commissioning phase, October 2002, is considered the starting date of the project activity. The commercial start-up occurred in November 2002 when the power plant delivered its first MWh of electricity to the grid of the city of Itacoatiara.

b) **Evidence demonstrates that CDM incentives were seriously considered in the development of project:** BK Energia Participações Ltda., a partnership between Koblitz Ltda. (Koblitz) and Brennand Group developed the BK Energia Itacoatiara Project.

Since 2000, Koblitz has formed several partnerships in order to invest in renewable energy projects throughout Brazil. In partnership with the Brennand Group, Koblitz developed the following renewable energy projects: Arapucel (small-hydro), Uruguaiana (rice husk fueled thermal power plant) and the BK Energia Itacoatiara Project. In another partnership with C.G.D.e, the Brazilian energy branch of the Portuguese bank Caixa Geral de Depósitos, one of the projects developed is the Piratini, C.G.D.e, Koblitz Energia S.A. (Piratini Project). In the second half of 2000, Koblitz requested from the Brazilian government, through Ecoinvest, a position regarding its participation in the Clean Development Mechanism. In April 2001, the project received a non-objection letter from the Brazilian government (Figure 2) and in the beginning of 2002, Piratini, through Ecoinvest, negotiated 1,600 tCO2e verified emission reductions with the Canadian government. The Piratini project, which is currently fully controlled by Koblitz, is the first project registered (V-AAA-001) in the Canadian GHG Reductions Registry (http://reductions.vcr-mvr.ca/rer_masterprojects_e.cfm). Through their experience with the Piratini project, Koblitz Ltda. developed the human capital and internal capabilities to apply CDM principles to future projects. By the end of 2000, all possible ventures by Koblitz using renewable energy sources were analysed in order to evaluate their eligibility under the CDM, specifically the development of the BK Itacoatiara Project.

Although enormous uncertainties were presented at the time, such as the entry into force of the Protocol, size of the market/price of the CERs, no nominated executive board, lack of approved baseline/monitoring methodologies and so on, the project owners took the risk and seriously considered the incentive from the CDM in the decision to proceed with the activity.

Step 1. Identification of alternatives to the project activity consistent with current laws and Regulation

Sub-step 1a. Define alternatives to the project activity:

Alternative 1: Continuation of the current situation: Before the BK Itacoatiara project was developed Itacoatiara's isolated electricity system was fully supplied by diesel.

In the year of 2002 the following sources supplied the total demand of 60,678 MWh in Itacoatiara's isolated system:

- CEAM – 28,877 MWh (diesel)
- Hermasa5 (self-generator) – 31,801 MWh (diesel)

Alternative 2: The implementation of the project: According to the "*Operation Plan 2004 - Isolated Systems*" (Eletrobrás, 2004), the forecasted demand of the Itacoatiara systems was 80,908 MWh, to be supplied by the following sources:

- BK Itacoatiara – 54.000 MWh (biomass)

- CEAM – 21.472 MWh (diesel)
- Hermasa (self-generator) – 5.436 MWh (diesel)

Sub-step 1b. Enforcement of applicable laws and regulations:
The CEAM and Hermasa[5] generators still operate during peak load hours. Both the project activity and the alternative scenario are in compliance with all applicable regulations.

Step 3. Barrier Analysis:
To substantiate the barrier analysis a brief overview of the Brazilian electricity market in the last years is first presented.
Until the beginning of the 1990's, the energy sector was composed almost exclusively of stateowned companies. From 1995 on due to the increase of international interest rates and the lack of investment capacity of the State, the government was forced to look for alternatives. The solution recommended was to initiate a privatization process and the deregulation of the market.
The four pillars of the privatization process initiated in 1995 were:

- Building a competition friendly environment, with the gradual elimination of the captive consumer. The freedom of choice of the electricity services supplier, initiated itself in 1998 for great consumers, and should culminate with a 100% free market in 2006;
- Dismantling of the state monopolies, separating and privatizing the activities of generation, transmission and distribution;
- Allowing free access to the transmission lines, and
- Placing the operation and planning responsibilities to the private sector.

At the same time three entities were created, the Electricity Regulatory Agency, ANEEL set up to develop the legislation and to regulate the market; the National Electric System Operator, ONS, to supervise and control the generation, transmission and operation; and the Wholesale Electricity Market, MAE, to define rules and commercial procedures of the short-term market.
Until the end of 2000, after five years of privatization, the process results were still modest (Figure 3). Despite high expectations, investments in new generation did not follow the increase in consumption.
The decoupling of GDP (average of 2% increase in the period of 1980 to 2000) from electricity consumption increase (average of 5% increase in the same period) is well known in developing countries, mainly due to broadening of the supply services to new areas and the growing infra-structure. The necessary measures to prevent bottlenecks in services were taken. These include an increase of generation capacity higher than the GDP growth and strong investments in energy efficiency. In the Brazilian case, the increase in the installed generation capacity (average of 4% in the same period) did not follow the growth of consumption as can be seen in Figure 4.
Without new installed capacity, the only alternatives were energy efficiency improvements or higher capacity utilization (capacity factor). Regarding energy efficiency, the government established in 1985 PROCEL (the National Electricity Conservation Program). Although the results of the program were remarkable, the efficiency achievement was not big enough to cover the mentioned gap between the need of new generation capacity and consumption growth.
The remaining alternative, to increase the capacity factor of the old plants, was actually the most widely used, as can be seen in Figure 5. To understand if such increase in capacity factor brought positive or negative consequences one needs to analyze the availability and price of fuel. In the Brazilian electricity model the primary energy source is the water accumulated in the reservoirs. Figure 6 shows what happened to the levels of "stored energy" in the reservoirs from January 1997 to January 2002. It can be seen that reservoirs which were planned to withstand 5 years of less-than-average rainy seasons, almost collapsed after a single season of low rainfall (2000/2001 experienced 74% of the historical average rain. This situation depicts a very intensive use of the country's hydro resources to support the increase in demand without increase of installed capacity. Under the

[5] Hermasa – Hermasa Navegação da Amazonia S.A

situation described there was still no long-term solution for the problems that finally caused shortage and rationing in 2001.

Aware of the difficulties since the end of the 1990's, the Brazilian government signalized that it was strategically important for the country to increase thermoelectric generation and consequently be less dependent of hydropower. With that in mind the federal government launched in the beginning of the

year of 2000 the *Thermoelectric Priority Plan* (*PPT*, "*Plano Prioritário de Termelétricas*", Federal Decree 3,371 of February 24th, 2000, and Ministry of Mines and Energy Directive 43 of February 25th, 2000), originally planning the construction of 47 thermo plants using Bolivian natural gas, totalizing 17,500 MW new installed capacity until December of 2003. During 2001 and the beginning of 2002 the plan was rearranged to 40 plants and 13,637 MW to be installed until December 2004 (Federal Law 10,438 of April 26th, 2002, Article 29). As of today, December 2004, 20 plants totalizing around 9,700 MW are operational.

During the rationing of 2001 the government also launched the *Emergency Energy Program* with the short-term goal of building 58 small to medium thermal power plants until the end of 2002 (using mainly diesel oil, 76,9 %, and residual fuel oil, 21.1 %), totalizing 2,150 MW power capacity (CGECBEE, 2002).

It is clear though that hydroelectricity is and will continue as the main source responsible for the electricity base load in Brazil. However, most if not all-hydro resources in the South and Southeast of the country have been exploited, and most of the remaining reserves are located in the Amazon basin, far from the industrial and population centers (OECD, 2001). Clearly, new additions to Brazil's electric power sector are shifting from hydroelectricity to natural gas plants (Schaeffer *et al.*, 2000). With discoveries of vast reserves of natural gas in the Santos Basin in 2003 (Figure 7) the policy of using natural gas to generate electricity remains a possibility and it still will continue to have interest from private-sector investments in the Brazilian energy sector.

In power since January 2003, the new elected government decided to fully review the electricity market institutional framework. A new model for the electricity sector was approved by Congress in March 2004. The new regulatory framework for the electricity sector has the following key features (OECD, 2005):

- Electricity demand and supply will be coordinated through a "Pool" Demand will be estimated by the distribution companies, which will have to contract 100 per cent of their projected electricity demand over the following 3 to 5 years. These projections will be submitted to a new institution (*Empresa de Planejamento Energético*, EPE), which will estimate the required expansion in supply capacity to be sold to the distribution companies through the Pool. The price at which electricity will be traded through the Pool is an average of all long-term contracted prices and will be the same for all distribution companies.
- In parallel to the "regulated" long-term Pool contracts, there will be a "free" market. Although in the future, large consumers (above 10 MW) will be required to give distribution companies a 3-year notice if they wish to switch from the Pool to the free market and a 5-year notice for those moving in the opposite direction a transition period is envisaged during which these conditions will be made more flexible. These measures have the potential to reduce market volatility and allow distribution companies to better estimate market size. If actual demand turns out to be higher than projected, distribution companies will have to buy electricity in the free market. In the opposite case, they will sell the excess supply in the free market.

Distribution companies will be able to pass on to end consumers the difference between the costs of electricity purchased in the free market and through the Pool if the discrepancy between projected and actual demand is below 5 per cent. If it is above this threshold, the distribution company will bear the excess costs.

- The government opted for a more centralized institutional set-up, reinforcing the role of the Ministry of Mines and Energy in long-term planning. EPE will submit to the Ministry its desired technological portfolio and a list of strategic and non-strategic projects. In turn, the

Ministry will submit this list of projects to the National Energy Policy Council (*Conselho Nacional de Política Energética*, CNPE). Once approved by CNPE, the strategic projects will be auctioned on a priority basis through the Pool. Companies can replace the non-strategic projects proposed by EPE, if their proposal offers the same capacity for a lower tariff. Another new institution is a committee (*Comitê de Monitoramento do Setor Elétrico*, CMSE), which will monitor trends in power supply and demand. If any problem is identified, CMSE will propose corrective measures to avoid energy shortages, such as special price conditions for new projects and reserve of generation capacity. The Ministry of Mines and Energy will host and chair this committee. No major further privatizations are expected in the sector.

Although one of the new model biggest aims is to reduce market risk, its ability to encourage private investment will depend on how the new regulatory framework is implemented. Several challenges are noteworthy in this regard. *First*, the risk of regulatory failure that might arise due to the fact that the government will have a considerable bigger role to play in long-term planning should be avoided by close monitoring of new rules applicability. *Second,* rules will need to be designed for the transition from the current to the new model to allow current investments to be rewarded adequately. *Third,* because of its small size, price volatility may increase in the short-term electricity market, in turn bringing about higher investment risk, albeit this risk will be attenuated by the role of large consumers. The high share of hydropower in Brazil's energy mix and uncertainty over rainfall also contribute to higher volatility of the short-term electricity market. *Fourth,* although the new model will require total separation between generation and distribution, regulations for the unbundling of vertically-integrated companies still have to be defined. Distribution companies are currently allowed to buy up to 30 per cent of their electricity from their own subsidiaries (self-dealing). *Finally,* the government's policy for the energy sector needs to be defined within a specific sectoral framework.

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity

Investment Barrier

It is difficult to develop an accurate investment analysis in Brazil without taking into account the Brazilian Prime Rate, known as SELIC rate, as well as the CDI – Interbank Deposit Certificate that leads the short-term credit market. Real interest rates have been extraordinarily high since the Real plan
stabilized inflation in 1994.

As a consequence of the long period of inflation, the Brazilian currency experienced a strong devaluation, effectively precluding commercial banks from providing any long-term debt operation. The lack of a long-term debt market has had a severely negative direct impact on the financing of energy projects in Brazil.

Interest rates for local currency financing are significantly higher than for US Dollar financing. The National Development Bank – BNDES is basically the only supplier of long-term loans. Debt funding operations from BNDES are made primarily through commercial banks. As the credit market is dominated by shorter maturities (90-days to 01-year) there are rare long-term credit lines being made available except for the strongest corporate borrowers and for special government initiatives. Credit is, thus, restricted to the short-term in Brazil or the long-term in dollars offshore.

The longest maturity for which there is a financial domestic market varies with circumstances and the perception. In Brazil, rare were the moments in which this term was over one year and in moments of stress the duration of savings instruments contracted drops to levels close to one day by massive concentration on overnight banking deposits. Savers do not accept to hold long-term financial contracts due to the impossibility to price-in the uncertainty involved in the preservation of the purchasing power value of financial contracts over longer time periods (Arida, Bacha & Lara Resende, 2004).

The inexistence of a local long-term market results not from a lack of financial investment opportunities, but from the reluctance of creditors and savers to lengthen the horizon of their placements. It has made savers look for the most liquid form and place their money in short-term government bonds instead of investing in long-term opportunities that could finance infrastructure projects.

The most liquid government bond is the LFT (floating rate bonds based on the daily Central Bank reference rate). As of January 2004, 51.1% of the domestic federal debt was in LFTs that has duration of one day. This bond rate is almost the same as the CDI - Interbank Deposit Certificate rate that is influenced by the SELIC rate, defined by COPOM[6].

The SELIC Rate (Figure 8) has been oscillating since 1996 from a minimum of 15% p.a. in January 2001 to a maximum of 45% p.a. in March 1999.

The project was developed on a project finance basis. To finance construction, the project developer took advantage from the financing lines of BNDES. This financial support covered 80% of the project costs with a rate of TJLP (BNDES Long Term Interest Rate – 10%) plus a 5% spread risk for a term of 8-year and 1-year grace period. From this amount, 75% was obtained through the CCC[7].

With the increase of 10% due to new source of biomass and the same increase also for electricity generation and as can be seen in the worksheet FCF_BK Itacoatiara(CER) v02.xls[8], the Project was set up with an expected financial IRR – Internal Rate of Return of the 13,60% per year. The project's IRR is lower than SELIC rate even though it corresponds to a riskier investment compared to a Brazilian government bonds.

The inclusion of the revenues from CERs makes the project's IRR increase approximately 1,800 basis point from 13,60% to 31,68% (Figure 9). Such increase in return would compensate for the additional risk an investor would enter into with this project.

With the increase of 1800 basis point the CER revenues would bring the project additional benefits due to the fact that they are generated in hard currencies (US Dollar or EURO). The additional revenue allows the project investor to hedge its debt cash flow against currency devaluation. Moreover, the CER Free Cash Flow, in US dollars or EURO, could be discounted at an applicable lower interest rate, thus increasing the project leverage.

The conclusion is that the CDM incentive plays a very important role in overcoming financial barriers. Figure 9 shows the CER revenues influence in the project NPV and IRR.

Cultural Barrier

The isolated system of the city of Itacoatiara has been supplied for many years by CEAM. The diesel generators were the only source of electricity in the city.

This may also be explained by the 1973 Law # 5,899 that laid down that fossil fuel consumption rights and duties should be split by all energy concessionaires to attend electric systems or national interest. The 1993 Law # 8,631 and subsequently 1993 Decree # 774 assure financing for grid expansion and rural electrification programs through a fund managed by Eletrobras, with compulsory contributions by all concessionaires. These contributions are included in the tariffs imposed by concessionaires (GNESD, 2004). This regulatory framework made that a considerable part of fossil fuel thermoelectric generation take advantage of the CCC resources.

Despite the fact that the 1998 Law # 9,648 alters several laws of the electricity sector and, among other things, extends the benefits of the CCC to renewable energy sources capable of substituting thermoelectric generation from fossil fuels in isolated electric-power systems, as established in

[6] COPOM – Comitê de Politica Monetária (Monetary Policy Commitee)

[7] "Diesel oil consumed for electricity generation in isolated areas is subsidized through the Fuel Consumption Account – CCC (Conta Consumo de Combustível). The CCC helps to expand electricity access in isolated communities" (Goldemberg et al, 2004), and helps to minimize the difference between grid-connected and off-grid electricity rates paid by consumers. This incentive, which is effective until 2022 for isolated systems, is in place since 1973 and since 1998 was extended to isolated renewable electric power systems replacing fossil based thermoelectric systems.

[8] The worksheet is available upon request

1993 Law # 8,631 (ANEEL, 2005). The switch to a new electricity source, provided by the sawmill, has faced mistrust from the local population used to Diesel generation (for a 2004 average 82.3 MW forecasted demand in the CEAM area, Itacoatiara is the only non-diesel powered power plant; (Eletrobrás, 2004)).
They did not understand that electricity could be supplied by biomass, nor did they trust that it would be reliable.
Other cultural barrier faced by the project was the resistance of some NGOs. They did not support the project activity until they understood that the project does not promote deforestation but promotes sustainable development through integration with a fully FSC certified forestry operation, which has been specifically supported by Greenpeace and the World Wildlife Fund since inception.
The inclusion of a new source of wood waste does not impact the argument presented.

Lack of Infrastructure
The region where the project is located is an isolated and underdeveloped area. There is a lack of infrastructure such as roads, reliable electricity, communication and transport. The project sponsors had to develop some of these facilities before the implementation of the project. In addition there were no qualified personnel available in the region due to the lack of schools and universities.
The inclusion of a new source of wood waste does not impact the argument presented.

Institutional Barrier
As described above, since 1995 government electricity market policies have been continuously changing in Brazil. Too many laws and regulations were created supposedly to organize and to incentive new investments in the energy sector. Obviously the result of such unstable regulatory environment was rather the contrary. During the rationing period the prices surpassed the value of BRL 600/MWh (around USD 200/MWh) and the forecasted marginal price of the new energy was at around BRL 120 to 150/MWh (around USD 45). In the middle of 2004 however, the average price was below BRL 50/MWh (less than USD 20/MWh). The volatility of the electricity price in Brazil has a correlation with the instability in government policies in the period, with 3 different regulatory environments in a 10-year period (from 1995 to 2004). In theory the new regulatory framework has the potential to reduce market risk considerably. Nevertheless only time will prove the efficiency of the new model in relation to market risks reduction and private investment attraction[9]. In that sense, it will be interesting to evaluate the
results of the first auction of licenses for the construction of new power plants in order to correctly assess the success of the implementation of the new regulatory framework.
The inclusion of a new source of wood waste does not impact the argument presented.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives:
The alternative to the project activity was to keep the diesel based power generation at the isolated system in Itacoatiara. As the barriers mentioned above are applicable only the proposed project activity, nor there was no obstacle to keep the current situation as would be safer to maintain the status quo.

Step 4. Common practice analysis:
S***ub-step 4a. Analyze other activities similar to the proposed project activity***
In the state of Amazonas and other states in the Amazon region over 90% of the electricity is supplied with diesel generators in several isolated systems. CEAM[10], the utility company that

[9] The reform of the legal framework of the Brazilian electricity sector started with Provisional Measure No. 144, later converted into Law No. 10,848, of 15 March 2004 - was unveiled with the publication of Decree No. 5,163, of 30 July 2004.

[10] CEAM – Companhia Energética do Amazonas

generates and distributes electricity to the isolated systems in the state of Amazonas, has 88-isolated systems under its operation.
In these systems the company currently operates 368 diesel generators with 212 MW total installed capacity. In Itacoatiara alone, the biggest isolated system, the company has seven diesel generators with 21MW of installed power capacity, which nowadays operate only during the peak hours due the fact that BK Itacoatiara covers most of the demand. In 2004 CEAM generated 665.727 MWh and consumed around 200 millions liters of diesel.
There is no other project delivering electricity to an isolated grid system replacing diesel with biomass. In the vast area of the Amazon region there are many small and independent biomass boilers but none of them is delivering electricity to an isolated system, and no one is supplied with biomass from sustainable, FSC certified sources. There is no information publicly available about any company producing electricity for internal demand.
The inclusion of a new source of wood waste does not impact the argument presented.

Sub-step 4b. Discuss any similar options that are occurring
There are other wood chip fired power plants in Brazil being developed as CDM projects. They are concentrated in the South/South-East regions of the country.
However, none of these projects is switching from diesel generation in large scale and none of them is using biomass originating from sustainable, FSC certified forest management.
The inclusion of a new source of wood waste does not impact the argument presented.

Step 5 – Impact of CDM Registration
The CDM has made possible to set up a power plant and export electricity to the isolated Itacoatiara grid and switch from diesel generation. With the inclusion of a new source of wood the CDM revenues improve the project's rate of return from 13.60 % to an acceptable 31.68%, which is necessary to initiate such pioneering projects with several partners involved and to guarantee their operation in the long term. Without the prospect of CERs revenues it is very unlikely that the project would have been implemented. Despite of the huge uncertainties project owners took the risk to finance the project and counted with the CERs revenues to overcome the above described cultural, institutional and financial barriers. The registration of the proposed project activity will have a strong impact not only rewarding the belief of the project owners in the Kyoto Protocol as well as it will pave the way for similar biomass projects to be implemented in the vast area of the Amazon rainforest. It will contribute to the recognition of renewable energy supply in the Amazon and promote the sustainable and intelligent use of the forest. This recognition is confirmed by the board of the Precious Woods Group, which has already signalized the intention to mobilize further capital to secure and expand the operations based on the availability of CDM revenues for such projects in Brazil.

In the next paragraphs, it is reflected the definition and conclusions laid out in the project for the second crediting period.

According to the Procedures for renewal of the crediting period of a registered CDM project activity the reassessment of the additionality is not applicable for the 2nd crediting period, but an assessment of the validity of the baseline.

Assessment of the validity of the baseline

For the 2nd crediting period, project participants are required to check the validity of the baseline scenario with the "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" *(Annex 1 of the "Procedures for the renewal of the crediting period of a registered CDM project activity"[Annex 11, EB 46]):*

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

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

For component 1, electricity generation, the only new sectoral policy/program since validation was the Proinfa Program (Renewable resources program). Law # 10,438 dated 26/04/2002[11], created PROINFA (from the Portuguese "Programa de Incentivo às Fontes Alternativas de Energia Elétrica", in a free translation, Alternative Electricity Sources Incentive Program). Brazilian Decree # 5,025 dated 30/03/2004, which regulates the Law nr. 10,438, states that PROINFA aims for the reduction of greenhouse gases as established by the United Nations Framework Convention on Climate Change (UNFCCC) under Kyoto Protocol, contributing to the sustainable development. Therefore, the program is clearly a "Type E-" policy and does not need to be considered in accordance to Annex 3, EB 22.[12]

Additionally, the editorial of a main Brazilian newspaper, Folha de S. Paulo, commented PROINFA on 10/01/2008[13]: "Energy conservation program (Procel) and Renewable sources program (Proinfa) are little more than just "ecologically correct window dressing". There is little use from the wind energy potential in Brazilian Northeast region as well as from the energy generation with biomass (sugarcane bagasse) in Brazilian Southeast region, because of lack of regulation and compensating prices. There is a lot to be done".

Finally, information made available by CCEE (Chamber for the Commercialization of Electric Power) describing the historical evolution of the Brazilian electric power system show no changes of relevant national and/or sectoral policies and circumstances since the project registration. [14].

The assessment concludes that the current baseline complies with all relevant mandatory national and/or sectoral policies, which have come into effect after the submission of the project activity for validation.

For component 2, methane avoidance, the following regional legislation came into force after project registration (12/05/2006) and was assessed:

- Amazon State Law n° 3219, dated 28/12/2007: it regulates the environmental licensing process in the Amazonas State[15];
- Amazon Institute for environmental Protection - IPAAM (form the Portuguese *Instituto de Proteção Ambiental do Amazonas*) Normative Ruling n° 001/06, dated 28/12/2006: it regulates the polluting sources classification[16] with regards to the environmental licensing process;

[11] Available at: http://www.eletrobras.com/elb/data/Pages/LUMISABB61D26PTBRIE.htm#Legislação.

[12] Please refer to: http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid08_v02.pdf

[13] Folha de São Paulo. *Planalto sem energia*. Editorial published on 10/01/2008. Online version available for subscribers at <http://www1.folha.uol.com.br/fsp/opiniao/fz1001200801.htm>. A copy was supplied to the DOE.

[14] CCEE divides the sector history in three different stages: Former Model (until 1995); Free Market Model (1995 to 2003) and the New Model (2004). The characteristics of each model and the period of its validity is clearly defined, and the current model, established in 2004 by Laws nos. 10,847 and 10,848, dated of 15/03/2004, and by Decree no. 5,163, dated of 30/07/2004. All of these laws, which are still in power, were approved before the project's registration date – i.e. 12/05/2006. More information is available at CCEE website: http://www.elbiamelo.com.br/site/wp-content/uploads/2011/06/Paper-Brazilian-Model-Finalx.pdf

[15] Available at https://www.legisweb.com.br/legislacao/?id=243659 accessed on 06/04/2016.

[16] Available at http://www.ipaam.br/legislacao.html accessed on 11/04/2011

– Environmental Ministry - MMA (from the Portuguese *Ministério do Meio Ambiente*) Normative Ruling n°6, dated 15/12/2006: it regulates the consumption of raw material from forestry activities[17];

They do not influence the situation occurring in the baseline scenario. The prohibition of burning the wood waste in open fire (Federal Decree[18] number 2661, dated 08/07/1998) is still effective.

The assessment concludes that the current baseline complies with all relevant mandatory national and/ or sectoral policies, which have come into effect after the submission of the project activity for validation.

Step 1.2: Assess the impact of circumstances

For component 1, electricity generation, fossil fuel grid electricity is still available and operational in the region and in Brazil and there are no supply constraints[19]. There is a rising demand for energy in Brazil, which is hardly met by biomass plants. Recent energy auctions in Brazil showed the following:

- in the auction on 26/07/2007, there was in an increase of 1,782 MW into National Electric System, all from oil thermo plants[20];
- in the auction on 16/10/2007, there was in an increase of 4,353 MW into National Electric System. 69% originated from fossil fuel (oil, coal and natural gas) plants[21].
- in the alternative energy auction on 18/06/2007, 2,803 MW were qualified, but only 639 MW were negotiated[22]. It shows the lack of interest by most of the participants, due to the price and conditions presented. From the estimated 2,000 to 3,000 MW available from sugarcane bagasse plants, only 542 MW were sold.

The generation of electrical energy from wood biomass represents only 0.26% of the total generation of electricity in Brazil in 2009 (see table below).

[17] Available at http://www.ambiente.sp.gov.br/legislacao/federal/instrucoes_normativas/2006%20-%20Instru%C3%A7%C3%A3o%20Normativa%2006-2006%20rep%20florestal%20e%20consumo%20d.pdf accessed on 11/04/2011.

[18] Available at http://www.carvaomineral.com.br/abcm/meioambiente/legislacoes/bd_carboniferas/geral/in_06-2006_mma_n.pdf accessed on 06/04/2016.

[19] This can be checked against the assessment of the SIGEL (Sistema de Informaçoes Georeferenciadas do Sector Eléctrico) by the MME (Ministry of Mines and Energy).

[20] Energy Research Company - EPE (from the Portuguese *Empresa de Pesquisa Energética*). Press Release dated 26/07/2007 available at http://www.epe.gov.br/imprensa/PressReleases/20070726_1.pdf

Accessed on 10/06/2011. A copy was supplied to the DOE.

[21] Resende, T. Termelétricas Dominam leilão de energia. Article published at Folha de S. Paulo newspaper on 17/10/2007. Online copy available for subscribers at http://www1.folha.uol.com.br/fsp/dinheiro/fi1710200730.htm. A copy was supplied to the DOE.

[22] Energy Research Company - EPE (from the Portuguese *Empresa de Pesquisa Energética*). Press Release dated 18/06/2007 available at http://www.epe.gov.br/imprensa/PressReleases/20070618_1.pdf Accessed on 10/06/2011. A copy was supplied to the DOE.

Table 2: **Operating Plants, as of 19/10/2009**

Source:

Type		Installed Capacity			Total		
		Number of plants	(kW)	%	Number of plants	(kW)	%
Hydro		814	78,213,049	68.74	814	78,213,049	68.74
Gas	Natural	91	10,605,802	9.32	123	11,852,285	10.42
	Processed	32	1,246,483	1.1			
Oil	Diesel	777	3,894,983	3.42	798	5,606,177	4.93
	Residual	21	1,711,194	1.5			
Biomass	Sugarcane bagasse	278	4,358,370	3.83	339	5,872,435	5.16
	Black Liquor	14	1,145,798	1.01			
	Wood	33	295,017	0.26			
	Biogas	7	41,842	0.04			
	Rice residues	7	31,408	0.03			
Nuclear		2	2,007,000	1.76	2	2,007,000	1.76
Coal	Mineral coal	8	1,455,104	1.28	8	1,455,104	1.28
Wind		36	602,284	0.53	36	602,284	0.53
Imports	Paraguai		5,650,000	5.46		8,170,000	7.18
	Argentina		2,250,000	2.17			
	Venezuela		200,000	0.19			
	Uruguai		70,000	0.07			
Total		**2,120**	**113,778,334**	**100**	**2,120**	**113,778,334**	**100**

This trend is about to continue, as shown by the huge difference between biomass thermal plants and fossil fuel thermal plants power capacity granted by ANEEL (Brazilian power regulatory agency - Agência Nacional de Energia Elétrica), from 19/10/2009:

Table 3: Fuel used for power plant capacity granted by ANEEL

Class of fuels used in Brazil - Grants			
Fuel	Quantity	Power (kW)	%
Biomass	49	1,997,220	15.81
Fossil	94	10,590,202	83.81
Others	9	49,100	0.39
Total	152	12,636,522	100

In conclusion, electricity based on fossil fuel thermo power plants would likely to continue to be the source of electricity supplied to Itacoatiara. As presented above, biomass based thermo power plants only corresponds to 0.26% of the national electricity matrix and private investors are not motivated enough to construct new biomass power plants.

For component 2, methane avoidance, the wood waste from the sawmill would be still left for decay in an unmanaged waste site close to the mill and not being burned in open fires.

The assessment concludes that there is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions.

Step 1.3:
Assess whether the continuation of the use of current baseline equipment(s) is technically possible

The baseline equipment for Component 1 - generating electricity with Diesel generators in the local grid of Itacoatiara - is the continuation of the current practice. The remaining technical lifetime of the equipment (Diesel generators in Itacoatiara) either exceeds the crediting period for which renewal is requested or generators are replaced by generators using the same technology (electricity generation based on diesel). This technical determinates are reflected in the factors used for ER calculations according to AMS-I.D. (V17).

The baseline equipment for Component 2 – avoidance of methane emissions – is the hypothetical waste disposal site and the necessary machinery to dump and compact the waste (trucks, loaders, bulldozers). No changes occurred there.

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

For both components, some data and parameters remain; some change and some are new due to methodological changes and update of IPCC Guidelines. Where IPCC default values are used, they were updated accordingly. For parameters and values to be applied in the 2nd crediting period of the project please refer to section B.6.2.

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

Step 2.1: Update the current baseline

The baseline emissions for the second crediting period are updated in the following sections B.6.1 and B.6.3 of this PDD.

Step 2.2: Update the data and parameters

The data and/or parameter(s) for the second crediting period are updated in section B.6.2. of this PDD.

According to the Procedures for renewal of the crediting period of a registered CDM project activity the reassessment of the additionality is not applicable for the 3rd crediting period, but an assessment of the validity of the baseline.

Assessment of the validity of the baseline

For the 3rd crediting period, project participants are required to check the validity of the baseline scenario with the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of a crediting period" *version 03.0.1 (Annex 47, EB 66):*

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

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

For component 1, electricity generation, the only new sectoral policy/program since validation was the Proinfa Program (Renewable resources program) explained for the renewal of the 2nd crediting period, but ended its application on December 2011. The original date for PROINFA projects to start commercial operation was 2006. This was subsequently extended to December 2008 (rule MME 452 of 2005), December 2010 (Law 11943 of 2009), and December 011 (Law 12431 of 2011)[23].

In 2004 Brazil reformed its electricity sector (adoption of Laws 10.847 and 10.848) and started utilising energy auction system to procure electricity. The procurement system was based on load forecast. Existing and new generators are allowed to participate in the auction. Short, medium and long term electricity procurement contracts are awarded through auction process.

In 2007 system was amended in order to allow technology specific auctions specially design for renewable generators. The first technology specific auction was held in 2008 procuring electricity from biomass. The first wind auction took place in 2009.

[23] Available http://www.iea.org/policiesandmeasures/pams/brazil/name-21963-en.php?s

There are two types of auctions: new energy auctions and reserve energy auctions.

a. New energy auctions (alternative energy auctions) contract new capacity needed to meet growing electricity demand. Contracted generators have to start delivering electricity within three (marked A-3) or five years (A-5) from the auction. Usually held once a year. Contracts are awarded for period of 20 to 30 years, depending on the technology. Hydropower plants receive contract for 30 years. Wind and biomass projects receive PPAs for period of 20 years.

b. Reserve energy auctions are used to contract additional capacity on order to increase capacity reserve. This type of auction is technology specific.

Table 4: Renewable electricity auctions held in Brazil[24]

No.	Auction title and type	Date held	Technology	Awarded capacity (MW)
1	1st alternative energy auction	June 2007	Biomass	97
			Small hydro	541
2	1st capacity auction	August 2008	Biomass	1284
3	2nd capacity auction	Dec 2009	Wind	1806
4	3rd capacity auction	26 Aug 2010	Small hydro	30
			Biomass	648
			Wind	528
5	2nd alternative auction	27 Aug 2010	Small hydro	101
			Biomass	65
			Wind	1520
6	12th energy auction	Aug 2011	Wind	1068
			Biomass	198
7	4th capacity auction	Aug 2011	Wind	921
			Biomass	297
8	13th energy auction	Dec 2011	Wind	977
			Biomass	100
			Large hydro	135
9	14th energy auction	Dec 2012	Cancelled	
10	15th energy auction	Dec 2012	Wind	289
			Large hydro	294
11	5th capacity auction	Aug 2013	Wind	1500
12	16th energy auction	Aug 2013	Large hydro	400
			Small hydro	218
			Biomass	647
13	17th energy auction	Nov-13	Wind	867.6
14	18th energy auction	Dec 2013	Wind	2338
			Small hydro	308
			Biomass	162
			Large hydro	700
15	19th energy auction	June 2014		
16	6th capacity auction	Oct-14	Solar PV	890
			Wind	769
17	20th energy auction	Nov-14	Wind	926
			Biomass	611
			Small hydro	43
18	3rd alternative energy	April 2015	Wind	90
			Biomass	389
19	22nd energy auction	Aug 2015	Biomass	*pending*
			Wind	
			Natural Gas	
			Small hydro	
20	7th capacity auction	Aug 2015	Solar PV	*pending*
21	8th capacity auction	Nov-15	Solar PV	*pending*

Auctions have then been the main instrument to promote new renewable electricity in Brazil, as the government can explicitly intervene on the technologies that will be allowed to participate as supply in the auctions. Decree 5163 of 2004 provided for new capacity auctions A3 and A5, to

[24] Available http://www.iea.org/policiesandmeasures/pams/brazil/name-146121-en.php

begin power delivery respectively 3 and 5 years after contracted, and A1 auctions for existing capacity, to deliver power one year after contracted. Decree 6048 of 2007 allowed A1 to A5 auctions exclusively for renewables. New capacity auctions must be included in the PDEE, while the government has more flexibility to call for reserve and alternative energy auctions. For renewable energy auctions, specific details such as PPA duration, ceiling prices, connection requirements, etc., are determined on a technology-by-technology and auction-by auction basis.

In December 2010, Brazilian Ministry of Mines and Energy approved the new 2010-2019 Decennial Plan for Energy Expansion. Such plan implements the phasing out of fossil fuel power plants construction by 2014 and foresees major expansions in the hydro and wind grid-connected power sectors over the next ten years.

Installed capacity targets for renewable energies have been fixed as follows:

- Hydro: from 83.1 GW in 2010 to 116.7 GW by 2019.
- Small hydro: from 4 GW in 2010 to 7GW by 2019.
- Biomass: from 5.4 GW bin 2010 to 8.5 GW by 2019.
- Wind: 1.4 in 2010 to 6 GW by 20119

The 10-year plan foresees an investment package of BRL 952 billion, EUR 420.2 billion equivalent, and targets additional grid-connected electricity generation from renewable sources of 4GW by the end of 2010, 777 MW in 2011 and 2 GW in 2012. Considering the dramatic increase in domestic electricity consumption, 52% by 2019, the total share of renewable energy sources will have to increase by 13% annually with wind, biomass and hydro as front-runners[25].

Finally, information made available by CCEE (Chamber for the Commercialization of Electric Power) describing the historical evolution of the Brazilian electric power system show no changes of relevant national and/or sectoral policies and circumstances since the project registration. [26].

The assessment concludes that the current baseline complies with all relevant mandatory national and/or sectoral policies, which have come into effect after the submission of the project activity for validation.

[25] Available http://www.iea.org/policiesandmeasures/pams/brazil/name-24980-en.php?s=dHlwZT1yZSZzdGF0dXM9T2s,&return=PG5hdiBpZD0iYnJlYWRjcnVtYiI-PGEgaHJlZj0iLyI-SW50ZXJuYXRpb25hbCBFbmVyZ3kgQWdlbmN5Jnp3bmo7PC9hPjxzcGFuPiAmZ3Q7IDwvc3Bhbj48YSBocmVmPSIvcG9saWNpZXNhbmRtZWFzdXJlcy8iPlBvbGljaWVzIGFuZCBNZWFzdXJlczwvYT48c3Bhbj4gJmd0OyA8L3NwYW4+-PGEgaHJlZj0iL3BvbGljaWVzYW5kbWVhc3VyZXMvcmVuZXdhYmxlZW5lcmd5LyI-UmVuZXdhYmxlIEVuZXJneTwvYT48c3BhbiBjbGFzcz0ibGFzdCI-PC9zcGFuPjwvbmF2Pg,,

http://www.epe.gov.br/PDEE/20101129_2.pdf

[26] CCEE divides the sector history in three different stages: Former Model (until 1995); Free Market Model (1995 to 2003) and the New Model (2004). The characteristics of each model and the period of its validity is clearly defined, and the current model, established in 2004 by Laws nos. 10,847 and 10,848, dated of 15/03/2004, and by Decree no. 5,163, dated of 30/07/2004. All of these laws, which are still in power, were approved before the project's registration date – i.e. 12/05/2006. More information is available at CCEE website: http://www.elbiamelo.com.br/site/wp-content/uploads/2011/06/Paper-Brazilian-Model-Finalx.pdf

For component 2, methane avoidance, the following regional legislation came into force after project registration (12/05/2006) and was assessed:

- New Amazon State Law n° 3785, dated 24/07/2012: it regulates the environmental licensing process in the Amazonas State[27];
- Amazon Institute for environmental Protection - IPAAM (form the Portuguese *Instituto de Proteção Ambiental do Amazonas*) Normative Ruling n° 001/06, dated 28/12/2006: it regulates the polluting sources classification[28] with regards to the environmental licensing process;
- Environmental Ministry - MMA (from the Portuguese *Ministério do Meio Ambiente*) Normative Ruling n°6, dated 15/12/2006: it regulates the consumption of raw material from forestry activities[29];

They do not influence the situation occurring in the baseline scenario. The prohibition of burning the wood waste in open fire (Federal Decree[30] number 2661, dated 08/07/1998) is still effective.

The assessment concludes that the current baseline complies with all relevant mandatory national and/ or sectoral policies, which have come into effect after the submission of the project activity for validation.

Step 1.2: Assess the impact of circumstances

For component 1, electricity generation, fossil fuel grid electricity is still available and operational in the region and in Brazil and there are no supply constraints[31]. There is a rising demand for energy in Brazil, which is hardly met by biomass plants. Recent energy auctions in Brazil showed the following:

- in the auction on 26/07/2007, there was in an increase of 1,782 MW into National Electric System, all from oil thermo plants[32];
- in the auction on 16/10/2007, there was in an increase of 4,353 MW into National Electric System. 69% originated from fossil fuel (oil, coal and natural gas) plants[33].
- in the alternative energy auction on 18/06/2007, 2,803 MW were qualified, but only 639 MW were negotiated[34]. It shows the lack of interest by most of the participants,

[27] Available at

https://www.legisweb.com.br/legislacao/?id=243659 accessed on 06/04/2016.

[28] Available at http://www.ipaam.br/legislacao.html accessed on 11/04/2011

[29] Available at http://www.carvaomineral.com.br/abcm/meioambiente/legislacoes/bd_carboniferas/geral/in_06-2006_mma_n.pdf accessed on 06/04/2016.

[30] Available at http://www.planalto.gov.br/ccivil_03/decreto/d2661.htm Accessed on 10/06/2011.

[31] This can be checked against the assessment of the SIGEL (Sistema de Informaçoes Georeferenciadas do Sector Eléctrico) by the MME (Ministry of Mines and Energy).

[32] Energy Research Company - EPE (from the Portuguese *Empresa de Pesquisa Energética*). Press Release dated 26/07/2007 available at http://www.epe.gov.br/imprensa/PressReleases/20070726_1.pdf. A copy was supplied to the DOE.

[33] Resende, T. Termelétricas Dominam leilão de energia. Article published at Folha de S. Paulo newspaper on 17/10/2007. Online copy available for subscribers at http://www1.folha.uol.com.br/fsp/dinheiro/fi1710200730.htm. A copy was supplied to the DOE.

[34] Energy Research Company - EPE (from the Portuguese *Empresa de Pesquisa Energética*). Press Release dated 18/06/2007 available at http://www.epe.gov.br/imprensa/PressReleases/20070618_1.pdf Accessed on 10/06/2011. A copy was supplied to the DOE.

due to the price and conditions presented. From the estimated 2,000 to 3,000 MW available from sugarcane bagasse plants, only 542 MW were sold.

The generation of electrical energy from biomass (including firewood, sugarcane bagasse and bleach) represents only 7.6% of the total generation of electricity in Brazil in 2014 (see table below).

Table 5: Brazil Electricity Generation installed capacity (MW)

Brazil electricity generation installed capacity (MW)

	2010	2011	2012	2013	2014	Δ% (2014/2013)	Part. % (2014)	
Total	**113,327**	**117,136**	**120,974**	**126,743**	**133,913**	**5.7**	**100**	**Total**
Usinas Hidrelétricas	77,090	78,347	79,956	81,132	84,095	3.7	62.8	Hydropower Plants
Usinas Termelétricas	29,689	31,243	32,778	36,528	37,827	3.6	28.2	Thermoelectric Plants
PCH	3,428	3,896	4,101	4,620	4,790	3.7	3.6	SHP
CGH	185	216	236	266	308	15.8	0.2	CHG
Usinas Nucleares	2,007	2,007	2,007	1,990	1,990	0.0	1.5	Nuclear Power Plants
Usinas Eólicas	927	1,426	1,894	2,202	4,888	122.0	3.7	Wind Power Plants
Solar	1	1	2	5	15	200.0	0.0	Wind Power Plants

Source: EPE, Anuário Estatístico de Energia Elétrica 2015

Table 6: Brazil Electricity Generation by source (GMW)

Brazil electricity generation by source (GWh)

	2010	2011	2012	2013	2014	Δ% (2014/2013)	Part. % (2014)	
Total	**515,799**	**531,758**	**552,498**	**570,835**	**590,479**	**3.4**	**100**	Total
Gás Natural	36,476	25,095	46,760	69,003	81,075	17.5	13.7	Natural Gas
Hidráulica (i)	403,290	428,333	415,342	390,992	373,439	-4.5	63.2	Hydraulics (i)
Derivados de Petróleo (ii)	14,216	12,239	16,214	22,090	31,668	43.4	5.4	Petroleum products (ii)
Carvão	6,992	6,485	8,422	14,801	18,385	24.2	3.1	Coal
Nuclear	14,523	15,659	16,038	15,450	15,378	-0.5	2.6	Nuclear
Biomassa (iii)	31,209	31,633	34,662	39,679	44,733	12.7	7.6	Biomass (iii)
Eólica	2,177	2,705	5,050	6,578	12,210	85.6	2.1	Wind
Outras (iv)	6,916	9,609	10,010	12,241	13,590	11.0	2.3	Other (iv)

This trend is about to continue, as shown by the huge difference between biomass thermal plants and fossil fuel thermal plants power capacity granted by ANEEL (Brazilian power regulatory agency - Agência Nacional de Energia Elétrica), from 19/10/2009:

At the end of 2014[35], the Brazilian electrical energy generation matrix was comprised of:

- 62.75% from hydroelectric sources.
- 17.9% from fossil sources.
- 8.6% from biomass sources.
- 3.5% from wind sources.
- 1.4% from nuclear sources.
- 5.7% imported.

In conclusion, electricity based on fossil fuel thermos power plants would likely to continue to be the source of electricity supplied to Itacoatiara. As presented above, biomass based thermo power plants only corresponds to 7.6-8.6% of the national electricity matrix and private investors are not motivated enough to construct new biomass power plants.

[35] http://ca.practicallaw.com/8-545-7207

For component 2, methane avoidance, the wood waste from the sawmill would be still left for decay in an unmanaged waste site close to the mill and not being burned in open fires.

The assessment concludes that there is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions.

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

The baseline equipment for Component 1 - generating electricity with Diesel generators in the local grid of Itacoatiara - is the continuation of the current practice. The remaining technical lifetime of the equipment (Diesel generators in Itacoatiara) either exceeds the crediting period for which renewal is requested or generators are replaced by generators using the same technology (electricity generation based on diesel). This technical determinates are reflected in the factors used for ER calculations according to AMS-I.D. (V18).

The baseline equipment for Component 2 – avoidance of methane emissions – is the hypothetical waste disposal site and the necessary machinery to dump and compact the waste (trucks, loaders, bulldozers). No changes occurred there.

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

For both components, some data and parameters remain; some change and some are new due to methodological changes and update of IPCC Guidelines. Where IPCC default values are used, they were updated accordingly. For parameters and values to be applied in the 3rd crediting period of the project please refer to section B.6.2.

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

Step 2.1: Update the current baseline

The baseline emissions for the third crediting period are updated in the following sections B.6.1 and B.6.3 of this PDD.

Step 2.2: Update the data and parameters

The data and/or parameter(s) for the third crediting period are updated in section B.6.2. of this PDD.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

>>

Emission reductions

Emission reductions of the project activity are calculated as follows:

$$ER_y = (BE_y + BE_{CH4,SWDS,y}) - PE_y - LE_y \quad \textbf{Equation 1}$$

Where,

$BE_{y,power}$ = Baseline emissions for electricity generated by the plant and supplied to the grid in the year y (tCO_2)

$BE_{CH4,SWDS,y}$ = Yearly Methane Generation Potential of the wastes diverted to be disposed in the disposal site from the beginning of the project (x=1) up to the year "*y*", calculated according to the "Tool to determine methane emissions avoided from disposal waste at a solid waste disposal site" (tCO_2e).

PE_y = Project emissions during year *y* (tCO_2)

LE_y = Leakage emissions during year *y* (tCO_2)

Baseline emissions

For the component 1, electricity-generation:

Baseline emissions (BE_y, in tCO_2e) are determined according to paragraph 19 and 22 of the AMS-I.D. methodology "The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid". Baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. *As the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid factor.* Only net electricity exported to the local grid is taken into account. Electricity consumed from the grid by the plant is discounted from the electricity produced by the plant, which is exported to the grid.

Baseline emissions are estimated as follows:

$$BE_y = EG_{PJ,facility,y} * EF_{grid,y} \quad \textbf{Equation 2}$$

Where,

BE_y = Baseline emissions in year *y* (tCO_2)

$EG_{PJ,facility,y}$ = Quantity of net electricity that is produce and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh).

$EF_{grid.y}$ = Weight average emission factor of the current generation mix (tCO_2/MWh)

The net electricity shall be used to calculate emission reductions. Hence, the following formula is used:

$$EG_{PJ,facility,y} = EG_{Exporty} - EG_{Importy} \quad \textbf{Equation 3}$$

Where,

$EG_{Exporty}$ = Quantity of electricity generated through biomass and exported to the grid in MWh in the year y

$EG_{Importy}$ = Quantity of electricity imported from the grid in MWh in the year y – and used for the project activity.

Following paragraph 23 (b) of AMS.I-D., the emission factor will be determined as: *"The weighted average emissions (in tCO_2 /MWh) of the current generation mix. The data of the year in*

which project generation occurs must be used. Calculations shall be based on data from an official source (where available) [reference to footnote 2] and made publicly available".

As of today Itacoatiara remains an isolated city grid. The electricity supplied comes from the plant of the project activity and from other two thermo power plants fuelled with diesel oil (UTE Itacoatiara and UTE Hermasa). Therefore, the emission factor of the local electricity system is the weighted average emissions of these two plants.

Eletrobrás Amazonas Energia, which is the local power utility, supplied the monthly electricity generation and diesel oil consumption of UTE Itacoatiara and UTE Hermasa[36]. Therefore this is used to calculate the weighted average emissions of the current generation mix plus data from official sources and default IPCC values.

The "weighted average emissions" of the Itacoatiara grid consisting of the two diesel fuel plants is calculated as follows (formula from the "Tool to calculate the emission factor for an electricity system", p.15, Option A1.):

$$EF_{grid,y} = EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}} \quad \text{Equation 4}$$

Where,

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

Data used and the calculations of the emission factor are detailed below in section B.6.3.

For the component 2, methane-emissions-avoidance:

Baseline emissions (BE_y, in tCO_2e) are determined according to version 17 of the AMS-III.E. methodology by preventing the anaerobically decay of wood waste in a solid waste disposal site through controlled combustion in the thermo power plant. .

The formula used is:

$$BE_y = BE_{CH4,SWDS,y} \quad \textbf{Equation 5}$$

Where,

[36] Data supplied by Eletrobrás is confidential. In line with item 2 of footnote #2 of paragraph 23, the calculation carried out by the project participants was supplied to the DOE and the CDM-PDD only shows the resultant carbon emission factor and the corresponding list of plants.

BE_y = Baseline emissions at year "*y*" during crediting period (tCO_2e)

$BE_{CH4,SWDS,y}$ = Yearly Methane Generation Potential of the wastes diverted to be disposed in the landfill from the beginning of the project (x=1) up to the year "*y*", calculated according to the "*Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site*" (tCO_2e).

According to the above mentioned tool:

$$BE_{CH4,SWDS,y} = \varphi_y \times (1 - f_y) \times GWP_{CH4} \times (1 - OX) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_{x=1}^{y} \sum_{j} \left(W_{j,x} \times DOC_j \times e^{-k_j \times (y-x)} \times \left(1 - e^{-k_j}\right) \right)$$

Equation 6

Where,

$BE_{CH4,SWDS,y}$ = Baseline methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (tCO_2e/yr)

Φy = Model correction factor to account for model uncertainties for year y

fy = Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y

GWP_{CH4} = Global Warming Potential of methane, valid for the relevant commitment period

OX = Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)

F = Fraction of methane in the SWDS gas (volume fraction)

$DOC_{f,y}$ = Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)

MCF = Methane correction factor

$W_{j,x}$ = Amount of organic waste type j disposed/prevented from disposal in the SWDS in the year x (tonnes)

DOC_j = Fraction of degradable organic carbon in the waste type j (weight fraction)

k_j = Decay rate for the waste type j (1/yr)

j = Type of residual waste or types of waste in the MSW

X = Years in the time period in which waste is disposed at the SWDS extending from the first year in the period (x=1) to year y (x=y)

y = Year of the crediting period for which methane emissions are calculated (y is a consecutive period of 12 months)

For $W_{j,x}$, the following equation is used at the time of the project verification:

$$W_{j,x} = W_x \cdot \frac{\sum_{n=1}^{Z_x} p_{n,j,x}}{Z_x}$$

Equation 7

Where,

$W_{j,x}$ = Amount of organic waste type j disposed or prevented from disposal in the SWDS in the year x (t)

W_x = Total amount of organic solid waste disposed or prevented from disposal in the SWDS in year x (t)

$p_{n,j,x}$ = Fraction of the waste type j in the sample n collected during the year x (weight fraction)

Z = Number of samples collected during the year x

n = Samples collected in year y

j = Types of solid waste

X = Years in the time period for which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)

Leakage emissions

According to AMS-I.D. general guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues and for AMS-III.E is not required as the project activity is not mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB).

According to "Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories" potentially significant sources of leakage and project emissions for renewable biomass projects must be identified in the following situations:

A. Shifts of pre-project activities. Decreases of carbon stocks, for example as a result of deforestation, outside the land area where the biomass is grown, due to shifts of pre-project activities.

B. Emissions related to the production of the biomass.

C. Competing uses for the biomass. The biomass may in the absence of the project activity be used elsewhere, for the same or a different purpose.

A and B do not apply for this project: neither there was a shift of the pre-project activities (sustainable forest management and sawn wood production by MIL Madeiras Preciosas), nor there are additional emissions to produce the wood residues because of the project activity.

Regarding C there was no pre-project activity which used the wood residues. Sawmill MIL disposed them on a landfill and in stockpiles around the mill. However, the PP shall evaluate ex-ante if there is a surplus of biomass in the region, which is not utilised.

SEMMA (Secretaria Municipal de Meio Ambiente, the Environmental Secretariat of the Municipality of Itacoatiara) confirmed on 04/05/2016 that BK Energia Itacoatiara Ltda. is the only consumer of biomass residues produced by the saw mill MIL. In the radius of 50 km around the Project Activity there is only one company, Hermasa (approx. 50 km away) as other potential consumer of biomass residues in the region. Hermasa uses biomass residues as fuel to generate steam for its industrial processes and to generate electricity for its internal consumption. Hermasa uses own biomass and purchases biomass residues from other suppliers. Hence, there is no lack of biomass residues for the operation of the industrial plants in the city of Itacoatiara.

In conclusion: there is no leakage due to the project activity.

Project emissions

For the Component 1, electricity-generation, AMS-I.D. (V18) determines that "For most renewable energy project activities, PEy = 0" – except geothermal plants and water reservoirs of hydro electricity generation.

In addition, the methodology requires that CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*". This source of emission is considered below while calculating project emissions in the context of AMS-III.E. (Emissions through electricity or diesel consumption in the year "*y*" – $PE_{y,power}$).

For the Component 2 - avoidance of methane generation, project emissions are calculated in accordance with AMS-III.E. (V17), as follows:

$$PE_y = PE_{y,comb} + PE_{TR,m} + PE_{y,power} \quad \textbf{Equation 8}$$

Where,

$PE_{y,comb}$ = Emissions through combustion and gasification of non-biomass carbon of waste and RDF/SB in the year "*y*"(tCO_2e)

$PE_{TR,m}$ = Project emissions from transportation of freight in the monitoring period m (tCO_2e)

$PE_{y,power}$ = Emissions through electricity or diesel consumption in the year "*y*"(tCO_2e)

In the context of the proposed project activity, project emissions are related to:

- Incremental CO_2 emissions due to transportation of combustion residues and final waste from controlled burning disposal site (paragraph 17bII of AMS-III.E. and tool Project and leakage emissions from transportation of freight version 01.1.0);
- CO_2 emissions related to the fossil fuel consumed by the project activity – *i.e.* back-up diesel generators consumed during downtimes e.g. for maintenance – (paragraph 22c of AMS-III.E.). Electricity consumed from the grid during downtimes is already subtracted in the baseline calculation as only the *net electricity* is accounted for ERs.

The biomass residues used in the proposed project activity do not contain non-biomass carbon and there are no auxiliary fossil fuels used. Hence, the provisions of paragraph 22a of the methodology are not applicable and $PE_{y,comb}$ is zero.

Also incremental CO_2 emissions from incremental distances between the collection points to the project site as compared to the baseline disposal site (paragraph 22bI of AMS-III.E.) is not applicable for MIL, since the biomass residues from the sawmill are directly forwarded to the power plant using conveyor belts which use electricity produced by the plant.

The collection point is the silo within the project boundary. Therefore, project emissions by the project activity consists of the sum of $PE_{y,transp}$ and $PE_{y,power}$ which will be calculated as further detailed below.

Project emissions from transportation of freight

$$PE_{TR,m} = \sum_{f} D_{f,m} * FR_{f,m} * EF_{CO2,f} * 10^{-6}$$

Equation 9

Where,

$D_{f,m}$	=	Return trip distance between the origin and destination of freight transportation activity f in monitoring period m (km)
$FR_{f,m}$	=	Total mass of freight transported in freight transportation activity f in monitoring period m (t)
$EF_{CO2,f}$	=	Default CO_2 emission factor for freight transportation activity f (g CO2/t km)
f	=	Freight transportation activities conducted in the project activity in monitoring period m

Emissions through back-up diesel consumption of the project activity

According to the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" the emissions are calculated as follows:

$$PE_{y,power} = PE_{FC,j,y}$$ **Equation 10**

And:

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	=	Are the CO_2 emissions from fossil fuel combustion in process j during the year *y* (tCO_2/yr);
$FC_{i,j,y}$	=	Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr);
$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i	=	Are the fuel types combusted in process *j* during the year *y*

The project uses the option B, the CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type i in year *y* (tCO_2/mass or volume unit)
$NCV_{i,y}$	=	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i	=	Are the fuel types combusted in process *j* during the year *y*

B.6.2. Data and parameters fixed ex ante

This section includes a compilation of the data and parameters NOT monitored but determined upfront so as to be available for validation. Data from monitoring (e.g. measurements after the implementation of the project activity) is included in the table in section B.7.1.

For component 1 – renewable electricity generation: All data and parameters are monitored.

For component 2 – methane avoidance:

Data/Parameter	$\Phi_{default}$
Data unit	-
Description	Default value for the model correction factor to account for model uncertainties
Source of data	-
Value(s) applied	0.85
Choice of data or measurement methods and procedures	- For project or leakage emissions: $\varphi_{default}$ = 1. For baseline emissions: refer to the table below to identify the appropriate factor based on the application of the tool (A or B) and the climate where the SWDS is located. **Default values for the model correction factor** Humid/wet conditions / Dry conditions Application A: 0.75 / 0.75 Application B: 0.85 / 0.80 The climatic conditions at the SWDS site (Itacoatiara, State of Amazonas) are humid equatorial. http://www.brcactaceae.org/climate.html Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions.
Purpose of data	Calculation of baseline emissions
Additional comment	The table above is applicable to Option 1 in the procedure "Determining the model correction factor (φ_y)"

Data/Parameter	**OX**
Data unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.1
Choice of data or measurement methods and procedures	0.1 is used for managed and unmanaged solid waste disposal sites.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	**F**
Data unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5

Choice of data or measurement methods and procedures	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	DOC_j
Data unit	-
Description	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value(s) applied	0.43
Choice of data or measurement methods and procedures	The waste is wet wood waste: **Waste type *j*** / **DOC_j (% wet waste)** Wood and wood products / 43
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	$MCF_{default}$
Data unit	-
Description	Methane correction factor
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.36
Choice of data or measurement methods and procedures	As discussed in detail in section B.4, the methane correction factor for open stockpiling only is chosen in order to follow the strict conservative approach as requested by the DOE. Waste disposal procedures and methods of MIL prescribe the necessary processes to be compliant with the FSC certification standard.
Purpose of data	Calculation of baseline emissions
Additional comment	If the PP can show further evidence that the disposal practice for the wood waste in case of absence of the project activity would qualify as an "unmanaged-shallow solid waste disposal" or another type of waste disposal site as defined in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", the applied value for MCF shall be adjusted accordingly.

Data/Parameter	k_j
Data unit	1/yr
Description	Decay rate for the waste type *j*
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3).
Value(s) applied	0.02

Choice of data or measurement methods and procedures	As discussed in detail in section B.4, the decay rate k_j for open stockpiling only is chosen in order to follow the strict conservative approach as requested by the DOE. Therefore in accordance with paragraph 29 of the AMS-III.E.. (V17), the lower value from the range for the Boreal and Temperate Climate Zones provided in the IPCC 2006 Guidelines was used. If the PP can show more evidence that the disposal practice for the wood waste in case of absence of the project activity would qualify as an "unmanaged-shallow solid waste disposal" or another type of waste disposal site as defined in the Tool "Emissions from solid waste disposal site", the applied value for $\mathbf{k_j}$ shall be adjusted accordingly. The climatic conditions at the SWDS site (Itacoatiara, State of Amazonas) are MAT>=20ºC (Tropical region), MAP>1000 mm (1,923 mm/year, wet region) and PET = 1,523 mm/year (MAP/ PET >1). Information from EMBRAPA Climatologic Database of Brazil (http://www.bdclima.cnpm.embrapa.br/resultados/balanco.php?UF=&COD=6).
Purpose of data	Calculation of baseline emissions
Additional comment	

For project emissions:

Data/Parameter	$\boldsymbol{EF_{CO2,f}}$
Data unit	g CO_2/t km
Description	Default CO_2 emission factor for freight transportation activity f
Source of data	Default values from the methodological tool Project and leakage emissions from transportation of freight Version 01.1.0
Value(s) applied	245 for light vehicles (vehicles with a gross vehicle mass being less or equal to 26 tonnes) 129 for heavy vehicles (Vehicles with a gross vehicle mass being higher than 26 tonnes)
Choice of data or measurement methods and procedures	Applicable to Option B. The default CO2 emission factors take into account emissions generated by loaded outbound trips and empty return trips. The default emission factors have been obtained from two sources. For light vehicles, the emission factor was obtained from empirical data from European vehicles.4 For heavy vehicles, the emission factor has been derived based on custom design transient speed-time-gradient drive cycle (adapted from the international FIGE cycle), vehicle dimensional data, mathematical analysis of loading scenarios, and dynamic modelling based on engine power profiles, which, in turn, are a function of gross vehicle mass (GVM), load factor, speed/acceleration profiles and road gradient. The following assumptions on key parameters have been made: an average driving speed of 30 km/h, an average gradient of 1%, and a load factor attained when biomass5 is transported were assumed
Purpose of data	Calculation of project emissions
Additional comment	

B.6.3. Ex ante calculation of emission reductions

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Baseline emissions

For the component 1, electricity-generation, baseline scenario emissions corresponds to the annual electricity produced by the plant and exported to the grid ($EG_{PJ,facility,,y}$ *in MWh*) times the baseline emission factor as described in section B.6.1 with the currently available data.

Net electricity supplied to the grid will be determined as the total electricity exported to the grid by the plant discounting the total electricity consumed by the plant from the grid. Both electricity exported to the grid and consumed from the grid by the plant are monitored directly using electricity meters. For the ex-ante estimations, data from the last three years were used, resulting in 35,301 MWh/year of net electricity supplied to the local grid.

As mentioned in section B.6.1. above, as of today, Itacoatiara remains an isolated system. The local grid is supplied with electricity from two Thermo Power Plant fuelled with diesel, namely UTE Itacoatiara and UTE Hermasa.

Information regarding electricity generation and diesel oil consumption of these power plants was supplied to the project participants by the local power utility, *i.e.* Eletrobrás Amazonas Energia. The emission factor was estimated considering data from 2013-15.

Nevertheless, these data is confidential. Therefore, only the resultant carbon emission is presented in the CDM-PDD. The original information as well as the emission factor calculation spreadsheet was presented to the DOE. All default data used to estimate the emission factor (such as diesel oil density, diesel oil heating value and diesel oil emission factor) is reported in section B.7.1.

$$BE_y = EG_{BL,y} * EF_{CO2}$$

BE_y = 35,2831 * 0.768 = 27,086tCO_2e

For the component 2, baseline emissions are calculated through the Tool "Emissions from solid waste disposal sites" as described in section B.6.1 –. Parameters and data as explained in B.6.2. and B.7.1:

$BE_y = BE_{CH4,SWDS,y}$ = 201,967 tonnes of CO_2e in total at the end of the third crediting period.

Leakage emissions

As discussed above in section B.6.1, leakage is zero.

Project emissions

As described in section B.6.1, project emissions are related to incremental CO_2 emissions due to transportation of the combustion residues ($PE_{y,transp}$) and consumption of diesel for generating electricity when the power plant is down ($PE_{y,power}$). Parameters and data as explained in B.6.2.and B.7.1:

$PE_{TR,m}$ = 2.6*597*129*10^{-6} = 0.2 tCO_2/year

$PE_{y,power}$ = 70,000 (litres)* 840 (g/litres)* 43.3 (TJ/Gg)*74.8 (tCO_2/TJ) = 190 tCO_2/year

Emission Reductions

Emissions reductions are calculated applying the values and equations determined above. Please refer to the below section for the results.

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Nov/2016-Oct/2017	51,269	190.6	0	51,078
Nov/2017-Oct/2018	52,641	190.6	0	42,635
Nov/2018-Oct/2019	53,986	190.6	0	44,337
Nov/2019-Oct/2020	55,305	190.6	0	45,822
Nov/2020-Oct/2021	56,597	190.6	0	47,121
Nov/2021-Oct/2022	57,864	190.6	0	48,533
Nov/2022-Oct/2023	59,106	190.6	0	49,678
Nov/2016-Oct/2017	51,269	190.6	0	51,078
Total	**386,768**	**1,335**	**0**	**329,203**
Total number of crediting years	7			
Annual average over the crediting period	55,253	191	0	47,029

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data monitored and required for verification and issuance will be kept for two years after the end of the crediting period.

Data for component 1, renewable electricity generation

Data / Parameter	$EG_{PJ, facility,,y}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Electricity meter(s)
Value(s) applied	35,283
Measurement methods and procedures	This parameter is calculated as difference between (a) the quantity of electricity supplied by the project plant/unit to the grid; and (b) the quantity of electricity the project plant/unit from the grid. In case it is calculated then the following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid: $EG_{Export\ y}$ (b) The quantity of electricity delivered to the project plant/unit from the grid: $EG_{Import\ y}$ Project sponsors, internal control will be crosschecked with sales receipt. Data will be measured on an hourly basis and monthly recorded. Meters used to measure the electricity exported to the grid are bidirectional. Therefore, electricity consumed from the grid will also be monitored using the same meters.
Monitoring frequency	Annually calculated.

QA/QC procedures	Energy metering QA/QC procedures are explained in section B.7.2 (the equipments used have by legal requirements an extremely low level of uncertainty). As there is no any guidelines in the methodology AMS I.D version 18 or in the tool to calculate the emission factor for an electricity system version 05.0 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the next rules: Instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting - "*Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*" - equipment used to monitor this parameter will be periodically calibrated at least once in 3 years and instruction presented in the CDM project standard version 9.0, project participants or the coordinating/managing entity shall ensure that the equipments are calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used, The calibration of measuring equipments shall be carried out by an accredited person or institution. This procedure will be checked by the auditor during verification.
Purpose of data	Calculation of baseline emissions
Additional comment	The value used for *ex-ante* estimation is based on the total electricity exported to the grid during the last three years of operation of the plant in the 2nd crediting period excluding electricity consumed from the grid by the plant.

Data / Parameter	$EG_{Export\ y}$
Unit	MWh/y
Description	Quantity of **electricity export** to the grid in the year y
Source of data	Electricity meter(s)For re-validation: Monitoring reports from the 2nd crediting period
Value(s) applied	35,452
Measurement methods and procedures	Electricity supplied by the project activity to the grid. Double checked by BK's internal control and sales receipt, cf. internal procedures #4 and #5 for energy readings
Monitoring frequency	Continuously, aggregated at least monthly
QA/QC procedures	Energy metering QA/QC procedures are explained in section B.7.2, cf. internal procedures # 4 and #5. As there is no any guidelines in the methodology AMS I.D version 18 or in the tool to calculate the emission factor for an electricity system version 05.0 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the next rules: Instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting - "*Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*" - equipment used to monitor this parameter will be periodically calibrated at least once in 3 years, cf. internal procedure # 8 for the calibration of scales and power meters and instruction presented in the CDM project standard version 9.0, project participants or the coordinating/managing entity shall ensure that the equipments are calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used, The calibration of measuring equipments shall be carried out by an accredited person or institution. This procedure will be checked by the auditor during verification.

Purpose of data	Calculation of baseline emissions
Additional comment	For re-validation: Average of the monitored amount of last 3 years.

Data / Parameter	$EG_{Import\ y}$
Unit	MWh/y
Description	Quantity of **electricity import** from the grid in the year y
Source of data	Electricity meter(s)
Value(s) applied	169
Measurement methods and procedures	Meters used to measure the electricity exported to the grid are bidirectional. Therefore, electricity consumed from the grid will also be monitored using the same meters. Electricity consumed by the project activity from the grid. Double checked by BK's internal control and sales receipts. In accordance with page 13 of AMS-I.D., data will be measured on an hourly basis and at least monthly recording, cf. internal procedures #4 and #5 for energy readings.
Monitoring frequency	Continuously, aggregated at least monthly
QA/QC procedures	Energy metering QA/QC procedures are explained in section B.7.2, cf. internal procedures # 4 and #5. As there is no any guidelines in the methodology AMS I.D version 18 or in the tool to calculate the emission factor for an electricity system version 05.0 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting - "*Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*" - equipment used to monitor this parameter will be periodically calibrated at least once in 3 years, cf. internal procedure # 8 for the calibration of scales and power meters.
Purpose of data	Calculation of baseline emissions
Additional comment	For re-validation: Average of the monitored amount of last 3 years.

Data / Parameter	$EF_{grid,y}$
Unit	tCO_2e/MWh
Description	CO_2 emission factor of the grid electricity in year *y*
Source of data	As per AMS-I.D. (V18), Footnote 2, item 2 and 3: Local Utility (electricity production and diesel consumption) IPCC 2006 Guidelines (NCV, EF of Diesel) and Brazilian Energy Balance 2015 (fuel density for transforming consumption of litres in kg)
Value(s) applied	0.768
Measurement methods and procedures	The emission factor is estimated as the weighted average emissions (in tCO_2/MWh) of the current generation mix. The current mix of Itacoatiara grid is supplied with electricity produced by the CDM project power plant and by two other power plants fuelled with diesel oil, UTE Itacoatiara and UTE Hermasa. For the calculation of the emission factor the data of electricity production and diesel consumption of the 2 diesel plants connected of the isolated Itacoatiara grid are used (confidential data, disclosed to DOE and UNFCCC). NCV and EF for Diesel oil are taken from IPCC Guidelines (see monitored data below). In order to transform the diesel consumption in volume to weight, the Brazilian diesel fuel density (0.840 kg/liter) is used.
Monitoring frequency	-

QA/QC procedures	As per paragraph 23 of AMS-I.D. (V18) this parameter shall be determined using data of the year in which project generation occurs. Thus, it will be monitored.
Purpose of data	Calculation of baseline emissions
Additional comment	For emission reductions ex-ante estimations data of the three last years of the 2nd crediting period was used.

Data / Parameter	$NCV_{i,y}$
Unit	GJ per mass or volume unit (e.g. GJ/m³, GJ/ton); IPCC: TJ/Gg
Description	Weighted average net calorific value (energy content) of fuel type i in year y
Source of data	AMS I.-D. paragraph 14 requests to use the "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*". Therefore the following data sources may be used if the relevant conditions apply:
Value(s) applied	43.3
Measurement methods and procedures	AMS I.-D. paragraph 14 requests to use the "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*". For the first option of data source: Measurements should be undertaken in line with national or international fuel standards. The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For the second option: Review appropriateness of the values annually For the third option: Any future revision of the IPCC Guidelines should be taken into account
Monitoring frequency	-
QA/QC procedures	Verify if the values under option I,II and III are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in I, II and III should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	Calculation of baseline emissions
Additional comment	As I is not available, III the IPCC default is used.

Data source	Conditions for using the data source
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g. utilities)
Regional or national average default values	If values are reliable and documented in regional or national energy statistics/energy balances
IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	

Data / Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ, IPPC: $kgCO_2/TJ$
Description	CO_2 emission factor of fossil fuel type i used in power unit in year y
Source of data	AMS I.-D. paragraph 14 requests to use the "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*". Therefore the following data sources may be used if the relevant conditions apply:

Data source	Conditions for using the data source
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g. utilities)
Regional or national average default values	If values are reliable and documented in regional or national energy statistics/energy balances
IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	

Value(s) applied	74,800
Measurement methods and procedures	AMS I.-D. paragraph 14 requests to use the "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*": For the first option of data source: Measurements should be undertaken in line with national or international fuel standards. The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For the second option: Review appropriateness of the values annually For the third option: Any future revision of the IPCC Guidelines should be taken into account
Monitoring frequency	-
QA/QC procedures	For I If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options II and III should be used.
Purpose of data	Calculation of project emissions
Additional comment	As I is not available, III the IPCC default is used.

Data / Parameter	$MC_{,y}$
Unit	%
Description	Average Moisture Content of the biomass (wet basis)
Source of data	Analysis in laboratory (according to relevant international standard (ASTM)
Value(s) applied	35.92 (Measurement for 2nd crediting period)

Measurement methods and procedures	As per Clarification SSC_563, the moisture content shall be monitored on-site during the first year of the crediting period and if the project continues to use same type of biomass during the rest of the crediting period, the monitored data on moisture content referred above shall be used for the rest of the crediting period. The average will be calculated and used in the calculations [37] The MCy is determined through four samples and submitted during the first Monitoring Report of the crediting period, the samples are analized randomly from the feed-in conveyor belt of wood residues into the boiler (homogeneous quality).
Monitoring frequency	-
QA/QC procedures	The samples were sent to a qualified laboratory and measured according to relevant international standards (ASTM).
Purpose of data	**-**
Additional comment	This value is not used for calculating emission reductions but just for cross-check purposes. The value will be calculated as described above from measurements taken during 1st year of 3rd crediting period following the advise of the clarification.

Data / Parameter	$NCV_{biomass\ dry}$
Unit	GJ per mass or volume unit (e.g. GJ/m³, GJ/ton); IPCC: TJ/Gg
Description	Average net calorific value of dry biomass
Source of data	Analysis in laboratory (according to relevant international standard (ASTM))
Value(s) applied	19.3 (Measurement from April 2012 – 2nd crediting period)
Measurement methods and procedures	The NCV is determined through three samples and submitted during the first Monitoring Report of the crediting period. The average value can be used for the rest of the crediting period. BK takes three samples randomly from the feed-in conveyor belt of wood residues into the boiler (homogeneous quality). For conservative reasons the inferior value is chosen.
Monitoring frequency	-
QA/QC procedures	For plausibility check, the Value 19 MJ/kg for Deciduous Wood from the Woodfuels Handbook[38] and the IPCC default of 15.6 TJ/Gg (within a range of 7.9 to 31.0) is taken (as provided in Table 1.2, Chapter 1, Vol. 2 of the 2006 IPCC Guidelines). The IPCC Guideline shows that there is a wide range. The Woodfuels Handbook refers to European Species, thus the measured value of 19.3 is considered as plausible.
Purpose of data	**-**
Additional comment	This value is not used for calculating emission reductions but just for cross-check purposes.

For component 2 – methane avoidance:

Data / Parameter	$DOC_{f,\ y}$

[37] Even though the methodology AMS-I.D., version 18 mentions that „the weighted average should be calculated and used in the calculations", the "weighted average" is not different to the "simple average" in this given case since only one kind of biomass (wood waste) is used in the project activity.

[38] cf. http://nuke.biomasstradecentres.eu/Portals/0/D2.1.1%20-%20WOOD%20FUELS%20HANDBOOK_BTC_EN.pdf (accessed on April 3, 2012)

Unit	Weight fraction
Description	Fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5 (the value will be updated for the first monitoring report)
Measurement methods and procedures	Application B according Methodological tool Emissions from solid waste disposal sites version 07.0 $DOC_{f,y} = DOC_{f,m} = 0.7 \times \frac{12}{16} \times \frac{BMP_j}{F \times DOC_j}$
Monitoring frequency	Once before the first monitoring report. The value determined is valid during the crediting period
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	BMP_j
Unit	t CH_4/t waste
Description	Biochemical methane potential (BMP) of the residual waste type j disposed or prevented from disposal.
Source of data	Samples
Value(s) applied	Tbd in the first monitoring report
Measurement methods and procedures	Conduct a fermentation test on a sample of the residual waste that is at least 500 g in weight. The test should be undertaken according to a national or international standard, which may need to be adapted to conduct the test on a sample that is 500 g or more in weight. The duration of the fermentation test should be until no further methane is generated (indicating the complete conversion of BMP to methane). Take the average of at least three test results
Monitoring frequency	At least three samples from different batches before the first monitoring report. Once calculated, the value determined is valid during the crediting period
QA/QC procedures	According to the standard followed (or adapted) to measure BMP
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$\boldsymbol{GWP_{CH4}}$
Unit	tCO_2e / tCH_4
Description	Global Warming Potential (GWP) of methane, valid for the relevant commitment Period
Source of data	Decisions under UNFCCC and the Kyoto Protocol for second commitment period (from 1 January 2013), verified on: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
Value(s) applied	25
Measurement methods and procedures	This value is to be applied for the second commitment period of the Kyoto Protocol. Checked annually at verification
Monitoring frequency	-
QA/QC procedures	-

Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**f**
Unit	-
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data	Onsite information
Value(s) applied	0
Measurement methods and procedures	No methane has been captured at the SWDS. There are no plans to capture it. If so, measurement methods and procedures must be supplied.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	No methane has been captured at the SWDS

Data / Parameter	$\mathbf{p_{n,j,x}}$
Unit	-
Description	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
Source of data	Onsite information
Value(s) applied	1
Measurement methods and procedures	Since the project activity started, the waste has been always been 100% wood waste. The PP foresee no technical and waste changes. As requested per DOE, this parameter will be monitored during verification.
Monitoring frequency	
QA/QC procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	**Z**
Unit	-
Description	Nr of samples collected during the year x
Source of data	Onsite information
Value(s) applied	1
Measurement methods and procedures	This parameter will be monitored during verification.
Monitoring frequency	
QA/QC procedures	
Purpose of data	-
Additional comment	

Data / Parameter	$W_X = Q_{biomass,\ fresh}$
Unit	Tonnes
Description	Total amount of organic waste prevented from disposal in year x

Source of data	Scale 1 with electronic supervisory system (JC Sistemas Software), Scale 2 with weighing tickets. Calculated with on-site information
Value(s) applied	94,738
Measurement methods and procedures	Calculation only: Measurements of Scale 1 minus Measurements of Scale 2, cf. internal procedure # 1 for the elaboration of the biomass consumption. Annually calculated from monthly recordings.
Monitoring frequency	Continuously, aggregated at least annually for year x
QA/QC procedures	As there is no any guidelines in the methodology AMS III.E version 17 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the next rules: Instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting - "*Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*" - equipment used to monitor this parameter will be periodically calibrated at least once in 3 years, cf. internal procedure # 8 for the calibration of scales and power meters and instruction presented in the CDM project standard version 9.0, project participants or the coordinating/managing entity shall ensure that the equipments are calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used, The calibration of measuring equipments shall be carried out by an accredited person or institution. This procedure will be checked by the auditor during verification.
Purpose of data	Calculation of baseline emissions
Additional comment	For the methane avoidance component, only "fresh" wood waste biomass from the saw mill MIL is accounted. For re-validation: Average of the monitored amount in the 1st crediting period is used.

As the biomass contains 100% wet wood waste, no waste fractioning and sampling need to be carried out, the monitoring parameters p and z do not apply for this project. No auxiliary fuel or non-biomass is used as well, thus those parameters are not applicable.

For Project Emissions:

Data / Parameter	$FR_{f,m}$
Unit	Tonnes
Description	Total mass of freight transported in freight transportation activity f in monitoring period m: Quantity of combustion residues produced in the year *y* For re-validation: 1% of the total biomass residue consumed
Source of data	Scale 2, Toledo 820
Value(s) applied	597
Measurement methods and procedures	Per truckload
Monitoring frequency	Scale 2 will be used to weight the ashes leaving the plant. Whenever a truck leaves the plant it is weighted on the scale and the quantity of ashes will be determined subtracting the weight of the truck.

QA/QC procedures	As there is no any guidelines in the methodology AMS III.E version 17 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the next rules: Instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting - "*Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*" - the scale will be calibrated at least once in 3 years, cf. internal procedure # 8 for the calibration of scales and power meters and instruction presented in the CDM project standard version 9.0, project participants or the coordinating/managing entity shall ensure that the equipments are calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used, The calibration of measuring equipments shall be carried out by an accredited person or institution. This procedure will be checked by the auditor during verification.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$CT_{y,ash}$
Unit	Tonnes per truckload
Description	Average truck capacity for residues transportation
Source of data	Ash disposal recordings from Scale 2
Value(s) applied	8
Measurement methods and procedures	BK Energia uses its own truck to transport the combustion residues until the place of the final disposal. They are weighted before and after being loaded with the ashes for disposal. It is annually calculated for verification
Monitoring frequency	
QA/QC procedures	As there is no any guidelines in the methodology AMS I.D version 18 or in the tool to calculate the emission factor for an electricity system version 05.0 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting - "*Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*" - the scale will be calibrated at least once in 3 years, cf. internal procedure # 8 for the calibration of scales and power meters
Purpose of data	This data is not used to calculate directly the project emissions, but to identify the vehicle class used,
Additional comment	Vehicle class - This tool defines two vehicle classes based on their gross vehicle mass: (i) Light vehicles - Vehicles with a gross vehicle mass (GVM) being less or equal to 26 tonnes; (ii) Heavy vehicles - Vehicles with a gross vehicle mass (GVM) being higher than 26 tonnes;

Data / Parameter	$FC_{i,j,y}$
Unit	litres per year

Description	Quantity of diesel combusted in the backup diesel generator of BK during the year y
Source of data	Onsite measurements
Value(s) applied	70,000
Measurement methods and procedures	Quantity of diesel used is measured by the flow meter/ gauge of the pump that pumps the diesel from the tank to the engines. As the tank has no gauge to measure its content, the recorded consumption and the purchase records can differ. The difference is the diesel still stored in the tank. Use amount of diesel used if available. Otherwise the amount of purchased diesel. Annual calculation for monitoring sufficient.
Monitoring frequency	Monthly recording of Diesel use
QA/QC procedures	Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Purpose of data	Calculation of project emissions
Additional comment	Data for 2015 was taken for the purpose of re-validation.

Data / Parameter	$D_{f.m}$
Unit	Kilometre
Description	Return trip distance between the origin and destination of freight transportation activity f in monitoring period m: Average distance for residues transportation
Source of data	Onsite information
Value(s) applied	2.6
Measurement methods and procedures	Ashes generated inside the project boundary are disposed in a waste disposal site (1.3 km distance) or on farm fields (due to the fact that wood ash is a valuable organic fertilizer). The truck used with this purpose returns to the plant after depositing the ashes. In case of transporting the ash to a farm, the distance can be several kilometres. It will be measured by the mileage counter of the truck, cross-checked and correspondingly considered in the PE calculation.
Monitoring frequency	
QA/QC procedures	Cross-check the measurements done with GPS equipment and maps
Purpose of data	Calculation of project emissions
Additional comment	

EF for diesel oil and NCV: see above.

B.7.2. Sampling plan

N.A

B.7.3. Other elements of monitoring plan

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Description of the monitoring plan

For component 1, renewable electricity generation :

According to AMS-I.D., the monitoring shall consist of metering the net electricity generated by the renewable technology.

BK Energia measures continuously with an electronic supervisory system (currently SCD - from the Portuguese "Sistema de coleta de dados operacionais) the amount of electricity exported to or imported from the grid, and also electricity consumed internally and sold to sawmill MIL. The data is aggregated and recorded at least monthly. The system keeps historical data that can be accessed when necessary. The BK internal procedure determines the monitoring details.

The buyer of the electricity, at present the local utility *Eletrobras Amazonas Energia*, measures continuously the export to and import from the grid with power meters (precision class 0.2 corresponding to a maximum permissible error of +/-0.2%). According to the Brazilian legislation[39] electricity shall be metered by the utility. Therefore, the calibration of the instruments is carried out the utility. However, the BK internal procedure ensures calibration at least every 3 years to be compliant to methodology and shall be carried out by an accredited person or institution in accordance with the local/national standards, or as per the manufacturer's specifications.

Based on mutual cross-checking, BK Energia issues the invoice with the records for sold electricity. The BK internal procedure determines the monitoring details.

In the annual monitoring report the export and import is aggregated and the net electricity supply to the grid calculated. Cross-check is carried out with the invoices of sold electricity. Copies of all monthly metering reports as well as invoices are available at the project site.

The following quantity of biomass consumed is monitored (there is no fossil fuel used):

(a) wood waste from the saw mill MIL,

(b) wood waste from the forest (road clearing, harvesting) or other saw mills.

All relevant monitoring of the project is cross-checked: Electricity export is checked by the buyer and by the seller. The biomass residues used in the power plant are weighted by the buyer and checked by the seller. The measured quantity of biomass is used for cross-checking electricity generation *ex post*. Therefore the amount of biomass (adjusted with moisture content) is multiplied by the NCV of dry biomass and the efficiency of the energy generation of the plant. For comparison the metered total net electricity shall be used: the electricity exported to the grid and to the saw mill minus electricity imported from the grid (the electricity generated for the saw mill does not account for ER).

All monitored data is archived on-site and is available for verification.

The emission factor of the grid will be determined considering the electricity generated and diesel oil consumed by the plants connected to the local/regional grid as informed by the local utility. As required by the methodology, data from the period in which the electricity generated by the project plant was dispatched to the grid will be used.

For component 2, methane avoidance :

According to AMS-III.E. (V17), 38, *"The amount of waste combusted […] by the project activity in each year (Qy) shall be measured and recorded, as well as its composition through*

[39] Brazilian Electricity Regulatory Agency – ANEEL (from the Portuguese *Agência Nacional de Energia Elétrica*), Resolution #344, dated 25/06/2002. National Power System Operator – ONS (from the Portuguese *Operador Nacional do Sistema*) & Wholesale Market for Electric Power – MAE (from the Portuguese *Mercado Atacadista de Energia Elétrica*), Measurement system for electricity billing: Technical Specification (2002).

representative sampling. Sampling is not necessary, because the biomass contains 100% wood waste[40].

The measuring and recording of the biomass combusted is already described above under component 1: Scale 1 measures and records all biomass entering the silo of BK Energia. It is aggregated annually in the monitoring report.

However, for methane avoidance only the biomass can be accounted which is wood waste from the saw mill MIL. This waste would be otherwise left for anaerobic decay in a solid waste disposal site. The other wood waste coming from the forest (road clearing, harvesting) would be otherwise left for aerobic decay in the forest. If it originates other saw mills, the waste disposal scenario is unknown and thus not accounted here. Hence, the biomass coming from the outside by truck is weighed on the Scale 2, which is designed for this purpose. Data is recorded and stored. Scale 2 is also periodically calibrated at least every three years[41] to ensure the correct measurement.

Finally, for methane avoidance the amount of biomass from the sawmill MIL will be determined as the difference between the total biomass entering the boiler (scale 1) and the total biomass from external sources (scale 2).[42].

According to the tool "Emissions from solid waste disposal sites" (version 07.0), monitoring involves an annual assessment of the conditions at the SWDS where the waste is disposed or prevented from disposal. No gas from the SWDS is being captured and flared or combusted.

In addition, as the project activity is processing mainly newly generated biomass wastes, paragraph 40 of AMS-III.E. applies. The project participants demonstrate annually, through the assessment of common practices at proximate waste disposal sites, what percentage of the amount of waste combusted in the project activity facility would have been disposed in a solid waste disposal site without methane recovery in the absence of the project activity and would decay anaerobically in the disposal site throughout the crediting period.

For the project emissions:

According to AMS-III.E. (1) the quantity of combustion residues ($Q_{y,ash}$), (2) average truck capacity ($CT_{y,ash}$), (3) electricity generated by backup diesel ($EC_{PJ,y}$) shall be monitored as sources of project emissions.

The total quantity of the combustion residues (wood ash) transported from the project site to its final disposal site is measured using scale 2 and recorded. For monitoring, the total quantity is aggregated annually as well as the average truck load.

The quantity of electricity generated by the backup diesel generators for BK is determined either by electricity meter, by monitored hours or by the quantity of diesel consumed (and then calculated).

[40] Only fresh processed biomass (wood chips and sawdust) is used as fuel, no rotting biomass. Rotting biomass has distinctive colour and odour and, if found in any delivered load, the whole load is not accepted and disposed.

[41] As there is no any guidelines in the methodology AMS I.D version 18 or in the tool to calculate the emission factor for an electricity system version 05.0 or in the general guidelines for SSC CDM methodologies version 22.0 about the period of calibration, the parameter will follow the instructions presented in the Annex 14 of the 54th CDM Executive Board Meeting "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories".

[42] This is in line with the EB recommendations related to the request for deviation raised in the context of the last verification of the first crediting period (I-DEV0332).Available at http://cdm.unfccc.int/Projects/deviations/40206.

All necessary procedures to monitor emission reductions and any project emissions generated by the project activity are actually part of the business-as-usual procedures of the project, therefore no extra operational and management structures are necessary.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

01/11/2002

C.2. Expected operational lifetime of project activity

25y-0m

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable crediting period

C.3.2. Start date of crediting period

01/11/2016 – starting date of the third crediting period

C.3.3. Duration of crediting period

7y-0m

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The proponent of any project that involves the construction, installation, expansion, and operation of any polluting or potentially polluting activity or any activity capable of causing environmental degradation is required to secure a series of permits from the respective state environmental agency. In addition, any such activity requires the preparation of an environmental assessment report, prior to obtaining construction and operation permits. Such a report containing an investigation of the following aspects was prepared:

- Impacts to climate and air quality.
- Geological and soil impacts.
- Hydrological impacts (surface and groundwater).
- Impacts to the flora and animal life.
- Socio-economical (necessary infra-structure, legal and institutional, etc.).

The sawdust and the wood chips residues were a problem to Mil Madeiras Preciosas and to the city of Itacoatiara. In 1997 the Federal Decree number 2661 prohibited the open burning of wood waste and Mil Madeiras Preciosas had to stop burning the residues. Since then, the company had started to store the residues in the stockpiles. This resulted in the accumulation of wood waste and the emission of methane.

Additionally, from the implementation of the power plant, the main environmental impacts identified were particulate matter emissions and wastewater management.

The implementation of the biomass power plant, in 2002, solved two problems for the city. One, switching the diesel generation and other, eliminating the huge stockpiles left to decay. To mitigate the main environmental impacts identified a multi-cyclone was installed to reduce particulate matter emissions and these emissions are periodically monitored and compliant to legal standards. A wastewater treatment was built to mitigate wastewater impacts and these impacts are also monitored and compared with legal standards.

BK Energia Itacoatiara Ltda. has the authorization issued by ANEEL to operate as an independent power producer (resolution number 425, 15/10/2001). Also the company possesses the necessary environmental permits. The Operation License (LO number 355/02-05) was renewed in 03/02/2009, by the environmental institute from the state of Amazonas (IPAAM – Instituto de Proteção Ambiental do Amazonas). The permit is renewed (Operation License N° 355/02-08, issued by IPAAM to BK Energia Itacoatiara Ltda on 28 August 2015 and valid for 1095 days (3 years). Corresponding evidence was forwarded to the DOE.

D.2. Environmental impact assessment

An Environmental Control Plan was conducted in June of 2002 before commissioning phase.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

Following the law established by IPAAM, BK Itacoatiara has published a call in a local newspaper informing that it had obtained the Construction License (LI, from the Portuguese Licença de Instalação). The public call was published on Local Newspaper, Diário do Amazonas on 10/12/2004.

Besides the stakeholders comment request required to obtain the environmental licenses, the Brazilian Designated National Authority for the CDM (“Comissão Interministerial de Mudanças Globais de Clima”), under other requirements, demands the translation of the PDD into Portuguese, the compulsory invitation of selected local stakeholders, the validation report issued by an au DOE (CIMGC resolution number 1, 11/09/2003), under other requirements, in order to provide the letter of approval.

At that time, the proponent of the project sent these letters to the stakeholders in order to invite their comments while the PDD of the project was open for comments in the validation stage in the United Nations Framework Convention on Climate Change.

A stakeholder feedback round was conducted in February and March 2011 in conjunction with the corresponding Gold Standard Registration of the project activity.

For the renewal of the crediting period this procedure is not applicable

E.2. Summary of comments received

Brazilian DNA for the CDM requests project activities to be open for comments prior to validation. Thus, in addition to UNFCCC global stakeholders comments process this project was open for inputs from local stakeholders at the same time. No comments were received.

In order to renewal the crediting period of the proposed CDM project activity it is not required that project proponents carry out a new consulting process. No comments were received during the Gold Standard stakeholder feedback round conducted in February and March 2011. The results can be verified in the Gold Standard Passport of the project activity.

E.3. Consideration of comments received

For renewal of the crediting period it is not required that PPs carry out a new consulting process

SECTION F. Approval and authorization

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Appendix 1. Contact information of project participants

Organization name	BK Energia Itacoatiara Ltda.
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Contact person	Mr. Martin Jenk

Appendix 2. Affirmation regarding public funding

Appendix 3. Applicability of methodologies and standardized baselines

Appendix 4. Further background information on ex ante calculation of emission reductions

Appendix 5. Further background information on monitoring plan

Appendix 6. Summary report of comments received from local stakeholders

Appendix 7. Summary of post-registration changes

There is some changes in the procedures of measurements for parameters MC_y (average moisture content of the biomass -wet basis) and $NCV_{biomass\ dry}$ (average net calorific value of dry biomass), the number of samples are below as proposed, but have not a direct effect in the GHG emission reductions and only are been used for crosschecking.

The explanation is based on the paragraphs 238 and 239 of the CDM standard for project activities version 02.0

The parameter MC_y (average moisture content of the biomass -wet basis) is not measured as described in PDD, one sample per month (= 12 samples in total), but BK took three samples (during the months of January, February and March 2018) randomly from the feed-in conveyor belt of wood residues into the boiler (homogeneous quality) instead of 12 samples. The nature of the non-conforming monitoring is the less number of samples collected for parameter MC_y during 2018, but it does not mean the reduction of quality of data as the value found keep relation with the laboratory tests performed in the previous crediting period. In addition, the extent in the non-conforming monitoring is only for crosschecking purposes; there is no an impact in emission reductions calculated. The parameter MC_y is used to estimate the theoretical efficiency of the biomass used and electricity generated and there is no impact in the emission reductions calculation.

The laboratory tests were conducted for the parameter MC_y but the change is about the number of samples gathered, 3 instead of 12, but results of the tests (36.00%) are similar as the ones conducted in 2nd crediting period (35.92%). As it is explained in the PDD the value of the parameter is only used for a cross-check and not for emission reduction estimation.

According the appendix ‘Indicative list of post-registration changes that may be suitable for approval under the issuance track of the CDM standard for project activities version 02.0’ the deviation fall under:

(c) Changes to the monitoring of a registered CDM project activity that have no material impact on the applicability of the applied methodologies or the other applied methodological regulatory documents, or the accuracy and completeness of the monitoring.

→ *The reported GHG emission reductions are free from material errors, omissions or misstatements as the change in the number of samples for the parameter MC_y does not affect the emission reduction estimation.*

(d) Changes to the project design of a registered CDM project activity that does not adversely impact any of the following:

(i) The applicability and application of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents with which the project activity has been registered;
(ii) The additionality of the project activity;
(iii)The scale of the project activity

→ *The methodology has been apply as written in the PDD, the change only affects a parameter that is use for crosscheck and the values found in the samples collected are roughly the same as calculated in second crediting period.*
The additionality has not been affect as the same procedures has been follow, no change in factors that change the evaluation of the additionality has been produced.
The scale of the project activity is the same; the change in the number of samples collected does not affect the scale of the project.

To follow conservative assumptions or discount factors, it is used as reference the paragraph 231 point b.ii) of the Standard CDM project standard for project activities (version 02.0), a 10% will be discounted for the values collected with the laboratory test. The value used for this parameter is 32.40%, despite there is no impact in the emission reductions calculation; it is used to crosscheck the theoretical efficiency of the electricity generated using biomass.

The parameters $NCV_{biomass\ dry}$ (average net calorific value of dry biomass) is not measured as described in PDD, 3 samples are measured quarterly (thus 12 values in total), but BK took four samples (in May 2018) randomly from the feed-in conveyor belt of wood residues into the boiler (homogeneous quality) instead of 12. The nature of the non-conforming monitoring is the less number of samples collected for parameter $NCV_{biomass\ dry}$ during 2018, but it does not mean the reduction of quality of data as the value found keep relation with the laboratory tests performed in the previous crediting period. In addition the extent of the non-conforming monitoring is only for crosschecking purposes, there is no an impact in the emission reductions calculated as it depend on other parameter monitored. The parameter $NCV_{biomass\ dry}$ is used to estimate the theoretical efficiency of the biomass used and electricity generated and there is no impact in the emission reductions calculation.

The laboratory tests were conducted to the parameter $NCV_{biomass\ dry}$ but the change is about the number of samples gathered, 4 instead of 12, but results of the tests (19.05) are similar as the ones conducted in 2nd crediting period (19.30). As it is explained in the PDD the value of the parameter is only used for a cross-check and not for emission reduction estimation.

According the appendix 'Indicative list of post-registration changes that may be suitable for approval under the issuance track of the CDM standard for project activities version 02.0' the deviation fall under:

(c) Changes to the monitoring of a registered CDM project activity that have no material impact on the applicability of the applied methodologies or the other applied methodological regulatory documents, or the accuracy and completeness of the monitoring.

→ *The reported GHG emission reductions are free from material errors, omissions or misstatements as the change in the number of samples for the parameter* $NCV_{biomass\ dry}$ *does not affect the emission reduction estimation.*

(d) Changes to the project design of a registered CDM project activity that does not adversely impact any of the following:

(i) The applicability and application of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents with which the project activity has been registered;
(ii) The additionality of the project activity;
(iii)The scale of the project activity

→ *The methodology has been apply as written in the PDD, the change only affects a parameter that is use for crosscheck and the values found in the samples collected are the roughly same as calculated in second crediting period.*
The additionality has not been affect as the same procedures has been follow, no change in factors that change the evaluation of the additionality has been produced.
The scale of the project activity is the same; the change in the number of samples collected does not affect the scale of the project.

To follow conservative assumptions or discount factors, it is used as reference the paragraph 231 point b.ii) of the Standard CDM project standard for project activities (version 02.0), a 10% will be discounted for the values collected with the laboratory test. The value used for this parameter is 17.14, despite there is no impact in the emission reductions calculation; it is used to crosscheck the theoretical efficiency of the electricity generated using biomass.

This is the first post registration change request for the third crediting period.

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Document information

Version	*Date*	*Description*
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).

Version	*Date*	*Description*
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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