Programme design document form
for CDM programmes of activities
(Version 03.0)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

(a) Title of the proposed PoA:	Biomass residues power generation Programme
(b) Current version number of the PoA-DD:	1.4
(c) Date the PoA-DD was completed:	30/07/2013

A.2. Purpose and general description of the PoA

General operating and implementing framework of the proposed PoA

The Biomass residues power generation Programme (hereafter referred to as "the PoA") aims to promote and support the implementation, replacement or retrofit of power-and-heat plants, utilizing biomass residues[1] as primary fuel. Extra electricity is likely to be exported into the electrical distribution grid, displacing the equivalent power generated from a fossil-fuel intensive baseline energy mix.

To assist project developers to invest in and/or to implement biomass residues power-and-heat plants, Standard Bank Plc has developed the PoA under which individual projects could join as a Component Project Activities (CPA). The PoA mainly provides a platform for overcoming institutional, financial and structural hurdles for the development of biomass-residue (co-)fired power-and-heat projects.

Standard Bank Plc is the coordinating and managing entity (CME) for this PoA. Standard Bank Plc or any of its affiliate will act as the Programme Manager and will assess project activities before submission to the DOE for CPA inclusion.

In quality of programme manager, it will be the responsibility of the CME to:

- design the overall program,
- develop and manage an appropriate operational structure for the PoA,
- provide support and guidance to all stakeholders,
- enforce compliance of the technology and the CPA(s) of potential independent implementers with PoA requirements,
- act as a liaison with Designated National Authority, Designated Operational Entities, and the CDM Executive Board,
- be responsible for data consolidation, overview and auditing of monitoring activities,
- monetize the carbon credits generated by the PoA,
- oversee all institutional communication regarding this PoA.

Standard Bank Plc will enter into a contractual agreement with each CPA implementer, giving Standard Bank Plc the legal rights to deal with the carbon credits that will be generated from these projects and monitor the project implementation and all necessary parameters that are required for the calculation of emission reductions from each CPA. The conditions for participation shall be in line with the eligibility

[1] Biomass residues is the biomass that is a by-product, residue or waste stream from agriculture, forestry and related industries (e.g. sugar cane fibre, including tops or leaves, sawmill waste). This shall not include municipal waste or other waste that contain fossilized and/or non-biodegradable material (however, small fractions of inert inorganic material like soil or sands may be included).

criteria of the projects for inclusion in the PoA and shall be elaborated in the agreements between Standard Bank Plc and the project developers or other entities.

Policy/measure or stated goal that the PoA seeks to promote

The stated goal of the PoA is the promotion and support of the implementation, replacement or retrofit of power-and-heat plants, utilizing biomass residues as primary fuel.

South Africa is endowed with abundant biomass residues existence from agribusiness industries, with a significant potential for power-and-heat plants implementation, replacement or retrofit in order to increase the levels of power and heat generation from renewable resources in the country. Still, to date the main energy resource in South Africa is coal, which contributes about 88% of the country's total electricity. However, the country recently experienced a decrease in its reserve margin, which forced it to embark on a number of interventions in early 2008. In some instances, load shedding had to be used as the last resort in order to prevent a system-wide blackout. (Odhiambo, 2009)

Emissions from the power sector amounted to 222 million tons of CO_2 in 2007, which ranked South Africa as the eighth country with the highest CO_2 emitting power sector worldwide. Eskom, the country's electricity public utility, operates 3 of the top-25 highest CO_2 emitting power generating plants in the world. (Center for Global Development, 2007)

South Africa's renewable energy policy to date has largely been driven by a 10,000 GWh target by 2013 and renewable energy project subsidies offered through the REFSO[2]. In March 2009 a Renewable Energy Feed-In Tariff was published (National Energy Regulator of South Africa, 2009), which has resulted in a great interest by Independent Power Producers to develop renewable energy projects in South Africa[3]. Nonetheless, under existing renewable energy policy few renewable energy projects for electricity generation have been deployed. (Edkins, Marquard, & Winkler, 2010)

Therefore as mean to durably enhance biomass-to-power practices in South Africa, this Programme of Activities will enable biomass-residue producers/owners to realize biomass-to-power projects and lock additional revenues by entering into an agreement with CME and including their expected facilities as CDM Project Activities under the PoA framework. Emissions from fossil-fuel combustion and/or carbon-intensive grid power generation will be avoided by recovering biomass residues for utilization in power-and-heat plants which would not be implemented/replaced/retrofitted in the absence of the proposed PoA.

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

The proposed PoA undertaken by Standard Bank Plc is a voluntary action since no laws or regulation in South Africa obligates the generation of power and heat from biomass residues.

The PoA meets the South Africa Sustainable Development requirements as published by the DNA (South Africa DNA, 2004).

SD criteria	Sustainable development requirements	PoA Responses
Social	Does the project contribute to social development in South Africa?	CDM Project Activities included under this PoA will generate additional employment opportunities throughout South Africa with a focus on local communities. Moreover by contributing to renewable energy generation in South Africa, this PoA will serve the improvement of quality of life of the South African people

[2] Renewable Energy Fund Subsidy Office

[3] The tariffs for wind energy and concentrating solar power are among the most attractive worldwide, but biomass energy do not qualify under the REFIT guidelines yet.

		currently confronted with a national shortfall, including electrification opportunities in rural areas.
Economic	Does the project contribute to national economic development?	This PoA will enable power-and-heat plants to be developed or expanded throughout South Africa and help creating an additional revenue stream within the national agro-industry, especially in rural area. Foreign exchange requirements are likely to be reduced because of fossil fuel imports reduction, which will also decrease the cost of energy. Besides, the PoA will enable technology transfer to South Africa by involving world-class power-and-heat equipments and skills to be durably set up locally and replicable throughout the programmatic approach.
Environment-al	Does the project conform to the National Environmental Management Act principles of sustainable development?	The proposed PoA is desirable in that it will aid in addressing the current electricity supply constraints in South Africa. This type of electricity generation facility is more environmentally friendly than the coal-derived power currently serving much of the regional electrical distribution grid. Coal-derived power plants tend to emit more harmful gasses, such as sulphur dioxide and nitrogen oxides, and are more carbon-intensive, as well as being unsustainable in the long-term. The PoA will promote the recovery and utilization of biomass residues currently abandoned or incompletely tapped (e.g. “green harvesting” amongst certain sugar cane growers/suppliers, decreasing the burning of sugar cane and associated environmental impacts).
General acceptability	Is the distribution of benefits reasonable and fair?	In the light of the above, CDM Project Activities included under this PoA will bring benefits to both the participating companies and the local communities involved, as well as global benefits at the national level.

A.3. CMEs and participants of PoA

1. Coordinating or managing entity of the PoA as the entity which communicates with the Board

The entity that manages and oversees communication with the Designated Operational Entity, the UNFCCC secretariat and the Executive Board is Standard Bank Plc.

Standard Bank Plc is a bank authorised and regulated by United Kingdom Financial Services Authority providing a range of banking and related financial services. It is a member of the London Stock Exchange, the London Bullion Market Association, the London Metal Exchange, the London Platinum and Palladium Market and is Chairman of the London Platinum and Palladium Fixing and has two seats on the New York Mercantile Exchange (COMEX Division). The franchise of Standard Bank Plc and its subsidiaries focuses on emerging markets - primarily debt, interest rate, equity and currency products and natural resources.

2. Project participants being registered in relation to the PoA

Standard Bank Plc is the only project participant being registered in relation to the PoA.

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants(as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)

Republic of South Africa (host)	Standard Bank Plc (Private entity)	No

A.5. Physical/ Geographical boundary of the PoA

The boundary of a PoA is defined as the geographical area within which all the CPAs included in the PoA will be implemented. The geographical boundary of the PoA will cover all provinces of South Africa.

Figure 1: *Global location of the PoA (source: United Nations Cartographic Section)*

The boundary of the programme may be amended post-registration to include additional other countries. As per EB60/Annex 26, in expanding the PoA to other countries the following three conditions will be met:

- The existing registered PoA design document (POA-DD) will be revised to reflect the changes, in particular, the eligibility criteria for inclusion of CPAs;
- A designated operation entity (DOE) will confirm that the baseline established in the POA- DD is applicable to the extended programme boundary; and
- The DNA of the new Host Party issues a letter of approval for the programme and a letter of authorization for the co-ordinating and managing entity.

A.6. Technologies/measures

The technology or measures to be employed by each CPA fall into Sectoral Scope 1: Energy Industries (renewable sources) as it concerns the implementation, replacement or retrofit of biomass-residue (co-) fired power-and-heat plants.

A typical CPA will consist in processing biomass residue for the generation of process heat and electricity through boilers and turbo-alternators. Excess of electricity may be exported into the electrical distribution grid of South Africa.

Power-and-heat plants encompass two broad categories of power plants:

1. cogeneration plants (power-and-heat plant in which at least one heat engine simultaneously generates both heat and power) and

2. plants in which heat and power are produced at the same installation although not necessarily in cogeneration mode, e.g. heat is extracted directly from a common heat header that also supplies heat to heat engines for power generation.

These two possible configurations may employ different technologies of thermal energy and electrical energy under various arrangements, with biomass residues as primary fuel.

Thermal energy:

Boilers

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

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

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

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

Heaters

The biomass fired heaters consist of thermic fluid / thermal oil heaters, pressurized and non-pressurized hot water generators, which work on closed loop pipe line system, for transferring the thermal energy indirectly, to the process through a heat transfer medium like thermic fluids / thermal oil or pressurized / non pressurized water.

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

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

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

The heaters are designed with a single / two or multi flue pass design, with furnaces having forced / induced / balanced draught, as per model and capacity and biomass fuel properties.
The type of heater and the capacity and range vary according to the user's requirement and choice. The biomass fuels are burnt in the combustors or furnaces of the heaters. The furnaces are lined fully or partly with refractory material. The combustion system of the heaters is similar to the boilers.

Electrical energy:

Turbines

When steam is used for electrical energy generation using steam turbines, two energy conversions are involved: converting the thermal energy of the steam into kinetic energy in the turbine and using a rotary generator to convert the turbine's mechanical energy into electrical energy.

A steam turbine consists of one or more rotors (rotating discs) mounted on a drive shaft, alternating with a series of stators (static discs) fixed to the turbine casing. The rotors have a propeller-like arrangement of blades at the outer edge.

Steam acts upon these blades, producing rotary motion. The stator consists of a similar, but fixed series of blades that serve to redirect the steam flow onto the next rotor stage. A steam turbine often exhausts into a surface condenser that provides a vacuum. The stages of a steam turbine are typically arranged to extract the maximum potential work from a specific velocity and pressure of steam, giving rise to a series of variably sized high and low pressure stages. An alternator/generator will be determined case by case according to the requirement for each CPA.

Each CPA will feature state-of-the-art monitoring equipment while the staff involved will be trained to properly operate, maintain and calibrate the monitoring system. Detailed technical description of the CPA installations and monitoring system is to be provided in each CPA-DD.

A.7 Public funding of PoA

The PoA does not expect to involve any public funding according to the OECD definitions for Official Development Assistance (ODA).

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

According to the Standard for *Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (EB 74, Version 03.0):

- *Additionality shall be demonstrated by establishing that in the absence of CDM PoA, none of the implemented CPAs would occur.*
- *PoAs that consist of one or more large scale projects as CPAs shall include eligibility criteria derived from all the relevant requirements contained in the additionality section of the large scale methodologies.*
- *The CME shall demonstrate that compliance with the additionality-related eligibility criteria set in the PoA design document will ensure that all the relevant additionality-related guidelines, tools or any requirements embedded in the methodologies are met.*

Barriers faced by the proposed PoA

Policy barriers

A recent Renewable Energy Barriers assessment for South Africa released by an Open Climate Network partner has highlighted how shifting policies stall South Africa's renewable energy growth (Pienaar, 2011).

As long ago as 2003, government committed to increase the contribution of renewable energy in meeting the country's growing energy needs, but has only relatively recently introduced a number of policy initiatives to promote the use of renewable sources for energy generation.

The Integrated Resource Plan of 2010, for example, increased its target for electricity production from renewable energy sources to 17.8 GW by 2030 following public consultations[4]. Many analysts question the ambition of this target[5], which would represent less than 10% of projected 2030 electricity demand. Ensuring that it is met (if not exceeded) will depend on finalizing and making operational a feed-in tariff and associated procurement rules, a process which has been repeatedly stalled over the last two years.

The Renewable Energy Feed-In Tariff (REFIT) guidelines, issued by the National Energy Regulator of South Africa (NERSA) in March 2009, were designed to "kick start and stimulat[e] the renewable energy sector" in South Africa. As elsewhere, REFIT essentially would pay a guaranteed fixed rate for a prescribed number of years to renewable energy generators for supplying electricity to the power grid, thus promoting the creation and sustainability of renewable energy (RE) providers and technology. However, REFIT has encountered several barriers to implementation:

- Wariness of utility monopoly, as a result of the conflict of interest apparent in Eskom's position as the national utility and its role as buyer of electricity from IPPs.

- Shifting policies and regulations, contributing to investor uncertainty: since the Electricity Regulations on New Generation Capacity promulgated in August 2009, initially sought to build confidence among potential RE independent power producers by clarifying the roles and authority of sector actors, NERSA announced early 2011 its intention to review and probably decrease the tariffs set in March 2009, even though no power had yet been purchased at these initial rates. This latest shift in a long history of policy u-turns by government and state agencies, also complicates the streamlined REFIT approach by reintroducing doubts about the identity of the buyer, and introducing extensive Ministerial discretion to the process of determining which power procurement projects would be prioritised, once again shaking investor confidence.

- Legal challenges to REFIT's bidding process, as the DoE and Treasury have expressed concern that the REFIT may not be legally compliant with government procurement rules. They have reportedly also indicated that they did not want to repeat some financial errors associated with REFIT programs in other countries.

Other barriers likely to be faced at CPA level

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice

- Given the barriers outlined above it is possible to state that in the absence of CDM, none of the implemented CPAs would occur. Therefore the proposed Programme of Activities is additional. CPA-specific additionality demonstration will however be undertaken at CPA level.

[4] Electricity Regulations on the Integrated Resource Plan 2010-2030 Regulation Gazette No. 9531 GG No. 34263 6 May 2011

[5] Experts opinion expressed in Daily Maverick on May 24, 2011 (http://dailymaverick.co.za/opinionista/2011-05-24-green-energy-nipped-in-the-bud)

Assessment of applicable laws and regulations

Table 1: *Assessment of applicable laws, regulations and policy*

Laws, policies and incentives applicable to power-and-heat from biomass residues, if any	Relevant extracts	Interpretation with regards to the proposed PoA
National Climate Change Response White Paper , 2011	*The White Paper aims to facilitate management of future climate impacts, as well as to promote, and contribute to, the stabilization of the greenhouse gasses (GHG) present in the atmosphere.*	This white paper is relevant to the proposed PoA, as the project activities would aid the sustainable development of the local sugar industry and displace some of the coal-derived power which services much of South Africa.
Integrated Resource Plan, 2010	*The installation of renewables (solar PV, CSP and wind) has been brought forward in order to accelerate a local industry.* *7.12 Further research is required on a number of potential technology options, including:* *3. Biomass (including municipal solid waste and bagasse)*	The latest Policy-adjusted IRP model's disaggregation of renewable energy technologies only explicitly displays solar PV, CSP and wind options, with no immediate commitment for biomass based technologies which 2020 levelised costs is foreseen as more expensive.
Renewable Energy Feed-In Tariff (REFIT) guidelines, 2009	*5. Renewable Energy Power Generator Qualification Criteria* *5.2. A Qualifying Renewable Energy Power Generator shall be defined as new investments in electricity generation using the following technologies:* *i. Landfill gas power plant;* *ii. Small hydro power plant (less than 10MW);* *iii. Wind power plant;* *iv. Concentrating Solar Power (CSP) plant.* *5.3. Qualification of other renewable energy technologies will be considered for inclusion in six months time.*	Biomass energy, although mentioned as part of South Africa's "largely unexploited valuable national resources", did not qualify in the REFIT when promulgated 3 years ago and has not been included yet.
National Environmental Management Act, 1998	*2.(4)(a)(iv) Sustainable development requires the consideration of all relevant factors - including that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;*	These general environmental governance framework edicts decision-making principles on matters affecting the environment, but does not explicitly refer to any type of renewable or non-renewable resources, let alone bio-residues promotion for power and heat.

As reviewed through existing laws and regulations, power-and-heat generation from biomass residues is not mandatory, thus the proposed PoA is a voluntary coordinated action from the CME to promote the implementation, replacement or retrofit of power-and-heat plants in South Africa.

Additionality will be demonstrated at CPA level, following the methodological requirements for the *Selection of the baseline scenario and demonstration of additionality* step-wise approach as follows:

- Identification of alternative scenarios;
- Barriers analysis; and/or
- Investment analysis
- Common practice analysis.

Nonetheless, it can be outlined that such voluntary coordinated action would not be implemented in the absence of the PoA except in another PoA or a stand-alone CDM project, given the barriers highlighted above which are also likely to be faced at CPA level's specific circumstances. As required in eligibility criteria (f) of the below section, any compliant CPA will necessarily meet the relevant additionality-related guidelines, tools or methodological requirements applicable.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

According to the Standard for *Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (EB 74, Version 03.0), the eligibility criteria for inclusion of a CPA in the PoA is specified in Table 2.

Table 2: *Eligibility criteria for CPA inclusion in the proposed PoA*

Eligibility criteria		
Category	**Std Ref**	**Description**
Boundary and location of the CPA	a	The geographical boundary of the CPA is within the Republic of South Africa, in consistency with the geographical boundary set in the PoA.
Double counting avoidance	b.1	The CPA is neither already included in another PoA, nor developed as a stand-alone CDM project.
	b.2	The industrial facility included in the CPA is uniquely identified.
Technology/measure specifications	c.1	The level and type of service provided by the CPA technology/measure design (in comparison with the baseline system being replaced), as well as its capacity, key feature and performance, comply with the PoA eligible technologies/measures as described in Section A.6.
	c.2	The technology/measure implemented within the CPA complies with national and/or international testing/certification requirements.
CPA start date	d	The start date of the CPA is verifiable through documentary evidence and is not prior to the start of PoA validation.
Compliance and application of the methodology ACM0006	e	The proposed CPA meets the applicability criteria and other requirements of the latest version of ACM0006 as outlined in section II.B.2. of the PoA-DD.
CPA additionality	f	The proposed CPA is additional, in compliance with the relevant requirements pertaining to the demonstration of additionality (step-by-step additionality demonstration of ACM0006 methodology) as outlined in section II.B.4. of the PoA-DD.
Undertaking of local stakeholder consultations and environmental impact analysis	g.1	A local stakeholder consultation has been conducted prior to the inclusion of the CPA.
	g.2	If applicable, an environmental impact analysis has been conducted prior to the inclusion of the CPA.
Non-diversion of ODA in case of Public funding	h	Confirmation that the CPA does not involve any public funding from Annex I Parties or that in case public funding is used, it does not result in diversion of Official Development Assistance (ODA)
Target Group / distribution mechanisms	i	N/A
Sampling requirements	j	N/A
Thresholds criteria	k	N/A
Debundling check	l	N/A
Supplemental eligibility criteria required by the CME		
Awareness and	1	The CPA is either implemented by the Coordinating/managing entity or

agreement of those operating a CPA on PoA subscription		by another entity that acknowledges its participation in the PoA.
Approval of CPA by CME	2	The CPA-DD has been reviewed by the Coordinating/managing entity and submitted to a DOE for inclusion into the PoA.
Crediting period	3	The crediting period of the CPA shall not exceed the length of the PoA (i.e. 28 years) regardless of the time of inclusion of CPA in the PoA.
CER ownership	4	The CPA is either implemented by the Coordinating/managing entity or by another entity that relinquishes its carbon rights to the CME.

Prior to the start of the inclusion process for a new CPA under the PoA, the proposed CPA-DD will be reviewed by an independent compliance team appointed by CME. This compliance team, which shall be composed of personnel with adequate competencies, shall check if the CPA-DD is drafted in line with the PoA's generic orientations and if the proposed CPA does comply with the eligibility criteria stated above.

For each proposed CPA the findings of the compliance team will be summarized in a short report and submitted to CME management for final approval. In case the conclusion of the compliance team are not positive, the CPA implementer will have to carry out the requested changes in its proposed CPA before submitting again the project document for inclusion.

B.3. Application of methodologies

As detailed in I.A.2 above, the proposed PoA is an initiative to promote and support the implementation, replacement or retrofit of power-and-heat plants in South Africa, utilizing biomass residues.

Accordingly, the chosen methodology is approved consolidated baseline and monitoring methodology ACM0006 - Consolidated methodology for electricity and heat generation from biomass (Version 12.1.1). Its appropriateness to the CPAs to be included in the PoA is analyzed in II.B below.

No CPA sampling plan is applicable since the CPAs to be included in the PoA are expected to be large industrial facilities uniquely designed and operated, thus individually monitored.

SECTION C. Management system

(a) **Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies**

Standard Bank Plc is the programme manager, the Coordinating and Managing Entity (CME). As stated in paragraph A.2., the roles and responsibilities of the CME to manage the PoA and associated CPAs inclusion are indicated below[6]:

Role	CDM responsibilities
PoA manager	- Recruitment of CPA implementers, - Review of competencies of personnel, - Decision on future CPAs inclusion and checks on their eligibility criteria during inclusion; - Ensuring compliance of the technology with the PoA requirements; - Hiring DOE to conduct validation and verification, - Negotiating and signing contractual agreements, - Finding CERs buyers and distributing CERs revenues to CPA implementers - Checks on periodical and annual monitoring set up and reports per CPA.

[6] The latest version of the CME Management System document has been provided to the DOE

CDM admin staff	- Writing the present PoA-DD and CPA-DD through service agreements with CDM consultants, - Collecting documents and supporting evidence required for PoA-DD and CPA-DD validation, - Communication with the South Africa DNA, the CDM Executive Board, the DOE and the consultant(s) - Follow up with registration, inclusion and issuance of CERs
Operation and monitoring staff	- Ensures that all the CPAs are following the monitoring steps in accordance with the registered monitoring plan as required by the UNFCCC guidelines and approved applied methodologies; - Ensures that the equipments and measurements in the field are in line with the measurement methods and recording frequency and storing approaches; - Ensures that all the monitoring data collected from project sites are consolidated and processed digitally in a central database centre; - Ensures that each CPA produces a coherent and standard monitoring report annually. - Training of personnel

The CME Lead should have competencies in CDM and carbon market regulatory issues, portfolio and project management and general management skills.

The CME Staff should have collective competencies in CDM project origination and development, due diligence and relevant technical expertise.

Note: The CPAs will be implemented by project developers, building on the Standard Bank Plc's relationship with individual project developers. Standard Bank Plc will enter into a contractual agreement with each CPA implementer. The contract would give Standard Bank Plc the legal rights to deal with the carbon credits that will be generated from these projects and monitor the project implementation and all necessary parameters that are required for the calculation of emission reductions from each CPA. The conditions for participation shall be in line with the eligibility criteria of the projects for inclusion in the PoA and shall be elaborated in the agreements between Standard Bank Plc and the project developers.

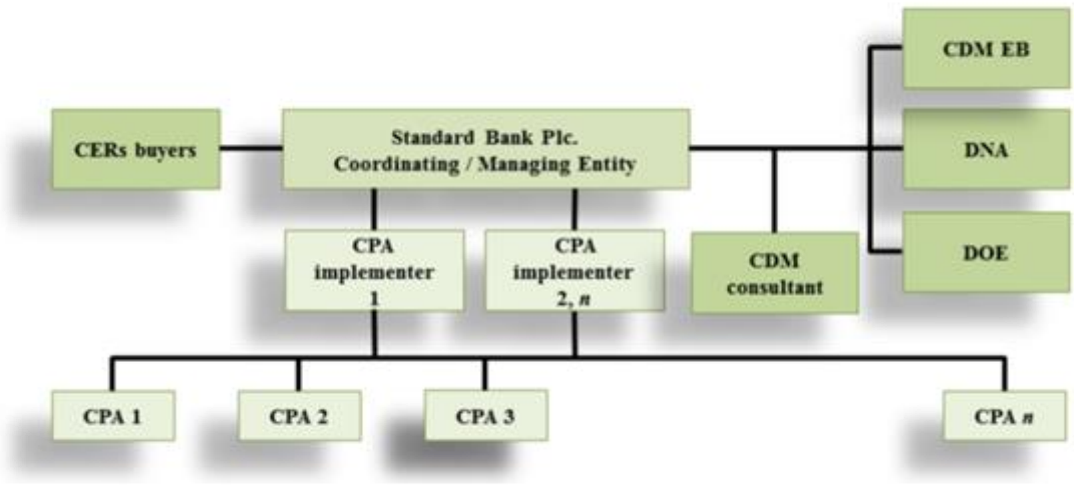


Figure 2: *Operational and management diagram*

CPA implementer is responsible for:

- Construction/replacement/retrofit, installation, operation and maintenance of power-and-heat plant(s)
- Data checking and monitoring,
- Facilitate the CME and DOE required documents and access to sites as needed.

In addition, the CME shall set up the following operational elements to ensure management and oversight of the proposed PoA.

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

In order to ensure that the competencies of the members of the compliance team remain current, training and capacity development records in which all instruction sessions and workshops related to CDM procedures and project management shall be established. The training and capacity development records shall be part of the CPA Inclusion Procedure.

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

All new CPAs proposed for inclusion in the PoA and monitoring reports proposed for verification will be reviewed by the CME using a technically competent, independent reviewer[7] to ensure that the new CPA or monitoring report fully complies with the registered design requirements and the CDM. This process can also be used by the intermediaries or CPA owners on new CPAs and monitoring reports before they are sent to the CME for approval. The review can be completed by either a fully competent individual reviewer or by a team of reviewers formed to include all necessary competencies.

- **The following Technical Review procedure is observed for CPA inclusion:**

1. Verify that all eligibility criteria for inclusion in the PoA are met.
2. Check the procedure to avoid double counting.
3. Check if EIA has been undertaken (if required).
4. Check if stakeholder consultation has been undertaken (if required).
5. Check if all supporting documentation quoted in PoA-DD are in accordance with CPA details.
6. Complete all the sections of the CPA-DD.
7. Reviewer shall check emission reduction calculation.
8. The person responsible shall seek CME and PoA manager approval for the draft CPA-DD.
9. Delivery of approval and contact agreement for CPA inclusion.
10. A DOE is contracted.
11. CPA-DD is submitted to the DOE.
12. CARs & CLRs closed.
13. The inclusion of the CPA in the PoA is confirmed.

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

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

Moreover, as shown in
Table **3**, the CPA implementers will be made aware of the double accounting principle and will guarantee to the CME that the proposed CPA is not registered under the Clean Development Mechanism of the UNFCCC or any voluntary scheme. Should such a case occur, the CME will not proceed with inclusion of the corresponding CPA in the proposed PoA.

Table 3: *Procedure to avoid double-counting*

Criteria	?	Source	Result

[7] The technical review tasks will be managed within the CME or by an appointed qualified third party, such as a CDM consultant, depending on CME staffing constraints.

1. No similar CPA already submitted as CPA under another PoA or CDM project. a. Research on UNFCCC's database b. Research with the South Africa DNA	True/ False	a. CDM projects/PoA registries (UNFCCC) b. DNA projects/PoA portfolio	If "False", the CPA is not eligible to the PoA
2. Signed authorization letter from CPA implementer confirming their voluntary participation to the present PoA and confirming that the proposed CPA is not registered or under validation under the Clean Development Mechanism of the UNFCCC or any voluntary scheme as a single project activity or as a component activity under another program	True/ False	Confirmation by CME review (project assessment and/or interviews)	If "False", the CPA is not eligible to the PoA
3. Unique identification number based on unique geographic coordinates for each CPA under the PoA	True/ False	Confirmation by CME review (project assessment)	

(e) **The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA**

In order to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA, a contractual agreement shall be established between the CPA implementerand the CME, confirming the following provisions:

- The CPA implementer confirms his voluntary participation to the present PoA.
- The CPA implementer cedes its rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC to Standard Bank Plc.

Moreover, the provisions to ensure that those operating the CPA are aware of, and have agreed that their activity is being subscribed to the PoA, will include the signature of:

1. CPA inclusion agreement
2. Emission reduction purchase agreement with each CPA/ project entity.

(f) **Records and documentation control process for each CPA under the PoA**

The CME will establish and maintain a database for each CPA. The CME will record CPA information detail delivered by CPA implementer, as follows:

- Name of the CPA,
- Name of CPA implementer,
- Contact details of CPA implementer,
- Capacity of the power-and-heat plant and other relevant technical specifications of each CPA,
- GPS coordinates of each CPA (GPS coordinates of each energy facility),
- Verification status (number of verification and associated monitoring period),
- Emission reductions monitored and issued each monitoring period.

The CME will be responsible for the management of records and data associated with each CPA. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. The database will be updated using the data supplied by the CPA implementer. It will form the basis for the verification of CPA and be available for inspection by the DOE at any point in time.

Four categories of documents with specific procedures for collection, approval processes, document identification, storage, are:

1. documents which directly support implementation of the system;

2. documents from external parties that are required to develop and manage the inclusion of CPAs;

3. documents from external parties to be collected during, and/or immediately post-, project implementation; and

4. Documents from external parties to be collected on an ongoing basis for the crediting period of the CPA.

Documents are controlled by making sure they are clearly identified, complete and up to date, properly approved, and that they are available where they need to be used. Records are the evidence of what was done to operate the PoA in accordance with the requirements of the registered project design and the CDM requirements. A document master list will be constantly filled in order to centralize all records of documents regarding the PoA.

Conformity of proposed CPA-DD with Generic CPA-DD will be checked by the compliance team. All evidences related to baseline identification, additionality and stakeholder consultation (if applicable) will be collected from the CPA implementer in electronic format and checked during technical review of the proposed CPA. These documents, evidences and all other records related to documentation control process shall be kept for the duration of the PoA under the supervision and responsibility of the compliance supervisor. Those documents will be made available for the DOE during the formal inclusion of the CPA into the PoA or afterwards if required.

(g)**Measures for continuous improvements of the PoA management**

Tracking what happens in the PoA is critical to being able to effectively improve and provide consistent performance. This section describes a general commitment or guidance to continual improvement.

- **Internal audit**

The internal audit processes are used to measure and improve the performance of management and personnel. Internal audits are a structured review by observation and interview of a critical activity. The internal audit process is managed by planning the audit of critical activities

- at a frequency based on risk (the higher the potential for error and the higher the impact on the integrity of the PoA, the more frequent the audit),
- using competent auditors independent of the area being audited,
- by providing timely and comprehensive audit reports, and
- by ensuring that any corrective action that result from the audit is effective and actually implemented.

- **Measures for continuous improvement**

Periodic meetings will be held under the supervision of the compliance supervisor in which will be discussed:

- A review of the previous period and the latest developments,
- Recurring issues related to the inclusion process,
- Comments provided by the members of the compliance team and CME,
- Feedback from the CPA implementers,
- Potential improvements to be implemented for the next period.

Furthermore in case a CPA is internally approved for inclusion and yet finds itself rejected by DOE, an extraordinary meeting shall be convened by the compliance supervisor in which the reasons of such outcome shall be analysed and provisions for improvements of the technical review process shall be proposed to the CME.

SECTION D. Duration of the PoA

D.1. Start date of the PoA

The PoA start date is set at 14/07/2012, the date of publication of the PoA-DD for global stakeholder consultation.

D.2. Duration of the PoA

The expected length of the PoA is 28 years.

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

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

Under the terms of the Environmental Impact Assessment Regulations (2010), the construction of renewable electricity generation facilities or infrastructure may be subject to:

- basic assessment when "(i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare", as per Activity 1 of Listing Notice 1 of the EIA regulations published in GNR 545 of 2010;
- submission of a Full Scoping and Environmental Impact Assessment (EIA) Report to the national Department of Environmental Affairs (DEA), when "(i) the electricity output is 20 megawatts or more, or (ii) the elements of the facility cover a combined area in excess of 1 hectare;" as per Activity 1 of Listing Notice 2 of the EIA regulations published in GNR 545 of 2010.

Environmental Analysis will thus be performed at CPA level according to the enforced regulations applicable in due time, given the singularity of each CPA to be included in the PoA and its presumably unique environmental impacts related to specific project context.

E.2. Analysis of the environmental impacts

Legal, Regulatory and Administrative Requirements in South Africa

The Environmental Analysis to be undertaken for each CPA will examine key relevant laws and regulatory requirements governing the construction, operation, retrofit, replacement and decommissioning of power-and-heat biomass-residue (co-)fired plants, inter alia:

- Environmental Impacts Assessment regulations, GNR 545 (2010)
- National Environmental Management Act, Act 107 (1998)
- National Environmental Management: Air Quality Act (Act No. 39 of 2004 - Solid Biomass Combustion Installations)
- National Environmental Management: Waste Act (Act No. 59 of 2008 - Section 20.b, Category B.10)
- Factories, Offices and Shops Act of 1970 (Act 328)

A summary of the analysis of the environmental impacts, including transboundary impacts and references to all related documentation will be provided at the CPA level.

E.3. Environmental impact assessment

If an environmental impact assessment is required, conclusions and references to all related documentation

will be provided at the CPA level.

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

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

Stakeholder consultation will be performed at the CPA level to ensure that a wider group of stakeholders is reached since each CPA affects different geographical positions and different groups of stakeholders.

A description of the process by which comments from local stakeholders were invited and compiled will be provided at CPA level.

F.2. Summary of comments received

Identification of stakeholders and summary of comments will be provided at the CPA level.

F.3. Report on consideration of comments received

Information demonstrating that all comments received have been considered comments will be provided at the CPA level.

SECTION G. Approval and authorization

The letter of approval from Party which wishes to be involved in the PoA is not available at the time of submitting the PoA-DD to the validating DOE.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

CPAs to be implemented under the PoA framework consist in the implementation, replacement or retrofit of a power-and-heat plant, utilizing biomass (e.g. sugar cane fibre, including tops or leaves) as primary fuel.

A typical CPA, under the framework of the proposed PoA voluntarily coordinated by the CME, consists in processing biomass for the generation of process heat and electricity through boilers and turbo-alternators, promoting the country's biomass potential. Excess of electricity may be exported into the electrical distribution grid of South Africa, in line with the Department of Energy's Renewable Energy Independent Power Producer Procurement Programme.

Each CPA will feature state-of-the-art monitoring equipment while the staff involved will be trained to properly operate, maintain and calibrate the monitoring system.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

The approved baseline and monitoring methodology selected for to the proposed Programme of Activities is: ACM0006 "Consolidated methodology for electricity and heat generation from biomass" Version 12.1.1 (EB 69).

In line with the application of the ACM0006 methodology, the programme refers to the following tools:

- Tool for the demonstration and assessment of additionality (Version 07.0.0, EB70)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 02, EB41)
- Emissions from solid waste disposal sites (Version 06.0.1, EB66)
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01, EB39)
- Tool to calculate the emission factor for an electricity system (Version 03.0.0, EB70)
- Tool to determine the baseline efficiency of thermal or electricity generation systems (Version 01, EB48)
- Tool to determine the remaining lifetime of equipment (Version 01, EB50).
- Assessment of the validity of the original/current baseline and to update of the baseline at the renewal of the crediting period (Version 03.0.1, EB66)
- Project and leakage emissions from transportation of freight (Version 01.1.0, EB70)
- Guidelines on common practice (Version 02.0, EB69)
- Guidelines on additionality of first-of-its-kind project activities (Version 02.0, EB69)
- Guidelines on the assessment of investment analysis (Version 05.0, EB62)
- [Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities is not applicable because there is no A/R component in the program]

B.2. Application of methodology(ies)

The approved consolidated baseline and monitoring methodology ACM0006 is applicable to biomass (co-)fired power-and heat plants. The typical project activity includes:

- The installation of new plants at a site where currently no power and heat generation occurs (Greenfield projects); or

- The installation of new plants at a site where currently power or heat generation occurs. The new plant replaces or is operated next to existing plants (capacity expansion projects); or
- The improvement of energy efficiency of existing plants (energy efficiency improvement projects), which can also lead to a capacity expansion, e.g. by retrofitting the existing plant; or
- The total or partial replacement of fossil fuels by biomass in existing plants or in new plants that would have been built in the absence of the project (fuel switch projects), e.g. by increasing the share of biomass use as compared to the baseline, by retrofitting an existing plant to use biomass, etc.

Table 4: *Methodology applicability conditions table*

Applicability conditions of the methodology	Applicability to the generic CPA	Evidence
(1) No biomass types other than biomass residues and/or biomass from dedicated plantations are used in the project plant;	By-product, residue or waste stream from agriculture, forestry and related industries and/or biomass from dedicated plantations are the only biomass types authorized in a typical CPA plant (e.g. sugar cane bagasse and leaves).	*Projected fuel consumptions from :* *- project feasibility study, or* *- EIA report, or* *- EPC specifications, or - supply/collection agreement(s) between CPA implementer and biomass supplier(s).*
(2) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired does not exceed 80% of the total fuel fired on an energy basis;	No co-firing of fossil fuels in amounts exceeding 80% of total energy consumption is envisaged in a typical CPA plant (mostly start-ups and emergency use).	*Projected fuel consumptions from :* *- project feasibility study, or* *- EIA report, or* *- EPC specifications.*
(3) For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project does not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process;	The implementation of a typical CPA does not result in an increase of the processing capacity of raw input or in other substantial change.	*Baseline and projected output levels (if applicable).*
(4) The biomass used by the project facility are not stored for more than one year;	A typical CPA does not store the biomass at use longer than a few months.	*Projected storage practices (if applicable).*
(5) The biomass used by the project facility are not obtained from chemically processed biomass (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical degradation, etc.) prior to combustion. Moreover, the preparation of biomass-derived fuel do not involve significant energy quantities, except from transportation or mechanical treatment so as not to cause significant GHG emissions;	No chemical process is involved in the biomass preparation prior to combustion in a typical CPA.	*Biomass supply description and transformation/preparation processes details (if applicable).*
(6) In the case of fuel switch project activities, the use of biomass or the increase in the use of biomass as compared to the baseline scenario is technically not possible	In case of a typical CPA that consists in fuel switch, the use (or increase) of biomass compared to the	*Biomass related capital expenditures, supply-chain description and transformation/ preparation*

at the project site without a capital investment in: • The retrofit or replacement of existing heat generators/boilers; or • The installation of new heat generators/boilers; or • A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); or • Equipment for preparation and feeding of biomass.	baseline scenario is made technically possible by significant capital investment in retrofit, replacement or installation of heat generators/boilers, or biomass dedicated supply chain, preparation or feeding equipments.	*processes details (if applicable).*
(7) In the case that biogas is used in power and/or heat generation, this methodology is applicable under the following conditions: • The biogas is generated by anaerobic digestion of wastewaster (to be) registered as a CDM project activity and the details of the registered CDM project activity must be included in the PDD. Any CERs from biogas energy generation should be claimed under the proposed project activity registered under this methodology; • The biogas is generated by anaerobic digestion of wastewater that is not (and will not) be registered as a CDM project activity. The amount of biogas does not exceed 50% of the total fuel fired on an energy basis.	Not applicable as no biogas recovery for power or heat generation is envisaged in a typical CPA.	*N/A*
(8) In the case of biomass from dedicated plantations: (a) The cultivated land can be clearly identified and used only for dedicated energy biomass plantations; (b) The CDM project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the proposed project activity can continue to provide at least the same amount of goods and services as in the absence of the project; (c) The plantations are established: (i) On land which was, at the start of the project implementation, classified as degraded or degrading; or (ii) On a land area that is included in the project boundary of one or several registered A/R CDM project activities; (d) The plantations are not established on organic soil (notably peatlands); (e) The land area of the dedicated	Not applicable as no biomass from dedicated plantations is envisaged in a typical CPA.	*N/A*

plantations will be planted by direct planting and/or seeding; (f) After harvest, regeneration will occur either by direct planting, seeding or natural sprouting; (g) Grazing will not occur within the plantation; (h) No irrigation is undertaken for the biomass plantations; (i) The land area where the dedicated plantation will be established is, prior to project implementation, severely degraded and in absence of the CDM project activity would have not been used for any other agricultural or forestry activity; (j) Only perennial plantations are eligible		

Finally, the methodology is applicable since the most plausible baseline scenario to a typical CPA, as identified per the "Selection of the baseline scenario and demonstration of additionality" section hereunder, is:

- For power generation: Scenarios P2: to P7:, or a combination of any of those scenarios;
- For heat generation: Scenarios H2: to H7:, or a combination of any of those scenarios;
- If some of the heat generated by the project activity is converted to mechanical power through steam turbines, for mechanical power generation: Scenarios M2: to M5:
    - In the case of M2 and M3, if the steam turbine(s) are used for mechanical power in the project, the turbine(s) used in the baseline shall be at least as efficient as the steam turbine(s) used for mechanical power in the project;
    - In the case of M4 and M5, steam turbine(s) for mechanical power are not allowed for the same purpose in the project.
- For biomass residue use: Scenarios B1: to B8:, or any combination of those scenarios. For scenarios B5: to B8:, leakage emissions should be accounted for as per the procedures of the methodology.
- No use of biogas is expected under the proposed PoA thus no baseline alternatives for the biogas.
- No dedicated plantation area is expected under the proposed PoA (thus scenario L1 is not applicable).

In addition to the applicability conditions of ACM0006, all the CPAs included in the PoA will also meet the applicability conditions of the following tools and standardized baseline:

Tool for the demonstration and assessment of additionality (Version 07.0.0):
All potential alternative scenarios to the proposed project activity included in the additionality assessment and available to project participants cannot be implemented in parallel to the proposed project activity.

Tool to calculate the emission factor for an electricity system (Version 03.0.0):
This tool will be applicable for those CPAs which will import and/or export electricity of the grid.

Standardized baseline | Grid emission factor for the Southern African power pool (Version 01.0):
This standardized baseline is applicable to CPAs which will import and/or export electricity of the grid as:

- The CPAs take place in the Republic of South Africa, a SAPP member country;
- The CPAs are connected to the project electricity system;
- The CDM approved methodology that is applied to the CPAs requires to determine CO_2 emission factor for the project electricity system through the application of the tool, for the determination of baseline emissions, project emissions and leakage emissions; and

- As the typical CPAs uses the ex ante option of data vintage, as per the tool, the latest approved values of this standardized baseline is used for calculation of emission reduction for the entire first crediting period.

Therefore, a typical CPA meets ACM0006 methodology requirements as reflected in the table above. It also meets the requirements of the tools and standardized baseline mentioned above.

There is no need to provide a general description of the sampling plan in this section of the PoA as there will be no sampling plan since the CPAs to be included in the PoA are expected to be large industrial facilities uniquely designed and operated, thus individually monitored.

B.3. Sources and GHGs

Emissions sources and greenhouse gases included in each CPA boundary

According to methodology ACM0006, the spatial extent of the typical project boundary encompasses:
- All plants generating power and/or heat located at the project site, whether fired with biomass , fossil fuels or a combination of both;
- All power plants connected physically to the electricity system (grid) that the project plant is connected to;
- Where possible, all off-site heat sources that supply heat to the site where the CDM project activity is located (either directly or via a district heating system);
- The means of transportation of biomass to the project site;
- The site where the biomass residues would have been left for decay or dumped;
- The wastewater treatment facilities used to treat the wastewater produced from the treatment of biomass.

Note that the typical project boundary encompasses not only the plants generating power and/or heat that are directly affected by the CDM project activity (e.g. retrofitted or installed) but also all other plants generating power and/or heat located at the same site as the CDM project activity, whether fired with biomass , fossil fuels or a combination of both. Thus power and heat generation, grid power and heat imports/exports should be considered for the whole site where the CDM project activity is located and all facilities are to be included in the power and heat balances.

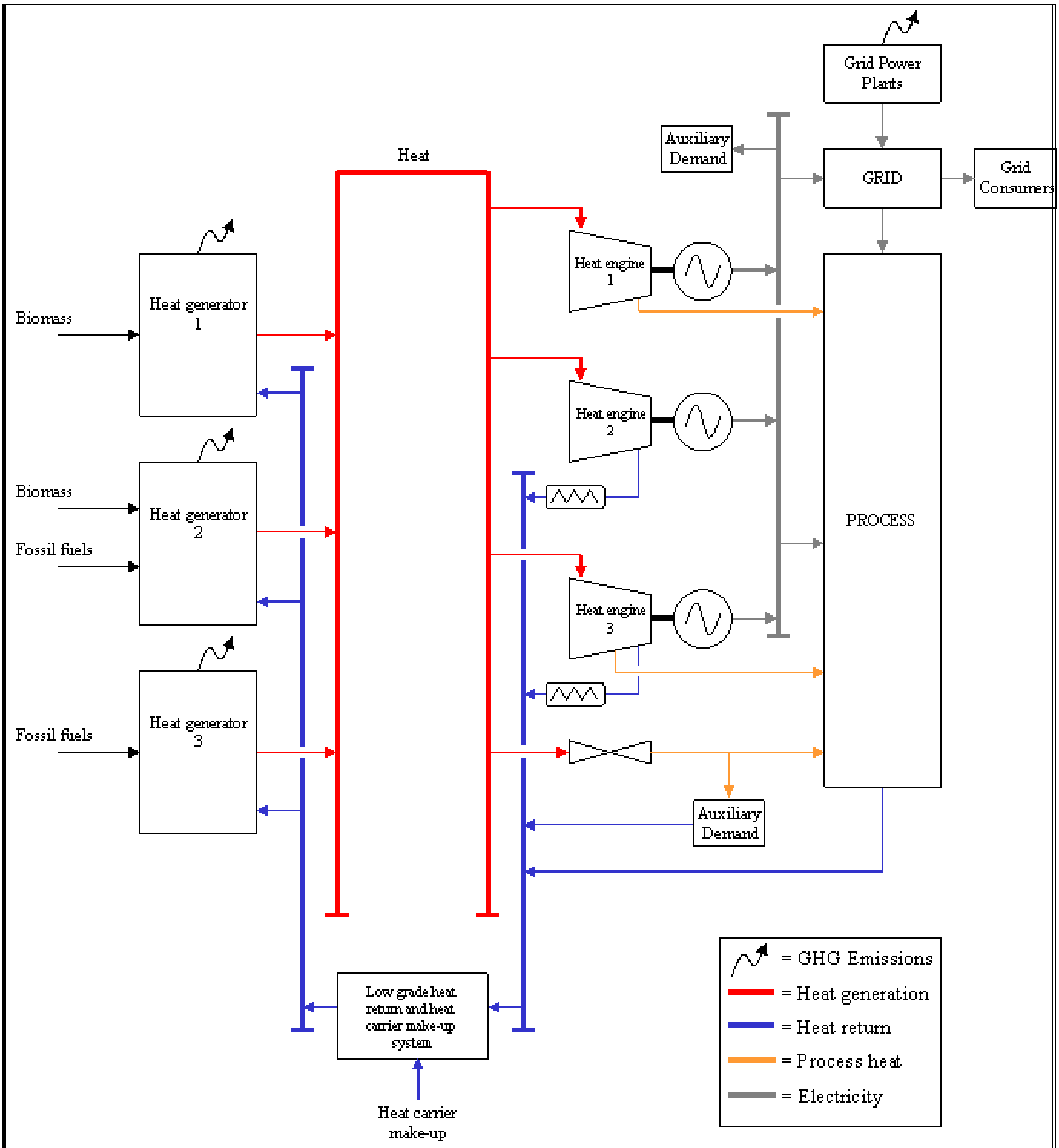
The main emission sources and type of GHGs in the project boundary are listed in the table below:

Table 5: *Gas included in the boundary related to the project activity*

Source		Gas	Included?	Justification / Explanation
Baseline	Electricity and heat generation	**CO_2**	**Included**	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	For conservativeness reasons, project participants decided not to include this emission source.
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources

Project Activity	On-site fossil fuel consumption	**CO_2**	**Included**	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Off-site transportation of biomass	**CO_2**	**Included**	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Combustion of biomass for electricity and heat	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	This emission source is not included because CH_4 emissions from uncontrolled burning or decay of biomass in the baseline scenario are not included.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small
	Storage of biomass	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification. Since biomass are stored for not longer than one year, this emission source is assumed to be small
		N_2O	Excluded	Excluded for simplification. This emissions source is assumed to be very small
	Wastewater from the treatment of biomass	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	**Included or excluded**	This emission source shall be included in cases where the waste water is treated (partly) under anaerobic conditions
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small
	Cultivation of land to produce biomass feedstock	CO_2	Excluded	Not applicable as no biomass from dedicated plantation is used
		CH_4	Excluded	Not applicable as no biomass from dedicated plantation is used
		N_2O	Excluded	Not applicable as no biomass from dedicated plantation is used

Schematic flow diagram of a typical CPA



B.4. Description of baseline scenario

Project participant shall follow the procedure for the "Selection of the baseline scenario and demonstration of additionality" described in the methodology:

Step 1: Identification of alternative scenarios

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

Sub-step 1a: Definition of alternative scenarios to the proposed CDM project activity

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

The alternative scenarios should specify:

- How electric power would be generated in the absence of the CDM project activity;
- How heat would be generated in the absence of the CDM project activity;
- If the CDM project activity generates mechanical power through steam turbine(s): how the mechanical power would be generated in the absence of the CDM project activity; and
- What would happen to the biomass residues in the absence of the CDM project activity.

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

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

P2: If applicable,[8] the continuation of power generation in existing power plants at the project site. The existing plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the starting date of the CDM project activity;

P3: If applicable,[8] the continuation of power generation in existing power plants at the project site. The existing plants would operate with different conditions from those observed in the most recent three years prior to the starting date of the CDM project activity;

P4: If applicable,[8] the retrofitting of existing power plants at the project site. The retrofitting may or may not include a change in fuel mix;

P5: The installation of new power plants at the project site different from those installed under the CDM project activity;

P6: The generation of power in specific off-site plants, excluding the power grid;

P7: The generation of power in the power grid.

The alternative scenarios for heat should include, but not be limited to, *inter alia*:

H1: The proposed project activity not undertaken as a CDM project activity;

H2: If applicable,[8] the continuation of heat generation in existing plants at the project site. The existing plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the CDM project activity;

H3: If applicable,[8] the continuation of heat generation in existing plants at the project site. The existing plants would operate with different conditions from those observed in the most recent three years prior to the CDM project activity;

H4: If applicable,[8] the retrofitting of existing plants at the project site. The retrofitting may or may not include a change in fuel mix;

H5: The installation of new plants at the project site different from those installed under the CDM project activity;

H6: The generation of heat in specific off-site plants;

H7: The production of heat from district heating.

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

M1: The proposed project activity not undertaken as a CDM project activity;

M2: If applicable, the continuation of mechanical power generation from the same steam turbines in

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

existing plants at the project site;

M3: The installation of new steam turbines at the project site;

M4: If applicable, the continuation of mechanical power generation from electrical motors in existing plants at the project site;

M5: The installation of new electrical motors at the project site.

For the use of biomass residues, the alternative scenarios should include, but not be limited to, *inter alia*:

B1: The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields;

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

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

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

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

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

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

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

Neither dedicated plantation area nor use of biogas is expected under the proposed PoA, thus no baseline alternatives are applicable for the land use where the dedicated plantations are established (L) and the biogas (BG).

Outcome of Sub-step 1a: *List of plausible alternative scenarios to the project activity.*

Sub-step 1b: Consistency with mandatory applicable laws and regulations

The alternative(s) shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution.[9] This sub-step does not consider national and local policies that do not have legally-binding status.

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

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

Outcome of Sub-step 1b: *List of alternative scenarios to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country.*

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

Proceed to Step 2 (Barrier analysis) or to Step 3 (Investment analysis)

Step 2: Barrier analysis

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

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

Establish a complete list of realistic and credible barriers that may prevent alternative scenarios to occur. Such realistic and credible barriers may include:

- Investment barriers, other than insufficient financial returns as analyzed in Step 3, *inter alia*:
    - For alternatives undertaken and operated by private entities: Similar activities have only been implemented with grants or other non-commercial finance terms. Similar activities are defined as activities that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant geographical area, as defined in Sub-step 1a above;
- No private capital is available from domestic or international capital markets due to real or perceived risks associated with investments in the country and/or sector and/or technology where the CDM project activity is to be implemented, as demonstrated by the credit rating of the country and/or sector and/or technology or other country and/or sector and/or technology investment reports of reputed origin. Technological barriers, *inter alia*:
    - Skilled and/or properly trained labour to operate and maintain the equipment is not available in the relevant geographical area, which leads to an unacceptably high risk of equipment disrepair, malfunctioning or other underperformance
    - Lack of infrastructure for implementation and logistics for maintenance of the equipment (e.g. natural gas cannot be used because of the lack of a gas transmission and distribution network);
    - Risk of technological failure: the process/technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed CDM project activity, as demonstrated by relevant scientific literature or technology manufacturer information;
    - The particular technology used in the proposed CDM project activity is not available in the relevant geographical area.
- Lack of prevailing practice:
    - The alternative is the “first of its kind”.

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

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

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

Outcome of Sub-step 2b: *List of alternative scenarios to the CDM project activity that are not*

prevented by any barrier.

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

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

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

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

- Option 1: Go to Step 3 (investment analysis); or
- Option 2: Identify the alternative with the lowest emissions[10] (i.e. the most conservative) as the baseline scenario, and proceed to Step 4.

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

Step 3: Investment analysis

The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios by conducting an investment analysis. The analysis should include all alternative scenarios (or in case that Step 2 is conducted, the remaining alternative scenarios after Step 2), including scenarios where the project participants do not undertake an investment (e.g. a combination of B1: and P7).

This step should be implemented following the guidance provided in Step 2 of the latest version of the "Tool for the demonstration and assessment of additionality".

Determine whether the proposed project activity is not:
(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Sub-step 3a: Determine appropriate analysis method

As proposed project activity generates financial and economic benefits other than CDM related income, the simple cost analysis cannot be applied. Benchmark analysis should preferably be used to demonstrate additionality (Option III). Otherwise, the investment comparison analysis (Option II) may be used if justified.

Sub-step 3b: Apply Benchmark analysis

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

The investment analysis should preferably be performed by using project IRR as the financial/economic indicator most suitable for the project type and decision-making context.

IRR for all [remaining] alternative scenarios will be compared with the relevant pre or post tax financial benchmark[11], namely the usual rate of return available to an investor in the host country and for this specific project type. This rate represents the minimum rate of return that would justify the financial viability of the project and therefore its implementation.

Power plant projects are financed using variable proportion of equity and fixed income funding, thus as the appropriate benchmark rate should enable the variable characteristics of the different source of funding, the Weighted Average Cost of Capital (WACC) is chosen. The WACC is the rate of return that a company should expect to pay on average to all its creditors (stock holders, bond holders, banks and other providers of capital). It is the minimum rate of return that a company should earn in order to represent a viable investment[12].

In general the WACC is calculated using the following formula:

$$WACC = \frac{\sum_i r_i MV_i}{MV_i}$$

With:

r_i the required rate of return for security or provider of capital *i*

MV_i the market value of all outstanding securities *i* or the remaining balance of loan *i*

In the usual case where the sources of capital narrow themselves to standard equity, fixed income securities and bank loans, WACC may be calculated by using the following formulas:

$$WACC_{at} = \frac{MV_d}{MV_d + MV_e} \cdot r_d (1 - t) + \frac{MV_e}{MV_d + MV_e} \cdot r_e$$ for after-tax comparison

$$WACC_{bt} = \frac{MV_d}{MV_d + MV_e} \cdot r_d + \frac{MV_e}{MV_d + MV_e} \cdot r_e$$ for pre-tax comparison

With:

r_d the required rate of return of all debt financing

r_e the required rate of return of all equity financing

t the applicable corporate tax rate in the host country

The required rate of return of equity financing may be estimated by using one of the following three methods:

1. The Capital Asset Pricing Model (CAPM):

$$r_e = r_f + \beta_e \cdot r_p$$

r_f the applicable risk-free rate in the host country. If no investment may be deemed as risk-free in the considered country, a risk-free rate shall be estimated by starting with a risk-free rate based on the 10-year U.S. government bond yield and then by adding projected difference over time between U.S. and local inflation to develop a nominal risk-free rate in local currency. As per the Guidelines on the Assessment of Investment Analysis (Version 05), a

[11] Calculated in nominal terms

[12] If all data needed to calculate the WACC are not available equity IRR may be used in conjunction with other benchmark such as the expected rate of return on equity.

default value of 3.0% may be used.

r_p the applicable equity risk premium, namely the excess rate of return of equity investments over the risk-free rate[13]. As per the Guidelines on the Assessment of Investment Analysis (Version 05), a default value of 6.5% may be applied.

β_e the sensitivity of project returns to the variation of market returns.
β_e is affected by the systematic component of business risk and financial risk. Therefore it is project specific and depends on the proportion of equity to debt financing. For each project it may be determined using the following formula: $\beta_e = \beta_u \cdot \left[1 + (1-t)\frac{MV_d}{MV_e}\right]$, with β_u being a measure of the business risk applicable to a specific industry.

2. The Build-up Approach:

$$r_e = r_f + r_p + r_c$$

r_c the host country risk premium, which is estimated as the yield on the host country market bonds (denominated in the currency of the host country market) minus the yield on long-term US government bonds.

3. The default approach:
Expected return on equity is estimated using default values stated for various countries in the Appendix of the Guidelines on the Assessment of Investment Analysis (Version 05). As the PoA only covers renewable energy projects which fall under the sectoral scope 1. Energy Industries, each CPA using the default approach will use the value defined for Group 1 (South Africa 10.9%).

Table 6: *Parameters for benchmark calculation*

Parameters	Description	Source and explanation
r_f	Risk-free rate in a developed country	The risk-free rate should be determined using reputable sources of financial information such as Reuters, Morningstar of Bloomberg databases
r_d	Cost of debt	The cost of debt is determined as the usual commercial lending rate in the host country for power plant projects or the yield of a 10 year bond issued by the government of the host country with the addition of a relevant yield spread based on company rating.
r_p	Equity risk premium	The equity risk premium should be determined using reputable sources of financial information such as Reuters, Morningstar of Bloomberg databases or data from academic research[14]. If data is not available from those sources of info, experts' opinions may be used as a replacement.
β_u	Unlevered beta (electricity utility sector)	The unlevered beta should be determined using reputable sources of financial information such as Reuters, Morningstar of Bloomberg databases or data from academic research[15] If data is not available from those sources of info, experts' opinions may be used as a replacement.
r_c	Country risk premium	The country risk premium should be determined using reputable sources of financial information such as Reuters, Morningstar of Bloomberg databases or data from academic research[16]. If data is not

[13] Calculation of the equity risk premium should be consistent with the determination of the risk-free rate. If the risk-free rate is chosen as a local rate then the equity risk premium should be calculated using local equity rate of return. If the risk-free rate is based on the 10-year U.S. government bond yield then the equity risk premium should be calculated as the excess return of major US equity index over the 10-year U.S. government bond yield.
[14] E.g.: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/implpr.html
[15] E.g.: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html
[16] E.g.: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

		available from those sources of info, experts' opinions may be used as a replacement.
MV_d	Percentage of financing from debt	As per the Guidelines on the Assessment of Investment Analysis (Version 05), paragraph 17 and 18
MV_e	Percentage of financing from equity	
t	Applicable corporate tax rate	Official documentation

For the assessment of the additionality of each CPA, all parameters should be determined by using the latest info available.

Sub-step 3c: Calculation and comparison of financial indicators

Project IRR shall be calculated as the discount rate that makes the present value of the future after-tax cash flows equal the investment outlay.

$$\sum_i \frac{CF_i}{(1+IRR)^i} = Investment\ Outlay$$

With:

CF_i — the annual pre or after-tax[17] operating[18] cash flow expected from the proposed project activity in the year *i*

Investment Outlay — this includes all costs required to set the power plant operational): land cost, project development costs (e.g. consultancy fees, license fees, engineering costs), equipment cost, construction costs, etc.

Table 7: *Parameters for IRR calculation*

Parameter	Unit	Sources
Investment decision date		Board decision notes, loan agreement, feasibility study
First spending year		
First operation year		
Project lifetime	year	
Annual power export	MWh	As per guidelines for the reporting and validation of plant load factors
Other revenues	Local Currency/year	Feasibility study (if applicable)
Electricity tariff	Local Currency/kWh	Legislation at the date of investment, Power Purchase Agreement
Expected increase in electricity tariff	%/year	
Inflation	%/year	Forecasts from official governmental statistics, international reputable sources (IMF, WB) or academic research
Exchange rate	Local Currency/USD	If applicable

[17] The definition of CF_i shall be consistent with the definition of WACC

[18] The cash inflow for the last year of project life shall include the expected profit realisable from the sale of project assets as per the Guidelines on the Assessment of Investment Analysis (Version 05), paragraph 4

Investment outlay	Local Currency	Board decision notes, loan agreement, feasibility study
Other Capex	Local Currency	Board decision notes, loan agreement, feasibility study (if applicable)
Operation & Maintenance Cost	Local Currency/year	Feasibility study
Other operating expenditure	Local Currency/year	
Salvage value of assets	Local Currency	
Insurance	% of Capex	If applicable
Income tax rate	%	
Debt ratio		
Loan interest rate,	%/year	In case of post-tax project IRR calculations
Depreciation period	years	In case it differs from the estimated project life period

All relevant data used for the calculation of the IRR shall be expressed in Local Currency. Thus all financial information denominated in Foreign Currency shall be converted in Local Currency using the 12-month trailing average exchange rate at the date of investment decision for investment outlay and other capital expenditures. For future revenues and costs the exchange rate is forecasted for each year by using the long-term average real exchange rate and the inflation forecasts in Local Currency and Foreign Currency.

The parameters listed in the table shall be obtained from the most recent sources, if there is any substantial gap between the date of investment decision and the date at which the corresponding sources was produced, the value of the relevant parameter shall corrected appropriately by using the host country price index.

Sub-step 3d: Sensitivity analysis

After the determination of the base case IRR, a sensitivity analysis shall be done by modifying monetary parameters that constitute more than 20% of either total project costs or total project revenues (such as investment outlay or O&M cost amongst others) by +/- 10%. The full array of the derived IRR will be reported in the CPA-DD. If the IRR of one of the scenarios considered for the sensitivity analysis exceeds the benchmark, CPA implementer shall demonstrate that the probability of such a scenario is negligible. If no sufficient evidence is provided the CPA shall be deemed as not additional.

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

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

Step 4: Common practice analysis

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

When similar activities to the proposed CPA are identified, the stepwise approach outlined in the Guidelines on Common Practice (Version 02.0) is applied as follows:

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:
(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

Step 5: calculate factor F = 1-$Ndiff$ /N_{all} representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

Outcome of Step 4: If the factor F is greater than 0.2 and N all-N diff is greater than 3, the proposed project activity is a "common practice" within its sector in the applicable geographical area then the proposed CDM project activity is not additional (similar activities can be observed and essential distinctions between the proposed CDM project activity and similar activities cannot reasonably be explained).

Otherwise, (i) similar activities cannot be observed or (ii) similar activities are observed but essential distinctions between the proposed CDM project activity and similar activities can reasonably be explained, then the proposed project activity is additional.

B.5. Demonstration of eligibility for a generic CPA

The CPA is eligible for inclusion in the PoA if it verifies all applicability assessments below.

Eligibility criteria		
Category	**N°**	**Description**
Boundary and location of the CPA	a	**The geographical boundary of the CPA is within the Republic of South Africa, in consistency with the geographical boundary set in the PoA.**
		How each generic CPA meets the eligibility criteria? Location and boundary are stated in the specific CPA-DD, confirming that the industrial facility is located in South Africa. **Mean of proof / Evidence Document:** Compliance with this criterion may be substantiated with one (or more) of the following documents: - Detailed project report; - Specifications of equipment supply/civil works; - EIA report; - Other credible documents.

<table>
<tr><td></td><td></td><td>Tick when met:
☐</td></tr>
<tr><td rowspan="4">Double counting avoidance</td><td rowspan="2">b.1</td><td>The CPA is neither already included in another PoA, nor developed as a stand-alone CDM project.</td></tr>
<tr><td>How each generic CPA meets the eligibility criteria?
The CME review confirms that the CPA is not already included in another PoA or developed as a stand-alone CDM project.
Mean of proof / Evidence Document:
The “Procedure to avoid double-counting” formulated in the PoA-DD is applied and the assessment is conclusive, based on:
- CDM projects/PoA registries (UNFCCC);
- DNA projects/PoA portfolio;
- Confirmation by CME review.
Tick when met:
☐</td></tr>
<tr><td rowspan="2">b.2</td><td>The industrial facility included in the CPA is uniquely identified.</td></tr>
<tr><td>How each generic CPA meets the eligibility criteria?
The proposed CPA is uniquely identified and defined in an unambiguous manner by amongst other aspects providing geographic information.
Mean of proof / Evidence Document:
GPS location and/or serial number and/or distinctive plate.
Tick when met:
☐</td></tr>
<tr><td rowspan="4">Technology/measure specifications</td><td rowspan="2">c.1</td><td>The level and type of service provided by the CPA technology/measure design (in comparison with the baseline system being replaced), as well as its capacity, key feature and performance, comply with the PoA eligible technologies/measures as described in Section A.6.</td></tr>
<tr><td>How each generic CPA meets the eligibility criteria?
The technology and measures taken are clearly described in the CPA-DD and in line with the technology definition in the PoA-DD.
Mean of proof / Evidence Document:
Compliance with this criterion may be substantiated with one (or more) of the following documents:
- Detailed project report;
- Technology provider contractual specifications;
- Other credible documents.
Tick when met:
☐</td></tr>
<tr><td rowspan="2">c.2</td><td>The technology/measure implemented within the CPA complies with national and/or international testing/certification requirements.</td></tr>
<tr><td>How each generic CPA meets the eligibility criteria?
The CPA implementer meets applicable testing or certification standard in the industry and at national level such as Energy Efficiency measurement and verification standard SATS 50010:2010, in addition to applicable permitting requirements among:
- Environmental authorisation (EIA)
- Waste licence
- Air emissions licence
- Water storage and use authorisation
- Electricity generation licence
- Compliance with the grid connection code
- Pressure vessel registration
- Stack height compliance
- Approval of building plans
Mean of proof / Evidence Document:</td></tr>
</table>

		Compliance with this criterion may be substantiated with one (or more) of the following documents: - Government approvals of the design and/or manufacturing permits; - Regional or national testing papers, evidence of compliance with standards or certificates; - International testing papers, certificates or documents confirming compliance with international standards; - EIA report; - Specifications for equipment supply; - Statement in the CPA-DD; - Other credible documents. **Tick when met:** ☐
CPA start date	d	**The starting date of the CPA is verifiable through documentary evidence and is not prior to the start of PoA validation.**
		How each generic CPA meets the eligibility criteria? The CPA-DD determines the start date based on implementation, construction or real action start. **Mean of proof / Evidence Document:** Supporting documentary evidence for the starting date is provided and described in CPA-DD section A.8.1. **Tick when met:** ☐
Compliance and application of the methodology ACM0006	e	**The proposed CPA meets the applicability criteria and other requirements of the latest version of ACM0006 as outlined in section II.B.2. of the PoA-DD.**
		How each generic CPA meets the eligibility criteria? The CPA-DD shall demonstrate in its section D.2 that all applicability criteria and requirements of ACM0006 methodology are verified. **Mean of proof / Evidence Document:** Applicability conditions' related evidence in CPA-DD section D.2 Table 3 **Tick when met:** ☐
CPA additionality	f	**The CPA is additional, in compliance with the relevant requirements pertaining to the demonstration of additionality (step-by-step additionality demonstration of ACM0006 methodology) as outlined in section II.B.4. of the PoA-DD.**
		How each generic CPA meets the eligibility criteria? The CPA successfully applies in its section D.4 the step-by-step additionality demonstration of ACM0006 methodology. **Mean of proof / Evidence Document:** Additionality demonstration related analysis and supporting evidence. **Tick when met:** ☐
Undertaking of local stakeholder consultations and environmental impact analysis	g.1	**A local stakeholder consultation has been conducted prior to the inclusion of the CPA.**
		How each generic CPA meets the eligibility criteria? The CPA-DD details the proceedings of the stakeholder consultation in its section C. **Mean of proof / Evidence Document:** Stakeholder consultation attendance sheet and comments. **Tick when met:** ☐
	g.2	**If applicable, an environmental impact analysis has been conducted prior to the inclusion of the CPA.**

		How each generic CPA meets the eligibility criteria? The CPA-DD outlines the EIA requirements and provides details on the EIA process/outcome in its section B. **Mean of proof / Evidence Document:** EIA report and/or Environmental license. **If applicable, tick when met:** ☐ **Tick if not applicable:** ☐
Non-diversion of ODA in case of Public funding	h	**Confirmation that the CPA does not involve any public funding from Annex I Parties or that in case public funding is used, it does not result in diversion of Official Development Assistance (ODA)**
		How each generic CPA meets the eligibility criteria? The CPA-DD confirms that the CPA does not involve any public funding or that in case public funding is used a confirmation that official development assistance is not being diverted to the implementation of the PoA. **Mean of proof / Evidence Document:** CPA-DD section A.11 statement. **Tick when met:** ☐

Supplemental eligibility criteria required by the CME		
Awareness and agreement of those operating a CPA on PoA subscription	1	**The CPA is either implemented by the Coordinating/managing entity or by another entity that acknowledges its participation in the PoA.**
		How each generic CPA meets the eligibility criteria? The CPA-DD shall state the name of the CPA implementer and shall confirm that it is the CME or that a binding agreement has been signed with the CME, which ensures that CPA implementer is aware and agrees that its project activity is subscribed to a PoA. **Mean of proof / Evidence Document:** Binding agreement signed between the CPA implementer and the CME. **Tick when met:** ☐
Approval of CPA by CME	2	**The CPA-DD has been reviewed by the Coordinating/managing entity and submitted to a DOE for inclusion into the PoA.**
		How each generic CPA meets the eligibility criteria? The CPA implementer shall submit a CPA-DD to the CME with all underlying evidence for review. If the conclusion of CME review is positive, the CME shall notify the CPA implementer of the submission of the CPA-DD to the DOE for inclusion. Otherwise conclusion of the CME review shall be sent to the CPA implementer **Mean of proof / Evidence Document:** Communication from the CME to the DOE (cc/ CPA implementer) submitting the proposed CPA-DD for inclusion into the PoA. **Tick when met:** ☐
Crediting period	3	**The crediting period of the CPA shall not exceed the length of the PoA (i.e. 28 years) regardless of the time of inclusion of CPA in the PoA.**
		How each generic CPA meets the eligibility criteria? The CPA-DD verifies that the crediting period of the CPA does not exceed the length of the PoA. **Mean of proof / Evidence Document:** CPA implementer's statement and chosen crediting period in CPA-DD section A.9. **Tick when met:**

		☐
CER ownership	4	**The CPA is either implemented by the Coordinating/managing entity or by another entity that relinquishes its carbon rights to the CME.**
		How each generic CPA meets the eligibility criteria? The CPA-DD shall states confirm that the CPA implementer has signed a binding agreement with the CME, which ensures that CPA implementer is aware and agrees that its carbon rights have to be relinquished to CME. **Mean of proof / Evidence Document:** Binding agreement signed by CPA implementer and the CME. **Tick when met:** ☐

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

The following equations are used to calculate emission reductions, baseline emissions, project emissions and leakage of the CPA:

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

Where:

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

Baseline Emissions

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

(2)

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$EL_{BL,GR,y}$	=	Baseline minimum electricity generation in the grid in year *y* (MWh)
$EF_{EG,GR,y}$	=	Grid emission factor in year *y* (tCO_2/MWh)
$FF_{BL,HG,y,f}$	=	Baseline fossil fuel demand for process heat in year *y* (GJ)
$EF_{FF,y,f}$	=	CO_2 emission factor for fossil fuel type f in year *y* (tCO_2/GJ)
$EL_{BL,FF/GR,y}$	=	Baseline uncertain electricity generation in the grid or on-site in year *y* (MWh)
$EF_{EG,FF,y}$	=	CO_2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year *y* (tCO_2/MWh)
$BE_{BR,y}$	=	Baseline emissions due to disposal of biomass residues in year *y* (tCO2e)
y	=	Year of the crediting period
f	=	Fossil fuel type

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

Step 1.1: Determine total baseline process heat generation

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

This methodology assumes for the sake of simplicity that the proposed CDM project activity consumes steam from the same quality as in baseline process transported through one steam header.

Step 1.2: Determine total baseline electricity generation

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

Where:

$EL_{BL,y}$	=	Baseline electricity generation in year *y* (MWh)
$EL_{PJ,gross,y}$	=	Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)
$EL_{PJ,imp,y}$	=	Project electricity imports from the grid in year *y* (MWh)
$EL_{PJ,aux,y}$	=	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year *y* (MWh)
y	=	Year of the crediting period

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

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

Step 1.3: Determine baseline capacity of electricity generation

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

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

Where:

$CAP_{EG,total,y}$	=	Baseline electricity generation capacity in year *y* (MWh)
$CAP_{EG,CG,i}$	=	Baseline electricity generation capacity of heat engine *i* (MW)
$CAP_{EG,PO,j}$	=	Baseline electricity generation capacity of heat engine *j* (MW)

$LFC_{EG,CG,i}$	=	Baseline load factor of heat engine *i* (ratio)
$LFC_{EG,PO,j}$	=	Baseline load factor of heat engine *j* (ratio)
LOC_y	=	Length of the operational campaign in year *y* (hour)
i	=	Cogeneration-type heat engine in the baseline scenario
j	=	Power-only-type heat engine in the baseline scenario
y	=	Year of the crediting period

Step 1.4: Determine the baseline availability of biomass residues

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

The determination of this parameter shall be based on the monitored amounts of biomass residues used for power and/or heat generation in the project boundary for which B4: or BG3 has been identified as the most plausible baseline scenario in the CDM-PDD (as per Step B.4 above). The biomass residues quantities used should be monitored separately for (a) each type of biomass residue (e.g. sugarcane bagasse, rice husks, empty fruit bunches, etc.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.).

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

- One biomass residue type from one particular source could be used in the baseline in two or more heat generators. In this case, the use of this biomass residue type from this source has to be allocated to the different heat generators should they have different efficiencies;
- One biomass residue type from one particular source could have two different fates in the baseline scenario. The biomass categories 1 and 2 in Table 2 of the methodology ACM0006 illustrate this situation: the rice husks are obtained from one source but would in the baseline partly be dumped (B1:) and partly be used for power generation (B4:). This can apply, for example, if parts of one biomass residue type were already collected prior to the implementation of the CDM project activity while another part was not needed and thus dumped, left to decay or burnt. In this case, it is necessary to allocate the biomass residue quantity used under the project to the following fates in the baseline scenario:
    - Power or heat generation (B4:), or
    - Dumping, leaving to decay or burning (B1:, B2: and/or B3:), or
    - Scenarios required for the purpose of calculating leakage effects: other fates (B5: - B8:).

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

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

(scenario B4:) and partly has been dumped, left to decay or burnt (scenarios B1:, B2:, B3:) and if this situation would continue in the baseline scenario, then use, as a conservative approach to address the uncertainty associated with such an allocation, the maximum value among the following two approaches for the quantity of biomass residue of category *n* allocated to scenario B4:

- The quantity of biomass residue of category *n* is the highest annual historical use of that biomass residue type from that source for power and/or heat generation at the project site observed in the most recent three calendar years prior the date of submission of the PDD for validation of the CDM project activity for which data is already available; and
- In the case of projects that use biomass residues from a on-site production process (e.g. production of sugar cane or rice), the quantity of biomass residues of category *n* is calculated as follows:

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

Where:

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

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

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

Option 1: **Default values.** Use Option F in the latest approved version of the “Tool to determine the baseline efficiency of thermal or electric energy generation systems”.[19]

The default value for the losses linked to the electricity generator group (i.e. turbine/engine, couplings and electricity generator), $GGL_{default}$, is 5%.

[19] Where a default value is not provided for a technology a request for revision to this methodology may be submitted.

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

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

Efficiency for heat generators

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

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

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

Where:

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

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

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

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

Where:

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

Efficiency for heat engines

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

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

Where:

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

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

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

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

Where:

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

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

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

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

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

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

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

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

Where:

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

Step 1.7: Determine the emission factor of grid electricity generation

The parameter $EF_{EG,GR,y}$ should be determined as the combined margin CO_2 emission factor for grid to which the CDM project activity is connected in year *y*, using the latest approved version of the "Standardized baseline: Grid emission factor for the Southern African power pool ".

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

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

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

Where:

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

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

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

Step 3.1: Determine the baseline biomass-based heat generation

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

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

Subject to,

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

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

Where:

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

		basis)
$\eta_{BL,HG,BR,h}$	=	Baseline biomass-based heat generation efficiency of heat generator *h* (ratio)
$BR_{B4,n,y}$	=	Quantity of biomass residues of category n used in the CDM project activity in year *y* for which the baseline scenario is B4: (tonne on dry-basis)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{HG,h}$	=	Baseline capacity of heat generator *h* (GJ/h)
$LFC_{HG,h}$	=	Baseline load factor of heat generator *h* (ratio)
y	=	Year of the crediting period
h	=	Heat generator in the baseline scenario

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

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

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

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

Subject to,

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

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

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

Where:

$EL_{BL,BR,CG,y}$	=	Baseline biomass-based cogenerated electricity in year *y* (MWh)
$\eta_{BL,EG,CG,i}$	=	Baseline electricity generation efficiency of heat engine *i* (MWh/GJ)
$HG_{BL,BR,CG,y,i}$	=	Baseline biomass-based heat used in heat engine *i* in year *y* (GJ)
$HC_{BL,BR,CG,y}$	=	Baseline biomass-based process heat cogenerated in year *y* (GJ)
$HPR_{BL,i}$	=	Baseline heat-to-power ratio of the heat engine *i* (ratio)
$GGL_{default}$	=	The default value for the losses linked to the electricity generator group (turbine, couplings and electricity generator. Set at 0.05) (ratio)
$HG_{BL,BR,y}$	=	Baseline biomass-based heat generation in year *y* (GJ)
$HC_{BL,y}$	=	Baseline process heat generation in year *y* (GJ)

LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{EG,CG,i}$	=	Baseline electricity generation capacity of heat engine *i* (MW)
$LFC_{EG,CG,i}$	=	Baseline load factor of heat engine *i* (ratio)
i	=	Cogeneration-type heat engine in the baseline scenario
y	=	Year of the crediting period

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

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

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

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

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

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

- Define $HG_{balance,BR,PO,y} = HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i}$,

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

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

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

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

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

- Define $HC_{balance,FF,y} = \left(HC_{BL,y} - HC_{BL,BR,CG,y} \right) - \frac{h_{LOW}}{h_{HIGH}} \cdot \left(HG_{BL,BR,y} - \sum_{i} \mathrm{HG}_{\mathrm{BL,BR,CG,y,i}} \right)$,
  $\mathrm{EL}_{\mathrm{balance,FF,y}} = \mathrm{EL}_{\mathrm{BL,y}} - \mathrm{EL}_{\mathrm{BL,GR,y}} - \mathrm{EL}_{\mathrm{BL,BR,CG,y}}$, and,
- Proceed to Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation.

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

- Define $HG_{balance,BR,PO,y} = \left(HG_{BL,BR,y} - \sum_{i} \mathrm{HG}_{\mathrm{BL,BR,CG,y,i}} \right) - \frac{h_{HIGH}}{h_{LOW}} \cdot \left(HC_{BL,y} - HC_{BL,BR,CG,y} \right)$,
  $\mathrm{EL}_{\mathrm{balance,PO,y}} = \mathrm{EL}_{\mathrm{BL,y}} - \mathrm{EL}_{\mathrm{BL,GR,y}} - \mathrm{EL}_{\mathrm{BL,BR,CG,y}}$, and,
- Proceed to Step 3.3: Determine the baseline biomass-based electricity generated in power-only mode.

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

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

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

Subject to,

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

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

Where:

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

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

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

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

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

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

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

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

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

fossil fuel baseline emissions. Where cogeneration capacity is still available it is assumed that the remaining process heat demand will first be supplied by cogeneration and then by direct use of heat supplied by heat generators.

$$HG_{BL,FF,CG,y,i} = \frac{(HPR_{BL,i} + 1 + GGL_{default})}{HPR_{BL,i}} \cdot HC_{BL,FF,CG,y,i}$$, i.e the amount of fossil fuel based heat required to supply the cogeneration heat engine *i* **(25)**

$$EL_{BL,FF,y} = \sum_i \frac{HC_{BL,FF,CG,y,i}}{HPR_{BL,i}}$$, i.e the amount of fossil fuel based electricity cogenerated by cogeneration heat engine i **(26)**

$$HG_{BL,FF,CG,y} = \sum_i HG_{BL,FF,CG,y,i} \quad \textbf{(27)}$$

Subject to,

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

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

Where:

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

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

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

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

Where:

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

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

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

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

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

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

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

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

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

Subject to:

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

Where:

$FF_{BL,HG,y,f}$	=	Baseline fossil fuel demand for process heat in year *y* (GJ)
$HG_{BL,FF,y,h}$	=	Baseline fossil-based heat generation in heat generator *h* in year *y* (GJ)
$\eta_{BL,HG,FF,h}$	=	Baseline fossil-based heat generation efficiency of heat generator *h* (ratio)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{HG,h}$	=	Baseline capacity of heat generator *h* (GJ/h)

$LFC_{HG,h}$	=	Baseline load factor of heat generator *h* (ratio)
$HG_{BL,FF,DHE,y}$	=	Baseline fossil-based heat used to meet baseline process heat demand via direct heat extraction in year y (GJ)
$HG_{BL,FF,CG,y}$	=	Baseline fossil-based heat cogeneration in year y (GJ)

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

Step5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues

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

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

Where:

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

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

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

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

Where:

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

To determine the CH_4 emission factor ($EF_{BR,n,y}$), project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use for biomass residues 0.0027 t CH_4 per ton of biomass as default value for the product of $NCV_{BR,n,y}$ and $EF_{BR,n,y}$.[20]

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

For the biomass residues categories, as described in the biomass residues categories table, for which the most likely baseline scenario is that the biomass residues would decay under clearly anaerobic conditions

[20] 2006 IPCC Guidelines, Volume 4, Table 2.5, default value for agricultural residues.

(case B2), project participants shall calculate baseline emissions using the latest approved version of the tool "Emissions from solid waste disposal sites". The variable $BE_{CH4,SWDS,y}$ calculated by the tool corresponds to $BE_{BR,B2,y}$ in this methodology. The project participants shall use as waste quantities prevented from disposal ($W_{j,x}$) in the tool, those quantities of biomass residues ($BR_{n,B2,y}$) for which B2 has been identified as the most plausible baseline scenario, as summarized in the example in Table 2 of the methodology ACM0006.

Step6: Calculate baseline emissions

Calculate baseline emissions using equation 2 above.

Project emissions

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

- Emissions from fossil fuel consumption at the project site for the generation of electric power and heat and for auxiliary loads related to the generation of electric power and heat;
- CO_2 emissions from grid-connected fossil fuel power plants in the electricity system for any electricity that is imported from the grid to the project site;
- If either $EL_{balance,PO,y} < EL_{BL,BR,PO,y}$ (Case 3.3.2) or $EL_{balance,FF,y} < EL_{BL,FF,y}$ (Case 4.2.2), CO_2 emissions from grid-connected fossil fuel power plants in the electricity system due to reduction in electricity generation at the project site as compared to the baseline scenario;
- CO_2 emissions from off-site transportation of biomass that are combusted in the project plant;
- If applicable, CH_4 emissions from combustion of biomass for electric power and heat generation at the project site;
- If applicable, emissions from anaerobic treatment of wastewater originating from the treatment of the biomass prior to their combustion;
- If heat and/or power is produced from biomass cultivated in dedicated plantations: project emissions from cultivation of plantation (this source shall not be included if the total area of dedicated plantation is registered as one or several A/R CDM project activities).

Project emissions are calculated as follows:

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

Where:

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

Determination of PE_{FFy}

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

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

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

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y} \qquad \textbf{(38)}$$

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 CO_2 emission coefficient $COEF_{i,y}$ are calculated using Option B, since the necessary data for Option A is not available in South Africa.

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:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \qquad \textbf{(39)}$$

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

Option A should be the preferred approach, if the necessary data is available.

Determination of $PE_{GR1,y}$

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

$$PE_{GR1,y} = EF_{EG,GR,y} \cdot EL_{PJ,imp,y} \qquad \textbf{(40)}$$

Where:

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

Determination of $PE_{GR2,y}$

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

$$PE_{GR2,y} = EF_{EG,GR,y} \cdot EL_{PJ,offset,y} \quad \textbf{(41)}$$

Where:

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

Determination of $PE_{TR,y}$

In cases where the biomass residues are not generated directly at the project site, and always in the case of biomass from plantations, project participants shall determine CO_2 emissions resulting from transportation of the biomass to the project plant using the latest version of the tool "Project and leakage emissions from transportation of freight". $PE_{TR,m}$ in the tool corresponds to the parameter $\boldsymbol{PE_{TR,y}}$ in this methodology and the monitoring period m is one year.

Option B: Using conservative default values

This option relies on conservative default emission factors to estimate project or leakage emissions from transportation of freight. These default values are established for two vehicle classes: light vehicles and heavy vehicles. Project emissions are determined as follows:

$$\left.\begin{matrix} PE_{TR,y} \\ LE_{TR,y} \end{matrix}\right\} = \sum_{f} D_{f,y} \cdot FR_{f,y} \cdot EF_{CO2,f} \cdot 10^{-6} \quad \textbf{(42)}$$

Where:

$PE_{TR,y}$	=	Project emissions from transportation of freight in year *y* (tCO_2)
$D_{f,y}$	=	Return trip distance between the origin and destination of freight transportation activity f in year *y* (km)
$EF_{CO2,f}$	=	Default CO_2 emission factor for freight transportation activity f (g CO_2 / t km)
$FR_{f,y}$	=	Total mass of freight transported in freight transportation activity f in year *y* (t)
f	=	Freight transportation activities conducted in the project activity in year *y*

Determination of $PE_{BR,y}$

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

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

Where:

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

Determination of $PE_{WW,y}$

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

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

Where:

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

Determination of $PE_{BG2,y}$

No biogas recovery is covered under the PoA thus no project emissions associated with the production of biogas are applicable.

Determination of $PE_{BC,y}$

No biomass from dedicated plantation is used under the PoA thus no project emissions associated with the use of biomass from dedicated plantation are applicable.

Leakage

The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the CDM project activity. Changes in carbon stocks in the LULUCF sector are expected to be insignificant for biomass residues. For biomass from dedicated plantations, the applicability conditions above prevent changes in carbon stock requires that the project activity does not lead to a shift of pre-project activities outside the project boundary, and thus no leakage emissions are expected.

The baseline scenarios for biomass residues for which this potential leakage is relevant are B5:, B6:, B7: and B8:.

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

Where:

LE_y	=	Leakage emissions in year *y* (tCO_2)
$EF_{CO2,LE}$	=	CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO_2/GJ)

$BR_{B5/B8,n,y}$	=	Quantity of biomass residues of category n used in the CDM project activity in year *y*, for which the baseline scenario is B5:, B6:, B7: or B8: (tonnes on dry-basis)
$NCV_{BR,n,y}$	=	Net calorific value of biomass residue of category *n* in year *y* (GJ/tonne on dry-basis)
n	=	Biomass residue category
y	=	Year of the crediting period

Changes required for methodology implementation in 2nd and 3rd crediting periods

At the start of the second and third crediting period for a CPA (if applicable), the continued validity of the baseline scenario shall be assessed by applying the latest version of the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

B.6.2. Data and parameters that are to be reported ex-ante

Document and justify all selected values in the CPA-DD. The following are not monitored data and parameters:

- **Baseline emissions parameters not monitored**

Data / Parameter	**Biomass categories and quantities used for the selection of the baseline scenario selection and assessment of additionality**
Unit	- Type (i.e. bagasse, rice husks, empty fruit bunches, etc.); - Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, from dedicated plantations etc.); - Fate in the absence of the CDM project activity (scenarios B); - Use in the project scenario (scenarios P); - Quantity (tonnes on dry-basis)
Description	Explain and document transparently in the CDM-PDD, using a table similar to Table 2, which quantities of which biomass categories are used in which installation(s) under the CDM project activity and what is their baseline scenario. The last column of Table 2 corresponds to the quantity of each category of biomass (tonnes). For the selection of the baseline scenario and demonstration of additionality, at the validation stage, an *ex ante* estimation of these quantities should be provided
Source of data	On-site assessment of biomass categories and quantities
Value(s) applied	(see table below)
Choice of data or Measurement methods and procedures	-
Purpose of data	Selection of the baseline scenario and assessment of additionality
Additional comment	-

Value(s) applied:

Biomass residues category (*k*)	**Biomass residues type**	**Biomass residues source**	**Biomass residues fate in the absence of the CDM project activity**	**Biomass residues use in project scenario**	**Biomass residues quantity (dry basis)**

Data / Parameter	$BR_{HIST,n,x}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category n used for power or heat generation at the project site in year x prior the date of submission of the PDD for validation of the CDM project activity prior the time of submission of the PDD for validation of the CDM project activity
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available). In case of volume meters use the fuel density to convert the measurement to mass basis
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Step 1.4 in the case a biomass residues type from one particular source has been used prior to the implementation of the project activity partly in heat generators operated at the project site (B4:) and partly has been dumped, left to decay or burnt (B1:, B2:, B3:) and if this situation would continue in the baseline scenario

Data / Parameter	$BR_{n,h,x}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category n used in heat generator h in year x
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available)
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 3 of Step 1.5

Data / Parameter	$FF_{f,h,x}$
Unit	mass or volume unit/yr
Description	Quantity of fossil fuel type f fired in heat generator h in year x
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available). In case of volume meters use the fuel density to convert the measurement to mass basis
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to heat generators that were operated using fossil fuels at the project site for at least three calendar years prior the implementation of the CPA

Data / Parameter	$HG_{h,x}$

Unit	GJ
Description	Net quantity of heat generated in heat generator h in year x
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	This parameter should be determined as the difference of the enthalpy of the heat (steam or hot water) generated by the heat generators(s) [in the CDM project activity, monitored during year *y*,] minus the enthalpy of the feed-water, the boiler blow-down and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 3 of Step 1.5 if fossil fuels and biomass residues were used for heat generation in the heat generator h prior to the implementation of the project activity. In absence of temperature and pressure records, use the default values from equipment as reference

Data / Parameter	$\mathbf{HG_{BR,CG/PO,x,i,j}}$
Unit	GJ
Description	Quantity of heat used in heat engine i/j in year x
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) generated by the heat generators(s) [in the CDM project activity, monitored during year *y*,] minus the enthalpy of the feed-water, the boiler blow-down and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 3 of Step 1.5

Data / Parameter	$\mathbf{HC_{BR,CG/PO,x,i/j}}$
Unit	GJ
Description	Quantity of process heat extracted from the heat engine i/j in year x
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) supplied to process heat loads in the CDM project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return to the heat generators. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Case 1of Step 1.5

Data / Parameter	$EL_{BR,CG/PO,x,i/j}$
Unit	MWh
Description	Quantity of electricity generated in heat engine *i/j* in year *x*
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	Electricity meters
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 3 and/or Case 1of Step 1.5

Data / Parameter	P_x
Unit	Use suitable units, as appropriate
Description	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year x from plants operated at the project site
Source of data	On-site measurements
Value(s) applied	
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Step 1.4 in the case a biomass residues type from one particular source has been used prior to the implementation of the project activity partly in heat generators operated at the project site (B4:) and partly has been dumped, left to decay or burnt (B1:, B2:, B3:) and if this situation would continue in the baseline scenario

Data / Parameter	$CAP_{HG,h}$
Unit	GJ/h
Description	Baseline capacity of heat generator h
Source of data	On-site measurements or reference plant design parameters
Value(s) applied	
Choice of data or Measurement methods and procedures	This parameter should reflect the design maximum heat generation capacity (in GJ/h) of the baseline heat generator *h*. It should be based on the installed capacity of the heat generator. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$CAP_{EG,CG,i}$ $CAP_{EG,PO,j}$
Unit	MW

Description	$CAP_{EG,CG,i}$ = Baseline electricity generation capacity of heat engine i $CAP_{EG,PO,j}$ = Baseline electricity generation capacity of heat engine j
Source of data	On-site measurements or reference plant design parameters
Value(s) applied	
Choice of data or Measurement methods and procedures	This parameter should reflect the design maximum electricity generation capacity (in MW) of the baseline heat engines *i*. It should be based on the installed capacity of the heat engines. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**$LFC_{HG,h}$**
Unit	Ratio
Description	Baseline load factor of heat generator h
Source of data	On-site measurements or reference plant design parameters
Value(s) applied	
Choice of data or Measurement methods and procedures	This parameter should reflect the maximum load factor (i.e. the ratio between the ‘actual heat generation’ of the heat generator and its ‘design maximum heat generation’ along one year of operation) of the baseline heat generator *h*, taking into account downtime due to maintenance, seasonal operational patterns, and any other technical constraints. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined (e.g. using historical records)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**$HPR_{BL,i}$**
Unit	Ratio
Description	Baseline heat-to-power ratio of the heat engine *i*
Source of data	On-site measurements or reference plant design parameters
Value(s) applied	
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**$LFC_{EG,CG,i}$** **$LFC_{EG,PO,j}$**
Unit	Ratio
Description	$LFC_{EG,CG,i}$ = Baseline load factor of heat engine i $LFC_{EG,PO,j}$ = Baseline load factor of heat engine j
Source of data	On-site measurements or reference plant design parameters
Value(s) applied	

Choice of data or Measurement methods and procedures	This parameter should reflect the maximum load factor (i.e. the ratio between the 'actual electricity generation' of the heat engine and its 'design maximum electricity generation' along one year of operation) of the baseline heat engine *i*. The actual electricity generation of the heat engine should be determined taking into account downtime due to maintenance, seasonal operational patterns, and any other technical constraints. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{BL,CO2,FF}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of the fossil fuel type that would be used for power generation at the project site in the baseline
Source of data	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default emission factors (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the value in a conservative manner and justify the choice
Value(s) applied	
Choice of data or Measurement methods and procedures	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Step 1.6 Option B In case of plants existing before project implementation, the lowest CO_2 emission factor should be used in case of multi fuel plants

Data / Parameter	$\eta_{BL,FF}$
Unit	ratio
Description	Efficiency of the fossil fuel power plant(s) at the project site in the baseline
Source of data	Either use the higher value among (a) the measured efficiency and (b) manufacturer's information on the efficiency; OR use default values as provided in Annex 1 of the "Tool to calculate the emission factor for an electricity system"; OR assume an efficiency of 100%
Value(s) applied	
Choice of data or Measurement methods and procedures	If measurements are conducted, use recognized standards for the measurement of the heat generator efficiency, such as the "*British Standard Methods for Assessing the thermal performance of boilers for steam, hot water and high temperature heat transfer fluids*" (BS845). Where possible, use preferably the direct method (dividing the net heat generation by the energy content of the fuels fired during a representative time period), as it is better able to reflect average efficiencies during a representative time period compared to the indirect method (determination of fuel supply or heat generation and estimation of the losses). Document measurement procedures and results and manufacturer's information transparently in the CDM-PDD
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Step 1.6 Option B

Data / Parameter	**$NCV_{BR,n,x}$**
Unit	GJ/tonnes on dry-basis
Description	Net calorific value of biomass residues of category n in year x
Source of data	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Value(s) applied	
Choice of data or Measurement methods and procedures	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 3 of Step 1.5 The NCV is to be calculated for wet biomass as used in the heat generator (i.e. deducting the energy used for the evaporation of the water contained in the biomass residues). Biogas should be included as appropriate if applicable (in which case convenient units such as GJ/m^3 should be used)

Data / Parameter	**$NCV_{FF,f,x}$**
Unit	GJ/mass or volume unit
Description	Net calorific value of fossil fuel type f in year x
Source of data	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Value(s) applied	
Choice of data or Measurement methods and procedures	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 3 of Step 1.5 if fossil fuels and biomass residues were used for heat generation in the heat generator h prior to the implementation of the project activity.

Data / Parameter	**GWP_{CH4}**
Unit	tCO_2e/tCH_4
Description	Global Warming Potential of methane valid for the commitment period
Source of data	IPCC
Value(s) applied	

Choice of data or Measurement methods and procedures	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions
Purpose of data	Calculation of baseline/project emissions
Additional comment	Applicable to Step 5.1 and/or determination of $PE_{BR,y}$ and/or $PE_{WW,y}$

Data / Parameter	$\eta_{BL,HG,BR,h}$
Unit	Ratio
Description	Baseline biomass-based heat generation efficiency of heat generator *h*
Source of data	Default value or manufacturer's data
Value(s) applied	
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 1 or 2 of Step 1.5

Data / Parameter	$\eta_{BL,EG,CG,i}$
Unit	(MWh/GJ)
Description	Baseline electricity generation efficiency of heat engine *i*
Source of data	Default value or manufacturer's data
Value(s) applied	
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to Option 1 or 2 of Step 1.5

- **Project emissions parameters not monitored**

<table>
<tr><td>Data / Parameter</td><td>$EF_{CO2,f}$</td></tr>
<tr><td>Unit</td><td>g CO_2 / t km</td></tr>
<tr><td>Description</td><td>Default CO2 emission factor for freight transportation activity f</td></tr>
<tr><td>Source of data</td><td>Default value</td></tr>
<tr><td>Value(s) applied</td><td><table><tr><th>Vehicle class</th><th>Emission factor (g CO_2 / t km)</th></tr><tr><td>Light vehicles</td><td>245</td></tr><tr><td>Heavy vehicles</td><td>129</td></tr></table></td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>-</td></tr>
<tr><td>Purpose of data</td><td>Calculation of project/leakage emissions</td></tr>
</table>

Additional comment	Applicable to Option B of the determination of $PE_{TR,y}$

- **Grid emission factor parameters not monitored**

Data / Parameter	$EF_{EG,GR,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for the project electricity system applicable to all project activities other than wind and solar for the first crediting period
Source of data	Standardized baseline
Value(s) applied	0.9644
Choice of data or Measurement methods and procedures	Grid emission factor for the Southern African power pool (Version 01.0)
Purpose of data	Calculation of baseline emissions
Additional comment	The values are valid for three years from the date of adoption of standardized baseline by the CDM Executive Board, provided that no legal restrictions for international electricity exchange between any of the SAPP member countries take effect after the adoption of the standardized baseline

B.6.3. Ex-ante calculations of emission reductions

- **Baseline Emissions**

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

Step 1.1: Determine total baseline process heat generation

	$HC_{BL,y}$	**Yearly flow**	**Enthalpy**	***Temperature***		***Pressure***		***condition***
	GJ	**t/y**	**kJ/kg**	***°C***	***(°F)***	***bar***	***(PSIg)***	
Feed-water								
Process loads								
Blow down								
Condensate return(s)								
Total (2-1-3-4)								

Step 1.2: Determine total baseline electricity generation

	$EL_{BL,y} = EL_{PJ,gross,y} + EL_{PJ,imp,y} - EL_{PJ,aux,y}$			
	$EL_{BL,y}$	**$EL_{PJ,gross,y}$**	**$EL_{PJ,imp,y}$**	**$EL_{PJ,aux,y}$**
Units	**MWh**	**MWh**	**MWh**	**MWh**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
(Year 8)				
(Year 9)				

(Year 10)				
TOTAL				

Step 1.3: Determine baseline capacity of electricity generation

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

	$CAP_{EG,total}$	LOC_y	$CAP_{EG,CG,i}$	$LFC_{EG,CG,i}$	$CAP_{EG,PO,j}$	$LFC_{EG,PO,j}$
Units	**MWh**	**hours**	**MW**	**ratio**	**MW**	**ratio**
Year 1						
Year 2						
Year 3						
Year 4						
Year 5						
Year 6						
Year 7						
(Year 8)						
(Year 9)						
(Year 10)						
TOTAL						

Step 1.4: Determine the baseline availability of biomass residues (dry basis)

	$BR_{PJ,n,y}$	$BR_{B4,bagasse,y}$	$BR_{B1/B3,leaves,y}$	$BR_{B1/B3,woodchips,y}$	$BR_{B5/B8,n,y}$
Units	**tons/y**	**tons/y**	**tons/y**	**tons/y**	**tons/y**
Year 1					
Year 2					
Year 3					
Year 4					
Year 5					
Year 6					
Year 7					
(Year 8)					
(Year 9)					
(Year 10)					
TOTAL					

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

a) Efficiencies of heat generators

$\eta_{BL,HG,BR,h}$	$\eta_{BL,HG,FF,h}$
ratio	ratio

b) Efficiency of heat engines

$\eta_{BL,EG,CG,i}$
MWh/GJ

c) and Heat-to-Power Ratio

$HPR_{BL,i}$
ratio

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

Option selection at CPA level

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

$EF_{EG,GR,y}$
tCO_2/MWh
0.948

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

	$EL_{BL,GR,y} = max(0, EL_{BL,y} - CAP_{EG,total,y})$		
	$EL_{BL,GR,y}$	$EL_{BL,y}$	$CAP_{EG,total,y}$
Units	**MWh**	**MWh**	**MWh**
Year 1			
Year 2			
Year 3			
Year 4			
Year 5			
Year 6			
Year 7			
(Year 8)			
(Year 9)			
(Year 10)			
TOTAL			

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

Step 3.1: Determine the baseline biomass-based heat generation

	$HG_{BL,BR,y} = \sum_h \sum_n (BR_{B4,n,h,y} \cdot NCV_{BR,n,y} \cdot \eta_{BL,HG,BR,h})$			
	$HG_{BL,BR,y}$	$BR_{B4,n,h,y}$	$NCV_{BR,n,y}$	$\eta_{BL,HG,BR,h}$
Units	**GJ**	**tonnes (dry)**	**GJ/tonne**	**ratio**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
(Year 8)				
(Year 9)				
(Year 10)				
TOTAL				

Subject to,

$$\sum_{h}\sum_{n} BR_{B4,n,h,y} = \sum_{n} BR_{B4,n,y}$$

$$\sum_{n}\left(BR_{B4,n,h,y} \cdot NCV_{BR,n,y} \cdot \eta_{BL,HG,BR,h}\right) \leq LOC_{y} \cdot CAP_{HG,h} \cdot LFC_{HG,h}$$

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

	$EL_{BL,BR,CG,y} = \frac{1}{3.6}\sum_{i}\left(\frac{1}{HPR_{BL,i}+1+GGL_{default}} \cdot HG_{BL,BR,CG,y,i}\right)$			
	$EL_{BL,BR,CG,y}$	**$HPR_{BL,i}$**	**$GGL_{default}$**	**$HG_{BL,BR,CG,y,i}$**
Units	**MWh**	**(GJ/MWh)**	**ratio**	**GJ**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
(Year 8)				
(Year 9)				
(Year 10)				
TOTAL				

	$HC_{BL,BR,CG,y} = \sum_{i}\left(\frac{HPR_{BL,i}}{HPR_{BL,i}+1+GGL_{default}} \cdot HG_{BL,BR,CG,y,i}\right)$			
	$HC_{BL,BR,CG,y}$	**$HPR_{BL,i}$**	**$GGL_{default}$**	**$HG_{BL,BR,CG,y,i}$**
Units	**GJ**	**(GJ/MWh)**		**GJ**
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
(Year 8)				
(Year 9)				
(Year 10)				
TOTAL				

Subject to,

$\sum_{i} HG_{BL,BR,CG,y,i} \leq HG_{BL,BR,y}$, $HC_{BL,BR,CG,y} \leq HC_{BL,y}$ and

$$\left(\eta_{BL,EG,CG,i} \cdot HG_{BL,BR,CG,y,i}\right) \leq LOC_{y} \cdot CAP_{EG,CG,i} \cdot LFC_{EG,CG,i}$$

Case selection at CPA level

Step 3.4: Determine the baseline biomass-based electricity generated in power-only mode

Applicability depending on configuration at CPA level

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

Applicability depending on configuration at CPA level

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

Applicability depending on configuration at CPA level

Step 6: Calculate baseline emissions

$$BE_y = \left\{EL_{BL,GR,y} \cdot EF_{EG,GR,y} + \sum FF_{BL,HG,y,f} \cdot EF_{FF,y,f} + EL_{BL,FF/GR,y} \cdot \min(EF_{EG,GR,y}, EF_{EG,FF,y}) + BE_{BR,y}\right\}$$

	BE_y	$EL_{BL,GR,y}$	$EF_{EG,GR,y}$	$FF_{BL,HG,y,f}$	$EF_{FF,y,f}$	$EL_{BL,FF/GR,y}$	$EF_{EG,FF,y}$	$BE_{BR,y}$
Units	t CO_2e	MWh	tCO_2e/MWh	GJ	t CO_2e/GJ	MWh	tCO_2e/MWh	t CO_2e
Year 1								
Year 2								
Year 3								
Year 4								
Year 5								
Year 6								
Year 7								
(Year 8)								
(Year 9)								
(Year 10)								
Total								

- **Project emissions**

$$PE_y = \left\{PE_{FF,y} + PE_{GR1,y} + PE_{GR2,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} + PE_{BG2,y}\right\}$$

	PE_y	$PE_{FF,y}$	$PE_{GR1,y}$	$PE_{GR2,y}$	$PE_{TR,y}$	$PE_{BR,y}$	$PE_{ww,y}$	$PE_{BG2,y}$
Units	t CO_2e	t CO_2e	t CO_2e	t CO_2e	t CO_2e	t CO_2e	t CO_2e	t CO_2e
Year 1								
Year 2								
Year 3								
Year 4								
Year 5								
Year 6								
Year 7								
(Year 8)								
(Year 9)								
(Year 10)								
TOTAL								

- **Leakage Emissions**

➔ *Applicability depending on configuration at CPA level*

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

- **Baseline emissions parameters monitored:**

<table>
<tr><th>Data / Parameter</th><th>Biomass categories and quantities used in the CDM project activity</th></tr>
<tr><td>Unit</td><td>- Type (i.e. bagasse, rice husks, empty fruit bunches, tree bark etc.);
- Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, dedicated plantations etc.);
- Fate in the absence of the CDM project activity (scenarios B);
- Use in the project scenario (scenarios P and H);
- Quantity (tonnes on dry-basis)</td></tr>
<tr><td>Description</td><td>Explain and document transparently in the CDM-PDD, using a table similar to Table 2, which quantities of which biomass categories are used in which installation(s) under the CDM project activity and what is their baseline scenario.

The last column of Table 2 corresponds to the quantity of each category of biomass (tonnes on dry-basis). These quantities should be updated every year of the crediting period as part of the monitoring plan so as to reflect the actual use of biomass in the project scenario. These updated values should be used for emissions reductions calculations.

Along the crediting period, new categories of biomass (i.e. new types, new sources, with different fate) can be used in the CDM project activity. In this case, a new line should be added to the table. If those new categories are of the type B1:, B2: or B3:, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in the guidance provided in the procedure for the selection of the baseline scenario and demonstration of additionality</td></tr>
<tr><td>Source of data</td><td>On-site measurements</td></tr>
<tr><td>Value(s) applied</td><td><table>
<tr><th>Biomass residues category (k)</th><th>Biomass residues type</th><th>Biomass residues source</th><th>Biomass residues fate in the absence of the CDM project activity</th><th>Biomass residues use in project scenario</th><th>Biomass residues quantity (tonnes)</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Measurement methods and procedures</td><td>Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Accuracy shall comply with national or international standards.</td></tr>
<tr><td>Monitoring frequency</td><td>Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.</td></tr>
<tr><td>QA/QC procedures</td><td>Calibrated as per national guidelines or supplier instructions. Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

Data / Parameter	**For biomass residues categories for which scenarios B1:, B2: or B3: is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario**
Unit	tonnes
Description	- Quantity of available biomass residues of type n in the region - Quantity of biomass residues of type n that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region - Availability of a surplus of biomass residues type n (which cannot be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region
Source of data	Surveys or statistics
Value(s) applied	
Measurement methods and procedures	Project participants may choose one among of the following procedures to demonstrate this: o Demonstrate that there is an abundant surplus of the type of biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of that type of biomass residues available in the region is at least 25% larger than the quantity of biomass residues of that type which is utilized in the region (e.g. for energy generation or as feedstock), including the project plant demand; o Demonstrate for the sites from where biomass residues are sourced that the biomass residues have not been collected or utilized (e.g. as fuel, fertilizer or feedstock) but have been dumped and left to decay, land-filled or burnt without energy generation (e.g. field burning) prior to their use under the project activity. This approach is only applicable to biomass residues categories for which project participants can clearly identify the site from where the biomass residues are sourced.
Monitoring frequency	At the validation stage for biomass residues categories identified *ex-ante*, and always that new biomass residues categories are included during the crediting period
QA/QC procedures	-
Purpose of data	Calculation of baseline/leakage emissions
Additional comments	-

Data / Parameter	$BR_{PJ,n,y}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category n used in the CDM project activity in year *y* (tonnes on dry-basis)
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. Crosscheck the measurements with an annual energy balance that is based on harvested/purchased quantities and stock changes

Purpose of data	Calculation of baseline emissions
Additional comments	The biomass residue quantities used should be monitored separately for (a) each type of biomass residue (e.g.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.).

Data / Parameter	$\mathbf{BR_{B4,n,y}}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B4: (tonne on dry-basis)
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. Crosscheck the measurements with an annual energy balance that is based on harvested/purchased quantities and stock changes
Purpose of data	Calculation of baseline emissions
Additional comments	The procedures in Step 1.4 of methodology ACM0006 should also be followed

Data / Parameter	$\mathbf{BR_{B1/B3,n,y}}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B1: or B3: (tonnes on dry-basis)
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. Crosscheck the measurements with an annual energy balance that is based on harvested/purchased quantities and stock changes
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$\mathbf{BR_{B5/B8,n,y}}$
Unit	tonnes of dry matter
Description	Quantity of biomass residues of category n used in the CDM project activity in year y , for which the baseline scenario is B5:, B6:, B7: or B8:
Source of data	On-site measurements
Value(s) applied	

Measurement methods and procedures	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Purpose of data	Calculation of baseline/leakage emissions
Additional comments	-

Data / Parameter	$EF_{BR,n,y}$
Unit	tCH_4/GJ
Description	CH_4 emission factor for uncontrolled burning of the biomass residues category n during the year y
Source of data	Conduct measurements or use reference default values
Value(s) applied	
Measurement methods and procedures	To determine the CH_4 emission factor, project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 t CH_4 per ton of biomass as default value for the product of NCV_k and $EF_{burning,CH4,k,y}$
Monitoring frequency	In case of measurements: At least every six months, taking at least three samples for each measurement In case of other data sources: Review the appropriateness of the data annually
QA/QC procedures	In case of measurements, calibrated as per national guidelines or supplier instructions
Purpose of data	Calculation of baseline emissions
Additional comments	Applicable to Step 5.1

Data / Parameter	$EF_{FF,y,f}$
Unit	tCO_2/GJ
Description	CO_2 emission factor for fossil fuel type f in year y
Source of data	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default emission factors (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the value in a conservative manner and justify the choice
Value(s) applied	
Measurement methods and procedures	Measurements shall be carried out at reputed laboratories and according to relevant national or international standards
Monitoring frequency	In case of measurements: At least every six months, taking at least three samples for each measurement In case of other data sources: Review the appropriateness of the data annually

QA/QC procedures	Check consistency of measurements (calibrated as per national guidelines or supplier instructions) and local/national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements
Purpose of data	Calculation of baseline emissions
Additional comments	Applicable to Step 4.2

Data / Parameter	$\mathbf{HC_{BL,y}}$
Unit	GJ
Description	Baseline process heat generation in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) supplied to process heat loads in the CDM project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return of the heat generators. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
Monitoring frequency	Calculated based on continuously monitored data and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$\mathbf{EL_{PJ,gross,y}}$
Unit	MWh
Description	Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y*
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Use calibrated electricity meters. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years)
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$\mathbf{EL_{PJ,imp,y}}$

Unit	MWh
Description	Project electricity imports from the grid in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Use calibrated electricity meters. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. The consistency of metered electricity generation should be cross-checked with receipts from electricity purchases
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$\mathbf{EL_{PJ,aux,y}}$
Unit	MWh
Description	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Use calibrated electricity meters. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).
Purpose of data	Calculation of baseline emissions
Additional comments	$EG_{PJ,aux,y}$ shall include all electricity required for the operation of equipment related to the preparation, storage and transport of biomass (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.) and electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.)

Data / Parameter	$\mathbf{NCV_{BR,n,y}}$
Unit	GJ/tonnes of dry matter
Description	Net calorific value of biomass residue of category n in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Measurements shall be carried out at reputed laboratories and according to relevant national or international standards.
Monitoring frequency	Measure the NCV on dry-basis, at least every six months, taking at least three samples for each measurement.

QA/QC procedures	Check the consistency of the measurements (calibrated as per national guidelines or supplier instructions) by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements.
Purpose of data	Calculation of baseline emissions
Additional comments	Ensure that the NCV is determined on the basis of dry biomass.

Data / Parameter	$\mathbf{h_{LOW,y}}$ $\mathbf{h_{HIGH,y}}$
Unit	GJ/tonnes
Description	$h_{LOW,y}$ = Specific enthalpy of the heat carrier at the process heat demand side $h_{HIGH,y}$ = Specific enthalpy of the heat carrier at the heat generator side
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	The specific enthalpies should be determined based on the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions
Purpose of data	Calculation of baseline emissions
Additional comments	Applicable to outcomes 3.2.4 of Step 3.2 The process heat demand side refers to where heat is finally used for heating purposes by end-users and the heat generator side refers to where heat is generated

Data / Parameter	**Moisture content of the biomass residues**
Unit	% Water content in mass basis in wet biomass residues
Description	Moisture content of each biomass residues type *k*
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	The moisture content should be monitored for each batch of biomass of homogeneous quality. Accuracy shall comply with national or international standards.
Monitoring frequency	The weighted average should be calculated for each monitoring period and used in the calculations.
QA/QC procedures	Calibrated as per national guidelines or supplier instructions
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$\mathbf{P_y}$
Unit	Use suitable units, as appropriate

Description	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year y from plants operated at the project site
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Data aggregated as appropriate
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	**LOC_y**
Unit	hour
Description	Length of the operational campaign in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Record and sum the hours of operation of the CDM project activity facilities during year *y*.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	-

- **Project emissions parameters monitored:**

Parameters to determine project emissions from fossil fuel consumption (if applicable):

Data / Parameter	**$FC_{i,j,y}$**
Unit	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description	Quantity of fuel type *i* combusted in process *j* during the year *y*
Source of data	Onsite measurements
Value(s) applied	
Measurement methods and procedures	Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.

Monitoring frequency	Continuously
QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. 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 comments	-

<table>
<tr><td>Data / Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>GJ per mass or volume unit (e.g. GJ/m³, GJ/ton)</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of fuel type i in year y</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source if the carbon fraction of the fuel is not provided (Option A)</td></tr>
<tr><td>b) Measurements by the project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available

These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances)</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) applied</td><td></td></tr>
<tr><td>Measurement methods and procedures</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards</td></tr>
<tr><td>Monitoring frequency</td><td>For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td>Verify if the values under a), b) and c) 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 a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.</td></tr>
</table>

Purpose of data	Calculation of project emissions.
Additional comments	Applicable where Option B is used

Data / Parameter	$EF_{CO2,i,j}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type *i* in year *y*
Source of data	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source**: a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the project participants — If a) is not available c) Regional or national default values — If a) is not available. These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances) d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories — If a) is not available
Value(s) applied	
Measurement methods and procedures	For a) and b): Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency	For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable where Option B is used For a): 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 b), c) or d) should be used.

Parameters to determine project emissions from transport of the biomass residues (if applicable):

Data / Parameter	$D_{f,y}$
Unit	kilometre
Description	Return trip distance between the origin and destination of freight transportation activity f in year *y*

Source of data	Records of vehicle operator or records by project participants
Value(s) applied	
Measurement methods and procedures	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources (e.g. on-line sources)
Monitoring frequency	To be updated whenever the distance changes.
QA/QC procedures	Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps).
Purpose of data	Calculation of project/leakage emissions
Additional comments	Applicable to Option B

Data / Parameter	$\mathbf{FR_{f,y}}$
Unit	tonnes
Description	Total mass of freight transported n freight transportation activity f in year y
Source of data	Records by project participants or records by truck operators
Value(s) applied	
Measurement methods and procedures	Using weight or volume meters. If volume meters are used convert to mass units using the density of each category of biomass residues. Accuracy shall comply with national or international standards.
Monitoring frequency	Data monitored continuously and aggregated as appropriate
QA/QC procedures	Calibrated as per national guidelines or supplier instructions. Check consistency of mass records with biomass residues categories and quantities used in the project activity
Purpose of data	Calculation of project/leakage emissions
Additional comments	Applicable to Option B

Parameters to determine project emissions from combustion of biomass residues (if applicable):

Data / Parameter	$\mathbf{EF_{CH4,BR}}$
Unit	tCH_4/GJ
Description	CH_4 emission factor for the combustion of biomass residues in the project plant
Source of data	On-site measurements or default values, as provided in Table 4 of methodology ACM0006.
Value(s) applied	
Measurement methods and procedures	The CH_4 emission factor may be determined based on a stack gas analysis using calibrated analyzers. Accuracy shall comply with national or international standards.
Monitoring frequency	At least quarterly, taking at least three samples per measurement
QA/QC procedures	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements

Purpose of data	Calculation of project emissions
Additional comments	Monitoring of this parameter for project emissions is only required if CH_4 emissions from biomass combustion are included in the project boundary ($PE_{BR,y}$). Note that a conservative factor shall be applied, as specified in the baseline methodology

Parameters to determine project emissions from wastewater (if applicable):

Data / Parameter	$\mathbf{V_{WW,y}}$
Unit	m³
Description	Quantity of waste water generated in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Accuracy shall comply with national or international standards
Monitoring frequency	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures	Calibrated as per national guidelines or supplier instructions
Purpose of data	Calculation of project emissions
Additional comments	Applicable to the determination of $PE_{WW,y}$

Data / Parameter	$\mathbf{COD_{WW,y}}$
Unit	tCOD/m³
Description	Average chemical oxygen demand of the waste water in year y
Source of data	On-site measurements
Value(s) applied	
Measurement methods and procedures	Accuracy shall comply with national or international standards
Monitoring frequency	In case of measurements: At least every six months, taking at least three samples for each measurement
QA/QC procedures	Calibrated as per national guidelines or supplier instructions
Purpose of data	Calculation of project emissions
Additional comments	Applicable to the determination of $PE_{WW,y}$

Data / Parameter	$\mathbf{B_{o,WW}}$
Unit	$tCH_4/tCOD$
Description	Methane generation potential of the waste water
Source of data	Reference default values (IPCC)
Value(s) applied	
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-

Purpose of data	Calculation of project emissions
Additional comments	Applicable to the determination of $PE_{WW,y}$

Data / Parameter	$\mathbf{MCF_{WW}}$
Unit	ratio
Description	Methane correction factor for the waste water
Source of data	Reference default values (IPCC)
Value(s) applied	
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable to the determination of $PE_{WW,y}$

- **Leakage parameters monitored**

Data / Parameter	$\mathbf{EF_{CO2,LE}}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of the most carbon intensive fossil fuel used in the country
Source of data	Identify the most carbon intensive fuel type from the national communication, other literature sources (e.g. IEA). Possibly consult with the national agency responsible for the national communication / GHG inventory. If available, use national default values for the CO_2 emission factor. Otherwise, IPCC default values may be used
Value(s) applied	
Measurement methods and procedures	-
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	Calculation of leakage emissions
Additional comments	Applicable to leakage determination for the categories of biomass residues whose baseline scenario has been identified as B5:, B6:, B7: or B8:

B.7.2. Description of the monitoring plan for a generic CPA

Details of the monitoring plan will be described within each CPA due to the size, location and nature-specific characteristics of projects under this proposed PoA. Each CPA monitoring plan will comply with the methodology ACM0006 and the CDM Project Standard.

Monitoring organization

Each CPA implementer is responsible for the organization of an adequately trained CDM-dedicated monitoring team prior to the start of the CPAs respective crediting periods. Clear roles and responsibilities

for data collection, consolidation and results analysis will be assigned to all staff involved in the CDM monitoring, to be supervised by an appointed CDM coordinator.

The responsibility of the CDM coordinator for each CPA will cover the following items:

1. Monitoring equipment compliance check, ensuring that instrumentations and devices are available and properly suited to perform its function for emission reduction monitoring;
2. Development, execution, analysis and improvement of the Standard (CDM) Monitoring/Reporting Procedures;
3. Deployment of the procedures through trainings, ensuring that these procedures are fully complied with;
4. Communication and coordination between and among multiple departments in the company and at group levels to disseminate CDM related information;
5. Reporting to the CME of the consolidated data necessary for emissions reductions calculation;
6. Liaison with the DOE during the verification.

On top of the CPA-level monitoring, the CME will establish and maintain a database for each CPA. The CME will record CPA information detail delivered by CPA implementer, as follows:

- Name of the CPA,
- Name of CPA implementer,
- Contact details of CPA implementer,
- Capacity of the power-and-heat plant and other relevant technical specifications of each CPA,
- GPS coordinates of each CPA,
- Verification status (number of verification and associated monitoring period),
- Emission reductions monitored and issued each monitoring period.

The CME will be responsible for the management of records and data associated with each CPA. The database will be updated using the data supplied by the CPA implementer. It will form the basis for the verification of CPA and be available for inspection by the DOE at any point in time.

For each CPA, all parameters included in section B.8.1. will be monitored by the CPA implementer, recorded electronically, and regularly provided to the CME.

Monitoring procedures

All monitoring procedures will be described and specified at CPA level, including the type of measurement instrumentation used, the responsibilities for monitoring and Quality Assurance and Quality Control (QA/QC) procedures that will be applied. Where the methodology provides different options (e.g. use of default values or on-site measurements), CPA-DD will specify which option is to be used. All meters and instruments should be calibrated regularly as per industry practices.

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

Data quality

CPA implementer will have to implement a QA/QC procedure for recording and archiving data, as a mean to identify and then correct nonconformities in the project implementation or monitoring requirements. The QA/QC procedures set to ensure consistency of the monitoring concern the equipment installed and the data recorded. The project participant will follow the operation guidelines set by the manufacturer for the monitoring devices. In case of measurement failure, it will be reported to the technology provider. If repairing is not possible, the equipment will be replaced by equivalent item as soon as possible. Failure events will be recorded.QA/QC internal audit teams should not have any direct hierarchical relationships or dependence links with all entities involved to measure net electricity supplied to the grid and assuring the correct operation and maintenance of the measuring equipment. This independence shall guarantee the integrity of the controls that will be performed.

The data and reports provided by each CPA implementer to the CME will be checked internally to ensure the accuracy and completeness of data. In case of mistakes, corrective action will be applied to avoid future similar mistakes. If applicable, the CPA implementer will have to deliver equipments calibration certificates to the CME. The CME will crosscheck, reconcile or consolidate data with multiple sources whenever possible. At minimum, data obtained from the electricity meters is to be crosschecked with the electricity sales receipts. This kind of reconciliation activity will be recorded properly as DOE may request for such information during the verification.

Appendix 1. Contact information on entity/individual responsible for the PoA

Organization	**Standard Bank Plc**
Street/P.O. Box	20 Gresham Street
Building	-
City	London
State/Region	-
Postcode	EC2V 7JE
Country	United Kingdom of Great Britain and Northern Ireland
Telephone	+44 20 3145 6890
Fax	+44 20 3189 6930
E-mail	co2@standardbank.com
Website	www.standardbank.com
Contact person	Geoff Sinclair
Title	Head of Carbon Sales & Trading
Salutation	Mr
Last name	Sinclair
Middle name	-
First name	Geoff
Department	Energy Trading and Marketing
Mobile	+44 7769 648 695

CDM consultant

ecosur afrique

Alexandre Dunod (CDM Project Manager)
a.dunod@ecosurafrique.com

Aurélie Lepage (COO)
a.lepage@ecosurafrique.com

ecosur afrique is not a project participant.

Appendix 2. Affirmation regarding public funding

The PoA does not expect to involve any public funding according to the OECD definitions for Official Development Assistance (ODA).

Appendix 3. Application of methodology(ies)

No further background information on the applicability of the selected methodology(ies).

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

Not applicable

Appendix 5. Further background information on the monitoring plan

Not applicable

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Document information

Version	*Date*	*Description*
03.0	3 December 2012	Revision to clarify the determination of the start date for a PoA and the documentation requirement for generic CPA-DDs. (EB 70, Annex 6).
02.0	11 May 2012	EB 66, Annex 12 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities".
01.0	2 March 2012	EB 33, Annex 41 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: issuance
Keywords: project design document, programmes of activities