CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY: BASELINE (CDM-NMB)
Version 01 - in effect as of: 1 July 2004

CONTENTS

SECTION A. Identification of methodology

A.1. Proposed methodology title:

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"Improvement in recovery of waste biomass from process streams and use of that biomass in energy generation"

A.2. List of category(ies) of project activity to which the methodology may apply:

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The project activity is applicable to 'Category 4 – Manufacturing industries', as per the CDM sectoral scope (CDM-ACCR-06). In the absence of an appropriate project category definition, a new project category may be considered titled "Recovery and use of waste biomass[1] from process streams".

A.3. Conditions under which the methodology is applicable to CDM project activities:

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The project activity consists of (a) and (c) with or without (b) and (d):

a) Additional waste biomass recovery from process stream;
b) Improvement in energy efficiency of waste biomass recovery from process stream;
c) Utilization of biomass for energy generation with consequent displacement of fossil fuel
d) Improvement in utilization of biomass for energy generation

This methodology is applicable to projects recovering additional waste biomass that was previously been discharged and use of that recovered biomass for energy generation with or without improved efficiency.

Other applicability conditions include:

a) the local regulations / programs do not constrain the facility from using coal and other fossil fuels to generate energy;
b) the project is not a common practice in the industry sector for industries of a similar nature and size;
c) the proposed project activity generates additional waste biomass from process stream and use of which is not prohibited by the national regulations;
d) energy would have otherwise been generated using fossil fuel under the control of the project operator;
e) the process output(e.g., quantity of blown pulp)can be directly correlated to waste biomass(e.g., black liquor) concentration in process stream
f) biomass is not stored in the plant and is directly fired;

A.4. What are the potential strengths and weaknesses of this proposed new methodology?

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The potential strengths of the proposed new methodology are:

a) the methodology demonstrates a clear displacement of a fossil fuel to generate energy substituting with a biomass fuel that was otherwise entering the waste stream;

[1] Biomass in a process stream that in the absence of the project activity would otherwise have become a constituent of waste

b) the methodology uses the parameters that are normally monitored in the industry sectors to which this methodology is applicable for such project activity to take place;
c) the methodology considers specific energy requirement within the project boundary to calculate emission reductions;
d) the methodology has built-in flexibility for being applied to industries like pulp, paper and paperboards, brewery and distillery, starch, sugar, meat processing, dairy etc.
e) emission reduction due to expansion of the plant are not considered in calculating emission reductions
f) this methodology does not allow any scope for perverse incentive to increase waste biomass in process streams that is later recovered and claimed as emission reduction;
g) project emissions have to be considered even though the emissions can be shown to be "zero" i.e. based on emissions from an existing climate neutral fuel based energy delivery system, i.e. biomass source;

The potential weaknesses could be :

a) the methodology does not take into consideration the possible change in product characteristics due to increased waste biomass recovery ;
b) the methodology neglects emission reductions from lower chemical consumption and reduced effluent organic load in subsequent process steps;
c) the methodology assumes that process vis-à-vis bio-mass content in the process stream and feed-stock would remain static during the crediting period (which in fact could is a conservative approach)

SECTION B. Overall summary description:

>> This methodology addresses additionality of emission reductions from biomass replacing fossil based energy in an industrial context. The project activity covered by this methodology consists of (a) and (c) with or without (b) and (d):

a) additional waste biomass recovery from process stream;
b) improvement in energy efficiency of waste biomass recovery from process stream;
c) utilization of biomass for energy generation with consequent displacement of fossil fuel
d) improvement in utilization of biomass for energy generation

The baseline scenario is described by :

a) level of waste biomass recovery from process stream;
b) energy efficiency of waste biomass recovery from process stream;
c) utilization of fossil fuel for energy generation
d) efficiency of utilization of biomass for energy generation

The following parameters that are specific to the projects historical and existing operations define the baseline scenario:

Baseline scenario	**Baseline parameter**
level of waste biomass recovery from process stream	Biomass per unit of product – average of last two years
energy efficiency of waste biomass recovery from process stream	Energy consumption per unit of biomass recovered quality of steam (enthalpy) used to recover biomass;

Baseline scenario	Baseline parameter
	Calorific value and carbon percent of fossil fuel Efficiency of energy generation using fossil fuel (heat rate of the boiler – average of the last two years)
utilization of fossil fuel for energy generation	Calorific value and carbon percent of fossil fuel Efficiency of energy generation using fossil fuel (heat rate of the boiler – average of the last two years)
efficiency of utilization of biomass for energy generation	Steam (tonnes) and quality of steam (enthalpy) generated using biomass fuel; Biomass processed for energy generation (average annual for recent two years)

The project emissions are computed for two project scenarios:

a) where equipment / processes for additional waste biomass recovery not present in the baseline scenario is installed in the project activity ,- the entire project emissions on account of energy use in this new equipment / processes is accounted for in the project emissions,
b) where no new equipment is installed for additional waste biomass recovery is installed in the project activity - project emissions on account of the incremental energy use over the baseline scenario are accounted for.

The following parameters for the above two scenarios define the project emissions:

Project Scenario	Project parameter
A> New equipment / process	Total energy used by the new equipment / process Calorific value and carbon percent of fossil fuel Efficiency of energy generation using fossil fuel (heat rate of the boiler – average of the last two years)
B > Incremental energy for efficient process operation	Energy use in process in the baseline and in the project Biomass processed for energy generation in the baseline and in the project

Biomass is considered a climate neutral fuel and emissions from its use for energy generation and its subsequent use in operation of project activity are considered “zero”.

Leakage to the project would be on account for additional chemical and reagent usage and due to intermittent storage of biomass beyond a certain period. However, such leakages are insignificant and also in case the biomass is stored, this methodology is not applicable.

This methodology is applicable if the national /sectoral policy /regulatory environment does not compel the recovery and use of biomass and there are no limitations on the use of fossil fuels. Also, the methodology

requires that the project activity is not the only option to meet the effluent discharge standards mandatory for the sector.

The baseline methodology proposes the use of last two-year plant data to determine parameters in the baseline scenario. In the project scenario, to ascertain annual emission reductions, parameters to determine the baseline scenario is monitored as well as additional parameters needed to assess project emissions.

The additionality is tested within the methodology following the guidelines of CDM EB - "Tool for the demonstration and assessment of additionality" with certain changed emphasis. Methodology recommends barrier analysis to investment, in preference to investment analysis. It further needs to be demonstrated that the project activity is not a common practice in the sector in the host country.

A summary of project and baseline emissions and emission reductions have been presented in the table below:

Type of emissions	**Baseline - emissions**	**Project Activity- emissions and emission reductions**
Direct emissions / reductions	Steam is produced by firing fossil fuel in boiler/s that can be replaced if more biomass becomes available. Increased load of organic in the effluent treatment plant due to un-recovered waste biomass.	Additional waste biomass generation due to extraction from lean waste stream and its use in steam generation.
	Same as above	Improved efficiency in steam utilization in waste biomass recovery leading to reduction in fossil fuel quantum used in steam generation
	Same as above	Improved efficiency in biomass fuel based steam generation leading to increased steam generation with the same quantum of biomass energy generation
	None	Project emissions from use of power and steam in the project activity that has a potential for increasing fossil fuel emissions and should be reduced from emission reductions
Indirect emissions	High usage of chemicals and additives throughout the facility	Significant reduction in process chemicals in the facility

SECTION C. Choice of and justification as to why one of the baseline approaches listed in paragraph 48 of CDM modalities and procedures is considered to be the most appropriate:
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C.1. General baseline approach:

? **Existing actual or historical emissions, as applicable;**

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

? The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.

C.2. Justification of why the approach chosen in 3.1 above is considere d the most appropriate:
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The interventions covered by the project activity have multiple outputs having impacts on economic and financial cost and benefits. It will be difficult to find interventions resulting in same or similar outputs as that in project activity. And hence, finding an option that is an economically attractive course of action will be difficult and highly data intensive. Also, in market situations where externalities, imperfections and distortions are many, such an analysis will be increasingly difficult. Hence, it is not appropriate to apply the approach
"Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment"

It is very unlikely that many project activities of this nature (recovering waste biomass from process streams for use in generation of energy) would have occurred in the host countries, where biomass is abundant and biomass concentrations in waste streams are not strictly regulated. In the absence of many similar activities it is not appropriate to apply the approach
"The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category".

The approach *"Existing actual or historical emissions, as applicable"* is appropriate for estimation of baseline for this project activity as

1. this would fairly represent the scenario (what would have happened) in the absence of project activity as process changes of such nature and magnitude would occur after periods similar to crediting periods envisaged in the mechanism and

2. data and information of this nature are collected and record ed as a part of process monitoring, in the sectors where the project activity could occur

SECTION D. Explanation and justification of the proposed new baseline methodology:

D.1. Explanation of how the methodology determines the baseline scenario (that is, indicate the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases (GHG) that would occur in the absence of the proposed project activity):

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The project activity consists of (a) and (c) with or without (b) and (d):

a. Additional waste biomass recovery from process stream;
b. Improvement in energy efficiency of waste biomass recovery from process stream;
c. Utilization of biomass for energy generation with consequent displacement of fossil fuel;
d. Improvement in utilization of biomass for energy generation

Accordingly, the alternatives to the project activity are:

1. Expand the capacity and improve the treatment at Effluent treatment plant; increase the use of fossil fuel in existing boilers and generate more energy to meet increased energy requirements

2. Expand the waste treating capability of the Effluent treatment plant; draw the energy from the grid

However, the option 1, would be preferred in the project activity context (the fossil fuel based boilers are already in place) as this option is financially more attractive.

As explained above, the energy generation using the fossil fuel and existing boilers would have been the most likely scenario in the baseline, And conservative, as this does not account for emissions due expanded Effluent Treatment Plant operations.

Project needs to demonstrate that the additional biomass recovered, processed and utilized by the project is not the result of increased production and is directly attributable to the project activity. The increase in biomass available is a consequence of the introduction of new technology that extracts the previously wasted biomass solids from the waste stream and processes it efficiently to the required quality and efficiently combusts it to generate maximal energy (steam or power).

D.2. Criteria used in developing the proposed baseline methodology:

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The baseline is developed using the following criteria:

1. In the absence of the project activity, the project proponent would have continued with similar quantum of waste bio mass recovery as was being done during the last two years

2. And such a scenario would have been permitted by the applicable regulations and is cost efficient

3. The additional demand for energy, would have been met by the combustion of fossil fuel in the existing fossil fuel fired boilers

4. The process efficiencies and energy efficiencies in waste biomass recovery, steam generation, heat rate of the boilers, steam use in the process would have remained same as during the last two years in the absence of the project activity.

D.3. Explanation of how, through the methodology, it can be demonstrated that a project activity is additional and therefore not the baseline scenario (section B.3 of the CDM-PDD):

>>To demonstrate that the proposed project is additional, the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board would be used. However, methodology suggests emphasis on barrier approach to the investment in preference to investment analysis.

Step 0 Preliminary screening of projects started after 1 January 2000 and before 31 December 2005

If the project has been initiated within the period mentioned above, evidence should be provided to the DOE that CDM initiative was seriously considered in the decision to proceed with the project activity. Such evidence should be based on (preferably official) documentation showing that the CDM initiative played a role in the decision-making process. If such evidence is not available then the project is not additional. If such evidence is available, then proceed to step 1.

Step 1 Demonstration that the project activity is not mandated under the law

The project activity needs to demonstrate that the use of biomass energy and low GHG intensive fuels for energy production is not a requirement under the current laws and regulations.

If the proposed project activity is the only alternative amongst the ones chosen by the project participants that is in compliance with all laws and regulations, then the proposed project activity is not additional.

However if there are other alternatives that are in compliance with law and regulations then proceed to step 2 or step 3.

Step 2 Investment analysis

Methodology suggests emphasis on barrier approach to the investment in preference to investment analysis.

Step 3 Barrier Analysis

The barrier analysis needs to be carried out to demonstrate that the project activity would have to overcome one or more of the barriers as below:

Investment – The investors of this project activity (such as the project proponent, bankers or financial institutions) may perceive risk of energy generation using biomass fuel arising out of availability of waste biomass , process variable fluctuations etc.

Technology- The process of generating, processing and utilizing biomass for captive power generation will involve unfamiliarity and uncertainties. Thus, project proponent will have to face technological uncertainties or have to establish additional devices/systems/practices.

Prevalence – It needs to be demonstrated that the project activity is not widely prevalent in a similar sector in the host country.

Other Barriers – The supply of biomass and/or low GHG intensive fuels may be irregular, which may affect the functioning of energy generation and hence operations of the plant.

If it is demonstrated that the project has none of these barriers then project is not additional. If it is demonstrated that the project has at least one of the above barriers, then proceed to step 4

Step 4 Common Practice Analysis

An analysis needs to be carried out showing that the project activity is not a common practice in the industry sector in the region or country where it is to be carried out. If the above cannot be established then proceed to step 5 and otherwise the project activity is additional.

Step 5 Impact of CDM Registration

CDM registration could encourage the project participants and other waste biomass based industries to implement such options. And if this too is demonstrated, not necessarily quantitative and conclusive, then the project is additional.

D.4. How national and/or sectoral policies and circumstances can been taken into account by the methodology:

>> This methodology is applicable if the national /sectoral policy /regulatory environment does not compel recovery and use of biomass and there are no limitations on the use of fossil fuels. Also, the methodology requires that the project activity is not the only option to meet the effluent discharge standards mandatory for the sector .

In addition, the new guidelines to incorporate national/secoral policies/regulations in baseline estimations, delineated at EB16 report, Annex 1 may be adhered to.

D.5. Project boundary (gases and sources included, physical delineation):

>> The project activity consists of (a) and (c) with or without (b) and (d):

a) additional waste biomass recovery from process stream;
b) improvement in the energy efficiency of waste biomass recovery from process stream;
c) utilization of biomass for energy generation with consequent displacement of fossil fuel;
d) improvement in utilization of biomass for energy generation

All the above should be included within the project boundary as a process train leading up the utilization of waste biomass as a fuel for energy generation.

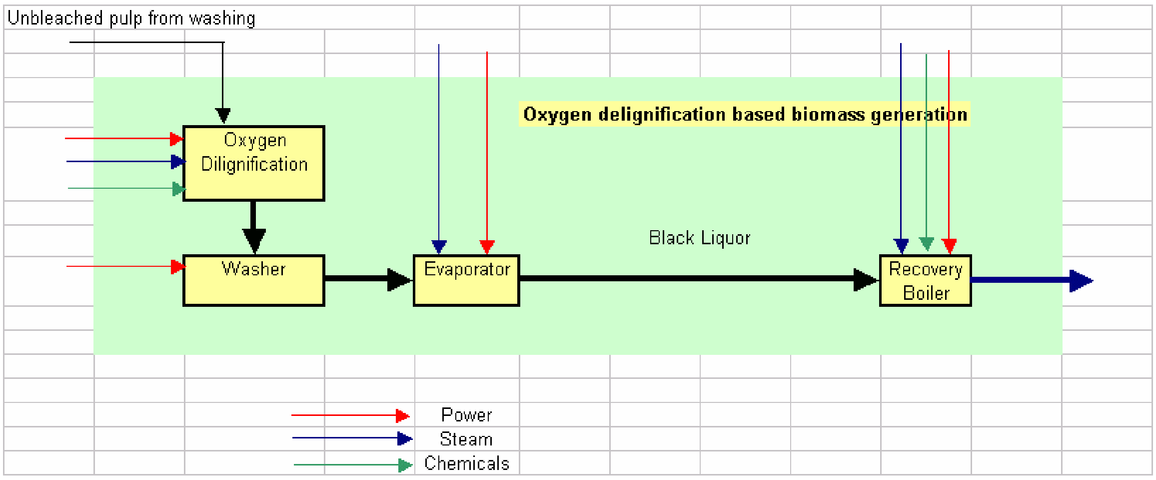

Figure 1 : Example of project boundary for the project in the pulp and paper sector

Out of the six GHG listed in the Annex A of the Kyoto Protocol, carbon dioxide (CO2) is the chosen GHG to which this methodology is applicable and included in the project boundary. Since the methodology does not allow for storage of biomass, methane emissions are avoided.

D.6. Elaborate and justify formulae/algorithms used to determine the baseline scenario. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

>>In the baseline the emissions are on account of energy generation using fossil fuel. The baseline emissions are calculated as follows :

The baseline emissions in any year 'Y' are computed as:

BEy = (EP / Eff) / FF_CV *C% * 44/12 *(1/1000) **(1)**

Where,

EP= the extra energy generated by the project using biomass fuel (kcal)
Eff= Efficiency of fossil fuel energy generation (%) monitored periodically;
FF_CV= Average calorific value of fossil fuel (kcal/kg) monitored in the plant;
C% = Percentage of Carbon in fossil fuel used (%);
44/12 = conversion of tC to tCO2 equivalent
1/1000 = conversion from kg to tonnes

Where,

EP = EP_bio + EP_proc+EP_util **(2)**

EP_bio= Energy generated from additional biomass generated by the project (kcal);

EP_proc= Energy saved due to efficiency improvements in biomass processing (kcal); and

EP_util= Energy saved due to efficiency improvements in biomass utilization for energy generation (kcal).

Each of the above parameters are calculated individually to arrive at the baseline emissions.

Step 1 : Compute EP_bio

EP_bio = (increase in enthalpy of steam generated in project over baseline per unit of biomass generated)*(incremental biomass generated due to the project at baseline levels of production)

EP_bio = ((SBIOP* Enth_ SBIOP)/BIOP -(SBIOB* Enth_ SBIOB)/BIOB)*((BIOP/PP- BIOB/PB) * (PB)) **(3)**

Where,
SBIOB = steam generated using biomass energy in baseline (tonnes)
SBIOP = steam generated using biomass energy in project (tonnes)
Enth_ SBIOB = Enthalpy of steam generated using biomass energy in baseline (kcal/tonne)
Enth_ SBIOP = Enthalpy of steam generated using biomass energy in project (kcal/tonne)

PB = product attributable to waste biomass source in baseline (tonne)
PP = product attributable to waste biomass source in project (tonne)
BIOB = Biomass generation in baseline (tonne)
BIOP = Biomass generation in project (tonne)

Step 2 : Compute EP_proc

EP_proc = (incremental specific steam economy in project over baseline)*(biomass generated in baseline)
EP_proc = ((EN_B* Enth_ ENB/BIOB) – (EN_P* Enth_ ENP/BIOP))*BIOB **(4)**

Where,

EN_B = steam consumed to process biomass in baseline (tonnes)
EN_P = steam consumed to process biomass in project (tonnes)
Enth_ ENB = Enthalpy of steam used to process biomass baseline (kcal/tonne)
Enth_ ENP = Enthalpy of steam used to process biomass project (kcal/tonne)
BIOB = Biomass generation in baseline (tonne)
BIOP = Biomass generation in project (tonne)

Step 3 : Compute EP_util

EP_util = ((SBIOP* Enth_ SBIOP)/BIOP -(SBIOB* Enth_ SBIOB)/BIOB)*BIOB **(5)**

Where,

SBIOB = steam generated using biomass energy in baseline (tonnes)
SBIOP = steam generated using biomass energy in project (tonnes)
Enth_ SBIOB = Enthalpy of steam generated using biomass energy in baseline (kcal/tonne)
Enth_ SBIOP = Enthalpy of steam generated using biomass energy in project (kcal/tonne)
BIOB = Biomass generation in baseline (tonne)
BIOP = Biomass generation in project (tonne)

D.7. Elaborate and justify formulae/algorithms used to determine the emissions from the project activity. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

>>Project emissions are considered even though the emissions can be shown to be "zero" i.e. based on emissions from a climate neutral, i.e. biomass source;

Total project emissions = PEy = **PE_new_y + PE_ex_y** **(6)**

A>For New equipment / process in the project activity:

PE_new_y = (SP_ENi / Eff) / FF_CV *C% * 44/12 *(1/1000) **(7)**

Where,

P_ENi= energy of type I used by new equipment / process in the project activity (kcal)
Eff= Efficiency of fossil fuel energy generation (%) monitored periodically;

FF_CV= Average calorific value of fossil fuel (kcal/kg) monitored in the plant;
C% = Percentage of Carbon in fossil fuel used (%);
44/12 = conversion of tC to tCO2 equivalent
1/1000 = conversion from kg to tonnes

B > Incremental energy for other processes inside the project boundary

PE_ex_y = (DELTA_EN / Eff) / FF_CV *C% * 44/12 *(1/1000) **(8)**

Where,
DELTA_EN = (SENPi/BIOP- SENB/BIOB)*(BIOP-BIOB)
ENPi = energy of type i used in by the project by processes whose efficiencies have improved
ENBi = energy of type i used in the baseline by processes whose efficiencies have improved in the project
BIOB = Biomass generation in baseline (tonne)
BIOP = Biomass generation in project (tonne)
Other parameters are as define above

D.8. Description of how the baseline methodology addresses any potential leakage of the project activity:

>> Leakage to the project would be on account for additional chemical and reagent usage and due to intermittent storage of biomass beyond a certain period. However in case of biomass storage this methodology is not applicable.

If it can be shown that leakage reductions on account of the project are significantly higher than any leakage caused by the project due to additional chemical or reagent use, only then can the estimation of these leakage be avoided.

D.9. Elaborate and justify formulae/algorithms used to determine the emissions reductions from the project activity. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

>> Annual Emission Reductions (**ER_Y**) from the project activity:

ERy = BEy – PEy – Leakage if any (Ley) **(9)**

SECTION E. Data sources and assumptions:

E.1. Describe parameters and or assumptions (including emission factors and activity levels):

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Parameter	Basis / Assumptions
Eff= Efficiency of fossil fuel energy generation (%) monitored periodically;	Monitored in the plant : For baseline : average of last two years data

FF_CV= Average calorific value of fossil fuel (kcal/kg) monitored in the plant; C% = Percentage of Carbon in fossil fuel used (%);	(quarterly) For project : quarterly Data is assumed to remain fairly constant during a quarter
SBIOB = steam generated using biomass energy in baseline (tonnes) Enth_ SBIOB = Enthalpy of steam generated using biomass energy in baseline (kcal/tonne) PB = product attributable to waste biomass source in baseline (tonne) BIOB = Biomass generation in baseline (tonne) ENBi = energy of type i used in the baseline by processes whose efficiencies have improved in the	Average of last two years data
P_ENi= energy of type I used by new equipment / process in the project activity (kcal) BIOP = Biomass generation in project (tonne) ENPi = energy of type i used in by the project by processes whose efficiencies have improved SBIOP = steam generated using biomass energy in project (tonnes) Enth_ SBIOP = Enthalpy of steam generated using biomass energy in project (kcal/tonne) PP = product attributable to waste biomass source in project (tonne)	Actual daily monitoring in the project

E.2. List of data used indicating sources (e.g. official statistics, expert judgement, proprietary data, IPCC, commercial and scientific literature) and precise references and justify the appropriateness of the choice of such data:

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Key Parameters	**Data Sources**
Total biomass, steam, power generated from project	Existing and historical data maintained at the industrial unit
Project fossil fuel, steam, power generation and quality and consumption	Should be maintained by the project as and when consumed
Fossil fuel characteristics	Should be collected from supplier or analyzed by the project operator.
IPCC defaults values	As mentioned by the methodology; Revised IPCC guideline and updated as and when changed.

E.3. Vintage of data (e.g. relative to starting date of the project activity):

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- Baseline emission data at the existing facility should be the last two years average data.
- Project data at the existing facility should be at least for the last one year.

E.4. Spatial level of data (local, regional, national):

>> The data required for the application of the proposed methodology will have the following spatial levels:

Local and unit level:	• All data related to baseline and project calculation except for fossil fuel characteristics can be crossed checked with supplier.
Global	• IPCC default values for fossil fuel emission factors and net calorific values when plant specific values are not available.

SECTION F. Assessment of uncertainties (sensitivity to key factors and assumptions):

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One or more of the following uncertainties, wherever applicable, would have to be assessed and addressed adequately for a project activity:

1. Confidence intervals of data recording and monitoring of critical parameters such as
   - calorific value of fossil fuel,
   - percentage carbon in fossil fuel,
   - actual quantity of biomass fired and
   - enthalpy of steam generation and consumption.

2. Effects of capacity enhancement if any would have to be negated.

SECTION G. Explanation of how the baseline methodology allows for the development of baselines in a transparent and conservative manner:

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Transparency

1. The data to be used for application of the methodology should be able to demonstrate reliability on the basis of availability in the logs/ registers available (for validation and verification) with the project proponent/ sponsor/ participant.
2. Data to compute baseline emission and other secondary data would be based on last two years performance data.

Conservatism

1. The possible leakages have been built into emission reduction calculations.

2. Practicability and data availability particularly frequency and relevance of available data could be a major concern in several developing countries hence this has been a guiding criteria in development of this methodology.

3. The dynamic nature of proposed methodology is a guard against any likely change in current situation with regard to biomass generation, parent unit capacity expansion and quality of output.

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