CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY: BASELINE (CDM-NMB)
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CONTENTS

SECTION A. Identification of methodology

A.1. Proposed Methodology Title:

CECL methodology for power generation for captive use, which is grid connected, using non-renewable and less GHG intensive fuels.

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

Sectoral Scope 1 - Grid-connected electricity generating project using non-renewable fuel in energy industries.

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

This methodology is applicable to projects where:

- the power generation is through a non-renewable and less GHG intensive fuel;
- the power generation is for captive use and the grid is used for wheeling the power;
- the fuel used for generating the power is not the only choice permitted by applicable regulations;
- the user of power is clearly identified through the crediting period;
- the user of power was drawing electricity from the grid before the CDM project activity;
- the capacity of captive power generation plant is less than 60MW altogether;
- the power produced by the CDM project activity has an insignificant impact on the supply deficit of the grid

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

Strengths of the proposed methodology are as follows:

- It is easy to use.
- It is conservative and transparent.
- It encourages new similar types of project to qualify for CDM, as the project itself is very easy to design and operate as CDM project.

Weaknesses of the methodology are as follows:

- Power generation point and the consumption point is not in the same project boundary and therefore, leakage might happen which could be overlooked.
- The Methodology is limited to the case where the user of power from the CDM project activity, was earlier drawing power from the grid.

SECTION B. Overall summary description:

Some countries where CDM projects will be located, the regulations covering power sector allow the power users to locate their power plant away from the user's location and transmit (wheel) the power from generation point to user point, using the grid. Without such flexibility in regulations, captive power plants generally use the fuel that is available at the location of industry, at competitive cost. In case, national/ regional grid permits the wheeling of power by generators, the options for location and the fuel for of the captive power plant, significantly increase. In such situations, the captive power plant, operating on cleaner and non-renewable fuels like natural gas and having almost low or near zero CO_2 emissions, will be set up in locations far away from the user plant/industry, to which electricity is to be supplied. The electricity produced from clean and non-renewable energy source is supplied to the closest grid connection point, from where it is wheeled to the location of user industry. The user industry has following options for meeting its need for power viz..

I. Locating the power plant nearest to the use point, using available GHG intensive fuel,
II. Locating the power plant at coal mine pit head and wheel the power to the use location, and
III. Drawing power from the grid,

In all the three options mentioned above, he would be contributing to the increased GHG emissions as compared to a captive power plant, which is set up at a distant location, using a cleaner fuel like Natural Gas.

In cases where the user was drawing power from the grid before the project activity, the baseline methodology proposes that:

In the absence of the CDM Project activity, the user Industry would have continued to meet its power demand through the grid. In that case, the grid would have received this quantum of power from :

I. the existing power plants which are feeding power into the grid, or
II. the power plants proposed to be built in future.

Accordingly, the methodology uses Combined Margin representing the GHG emissions that would have occurred to meet this demand by a suitable set of existing and proposed power plants.

The methodology, proposed herein, has the following steps:

- Establish additionality of the proposed activity
- Determine the relevant grid. (As the capacity of the power plant- project activity – is limited to 60 MW as per the applicability conditions (see A.3), it is appropriate to chose lowest level of the grid)
- Determine set of plants in the operating and build margins. The set of plants in the operating margin are selected based on ratio of annual despatched power to the design despatch. The set of plants in the build margin are either:
  - ✓ Five power plants that have been built most recently [including plants under construction], or

- ✓ Power plants that have been built most recently [including plants under construction], whose capacity additions in the electricity system, comprise 20% of the total power generation in the system.

- Compute the GHG intensity (tCO_2/GWh) of the power generated by the generators in the operating margin and build margin- which constitutes the baseline.

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:

C.1. General baseline approaches:

- □ **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 C.1 above is considered the most appropriate:

The selected baseline approach considers 'electricity generated by the operation of the existing grid connected power plants, and the addition of new generation sources'.

The chosen baseline methodology is in line with the approach marked (highlighted & underlined) under section C.1, as foreseen in the Marrakech Accords. "The current or the existing emission", are based on the emission data of the power plants operating in the applicable electricity grid(s) system(s). The "emissions from plants considered in the build margin" would be those that will be impacted through a delay in the joining schedule of power plants to the grid analogous to the plants considered under this margin.

The other two approaches mentioned under section C.1 are not suitable because:

The second approach –"*Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment"* requires determination of economically attractive options and in situations where the markets are distorted and/ or the availability of data is doubtful, the applicability of the methodology may be restrictive.

The third 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"* may not represent the situation in the absence of the project. As in the absence of the project, the operating power plants at the lower margin may continue to operate and the projects in the pipeline may get delayed.

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):

In the absence of the project activity the user industry would have met its demand for power, by the following alternatives:

I. Drawing the required power from the grid
II. Establishing a power plant with an alternative GHG intensive fuel at the power user Industry
III. Establishing a power plant at any other location with an alternate fuel other than the option of CDM project activity.

In the case under consideration, the user industry was drawing the power form the grid, till recently. Thus, this scenario is representative of what would have continued to happen, in the absence of the proposed CDM project activity.

The CDM project activity reduces the demand for power on the grid, which of course is insignificant as compared to the demand-supply gap in the grid. However, the CDM project activity will impact the power generation from the projects, which are lower in the merit order amongst the operating plants connected to the grid, and also the plants being built and proposed to be built.

And hence, the methodology uses the combined margin, representing the GHG emissions that would have occurred, to meet the demand of user industry, which is avoided by the CDM project activity, by making a suitable choice of a set of operating plants and plants being and proposed to be built.

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

The baseline is developed using the following criteria:

- The user industry, which was earlier drawing power from the grid, is now getting power from the captive power plant Thus, it avoids drawl of power from grid to the extent of generation by the captive power plant, and

- The power generated by the CDM project activity has reduced the GHG emissions from the grid, which would have occurred in the absence of CDM activity, in order to meet the marginal power demand of user industry. Such demand would have been met from the operating plants at the margins of merit; and the plants that are being constructed and proposed to be constructed and connected to the applicable grid.

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):

The demonstration of additionality for any **project activity** that is based on the proposed methodology is as per the "Annex 1 - Tool for the demonstration and assessment of additionality". The additionality check given below is carried out as per the additionality check mentioned above.

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 non-renewable 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

An investment analysis using financial indicators (such as IRR, cost benefit ratio, cost of unit generation etc.) could be applied to check whether there is at least one identified alternative that is better for investment than the project activity. Through this analysis it needs to be demonstrated whether the proposed project activity is economically or financially more attractive than other alternatives without revenue from CERs. If it is financially attractive than all the alternatives without the CERs then proceed to next step for checking additionality. However, if there is one alternative that is permitted by the applicable regulations and is financially more attractive than the CDM project activity, then proceed to step 4

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 bankers or financial institutions) may perceive risk as power generation using this fuel, this technology, at a chosen location, through the process of wheeling is not a prevalent practice.

Technology- The process of transfer of captive power to grid and then to the utility region will involve unfamiliarity and uncertainties. Thus, project proponent will have to face technological uncertainties or have to establish additional devices.

Prevalence – The project activity could be the first of its type in captive power generation and supply. The project may face problems due to reluctance from power grid to accept power from such system.

Other Barriers – The supply of non-renewable and low GHG intensive fuels may be irregular, which may affect the functioning of power 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 region or country where it is to be carried out. If the above cannot be established, then the project is not additional, otherwise proceed to step 5.

Step 5 Impact of CDM Registration

CDM registration could encourage the project participants and other power generators 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 be taken into account by the methodology:

The methodology considers that the national or sectoral policies do not restrict the use of non-renewable and less GHG intensive fuel and hence the choice of fuel for power generation is not mandated by regulations.

The methodology is applicable only if the captive power plants can wheel the power from any location to the other in the region covered by the applicable grid.

The user of the power generated by the CDM project activity- industry in a sector- is not restricted by the regulations to use power generated by specified fuels or technologies and utilities located in a region. If yes, as per the methodology, the additionality of CDM project activity will be impacted.

The user of the power generated by the CDM project activity is not required to establish the captive power plant and is permitted to draw power from the grid by applicable regulations. Otherwise the methodology is not applicable.

If the national and sectoral circumstances demonstrate that the CDM project activity involving:

- Captive power
- Wheeling of power
- Using the same fuel
- Using the same technology
- In the region where project activity is being undertaken and the captive user is located is a common practice, then the CDM project activity's additionality is impacted.

The sectoral circumstances of power sector – choice of fuels and generation technologies by the generators, merit order followed by the grid, final despatch to the grid, demand and supply gap, investment climate etc would impact the operating and built margins and hence the baseline quantum.

The policy articulations preferring one fuel over the other, one technology over the other, is not accounted for in the operating and combined margin determination

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

Out of the six GHGs listed in the Annex A of the Kyoto Protocol, carbon dioxide (CO_2) is the chosen GHG to which this methodology is applicable and included in the project boundary. The project boundary is from the point of fuel supply to the point of power generation to export to the grid/ third

party, where the project proponent has a full control. Therefore, the project boundary will cover the following items:

- storage and transportation (by the project proponent) of fuel,
- power generation facility,
- dispatch to the grid, and
- captive consumption (within the power generation plant) units.

Further, upstream emissions should be placed within the project boundary when the project developer can significantly influence these emissions. This could mean that the fuel source can be included within the system boundaries, if required.

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):

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

$$\mathbf{BE_Y = EF_{CM,Y} * NETPOWER_Y}$$

Where:

$$\mathbf{EF_{CM} = (EF_{OM} + EF_{BM})/ 2} \quad \text{..... (1)}$$

EF_{CM} = Emission intensity of power generation in the Combined Margin (tCO_2/GWh)
EF_{OM} = Emission intensity of power generation in the Operating Margin (tCO_2/GWh)
EF_{BM} = Emission intensity of power generation in the Build Margin (tCO_2/GWh)

Calculations in the Operating Margin

The average OM emission factor ($E_{OM,average,Y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/GWh) of all generating sources serving the system, including low-operating cost and must-run power plants.

Merit Order Data Analysis Operating Margin calculations (based on performance ratio)
The dispatch data OM emission factor ($EF_{OM, DD}$) is calculated at the start of the project activity as per the following procedure. The performance ratio is calculated for all power plants operating in the applicable/relevant grid:

Performance Ratio (PR) = (Actual Power Generation) / (Design Capacity* Plant Load Factor) ……. **(2)**

The PRs for all plants in the operating margin are analyzed and then ranked in order (0 – 1, including fractional values) to select the worst performers (merit order analysis) who contribute about 10% of the total power generated in the grid.

The total power contributed by these plants will be $\mathbf{EG_{OM}}$ (in GWh).

The power generated from each of these power plants ($EG_{OM,p}$) is multiplied by the IPCC emission factor (per GWh) for the type of fuel used to calculate CO_2 contributed by each plant. The summation of CO_2 contributed by all plants provides the total CO_2 contributed by all the plants in the operating margin.

$E_{OM,Y} = \sum EG_{OM,p} * IPCC\ factor$……..…….**(3)**

Therefore, the OM emission factor (EF_{OM}) is calculated as:

$EF_{OM} = E_{OM,Y} / EG_{OM}$ .....**(4)**

Calculations in the Build Margin
This is calculated as the likely emission intensity (tCO_2/GWh) of following sample of power plants, whichever results in greater power generation:

- ✓ Five power plants that have been built most recently [including plants under construction], or
- ✓ Power plants capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently [including plants under construction].

EG_{BM} = Total power contributed by all the power plants from one of the options as above… (5)

To calculate CO_2 emissions from each of power plant in the BM, the installed capacity of individual plants ($EG_{BM,Y}$ in GWh) is multiplied by the IPCC emission factor (IPCC in tCO_2/GWh) for the type of fuel used such plant. The summation of CO_2 contributed by all plants provides the total CO_2 contributed by all the plants in the build margin given as following.

$E_{BM,Y} = \sum (EG_{BM,Y} * IPCC)$……**(6)**

The emission factor in the build margin is then calculated as:

$EF_{BM} = E_{BM,Y} / EG_{BM}$ …… **(7)**

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

$BE_Y = E_{CM,Y} * NETPOWER_Y$…….**(8)**
Where,

The net power, $NETPOWER_Y$, is the power received by the user industry from the CDM project, as certified by the local transmission utility, after wheeling (transmission) through the local grid.

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):

The emissions from the project activity have two components:

(1) Emissions due to fossil fuel combustion, and
(2) Emissions during transportation of power generating fuel.

Emissions due to fossil fuel combustion

$PE_f = (PC * PLF * HR_f * EF_f * CF)$…….. **(9)**

where:

PE_f = Emissions due to "f" fuel consumption during operation of the project in an year (tCO_2)
PC = Installed Plant Capacity (MW);
HR_f = Heat Rate of the facility for Natural Gas as fuel "f"(kCal/MWh);
EF_f = Fossil fuel emission factor (approved IPCC emission factor- tCO2/TJ);
PLF = Plant Load Factor (expected/monitored)
CF = Conversion Factor of units (=365*24* $4.18/10^9$)

Emissions during transportation of power generating fuel

$PE_t = (L_P * P_{EF} * GWP\_CH4)$……..**(10)**

where:

PE_t = Emissions due to transportation of power generating fuel (tCO_2);
L_P = Length of pipeline to transport fuel to power plant (km)
P_{EF} = Emission factor for fuel (primarily comprising methane) per unit length of transporting pipeline used (tCH_4/KM);
GWP_CH_4 = Global warming potential of methane (tonnes of CO_{2e} per tonne of CH_4) i.e. 21.

Emissions due to Project Activity

$PE_Y = PE_f + PE_t$…….. (11)

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

The leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases, which occurs outside the project boundary. For the power plant project, the leakage is identified as the activity, which contributes for GHG emissions outside the project boundary. Hence, the following can be considered as potential leakage scenario:

Transloss (GWh/year): Transmission losses if they are significantly different for the sections of the grid that is relevant for the CDM project activity.

Thus, losses of power are duly accounted for in baseline emission formula.

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 from the project activity:

$ER= BE_Y – PE_Y$ …….... **(12)**

SECTION E. Data sources and assumptions:

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

Merit order to determine Operating Margin – Performance Ratio (PR)

Merit order can be determined from the design dispatch of the plants and actual dispatch during the recent past. In many countries, the power generation and dispatch information aggregated over a period of week/ month/ year is available in the public domain.

Emission Factors
For all fossil fuels, the IPCC standard emission factors are to be used for estimation of CO_2 emissions. Though plant specific emission factors may be more desirable, availability of such data in the public domain may not be the case in many non-Annex I countries.

Government Policies/ guidelines regarding power sector
The effect of the present and proposed national and state government power sector policies regarding generation, distribution, transmission, trading, captive generation etc. is to be appropriately considered for development of future power scenario. Policies/circulars related to the various incentives and disincentives regarding use of particular fuel, are also to be accounted properly. Further, as a result of ratification of Kyoto Protocol by the nations, it is expected that more and more funds flow through CDM and help the environment friendly activities like power generation with use of low GHG emitting fuels, development of renewable energy and energy efficiency projects etc. Study of specific country/ state policies, data regarding potential for use of low carbon fuels, renewable energy projects, energy efficiency improvement and relevant data/ document in this regard needs to be referred for future projections on realistic and conservative basis.

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:

Key Parameters	Data Sources
Dispatch data for all operating plants in the selected grid area on actual annual generation basis for each year during the crediting period.	Published at any public domain by any level of government authority and is verifiable.
Installed capacities and plant load factors for all operating plants as mentioned above.	Published at any public domain by any level of government authority and is verifiable.
Installed capacities and plant load factors for all plants considered under the build margin.	Published at any public domain by any level of government authority and is verifiable.
Emission factors for each plant considered in the operating and build margins, and plant considered under the project activity.	IPCC, since plant specific data on emission factors may not be available in the public domain in most situations and circumstances, for specific fuel and power generation technology.
Annual fuel consumption at proposed power plant, gross calorific value of fuel, annual plant load factor and installed capacity of power plant.	From database with project sponsor, and suppliers for power plant technology and fuel.

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

- The data for set of operating power plants, their generation capacity, despatch, fuels etc., to be maximum of past three years.

- The cohort of power generators in the built margin would have to be determined from two-year-old data.

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 state:	• Data for all grid-connected power generators. • Data on fuel characteristics for calculating project emissions.
Regional and National:	• Plants synchronized to the grid in the recent 5 years. • Most recent 5 capacity additions synchronized to the grid, including plants under construction. • Most recent 20% of capacity additions synchronized to the grid, including plants under construction.
Global	• IPCC Emission Factors.

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

- Due to increase in cost of fossil fuel, it is likely that the efficiency of power plants will increase which will increase the power supply to the grid.
- Power generation system efficiency of project activity may reduce in the future due to aging of equipment or due to improper maintenance of the system.
- Capacity additions in each sector may not take place as predicted for baseline calculations.

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

The proposed baseline methodology is developed as transparent and conservative in following ways:

- The methodology uses guidelines of CDM Executive Board to identify the project additionality.
- It is based on the OECD and IEA literature and research information regarding baseline development.
- It refers to the UNFCCC guidelines of indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories.
- To apply the methodology information / data collected from government, semi-government, published and authentic private organisations are to be used.

The proposed methodology is transparent since it uses authentic, published data with references, which can be easily verified.

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