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

## CONTENTS

A. Identification of methodology

B. Overall summary description

C. Choice of and justification as of baseline approach

D. Explanation and justification of the proposed new baseline methodology

E. Data sources and assumptions

F. Assessment of uncertainties

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

## SECTION A. Identification of methodology

### A.1. Proposed methodology title:

Avoiding flaring of waste gases from steel manufacturing operations and its utilization for generating thermal power thereby substituting fuel and supplying to grid.

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

✓ The project activity is applicable to 'Category 9, metal production', as per sectoral scope. In the absence of an appropriate project category definition, a new project category may be considered titled *"Process waste gas recovery and combustion for electricity generation in grid connected power plants"*.

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

The conditions under which this project activity would be applicable include the following:

- part of the waste gases generated during the steel manufacturing operations are used for meeting internal heating requirements within the steel manufacturing industry, and remaining waste gases would normally have been flared in the absence of the project activity;
- project activity does not induce diversion of waste gases required for internal usage, to project activity;
- proposed project activity does not result in integrated process change, except for possible associated changes due to collection, stabilization and transportation of waste gases to electricity generators;
- there are neither local regulations/ programmes to constrain use of GHG intensive fuels (like coal) nor any regulation making use of waste gases mandatory; and
- project activity results in supply of electricity to local grids, excluding grids with surplus power, unless cost of generation and supply is favourable for inter-grid transfers.

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

**Potential Strengths**

1. The methodology takes into account the availability of data in public/ semi-public domain;
2. The methodology is cost effective and conservative; and
3. The methodology accounts for use of waste heat for other associated purposes (e.g., internal heating requirements) and such a scenario is common and is required for effective use of waste gases.

**Potential Weakness**

1. Potential for bias in decision making process pertaining to inclusion/ exclusion of units in the Operating Margin Method;
2. Conservativeness of the methodology shall have to be assessed on a grid-to-grid basis;
3. Representative character of the build margin component in the baseline is uncertain since future developments need not always follow the historical trend based on policy decisions at government level, and the Build Margin for do not capture such uncertainties; and
4. There could be lack of adequate data for similar waste gas generating projects[1].

[1] E.g., there are only three COREX process based steel manufacturing units in the world, in whose activities the proposed new methodology could be applied.

## SECTION B. Overall summary description:

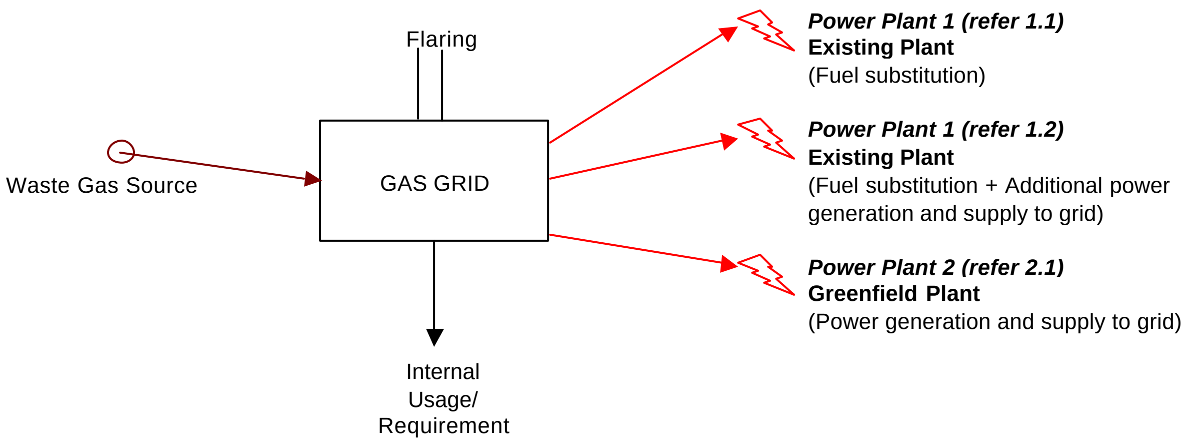
Energy contained in waste gases in a steel manufacturing industry is utilized to generate electricity, thereby avoiding need for flaring the waste gases, replacing more GHG intensive fuel in the thermal power plants connected to an electricity grid. The utilization of heat content in waste gases has been considered to be a credible solution of reducing emission of GHG (primarily $CO_2$). The proposed methodology establishes the environmental and sustainable credibility of the CDM project activity.

There are multiple waste gases generating sources in steel manufacturing industry that is based on the COREX or ROMELT processes. In such processes, neither the generation of waste gases from any particular source is steady nor waste gases are generated in consistent quantity.

The activity envisaged in this new baseline is establishment and operation of a common gas grid to enable collection of waste gases and enable steady supply of the gases to the electricity generators who could use the same for the purpose indicated below:

| Electricity Generation Plant | Use of Waste Gases |
|---|---|
| 1. Existing power plant | 1.1 Partial substitution[2] of existing fuel.<br><br>1.2 Partial substitution of existing fuel + Supply of additional measure of electricity to grid using a fuel mix of existing fuel and waste gases. |
| 2. Greenfield power plant | 2.1 Power generation and supply to grid using waste gases as one of the fuels. |

The gas grid considered under this methodology has the flexibility to collect waste gases from multiple sources to supply to two types of power plants connected to the gas grid. A schematic of the type of gas grid considered is shown below.




Based on the selected gas grid, the proposed CDM project activity involves adding necessary equipment and accessories for collection, cleaning *(if required)* and transportation of waste gases to power plant(s) at steady rate for combustion to generate electricity, and all associated modifications in the existing gas handling system to make the project activity happen.

[2] Supply of existing measure of electricity to grid using a fuel mix of existing fuel and waste gases.

## 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 approach:

- **Existing actual or historical emissions, as applicable *[48(a) – this has been selected]*;**

- Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment [48(b)];

- 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 [48(c)].

### C.2. Justification of why the approach chosen in C.1 above is considered the most appropriate:

The baseline scenario considers that electricity would have been otherwise generated by (i) use of existing GHG intensive fuels in the existing power plant(s) and/ or (ii) the operation of other grid-connected power plants and by addition of new power generating sources. This chosen baseline methodology is in line with the approach marked (highlighted) above under **section C.1**, foreseen in the Marrakech Agreement.

"**The current or the existing emission**", are based on the following:

- current fuel mix will be continued in the existing power plants, where a part of one of the fuels may be substituted with waste gas; and

- modification trends in the applicable electricity generation matrix (i.e., generating unit for fuel substitution and for additional power generation) in the local electric sector, and the impact that the project's activities may cause to this trend.

## 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, excess[3] waste gases from steel manufacturing operations will not be dispatched to power pla nt(s) for generation of electricity and supply to the grid, resulting in the following incidences/ occurrences:

1. flaring of excess waste gases leading to $CO_2$ emissions;

2. use of more GHG intensive fuels for generation of additional electricity at the existing power plants leading to emission of GHG; and

[3] After utilizing a portion of total waste gases for meeting the internal heating requirements.

3. need to establish new power plants to meet any shortfall in supply, with possibility of further GHG emission.

The baseline methodology uses existing actual and historical (as available) emission data, of existing power plant(s) due to use of more GHG intensive fuels and those of other suppliers of power to the grid. The baseline methodology can be used for the following two power generating scenarios:

Case I: The project activity results in partial replacement of existing GHG intensive fuel in an existing power plant with waste gases to supply equal measure of electricity which would otherwise have been generated using the GHG intensive fuel. The electricity replaced is not significantly large and the baseline scenario is therefore 'continued use of the GHG intensive fuel'; and

Case II: Use of waste gases to generate additional[4] power in existing power plant and/ or generate power in new power plant(s) connected to the gas grid. Therefore, the baseline scenario in this case is 'electricity would have otherwise been generated by the operation of grid-connected power plants and by addition of new generation sources'. The project activity would thus impact at the margin the supply of additional electricity to the grid by existing built and operating power plants.

In any specific situation, the baseline emission would comprise of either individual cases (i.e., Case I or Case II) or a combination, based on the use of the available waste gases. Thus, the proposed methodology is described under the following two stages:

**Stage 1: Choice of replacement fuel and determination of GHG intensity of existing power plant**

The choice of the waste gases as replacement fuel is not automatic but on the basis of research and partial replacement of existing GHG intensive fuel with waste gases from one area of existing steel manufacturing process operations, and planning of logistics for its uninterrupted availability for power generation. Based on such research and partial replacement of the existing fuel with waste gases, it would have been established that the latent heat content of waste gases is significant enough to allow its use as a viable alternative fuel. It could be also understood and established that minimal logistics would be required for storing and transportation of these gases from another neighbouring waste gas generating source within the same steel manufacturing industry, thus allowing uninterrupted supply of the waste gases to the power generating stations.

A mix of fuels, comprising GHG fuels (including those used for auxiliary needs such as start-up operations) and waste gases from already existing plant, determines the carbon intensity in choice of fuel, for which available historical data (at least 3 years or total operation period, which ever is less) need to be analysed. The methodology describes ways of determining GHG intensity of power generation in the power plant, based on available emission factors for existing fuels as per Intergovernmental Panel for Climate Change (IPCC - current version). The emission factors are reported in terms of $tCO_{2equ}$/GWh.

**Stage 2: Determination of GHG intensity of the grid**

The mix of power plants supplying electricity to the grid determines its GHG intensity. A combined margin (CM) methodology incorporating elements of operating margin (OM) and build margin (BM) has been

[4] Additional power means 'power in excess of what is currently generated using a GHG intensive fuel.

suggested in this case for determining the carbon intensity of the selected grid, based on Meth Panel's "**Approved consolidated baseline methodology ACM0002**[5]".

**Operating Margin:** The weighted average emission (in $tCO_{2equ}$/GWh) of current generation mix has been considered based on the justification that 'in absence of the electricity produced from the waste gases at least equivalent measure of electricity would have otherwise been generated by the operation of grid-connected power generators and by addition of new generation sources'. The project activity, in view of the energy deficit in the local grid as well as the insignificant size of its electricity contribution to the grid, is unlikely to impact other investments in the power connected to the local grid. Hence, this project activity may impact only the operations of the current or future (under construction) power plants at the margin. To that extent, the "Operating Margin Methodology" is of relevance in case of this project activity.

In view of the cost of power being higher than the realization for the grid, it is likely that the grid shall take increasing recourse to merit order dispatch. Since the power cost with waste gas shall be less than the current tariff for power plant with other fuels, the OM impact of the CDM project can be better depicted by the weighted average emissions of all generating sources serving the system, including low-operating cost and must-run options such as hydro, wind, low-cost biomass, nuclear and solar generation.

**Build Margin:** The weighted average emission (in $tCO_{2equ}$/GWh) of recent capacity additions to the system, defined as the greater of the power additions from the top of most recent 20% of the plants built or the five most recent plants, is proposed as the BM.

In the event that there is an energy deficit in the local grid forcing the grid to purchase power from other grids/ states with surplus power, the power availability scenario in the local grid may be improved at a higher cost.

The project activity, may impact the total power dispatched from the build power plants serving the grid and also to some extent new or proposed capacity additions to the grid. In light of these facts, the project can impact the nature and timing of new facilities that may be proposed. Hence, "Build Margin Methodology" also has relevance for assessing impact of the project activity.

The BM effect, on account of the increased dispatch from the power plant(s), shall pertain to projects commissioned immediately preceding the project and those following it. The BM so developed is a current margin as on date also since it uses a "cohort" of most recent 5 projects and 20% of the most recent projects from all projects added to the system in the last 5 years.

"Combined Margin Methodology" would be the most suitable representation of the baseline scenario, particularly if the low-cost/ must-run resources are in excess of 50% of the total grid generation. Accordingly, a straight average[6] of the OM and BM has to be taken to develop the CM.

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

The baseline methodology is developed on the basis of replacement of more GHG intensive fuel and combined margins (in operating and build situations) for existing actual and historical emissions.

[5] Consolidated baseline methodology for grid-connected electricity generation from renewable sources.

[6] Providing for equal weight to OM and BM.

**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):**

Within the scope of the proposed methodology, additionality could be demonstrated by using CDM Meth panel guidelines[7]. The additionality can be demonstrated through the following steps:

**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 publicly provided that the CDM incentive 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 incentive played a role in the decision-making process. If such evidence is not available then the project is not additional.

**Step 1 Demonstrating that the project activity is not mandated under current laws and regulations.**

The project activity needs to demonstrate that management of waste gases from steel industry for electricity generation is not a requirement under current laws and regulations. In case this is mandated under current law in a country or region then alternatives to the project activity should be checked under step 2; else either of step 2 or step 3, or both steps 2 and 3 should be analysed for demonstration of additionality.

**Step 2 Identification of alternatives to project activity consistent with current laws and regulations.**

In case the project activity is mandated under existing legal requirements, the alternatives to project activity could be one or more of the following:

- ✓ flaring excess waste gases (after meeting internal heating requirements in the steel industry);
- ✓ existing power generator continues using existing GHG intensive fuel for generating current or additional measure of electricity under legal mandate; and
- ✓ any new Greenfield power plant can choose and obtain regulatory permission to use any GHG intensive fuel to generate power.

**Step 3 Investment Analysis.**

- ✓ Applying an investment comparison analysis using a financial indicator (such as IRR, NPV, cost benefit ratio, levelized cost of electricity generation or Rs./kWh values), and checking whether there is at least one identified alternative which is better for investment than the project activity.

**Step 4 Barrier Analysis**

- ✓ ***Investment***- the investors to this project activity (such as bankers or financial institutes) may perceive risks to their investment due to unfamiliarity of the technology that would be used to general power from waste gases; in addition the management may also feel that the investment required for the project activity has associated risks since the project activity is first of its kind using excess waste gases from similar steel industry;

[7] As per "Draft consolidated tools for demonstration of additionality". The validity of the proposed methodology is subject to approval of the 'draft additionality tool' in its present form or in any revised form.

- ✓ ***Technological***- the technology for waste gas utilization to generate power may not be widely used, and there would be unfamiliarity and uncertainties to the processes and procedures involved that may need to be addressed through R&D or pilot plant studies;

- ✓ ***Prevalence***- the project activity if executed could be one of the first of such projects on which neither the project proponent nor the available labour have familiarity with successful operation; and

- ✓ ***Other Barriers***- there could be unavailability of adequately skilled labour for utilisation of waste gases for power generation, operation and maintenance because of unfamiliarity with the processes involved in the project activity.

The above barriers may prevent the project sponsor from undertaking the project activity, if there is no sufficient incentive for overcoming these barriers and making the project happen.

**Step 5 Common Practice Analysis**

- ✓ in the country or region where the project activity would be performed, not more than 20% of the existing steel industries utilize waste gases for power generation;

- ✓ since utilizing the waste gases for power generator may not be a common practice, the waste gas generator may have carried out R&D work and/ or pilot-scale feasibility studies to establish the use of these gases as replacement fuel for GHG intensive fuels; and

- ✓ based on research and partial replacement of the existing fuel with waste gases from another operation within the same or similar steel industry, it could be established that the latent heat content of waste gases is significant enough to allow its use as a viable alternative fuel for generation of electricity, even though such is not a prevalent practice in the country and region of the project activity.

**Step 6 Impact of CDM Registration**

- ✓ The CDM registration could encourage other operators of similar steel manufacturing operations to implement such options in their processes;

- ✓ This could encourage laws at country levels to prescribe use of waste gases as potential alternatives to GHG intensive fuels;

- ✓ This may encourage equity participation by private parties on such projects, and bring in investors; and

- ✓ This could bring credibility to the project activity.

Based on the above analysis, it may be satisfactorily concluded that the project activity is not a baseline scenerio, and thus it is additional.

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

The methodology considers that at the time of start of project activity, the national and sectoral policies may not support the use of waste gases for electricity generation. However, the project activity where

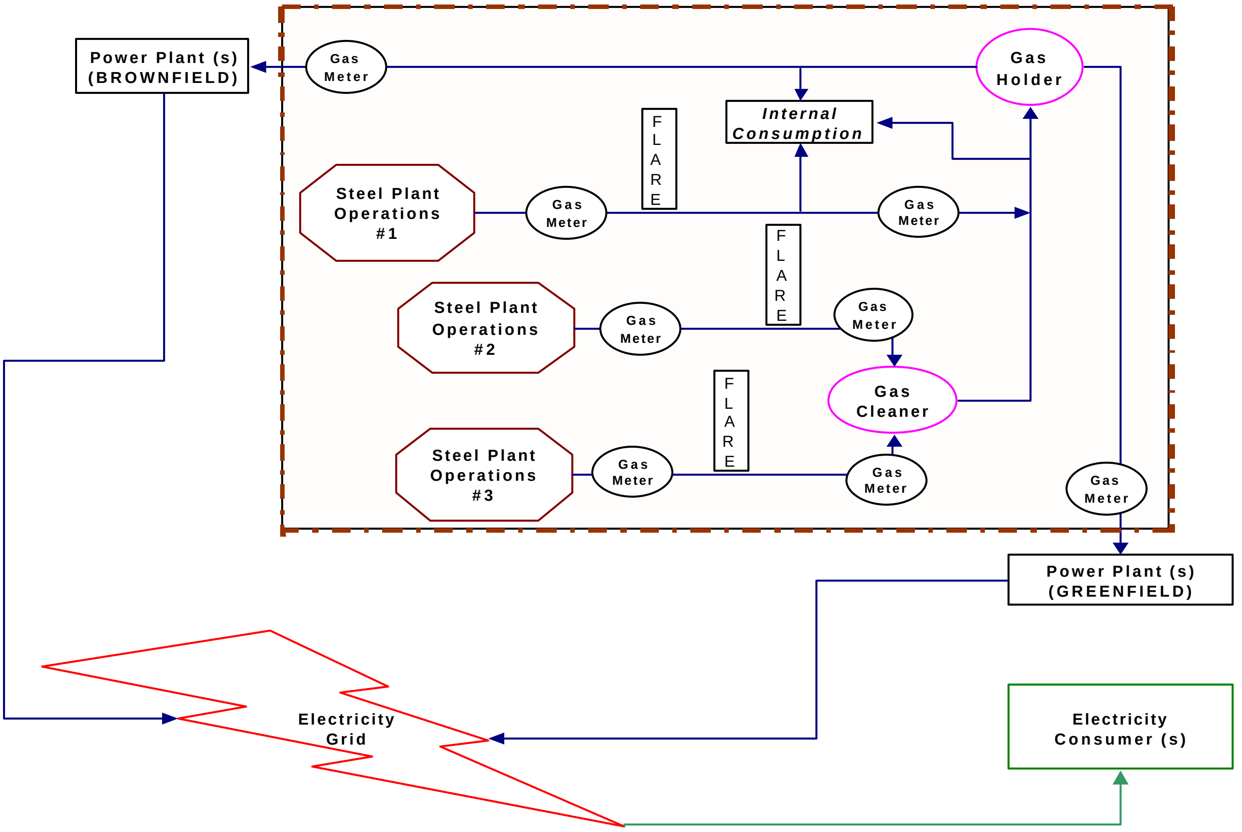
this methodology would be applied may demonstrate that circumstances such as power deficit and/or fuel deficit and/or sustainable development needs could encourage development of national and/or sectoral policies that would support electricity generation utilizing waste gases. However, if current national and/or sectoral policies require utilization of waste gases for power generation, the baseline provided under this methodology is not applicable.

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

The project boundary is defined as points of generation of waste gases in the steel manufacturing operations, stabilisation, cleaning and transportation of these gases to the power plant(s) through a gas handling network/ grid, delivery of power to the grid, and all associated equipment for such project activity, under control of the project proponent(s). The schematic of such a network showing the physical delineations is shown below, encompassing the following:

- all physical facilities constructed/ erected on account of the project activity;
- all physical facilities and geographical areas of relevance to the project activity and under the control of the Project Partners/ Sponsors.
- at least major activities and facilities one step upstream and one step down stream of the facilities set up as part of the project activity;
- all direct on-site emissions, including emissions from fuel combustion and process emissions on the site of the project activity due to combustion of gas to generate electricity;
- direct off-site emissions where feasible or may be treated appropriately under leakages, involving emissions upstream and downstream of the project, which are directly influenced by the project activity; and
- indirect on-site and off-site emissions *(may be addressed separately under leakages)*.

**Schematic of Project Boundary**



**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 project activity results in availability of waste gases at one or more electricity generators for:

- ✓ replacement of existing GHG intensive fuel with waste gases, and
- ✓ replacement/ avoidance/ delay of equivalent amount of electricity supplied to the grid.

Hence, there are two applicable baselines that have to be appropriately chosen to compute the emission reduction due to project activity. The applicable baselines are:

1. **Baseline I:** emission from an existing electricity generating utility (where fuel replacement will occur due to project activity) using GHG intensive fuel, and

2. **Baseline II:** emission due to replacement/ avoidance of equivalent amount of electricity supplied to the grid[8].

As explained earlier under *D.1*, based on any specific project scenerio, either Baseline I or Baseline II or summation of both the baselines will be applicable to estimate the baseline emission $\mathbf{BE_y}$ (in $tCO_{2equ}$) during any year 'y'.

**Baseline I: Replacing GHG intensive fuel with waste gases**

The baseline emission will depend on quantities of waste gases combusted at the power plant(s) as replacement of GHG intensive fuel. The methodology for calculation of baseline for fuel replacement scenario will be as per the following algorithm.

$$MPO_{i,y} = Q_{i,y} * GCV_i / HR_i \quad (1.1)$$

$$TPO_y = S\ MPO_{i,y} \quad (1.2)$$

$$Baseline\ I = EF\_IPCC * TPO_y \quad (1)$$

where:

| | |
|---|---|
| $Q_{i,y}$ | Monthly 'Waste Gas Consumption' of during year 'y' (in SCM) |
| $GCV_i$ | Monthly 'Gross Calorific Value' for waste gas (in kCal/ SCM), based on average daily values |
| $HR_i$ | Monthly 'Heat Rate' for waste gas (in kCal/kWH), based on average daily values |
| $MPO_{i,y}$ | Monthly 'Power generated by waste gases' (in GWh, after converting MWh to GWh) during year 'y' |
| $TPO_{i,y}$ | Total annual 'Power generated by waste gases' (in GWh) during year 'y' |

[8] Applicable to power generation by a new power generator solely using waste gases or in combination with other fuels or additional power generation by the power generator who has substituted waste gases and producing additional power.

| | |
|---|---|
| EF_IPCC | Emission Factor of GHG intensive fuel as per IPCC (in $tCO_2$ / GWh) |
| Baseline I | $CO_2$ emission due to replacement of GHG intensive fuel with waste gases (in $tCO_{2equ}$) during any year 'y'. |

**Baseline II: Replace/ avoid/ delay equivalent amount of electricity supplied to the grid**

**'Average Operation Margin' calculations**

The average OM emission factor ($EF_{OM,Average,y}$) is to be calculated as the average emission rate of all power plants, including low-operating cost and must-run power plants, using equation (2.1) below. A 3-year average data vintage, based on the most recent statistics available at the time of PDD submission, is to be considered.

$EF_{OM,Average,y} = S\ (GEN_{j,y} * EF\_IPCC_{i,j}) / S\ GEN_{j,y}$ ……………………………………………………....(2)

where,

| | |
|---|---|
| $EF_{OM,Average,y}$ | Average OM $CO_2$ emission factor per unit of energy ($tCO_2$/GWh) of all generating sources serving the grid. |
| $GEN_{j,y}$ | Electricity (GWh) delivered to the grid by source j |
| $EF\_IPCC_{i,j}$ | Emission Factor as per IPCC for $CO_2$ from fuel i ($tCO_2$ / GWh) at power sources j |

**Build Margin calculations**

This is calculated as the generation-weighted average emission factor ($tCO_2$/GWH) of a sample of power plants, as per the following algorithm:

$EF_{BM,,y} = S\ (GEN_{m,\ y} * EF\_IPCC_m) / S\ GEN_{m,y}$ ……………………………………………………...(3.1)

where, $EF\_IPCC_m$ and $GEN_{m,y}$ are analogous to the variables described for the average OM method earlier for plants *m*. The sample group *m* consists of either:

- 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 (in *GWh*) and that have been built most recently [including plants under construction].

Considering equal weightage for both OB and BM, the baseline emission factor by average CM in any year y, is calculated as,

$EF\_BL_{CM,y} = EF_{OM,Average,y} + EF_{BM,,y}$ ………………………………………………………...………...(3.2)

*Baseline II* (in $tCO_{2equ}$)
= $EF\_BL_{CM,y}$ * *Average annual power generated (GWh) in the grid during last 3 years operation…(3)*

**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 project activity results in combustion of a quantity of excess waste gases in one or more power plants (existing and/or greenfield) instead of flaring. This means that the project activity does not normally cause any additional GHG emissions than those were already occurring in its absence, but causes a physical relocation of the emitting point(s).

Hence, the project emission $\mathbf{PE_y}$ (in $tCO_{2equ}$) during any year 'y' is zero.

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

- ✓ Leakages could occur (in the form of additional emissions on account of the project activity) due to use of hydrocarbon fuel (if displaced due to the project activity and in turn used by other smaller power generators who currently use renewables). However in cases where there could be demand for power, such possibilities are ruled out since this would necessitate replacement and use of alternate power generating technology, which may not be feasible for a smaller generator.

- ✓ Potential for leakages due to the following two situations are addressed as per the procedures mentioned below:

  - The methodology imposes a restriction that while determining the baseline emission, any increase in rate of waste gas generation *(during the last 3 years of operation or any other smaller duration in case of recently stabilized manufacturing operations)* in the steel manufacturing process (in $Nm^3$/ MT of steel produced) during the crediting period will not be included in the baseline; and

  - Similar restriction *(the waste gas utilisation for internal heating and steam generation cannot be less than the sectoral average in the country or region)* is imposed on making more waste gas available to the power plant through replacing portion of waste gas for meeting the internal requirements of the steel manufacturing operations with any other fuel.

**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):**

Let the project activity result in availability of waste gas quantity 'W' for use in power generation. The following steps need to be followed to compute emission reduction.

**Step 1: Calculation of Correction Factor for eligible gas quantity in emission reduction**

Let 'X' be the minimum quantity of waste gases that were generated in the steel manufacturing industry sector during the last 3 years or any other smaller duration in case of recently stabilized manufacturing operations.

Let 'Y' be the minimum quantity of waste gases that were flared in the steel manufacturing industry sector during the last 3 years or any other smaller duration in case of recently stabilized manufacturing operations.

Let 'Z' be the average amount of waste gases that were used for meeting the internal requirements of all waste gas generators (in similar steel manufacturing sector) in the region or country during the last 3 years or any other smaller duration in case of recently stabilized manufacturing operations.

Quantity of excess waste gas available for (i) flaring or (ii) flaring and delivery to power plants = (X – Z).

*Correction Factor (CF) for gas quantity eligible for emission reduction*
*= Minimum[(X-Z), Y, W] / W……………………………………………………………………(4)*

In case in any regional setting, steel industry sector values for X, Y and Z are not available, then CF will be taken as 1.

**Step 2: Emission reduction during any year 'y' in existing power plant where only fuel replacement occurs**

$ER_y(1) = Baseline\ I * CF - PE_y$……………………………………………………………..(5)

**Step 3: Emission reduction in existing power plant during any year 'y' where fuel replacement occurs alongwith additional power generation**

$ER_y(2) = (Baseline\ I + Baseline\ II) * CF - PE_y$……………………………………………………..(6)

**Step 4: Emission reduction in a greenfield power plant during any year 'y' connected to the grid or approximate emission reduction in an existing power plant where fuel replacement has not yet started (i.e., tentative emission calculations prior to start of project activity)**

$ER_y(3) = Baseline\ II * CF - PE_y$……………………………………………………………...(7)

**Step 5: If more than one of steps 2, 3 or 4 occurs by distributing the available waste gas during any year 'y' connected to the grid**

$ER_y(4) = S\ (Baseline_i * CF_i) - PE_y$,…………………………………………………………(8)

*wherein the monitored gas volumes to individual plants (i) will be used for calculating* $CF_i$.

## SECTION E. Data sources and assumptions:

▪

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

- In case of power generation in a new power plant solely using waste gases, only Baseline II will be considered.
- Emission factor of fuel replaced will be as per the IPCC recommended values.
- Project will not add any additional GHG emission than added during normal flaring in the absence of the project activity, and hence the net emissions from project are zero.

- The project activity will not result in diversion of waste gases normally required for internal heating requirements to a power generator.
- Any additional waste gases produced due to process improvements in the steel plant during crediting period will not be considered for accrual of CDM benefits.

**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:**

| Type of data | Source(s) |
|---|---|
| $Q_{i,y}$ - Annual Fuel (solid or liquid) Consumption of $i^{th}$ fuel | Proprietary data of power generator where fuel is replaced. |
| $GCV_i$ - Gross Calorific Value of $i^{th}$ fuel | Proprietary data of power generator where fuel is replaced. |
| $EF\_IPCC_i$ - Emission Factor of $i^{th}$ fuel | IPCC. |
| $HR_i$ - Heat rate for $i^{th}$ (solid or liquid) fuel | Proprietary data of power generator where fuel is replaced. |
| $GEN_{j,y}$ and $GEN_{m,y}$ - Electricity (MWh) to be delivered to the grid by source 'j or m' in in year 'y' | Regional electricity boards. |
| Quantity of waste gases that were flared in the steel manufacturing industry | Proprietary data of steel industry. |
| Quantity of waste gases that were flared in the steel manufacturing industry | Proprietary data of steel industry. |
| Amount of waste gases that were used for meeting the internal requirements of all waste gas generators (in similar steel manufacturing sector) in the region or country | Proprietary data of steel industry. |

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

All local level data *(refer section E.4)* will be 3 years old or of lesser vintage (in case of recently stabilized steel manufacturing units and/or power plants; the currency of the vintage period is from the start date of project activity). This is necessary since project related data for similar project activity is expected to be limited due to uncommon nature of the project activity.
All regional level data will be of 5 years vintage.

**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:** | • All data from the project including waste gas volume, waste gas consumption at power plant, and gross caloric and heat rate values of waste gas, as mentioned earlier under section E.2. |
| **Regional and National:** | • As mentioned earlier under section D.6.<br>• Waste gas production and internal utilization for industries in the same sector.<br>• Plants synchronized to the grid in the recent 5 years.<br>• Thermal Power (from fossil fuels) and hydropower generation for grid connected |

| | |
|---|---|
| | sources.<br>• Most recent 5 capacity additions synchronized to the grid.<br>• Most recent 20% of capacity additions synchronized to the grid. |
| **Global** | • IPCC Emission Factors for GHG intensive fuel. |

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

The uncertainties need to be analysed based on project specific assumptions. The types of uncertainties involved in this methodology are as follows:

| **Assumption/ Key Factors** | **Uncertainties** |
|---|---|
| Power generators will continue to use waste gases during the entire crediting period | The power plants may decide not to use waste gases for power generation based on unfamiliarity with the new technology, under performance in power generation etc. |
| The steel industry continues with same production technology over the crediting period | The steel industry may decide to improve its existing technology thereby producing more waste gases, or utilizing less waste gases for internal heating requirements. |
| The power generators having opted for using waste gases will continue to use the same as fuel during the entire crediting period | One or more of the greenfield power generators could shift to more GHG intensive fuel thereby making it necessary to flare more of waste gases. |

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

**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 public/ published sources or from the books/ logs/ registers available *(for validator and verifier)* with the project proponent/ sponsor/ participant.

**Conservatism**

1. All values of the parameter to be used for computation of emissions should be taken as maximum, minimum or 95% of special and temporal values (as applicable to specific parameters) in a way that demonstrates that the emission reduction value is conservative and not overstated/ doubly accounted (anywhere).
2. It is important that the potential impact of these uncertainties on the project baseline, be at least qualitatively (such as economic factors) understood, and an appropriate decision in the interest of conservatism be taken in application of the methodology.
3. To prevent the possibility that waste gases are not diverted from pre-project activity usages, the methodology sets limits on waste gas availability to the power plants *(refer section D.8 on potential leakages)*.

- - - - -