



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

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**SECTION A. Identification of methodology****A.1. Proposed methodology title:**

Baseline methodology for energy efficiency through technological improvements in the metal production industry through smelting.

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

This methodology is applicable to energy efficiency projects in the metal production industry through smelting.

The methodology is applicable to Scope 9, as defined by the UNFCCC including the following sectors:

- 9 -Metal Production

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

This methodology is applicable where the following conditions apply:

- Electricity and potentially other fossil fuel consumption is reduced at the project site<sup>1</sup> through the introduction of new technologies that lead to energy efficiency;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified; and
- Information on the characteristics of the grid is available.

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

- The methodology builds on existing approved baseline methodologies (ACM0002 and other methodologies approved for grid connected electricity generation where information is insufficient to support application of ACM0002). It extends the scope of these methodologies by making them applicable to components of any project improving energy efficiency in metals production through smelting and reducing the amounts of electricity taken from a grid system. The methodology also builds on principles established in the recently approved NM0041-rev that quantification protocols for the production of electricity and sent to a grid has the same quantification impact as electricity generated on site and not taken from a grid- similar to electricity conserved on site.
- The methodology builds on processes set out in the small scale methodologies and AM0008 (for example) to quantify any emissions from other fossil fuels.

<sup>1</sup> Metal production will often require the use of electricity and a reducing agent (often coal, coke and some times natural gas) to reduce the ore to the metal. This methodology is designed primarily for metal smelting processes using both electricity and other fossils fuels, but it me be applicable for other project types- though this is not tested here and the project proponent must make a valid case that this methodology is appropriate for the project at hand,



- The methodology uses an already existing tool for demonstrating additionality (Consolidated Additionality Tool- Annex 1, EB16 Meeting Report).
- The methodology is conservative and transparent. It requires the use of data that are verifiable and transparent to calculate baseline emissions.
- It is simple, and has wide potential application in the metal smelting sector.

#### Weaknesses:

- The methodology does not attempt to incorporate transport and distribution losses in the grid system. Such losses, and emissions associated with them, are extremely hard to reliably quantify. Where the power produced is consumed on site as opposed to taking energy from the grid, the emissions reduction will be underestimated. This is in fact positive, as it will add to methodology conservatism.

### **SECTION B. Overall summary description:**

This methodology focuses on entities that are planning the introduction of new technologies in the metal production industry (where electricity is used to reduce metal oxides) that lead to the reduction of electricity and potentially fossil fuel consumption during the production processes. Financial reasons or other barriers have traditionally prevented the use of such equipment or technology being applied. For example, this methodology could be used by manganese alloy producers using carbon finance to introduce new technologies to improve energy efficiency, thereby reducing the amount of electricity and potentially other energy sources needed for the production of alloys and consequently the emissions associated with production. The elements of determination of additionality for this new baseline methodology are based on the consolidated additionality tool published the CDM Methodology Panel.

The methodology is divided in two parts: determination of baseline scenario and project additionality, and ERs calculations, as follows:

#### **Determination of baseline scenario and project additionality**

The baseline scenario and additionality are determined in a step-wise process to determine the financial barriers associated with the development of the project, based on approach of Art 48(b) of Marrakech Accords and following the Consolidated Additionality Tool- Annex 1, EB16 Meeting Report. For more details see section D.1 and D.3 of this document.

#### **Calculation of emission reductions**

After the baseline scenario has been determined and additionality demonstrated, it is then necessary to calculate the emissions associated with the baseline and project scenarios. The relevant calculation procedures are described in sections D.6 and D.7 of this document.

### **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;
- ☒ 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 considered the most appropriate:**

As this methodology focuses on current metal smelting activities, real and verifiable data in relation to existing performance of the installation will be applied to underpin the baseline development process in a credible and transparent manner.

**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):**

The baseline scenario and additionality are determined in the step-wise process described in the Tools for the Demonstration and Assessment of Additionality' (Annex 1, EB16 Meeting Report). The methodology should use the option 2 related to investment analysis. Full details can be found in the original document.

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

This methodology has been developed to be applicable to projects in the metals production through smelting industry that reduce electricity and fossil fuel consumption patterns. It specifically aims to extend the scope of the ACM0002 and other approved grid electricity related methodologies, aiming to accurately reflect emission reductions achieved in a conservative manner. It also aims to extend practices accepted under AM0008 and the SSC methodologies to quantify fossil fuel consumption and emissions.

The methodology takes into account national and sectoral policies and circumstances. The methodology is not applicable to activities that occur as a result of policy or regulatory obligations.

**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 activity is not the business as usual scenario and additional the consolidated 'Tools for the Demonstration and Assessment of Additionality', as published in Annex 1 of the 16<sup>th</sup> EB meeting report, should be used.

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



Application of ACM0002 inherently incorporates national energy production policy (i.e. macro economic delivery of energy) through the analysis of the Build Margin. The methodology is based on national or sectoral policies in relation to the management of energy resources, and in particular policies focusing on energy production, and industrial energy efficiency (micro economic energy delivery and consumption).

The proposed project activity should be evaluated in the context of sector trends, and incorporating the effects of any legislation and government policies that may affect this trend. This can be done by analysing the policies (subsidies, laws, economic trends), as well as the behaviour of companies involved in the same production sector in the region where the project will be implemented.

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

The project boundaries proposed here are exactly the same as those set out in ACM0002 or other appropriate methodologies, with an extension of the emissions sources to encapsulate emissions on the proposed project site that may have not been incorporated.

1) *Emission sources*: This refers to the geographical site where the electricity consumption is altered. For this purpose the project boundary is the physical, geographical location of the installation.

It shall encompass any relevant CO<sub>2</sub> emissions associated with the activity that will be materially affected by the proposed CDM project.

For the determination of the baseline, only CO<sub>2</sub> from electricity generation in the relevant grid mix analysed has to be accounted for (as per ACM0002).

2) *Spatial extent*: The spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the proposed project activity will affect, as per ACM 0002 or other relevant methodology. The methodology user is referred to ACM0002.

#### **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):**

Emissions associated with baseline material production in the baseline scenario are determined as set out below:

$$BE_y = BE_y(\text{offsite}) + BE_y(\text{onsite}) \quad \text{Equation 1}$$

Where:

**BE<sub>y</sub>:** Baseline emissions (year y)

**BE<sub>y</sub>(offsite):** Offsite electricity emissions associated with the material being produced (tCO<sub>2</sub>e in year y) (e.g., emissions associated with the use of grid electricity)

**BE<sub>y</sub>(onsite):** Onsite baseline emissions associated with the material being produced (such as coal/gas/oil use) (tCO<sub>2</sub>e in year y)

$$\begin{aligned} BE_y(\text{offsite}) &= EG_{by} \times EF_y(\text{offsite}) \\ &= (EG_{py/t} \times QP_y) \times EF_y(\text{offsite}) \end{aligned} \quad \text{Equation 2}$$



Where:

<b>EG<sub>by</sub>:</b>	Quantity of baseline grid electricity in year y (MWh)
<b>EF<sub>y</sub> (offsite):</b>	Grid electricity emissions factor in year y (tCO <sub>2</sub> e/MWh) NB: This emissions factor for grid electricity is defined by following ACM0002 or another approved methodology for calculation of emissions associated with grid connected renewable electricity generation if sufficient data to underpin ACM0002 is not available, as appropriate
<b>EG<sub>by/t</sub>:</b>	Grid electricity consumed per tonne of metal produced in the project scenario in year y
<b>QP<sub>by</sub>:</b>	Quantity of production in year y (relevant units)

Where system boundary setting excludes onsite fossil fuel emissions (following an assumption of their immateriality) equation 3 and equation 4 may be ignored from the analysis.

$$BE_y(\text{onsite}) = QP_{by} \times EF_{by}(\text{onsite}) \quad \text{Equation 3}$$

Where:

<b>QP<sub>by</sub>:</b>	Quantity of production in year y (relevant units)
<b>EF<sub>by</sub>(onsite):</b>	Baseline emissions factor for any emissions taking place onsite (if appropriate) in tCO <sub>2</sub> e/production unit. EF <sub>by</sub> (onsite) will be defined as the emission factor associated with production of a single unit of product through on site fossil fuel use

$$EF_{by}(\text{onsite}) = \sum(A_{bny} \times EF_{ny-on}) \quad \text{Equation 4}$$

Where:

<b>A<sub>bny</sub>:</b>	Quantity of each individual source (n) of onsite fossil fuel in relevant units (tonnes, m <sup>3</sup> ) per individual unit of product (in relevant units) in year y - e.g. amount of coal used per tonne of product produced
<b>EF<sub>ny-on</sub>:</b>	Emissions factor applied for that source (n), in year y, using the relevant IPCC emissions factor (tCO <sub>2</sub> )

**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):**

Estimates of the emissions associated with metal production in the project scenario are determined as set out below.

$$PE_y = PE_y(\text{offsite}) + PE_y(\text{onsite}) \quad \text{Equation 5}$$

Where:

<b>PE<sub>y</sub>:</b>	Project emissions in year y
<b>PE<sub>y</sub>(offsite):</b>	Offsite electricity emissions associated with the material being produced in year y (tCO <sub>2</sub> e) (e.g., emissions associated with the use of grid electricity)
<b>PE<sub>y</sub>(onsite):</b>	Onsite project emissions associate with the material being produced in year y (such as coal/gas/oil use) (tCO <sub>2</sub> e)



$$\begin{aligned}
 PE_y(\text{offsite}) &= EG_{py} \times EF_y(\text{offsite}) \\
 &= (EG_{py/t} \times QP_y) \times EF_y(\text{offsite})
 \end{aligned}
 \quad \text{Equation 6}$$

Where:

<b>EG<sub>py</sub>:</b>	Quantity of project grid electricity in year y (MWh) – calculated through (EG <sub>py/t</sub> x QP <sub>y</sub> )
<b>EF<sub>y</sub>(offsite):</b>	Grid electricity emissions factor in year y (tCO <sub>2</sub> e/MWh) NB: This emissions factor for grid electricity is defined by following ACM002 or another approved methodology for calculation of emissions associated with grid connected renewable electricity generation if sufficient data to underpin ACM002 is not available, as appropriate
<b>EG<sub>py/t</sub>:</b>	Grid electricity consumed per tonne of metal produced in the project scenario in year y
<b>QP<sub>y</sub>:</b>	Quantity of production in year y (relevant units)

Where system boundary setting excludes onsite fossil fuel emissions (following an assumption of their immateriality) equation 7 and equation 8 may be ignored from the analysis.

$$PE_y(\text{onsite}) = QP_y \times EF_{py}(\text{onsite}) \quad \text{Equation 7}$$

Where:

<b>QP<sub>y</sub>:</b>	Quantity of production in year y (relevant units)
<b>EF<sub>py</sub>(onsite):</b>	Project emissions factor for onsite emissions in year y (tCO <sub>2</sub> e/relevant production unit). EF <sub>py</sub> (onsite) will be defined as the emission factor associated with production of a single unit of product through on site fossil fuel use in the project scenario

$$EF_{py}(\text{onsite}) = \sum (A_{pny} \times EF_{ny-on}) \quad \text{Equation 8}$$

Where:

<b>A<sub>pny</sub>:</b>	Quantity of each individual source (n) of onsite fossil fuel in year y in relevant units (tonnes, m <sup>3</sup> ) per individual unit of product (in relevant units) in project case - e.g. amount of coal used per tonne of product produced
<b>EF<sub>ny-on</sub>:</b>	Emissions factor applied for that source (n) in year y, using the relevant IPCC emissions factor

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

##### Electricity Related Leakage

As defined in ACM002, “the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – not applicable here). Project participants do not need to consider these emission sources as leakage in applying this methodology. Project activities using this baseline methodology shall not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario.”

##### On Site Fossil Fuel Leakage



The expected materiality in the change of on site fossil fuel emissions can lead to fossil fuel use being excluded from system boundaries, and consequently from baseline analysis quantification of expected project and baseline emissions. However this assumption (that no material change to on site fossil fuel emissions occurs) could potentially lead to a source of leakage where the assumption is in practice actually incorrect. If on site fossil fuel emissions are excluded from system boundaries under the assumption that they will not be materially affected by the proposed CDM project, consumption shall be monitored (see the accompanying new monitoring methodology- NMM000XX).

In order to ensure that the assumption that on site fossil fuel consumption is in fact immaterial, a determination must be made of the historic consumption of fossil fuels during the baseline analysis. This analysis should utilise the last three years data (or appropriate data- see E3- Vintage of Data) to determine an average fossil fuel consumption per unit metal produced, per fossil fuel source. On site fossil fuel utilisation should be monitored as part of the monitoring plan. When annual calculations of emissions reductions are carried out as part of the verification process the validity of the assumption must be tested. (An annual assessment of fossil fuel use is to be made as opposed to monthly, or even daily, because metal smelting operating profiles vary dramatically from hour to hour depending on a variety of operational factors. An annual assessment is deemed more representative of overall performance of project activities.)

The accompanying monitoring methodology sets out exactly how leakage should be calculated if it arises in the project scenario following this verification.

#### Other Leakage Sources

The methodology does not anticipate that any other forms of leakage will arise as a result of the project activities covered outside the physical site location of the project (facility) itself, but this assumption should be verified when a project is developed to validate this assumption.

**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):**

Following determination of the baseline and additionality, emissions must be estimated in both baseline ( $BE_y$ ) and project ( $PE_y$ ) scenarios in order to determine project emissions reductions ( $ER_y$ ) in year  $y$ . The emission reductions ( $ER_y$ ) of the project activity during a given year  $y$  is the difference between the baseline, project emissions and emissions due to leakage, as expressed in the formula below.

$$ER_y = BE_y - PE_y - L_y$$

**Equation 9**

Where

- $ER_y$ : Emissions Reductions (t CO<sub>2</sub>e) in year  $y$
- $BE_y$ : Emissions in the baseline scenario (t CO<sub>2</sub>e) in year  $y$
- $PE_y$ : Emissions in the project scenario (t CO<sub>2</sub>e) in year  $y$
- $L_y$ : Leakage (t CO<sub>2</sub>e) in year  $y$

### **SECTION E. Data sources and assumptions:**

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

The parameters and assumptions to determine the baseline scenario and project activity are listed below:

- 1) Determination of baseline scenario and additionality is based on the following assumptions:





- Information on acceptable IRRs or discount rates for comparable investments with a similar risk profile in the relevant sector and country. Data source: various business statistics, expert judgment.
  - Conservative calculation of IRR as explained above. To be checked by Designated Operational Entity (DOE).
- 2) After determining the baseline scenario and additionality, the next step is to calculate emissions in the baseline scenario and in the project activity. These are based on the following parameters and assumptions:
- Emission factors, conversion factors or default data used for this analysis needs to be gathered from scientific publications, specialized institutions and consultants, the IPCC, or any other recognized sources, or from validated/documented data gathered by the project company. Full references must be given for the sources of data used. These will need to be checked by Designated Operational Entity (DOE).
- 3) Applicability of ACM0002 or other approved methodologies & Tools for the Demonstration and Assessment of Additionality:
- It is assumed that the baseline methodology ACM0002 (or the methodology used for calculation of emissions associated with electricity generation) is a suitable methodology for determining emissions associated with any grid electricity in the baseline or project scenario. As such all assumptions made in the ACM0002 methodology are also applicable in this methodology, other than where required to extend this methodology to the cohort of projects identified in A.2 above.
  - It is assumed that other approved grid connected baseline methodologies are acceptable where sufficient quality information required to apply ACM0002 is not available.
  - It is assumed that the principles established in previously accepted methodologies (AM008 and the SSC methodologies) are appropriate here too to quantify any potential fossil fuel emissions.
  - It is assumed that the Consolidated Tool for Demonstration of Additionality as developed by the Meth Panel and the EB is a suitable tool for demonstration of additionality of a project activity using this methodology.

**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:**

The exact type and source of data needed may vary from project to project, but the table below specifies the type of data that will be required for the calculation of emissions for projects using this methodology.

The table below provides examples based on the case study of a project that reduces CO<sub>2</sub> emissions due to energy efficiency in the manganese alloy production process.

**Table 1:** Data necessary to apply this methodology, including when the data is used.

ID n°	Data	Unit	When is used	Source
1	List of plausible scenarios	-	Baseline and additionality definition	To be elaborated by the project proponent for the PDD
2	Baseline IRR	%	Baseline and additionality definition	To be elaborated by the project proponent for the PDD, and determined through appropriate sources



3	Project IRR without CERs revenues	%	Baseline and additionality definition	To be elaborated by the project proponent for the PDD
4	Project IRR with CERs revenues	%	Baseline and additionality definition	To be elaborated by the project proponent for the PDD
5	Discount rate	%	Baseline and additionality definition	To be indicated by the project proponent and checked by DOE
6	Baseline (or project, both are the same) Production level	Tonnes or units / year	Baseline and project emission calculation	Project proponent data
7	Quantity of grid electricity used in baseline	MWh	Calculation of BE <sub>y</sub> (offsite)	Project proponent data
8	Quantity of grid electricity used in project	MWh	Calculation of PE <sub>y</sub> (offsite)	Project proponent data
9	Grid electricity emissions factor	tCO <sub>2</sub> e/MWh	Calculation of offsite electricity emissions	Grid data, processed using ACM002 or another methodology, as appropriate
10	Quantity of fossil fuels used for production process onsite, baseline scenario	t or m <sup>3</sup>	Calculation of BE <sub>y</sub> (onsite)	Project proponent data (where appropriate)
11	Quantity of fossil fuels used for production process onsite, project scenario	t or m <sup>3</sup>	Calculation of PE <sub>y</sub> (onsite)	Project proponent data (where appropriate)
12	Emissions Factor of fossil fuel used in production process on site	tCO <sub>2</sub> e	Calculation of onsite emissions	IPCC

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

The project should aim at using the most recent data sources available at the time of construction of the baseline. The last three years of fully comprehensive data available should be used where possible, Where three years data is not available, data from the previous two years may be utilised. Where data from only one year is available this may be used as a last resort.

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

**Table 2:** Data necessary to apply this methodology, including when the data is used.

ID n°	Data	Spatial level
1	List of plausible scenarios	Local
2	Baseline IRR	Local/National
3	Project IRR without CERs revenues	Local
4	Project IRR with CERs revenues	Local
5	Discount rate	National or local
6	Baseline (or project, both are the same) Production level	Installation level
7	Quantity of grid electricity used in baseline	Installation level
8	Quantity of grid electricity used in project	Installation level
9	Grid electricity emissions factor	National
10	Quantity of fossil fuels used for production process onsite, baseline scenario	Installation level
11	Quantity of fossil fuels used for production process onsite, project scenario	Installation level
12	Emissions Factor of fossil fuel used in production process on site	International

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

The application of the methodology described in the “Consolidated Additionality Tool- Annex 1, EB16 Meeting Report” can lead to an erroneous baseline scenario in the following situations:

- The set of plausible alternatives is incomplete. A careful analysis of possible and plausible alternatives and confirmation by a DOE of the validity of the analysis and the conclusions drawn from it is imperative in order to mitigate risks and to ensure credibility of the result.
- The financial analysis is not conservative. The DOE must carefully control and check all assumptions used in order to ensure a conservative result.

With relation to the quantification of emission reductions, there are two sources of uncertainty:

- The first one relates to the quality of data used. In this regard, the use of quality control and management systems, such as ISO 9000 and ISO 14000, would help to ensure that data used for the quantification of emissions and emission reductions are consistent and of appropriate quality.
- The second source of uncertainty relates to the quality of emission factors collected from literature. The literature source, the reliability of data, and the appropriateness to the project's circumstances must be checked by DOE.

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

The methodology aims to:

- Be transparent and conservative by referring to real, verifiable data, with little use of default factors;
- Where default data has to be used, it should be default data from internationally recognized institutions like the Intergovernmental Panel on Climate Change and International Energy Agency;
- Guidance from the EB and other Approved Methodologies on the issue Additionality shall be taken into account;
- Use shall be made of the approved methodology ACM0002 or another approved methodology (as appropriate);
- Use shall be made of the Consolidated Additionality Tool.

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