Draft approved baseline and monitoring methodology AM00XX

"Methodology for improved energy efficiency by modifying ferroalloy production facility "

I. SOURCE AND APPLICABILITY

Source

This baseline methodology is based on the proposed methodology NM0259 "Highveld Vanadium-Iron Smelter Energy Efficiency Project" submitted by Highveld Steel and Vanadium Corporation Ltd. and EcoSecurities Group Plc.

For more information regarding this proposal and its consideration by the Executive Board please refer to <http://cdm.unfccc.int/goto/MPappmeth>.

The methodology also uses the latest versions of following tools:

- "Draft tool to calculate baseline, project and/or leakage emissions from electricity consumption"
- "Combined tool to identify the baseline scenario and demonstrate additionality".

For more information on these tools please refer to <http://cdm.unfccc.int/goto/MPappmeth>.

Baseline Approach Selected from Paragraph 48 of the CDM Modalities and Procedures

"Existing actual or historical emissions, as applicable"

Definitions

Existing ferroalloy production facility: The facility, which was under operation for at least three years prior to implementation of CDM project activity

Applicability

This methodology is applicable to projects that aim at improving energy efficiency of an existing ferroalloy production facility by implementing the following modifications to the production process. The facility is limited to the submerged electric arc smelting furnace(s) and rotary kilns producing only one type of ferroalloy, as defined by its composition of ingredients.

The methodology is applicable to following measures:

(1) Improving energy efficiency by modifying furnaces from submerged electric arc smelting furnace(s) to open slag bath smelting furnace(s);
(2) Improving energy efficiency by modifying rotary kilns from co-current rotary kilns to counter-current rotary kilns.

Where project activities consisting of modification of rotary kilns alone are not eligible for CDM credits till the point of time the furnace is not replaced with open slag bath furnace. Such projects can be credited only from the point where the furnaces (s) are replaced.
In applying this methodology, the project participants should submit the facility's plan for energy efficiency improvements in its entirety. For example, if the modification of electric smelting furnace(s) is to be followed by modification of rotary kilns at a later date, the entire modification of the production facility is regarded as the project activity to be described in the CDM-PDD. For example, if the CDM-PDD submitted for validation describes only the modification in electric smelting furnace(s) as the project, and the rotary kilns are modified later during the crediting period, then the project activity ceases to be eligible for credits once the rotary kilns are modified, and the combined project is treated as new CDM project for which validation needs to be conducted again.

Furthermore, this methodology is applicable under the following conditions:

- Upon verification, it must be ensured that the type and quality of ferroalloy produced is not affected by the project activity and remains unchanged throughout the crediting period. If there is a change in the type and quality of ferroalloy upon verification, the project activity ceases to be eligible for CDM;
- Data for at least three years preceding the implementing the project activity is available to estimate the baseline emissions;
- Emission reduction credits shall be claimed only until the end of the lifetime of the existing equipment;
- The methodology is applicable only if the most plausible baseline scenario is the continued operation of the ferroalloy production facility that was already used prior to the implementation of the project activity and undertaking business as usual maintenance and not involving major overhaul.

In order to estimate the remaining lifetime or the point in time when the rotary kilns and existing smelting furnace(s) would need to be replaced in the absence of the project activity, project participants shall take the following approaches into account:

(a) The typical average technical lifetime of the type of equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc. The project activity ceases to be eligible for CDM once the existing rotary kilns or smelting furnace(s) have reached its technical lifetime.
(b) The practices of the responsible company regarding replacement schedules may be evaluated and documented, e.g. based on historical replacement records for similar equipment.

The point in time when the existing equipment would need to be replaced in the absence of the project activity should be chosen in a conservative manner, i.e. the earliest point in time should be chosen in cases where only a time frame can be estimated.

It is possible that the facility is currently recovering waste heat for other use, which can be reduced as a result of increased energy efficiency due to project activity. In case of such onsite energy recovery from exhaust gases or non-product streams, project participants shall demonstrate that, either:

The project activity will not lead to any decrease of energy recovery by comparing actual energy recovery with historic average energy recovery. Whereby the historic average energy recovery is estimated within a vintage period of at least three years. In case a three-year data is not obtainable, maximum monthly heat recovery data of at least one year is taken as the benchmark,
or;
The project activity will not lead to any diversion of electrical or thermal energy to other down- and upstream processes.

II. BASELINE METHODOLOGY PROCEDURE

Procedure for selection of baseline scenario and demonstration of additionality:

For the selection of the most plausible baseline scenario and assessment of additionality, use the latest version of the "Combined tool to identify the baseline scenario and demonstrate additionality" agreed by the CDM Executive Board, available at the UNFCCC CDM website. The following specific guidance is provided for the application of the combined tool:

Specific guidance

The project participant could implement the first of the following measures, or a combination of the two following measures to improve energy efficiency of an existing ferroalloy production facility as part of the project activity:

(1) Improving energy efficiency by modifying furnaces from submerged electric arc smelting furnace(s) to open slag bath smelting furnace(s);
(2) Improving energy efficiency by modifying rotary kilns from co-current rotary kilns to counter-current rotary kilns.

Measures are considered to be interdependent when project participant can demonstrate that it is not technically feasible to implement one measure without implementing another. For example, if it is considered impossible to switch from submerged arc furnace to open slag bath smelting furnace (s) configuration without changing from co-current to rotary kilns to counter-current rotary kilns, then the two measures are considered to be interdependent. The demonstration of feasibility or infeasibility should be carried out by independent qualified/certified external process experts such as a chartered engineer(s), based on, *inter alia*, the following criteria:

- Spatial configuration;
- Requirement of physical and chemical characteristics of feed into the furnace, taking into account whether kilns would be able to control such characteristics. For example, if kilns are designed in a way to utilize supplementary fuel to maintain / control the temperature and degree of metallization, then barriers with respect to requirement of physical and chemical characteristics are assumed not to exist.

In case where both kiln and smelting furnace (s) are modified, or in case the proposed project activity results in an increase of production capacity, project participants shall conduct an investment analysis specified under "Combined tool to identify the baseline scenario and demonstrate additionality". Further, the project participants shall identify the baseline scenario and demonstrate additionality for each measure separately if it cannot be demonstrated that both measures are interdependent. For example, if the current facility consists of a co-current kiln and submerged electric arc smelting furnace(s), and it has been determined that a counter-current rotary kilns can be operated in combination with the furnace configuration, the implementation of both measures is not considered interdependent and therefore both energy efficiency measures are separately subject to identification of baseline scenario and demonstration of additionality. Note that the methodology is not applicable if the proposed activity is the change in kiln alone, and emission reduction can be claimed once the smelting furnace (s) are changed.

Specific guidance on Step 1a. Define alternative scenarios to the proposed CDM project activity

Consider, *inter alia*, the following alternative(s) to the proposed project activity with comparable quality, properties and application areas:

- Continuation of operation of the current ferroalloy production facility, undertaking business as usual maintenance;
- Individual energy efficiency measures (e.g. modification of co-current rotary kilns, or modification of submerged electric arc smelting furnaces) not undertaken under the CDM (this is required to distinguish the additional measures from the non-additional ones);
- Combination of the measures (which will be subjected to individual analysis of additionality if deemed not to be interdependent).

Specific guidance on Step 3. Investment analysis

Project participants shall explicitly include the following parameters as part of the investment analysis:

- Investment requirements (incl. break-up into major equipment cost, required construction work, installation);
- A discount rate appropriate to the country and sector (for example, government bond rates, increased by a suitable risk premium to reflect private investment in the specific project type, as substantiated by an independent (financial) expert);
- Current price and expected future price (variable costs) of energy, raw materials and other products (*Note*: As a default assumption the current prices may be assumed as future prices. Where project participants intend to use future prices that are different from current prices, the future prices have to be substantiated by an official publication that is in the public sphere from a governmental body or an national, sectoral or intergovernmental institution);
- Other operating revenues and costs for each alternative (including anticipated changes in electrode consumption and energy consumption) if the proposed project activity results in an increase in production, then the additional revenues as well as expenditures as a result of increased production must be taken into account;
- Lifetime of the project, equal to the remaining lifetime of the existing facility; and
- Other operation and maintenance costs.

In case project participants apply the NPV financial indicator, they should take into account the residual value of the new equipment at the end of the lifetime of the project activity[1]. The information on all of above factors as well as assumptions shall be explicitly stated in the CDM-PDD.

The methodology is applicable only if the most plausible baseline scenario is the continued operation of the ferroalloy production facility that was already used prior to the implementation of the project activity and undertaking business as usual maintenance not involving major overhaul.

Project boundary

- The project boundary comprises the physical location of the ferroalloy production facility, including and limited to the electric smelting furnace(s) and rotary kilns producing only one type of ferroalloy, as described in the figure below (Figure 1).

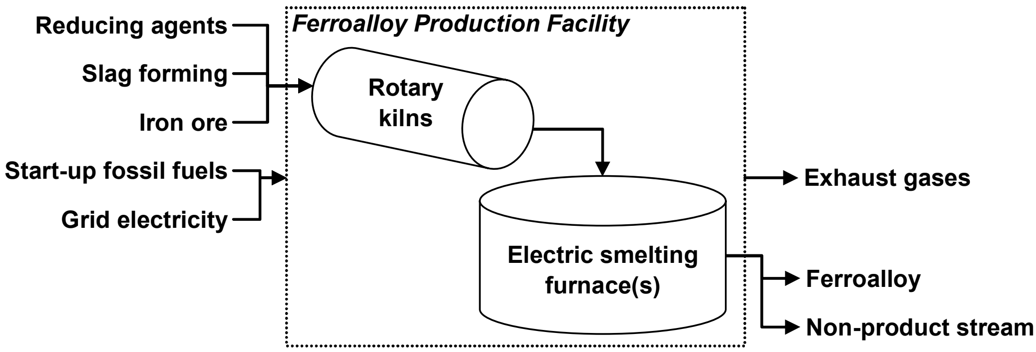

Figure 1: Spatial extent of the project boundary (apart from the grid generation capacity according to the latest version of the "Tool to calculate the emission factor for an electricity system")

Note: non-modified rotary kilns and smelting furnace(s) producing same type of ferroalloy are also part of the project boundary to ensure that the ferroalloy production by modified smelting furnace(s) and/or c kilns is estimated conservatively in case of phased-in project implementation.

Emissions sources included in or excluded from the project boundary

The emissions sources included in the project boundary are defined in the table below.

[1] Note that NPV value may be negative.

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation	CO_2	Included	Only CO_2 emissions associated with the electricity consumptions of the ferroalloys smelting furnace(s)
		CH_4	Excluded	CH_4 emissions are conservatively excluded for simplification.
		N_2O	Excluded	N_2O emissions are excluded for simplification.
	Emissions from transformation of iron ore, reducing agents and slag forming material into ferroalloys and non-product streams	CO_2	Included	Based on a mass balance the carbon emitted to the air via the exhaust gases is estimated. Any CO emitted to the atmosphere is assumed to be converted to CO_2 within days afterwards.
		CH_4	Excluded	CH_4 emissions are excluded for simplification.
		N_2O	Excluded	N_2O emissions are excluded for simplification.
	Consumption of fossil fuels for energy	CO_2	Included	Main source
		CH_4	Excluded	CH_4 emissions are excluded for simplification.
		N_2O	Excluded	N_2O emissions are excluded for simplification.
Project Activity	Electricity generation	CO_2	Included	Only CO_2 emissions associated with the utilisation of the ferroalloys smelting furnace(s) will be accounted;
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	N_2O emissions are excluded for simplification.
	Emissions from transformation of iron ore, reducing agents and slag forming material into ferroalloys and non-product streams	CO_2	Included	Based on a mass balance the carbon emitted to the air via the exhaust gases is estimated. Any CO emitted to the atmosphere is assumed to be converted to CO_2 within days afterwards.
		CH_4	Excluded	CH_4 emissions are excluded for simplification.
		N_2O	Excluded	N_2O emissions are excluded for simplification.
	Consumption of fossil fuels for energy	CO_2	Included	Main source
		CH_4	Excluded	CH_4 emissions are excluded for simplification.
		N_2O	Excluded	N_2O emissions are excluded for simplification.

Baseline emissions

General guidance for baseline and project emissions

Throughout the procedure to calculate the baseline and project emissions the term *modified ferroalloy production facility* (subscript PA) refers to the rotary kilns and electric smelting furnace(s) that are part of the project activities, as stated in Section I:

The term *non-modified ferroalloy production facility* (subscript non-PA) refers to the rotary kilns or smelting furnace(s) that are part of the project boundary but not yet modified after start of the CDM project activity.

Baseline emissions

Baseline emissions associated with operating a ferroalloy production facility are estimated based on process and energy-related emission sources that are significant and reasonably attributable to the CDM project activity.

Note: Subscript *y* indicates years during the crediting period and subscript *i* is used for years preceding the start of the CDM project activity.

$$BE_y = BE_{y,elec} + BE_{y,process} \quad \textbf{(1)}$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2e)
$BE_{y, elec}$	=	Baseline emissions from electricity consumption in year y (tCO_2e)
$BE_{y, process}$	=	Baseline emissions from process in year y (tCO_2e)
y	=	Years during the crediting period

Baseline emissions from process

Baseline emissions from process are estimated by multiplying the quantity of ferroalloys produced by operating modified ferroalloy production facility in year y ($QP_{PA,max, y}$) by the baseline emission factor ($EF_{BE, process}$) associated with the transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products per ton of ferroalloys produced.

$$BE_{y,process} = QP_{PA,\max,y} * EF_{BE,process} \quad \textbf{(2)}$$

Where:

$BE_{y, process}$	=	Baseline emissions from process in year y (tCO_2e)
$QP_{PA, max,y}$	=	Ferroalloys production by operating modified ferroalloy production facility used for estimating baseline and project emissions for year y (tonnes/y)
$EF_{BE, process}$	=	Baseline emission factor associated with thermal energy supply, transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products per ton of ferroalloys produced (tCO_2e/tonnes ferroalloy)

The figure below indicates the expected behaviour of the ferroalloy production of *modified* and *non-modified* production facility in case of gradually phased-in project implementation.

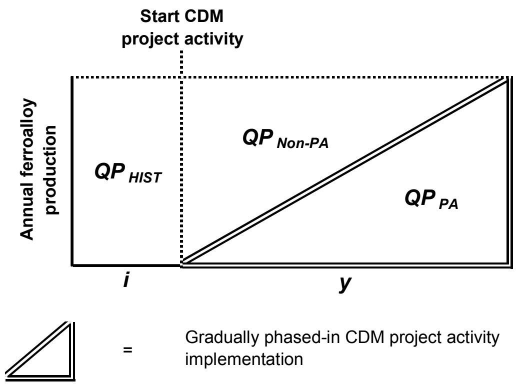

Figure 2: Ferroalloy production by gradually phased-in project implementation

The quantity of ferroalloys production to be used in baseline and project emission calculations is chosen conservatively via two means. It is capped at an historic level, and the production of ferroalloys by non-modified production facility in year *y* is subtracted, as follows.

$$QP_{PA,\max,y} = QP_{y,\max} - QP_{Non-PA,y} \quad (3)$$

Where:

$QP_{PA,max,y}$	=	Ferroalloys production by operating modified ferroalloy production facility used for estimating baseline and project emissions for year *y* (tonnes/y)
$QP_{y,\ max}$	=	Maximum quantity of ferroalloys accounted for in year *y* (tonnes)
$QP_{Non-PA,\ y}$	=	Quantity of ferroalloys produced by operating non-modified ferroalloy production facility in year *y* (tonnes)

The maximum ferroalloy production ($QP_{y,\ max}$) accounted for is capped to the historic average level in the following equation. The estimated value is applied in both the baseline and the project emission calculations.

$$QP_{y,\max} = MIN(QP_y, QP_{HIST}) \quad (4)$$

Where:

$QP_{y,\ max}$	=	Maximum quantity of ferroalloys accounted for in year *y* (tonnes)
QP_y	=	Monitored quantity of ferroalloys produced by *modified* and *non-modified* production facility in year *y* (tonnes)
QP_{HIST}	=	Historic annual average quantity of ferroalloys produced (tonnes)

The historic yearly average of ferroalloys production (QP_{HIST}) is calculated *ex-ante* for at least three year vintage.

$$QP_{HIST} = \frac{\sum_{i=1}^{n} QP_i}{n} \tag{5}$$

Where:

QP_{HIST}	=	Historic annual average quantity of ferroalloys produced (tonnes/y)
QP_i	=	Annual quantity of ferroalloys produced in year *i* preceding the start of the project activity (tonnes)
n	=	Number of years of historic data considered (at least 3 consecutive)
i	=	Years preceding the start of the CDM project activity

Process baseline emission factor

The baseline emission factor ($EF_{BE,\ process}$) associated with the transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products, per ton of ferroalloys produced, is calculated with at least three years historical data.

$$EF_{BE,process} = \frac{\sum_{i=1}^{n}\left(\left(CC_{BE,IP,i} - CC_{BE,OP,i}\right) * 44/12\right)}{n} \tag{6}$$

Where:

$EF_{BE,\ process}$	=	Baseline emission factor for the transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products (tCO_2e/tonnes)
$CC_{BE,IP.i}$	=	Carbon content of fuel, reducing agents, electrode paste, ores and slag forming materials per ton of ferroalloys produced in year *i* prior to the start of the project activity (inputs) (tC/tonnes)
$CC_{BE,OP,i}$	=	Carbon content of ferroalloys and non-products per ton of ferroalloys produced in year *i* (outputs) (tC/tonnes)
n	=	Number of years of historic data considered (at least 3 consecutive)
i	=	Years preceding the start of the CDM project activity
44/12		Multiplication factor for the mass of tCO_2 emitted from each mass unit of total carbon emitted

Baseline carbon content of inputs

The carbon content of raw inputs ($CC_{BE,IP,i}$) is estimated per ton of ferroalloys produced for each year *i* of historic data.

$$CC_{BE,IP,i} = \frac{\sum_{f}^{F}\left(FF_{BE,f,i} * CC_{FF,f}\right) + \sum_{k}^{K}\left(QP_{BE,RA,k,i} * CC_{BE,RA,k}\right) + \left(QP_{BE,ore,i} * CC_{BE,ore}\right) + \sum_{g}^{G}\left(QP_{BE,SFM,g,i} * CC_{BE,SFM,g}\right)}{QP_i} \tag{7}$$

Where:

$CC_{BE,IP,i}$	=	Carbon content of fuel, reducing agents, electrode paste, ores and slag forming materials per ton of ferroalloys produced in year *i* prior to the start of the project activity (inputs) (tC/tonnes)
$FF_{BE,f,i}$	=	Quantity of fossil fuel type *f* combusted in rotary kilns and smelting furnaces for energy supply in year *i* preceding the start of the project activity (mass or volume unit)
$CC_{FF,f}$	=	Carbon content of fossil fuel type *f* (tC/mass or volume unit)
$QP_{BE,RA,k,i}$	=	Annual quantity of reducing agent *k* consumed in year *i* preceding the start of the project activity (tonnes)
$CC_{BE,RA,k}$	=	Carbon content of reducing agents *k* (tC/tonnes)
$QP_{BE,ore,i}$	=	Annual quantity of ore consumed in year *i* preceding the start of the project activity (tonnes)
$CC_{BE,ore}$	=	Carbon content of ore (tC/tonnes)
$QP_{BE,SFM,g,i}$	=	Annual quantity of slag forming material *g* consumed in year *i* preceding the start of the project activity (tonnes)
$CC_{BE,SFM,g}$	=	Carbon content of slag forming material *g* (tC/tonnes)
QP_i	=	Annual quantity of ferroalloys produced in year *i* preceding the start of the project activity (tonnes)
F	=	Total number different types of fossil fuels for energy supply
f	=	Types of fossil fuels for energy supply
K	=	Total number different types of reducing agents
k	=	Types of reducing agent
G	=	Total number different types of slag forming materials
g	=	Types of slag forming materials

For type of slag forming materials, project participants need to account for at least the use of dolomite and limestone.

For type of reducing agents, project participants need to account for at least the use of coke, coal and (pre-baked) electrode paste. The carbon content of reducing agents is estimated using the following equations.

$$CC_{BE,RA,k} = F_{BE,FixC,k} + \left(F_{BE,volatiles,k} * CC_{BE,V}\right) \quad \textbf{(8)}$$

Where:

$CC_{BE,RA,k}$	=	Carbon content of reducing agents *k* in the baseline (tC/tonnes)
$F_{BE,FixC,k}$	=	Mass fraction of Fixed C in reducing agent *k* in the baseline (tC/tonnes reducing agent)
$F_{BE,volatiles,k}$	=	Mass fraction of volatiles in reducing agent *k* in the baseline (tonnes volatiles/tonnes reducing agent)
$CC_{BE,V}$	=	Carbon content in volatiles in the baseline (tC/tonnes)
k	=	Types of reducing agent

Unless project specific information is available, IPCC values should be used to estimate $CC_{BE,V}$.

Project participants may use coal and coke with different contents of ash, fixed carbon and volatiles. In order to determine the carbon contents of the reducing agents used in the production processes project participants need to differentiate between the percentages of ash and volatiles, as follows.

$$F_{BE,FixC,k} = 100\% - \%Ash - \%Volatiles \tag{9}$$

Where:

$F_{BE,FixC,k}$	=	Mass fraction of Fixed C in reducing agent *k* in the baseline (tC/tonnes reducing agent)

Baseline carbon content of outputs

The carbon content of raw inputs ($CC_{BE,OP,i}$) is estimated per ton of ferroalloys produced for each year *i* of historic data.

$$CC_{BE,OP,i} = \frac{(QP_i * CC_{BE,FA}) + \sum_{h=1}^{h=H}(QP_{BE,NPS,h,i} * CC_{BE,NPS,h})}{QP_i} \tag{10}$$

Where:

$CC_{BE,OP,i}$	=	Carbon content of ferroalloys and non-products per ton of ferroalloys produced in year *i* (outputs) (tC/tonnes)
QP_i	=	Annual quantity of ferroalloys produced in year *i* (tonnes)
$CC_{BE,FA}$	=	Carbon content of ferroalloys (tC/tonnes)
$QP_{BE,NPS,h,i}$	=	Annual quantity of non product stream *h* in year *i* (tonnes)
$CC_{BE,NPS,h}$	=	Carbon content of non product stream *h* (tC/tonnes)
H	=	Total number different types of non product streams
h	=	Types of non product streams

Baseline emissions due to electricity consumption

Electricity-related baseline emissions ($BE_{y,elec}$) are estimated by multiplying the maximum accountable quantity of ferroalloys produced ($QP_{PA,max,y}$) in year *y*, by the baseline specific electricity consumption per tonne of ferroalloys and by the emission factor of the electricity (grid or captive generation).

$$BE_{y,elec} = QP_{PA,\max,y} * SEC_{BE} * EF_{y,elec} \tag{11}$$

Where:

$BE_{y,elec}$	=	**Baseline emissions due to electricity consumption** in year *y* (tCO_2e)
$QP_{PA,max,y}$	=	Ferroalloys production by operating modified ferroalloy production facility used for estimating baseline and project emissions for year *y* (tonnes/y)
SEC_{BE}	=	Historic specific electricity consumption by rotary kilns and smelting furnace(s) per ton of ferroalloys produced (MWh/tonnes)
$EF_{y,elec}$	=	Electricity emissions factor (tCO_2e/MWh). If grid electricity is used, estimate this using the latest version of the “Draft tool to calculate

baseline, project and/or leakage emissions from electricity consumption" as recommended at the 32nd Meth Panel, available at the UNFCCC CDM website. For the purpose of the project activity, transmission and distribution losses (TDL) can be assumed to be zero.

The historic average electricity consumption per ton of ferroalloys produced by rotary kilns and smelting furnace(s) is estimated by considering the electricity consumption by rotary kilns and smelting furnace(s), and the quantity of ferroalloys produced in year *i* prior to the start of the project activity, for at least a three year vintage.

To conservatively account for the impacts of fluctuations in ferroalloy production on specific electricity consumption, project participants need to choose, the year with lowest specific electricity consumption to calculate the baseline specific electricity consumption.

$$SEC_{BE} = \frac{\sum_{i=1}^{n} EC_i}{\sum_{i=1}^{n} QP_i} \quad \textbf{(12)}$$

Where:

SEC_{BE}	=	Historic specific electricity consumption by rotary kilns and smelting furnace(s) per ton of ferroalloys produced (MWh/tonnes), taken as a minimum figure for average annual specific electricity consumption during the three year period prior to implementation of project activity.
EC_i	=	Annual electricity consumption for the production of ferroalloys by operating rotary kilns and smelting furnace(s) in year *i* (MWh).
QP_i	=	Quantity of ferroalloys produced in year *i* (tonnes)
n	=	Number of years of historic data considered (at least 3 consecutive years)

When IPCC values are used to determine the emission factors for calculating emissions an uncertainty coefficient shall be defined based on the most recent version of the IPCC guidelines on National Greenhouse Gas Inventories and the most recent country specific information reported on the basis thereof.

Project Emissions

Project emissions associated with operating a modified ferroalloy production facility are estimated based on process-related and electricity-related emission sources that are significant and reasonably attributable to the project activity.

$$PE_y = PE_{y,process} + PE_{y,elec} \quad \textbf{(13)}$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e)
$PE_{y,\ elec}$	=	Project emissions from electricity consumption in year *y* (tCO_2e)
$PE_{y,\ process}$	=	Project emissions from process in year *y* (tCO_2e)
y	=	Years during the crediting period

Project emissions from process

The process-related project emissions for year *y* ($PE_{y,process}$) are estimated by multiplying the ferroalloys production used for estimating baseline and project emissions in year *y* ($QP_{PA,max,y}$) and the project emission factor ($EF_{PA,\ process,y}$) for the onsite transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products per ton of ferroalloys produced by operating *modified ferroalloy production facility*.

$$PE_{y,process} = QP_{PA,\max,,y} * EF_{PA,process,y} \qquad \textbf{(14)}$$

Where:

$PE_{y,\ process}$	=	Project emissions due to process in year *y* (tCO_2e)
$QP_{PA,\ max,y}$	=	Ferroalloys production by modified ferroalloy production facility used for estimating baseline and project emissions for year *y* (tonnes/y)
$EF_{PA,process,y}$	=	Project emission factor associated with the fuel usage, onsite transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products per ton of ferroalloys produced in modified ferroalloy production facility (tCO_2e/tonnes)

Process-related project emission factor

Project emission factor ($EF_{PA,\ process,y}$) associated with the onsite transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products per ton of ferroalloys produced is calculated as follows:

$$EF_{PA,process,y} = \left(CC_{PA,IP,y} - CC_{PA,OP,y}\right) * 44/12 \qquad \textbf{(15)}$$

Where:

$EF_{PA,process,y}$	=	Project emission factor associated with the onsite transformation of reducing agents, electrode paste, ores and slag forming materials into ferroalloys and non-products per ton of ferroalloys produced in modified ferroalloy production facility (tCO_2e/tonnes)
$CC_{PA,\ IP,y}$	=	Carbon content of fuel, reducing agents, electrode paste, ores and slag forming materials per ton of ferroalloys produced by modified ferroalloy production facility in year *y* (inputs) (tC/tonnes)
$CC_{PA,\ OP,y}$	=	Carbon content of ferroalloys and non-products per ton of ferroalloys produced by modified ferroalloy production facility in year *y* (outputs) (tC/tonnes)
y	=	Years during the crediting period
44/12	=	Multiplication factor for the mass of tCO_2 emitted from each mass unit of total carbon emitted

Project carbon content of inputs

During the crediting period, the carbon content of raw inputs is estimated per ton of ferroalloys produced as follows:

$$CC_{PA,IP,y} = \frac{\sum_{f}^{F}\left(FF_{PE,f,y} * CC_{FF,f}\right) + \sum_{k}^{K}\left(QP_{PE,RA,k,y} * CC_{PE,RA,k}\right) + \left(QP_{PE,ore,y} * CC_{PE,ore}\right) + \sum_{g}^{G}\left(QP_{PE,SFM,g,y} * CC_{PE,SFM,g}\right)}{QP_{PA,y}} \tag{16}$$

Where:

$CC_{PA, IP,y}$	=	Carbon content of fuel, reducing agents, electrode paste, ores and slag forming materials per ton of ferroalloys produced by modified ferroalloy production facility in year *y* (inputs) (tC/tonnes)
$FF_{PE, f, y}$	=	Quantity of fossil fuel type *f* combusted in modified ferroalloy production facility for energy in year *y* (mass or volume unit)
$CC_{FF, f}$	=	Carbon content of fossil fuel type *f* (tC/mass or volume unit)
$QP_{PE, RA, k, y}$	=	Annual quantity of reducing agent *k* consumed by operating modified ferroalloy production facility in year *y* (tonnes)
$CC_{RA, k}$	=	Carbon content of reducing agents *k* (tC/tonnes)
$QP_{PE, ore, y}$	=	Annual quantity of ore consumed by operating modified ferroalloy production facility in year *y* (tonnes)
$CC_{PE, ore}$	=	Carbon content of ore (tC/tonnes)
$QP_{PE,SFM,g,y}$	=	Annual quantity of slag forming material *g* consumed by operating modified ferroalloy production facility in year *y* (tonnes)
$CC_{PE,SFM,g}$	=	Carbon content of slag forming material *g* (tC/tonnes)
$QP_{PA,y}$	=	Annual quantity of ferroalloys produced by operating modified ferroalloy production facility in year *y* (tonnes)
F	=	Total number different types of fossil fuels
f	=	Types of fossil fuels
K	=	Total number different types of reducing agents
k	=	Types of reducing agent
G	=	Total number different types of slag forming materials
g	=	Types of slag forming materials

For type of slag forming materials, project participants need to account for at least the use of dolomite and limestone.

For type of reducing agents, project participants need to account for at least the use of coke, coal and (pre-baked) electrode paste. The carbon content of reducing agents is estimated using equations 9 and 10.

$$CC_{PE,RA,k} = F_{PE,FixC,k} + \left(F_{PE,volatiles,k} * CC_{PE,V}\right) \tag{17}$$

Where:

$CC_{PE,RA,k}$	=	Carbon content of reducing agents *k* in the project activity (tC/tonnes)
$F_{PE,FixC,k}$	=	Mass fraction of Fixed C in reducing agent *k* in the project activity (tC/tonnes reducing agent)
$F_{PE,volatiles,k}$	=	Mass fraction of volatiles in reducing agent *k* in the project activity (tonnes volatiles/tonnes reducing agent)
$CC_{PE,V}$	=	Carbon content in volatiles in the project activity (tC/tonnes)
K	=	Types of reducing agent

and

$$F_{PE,FixC,k} = 100\% - \%Ash - \%Volatiles \quad \textbf{(18)}$$

Where:

$F_{PE,FixC,k}$	=	Mass fraction of Fixed C in reducing agent *k* in the project activity (tC/tonnes reducing agent)

Project carbon content of outputs

During the crediting period, the carbon content of (non-) product outputs is estimated per ton of ferroalloys produced as follows:

$$CC_{PA,OP,y} = \frac{\left(QP_{PA,y} * CC_{PE,FA}\right) + \sum_{h=1}^{h=H}\left(QP_{PE,NPS,h,y} * CC_{PE,NPS,h}\right)}{QP_{PA,y}} \quad \textbf{(19)}$$

Where:

$CC_{PA,OP,y}$	=	Carbon content of ferroalloys and non-products per ton of ferroalloys produced by modified ferroalloy production facility in year *y* (outputs) (tC/tonnes)
$QP_{PA,y}$	=	Annual quantity of ferroalloys produced by operating modified ferroalloy production facility in year *y* (tonnes)
$CC_{PE,FA}$	=	Carbon content of ferroalloys (tC/tonnes)
$QP_{PE,NPS,h,y}$	=	Annual quantity of non product stream *h* by operating modified ferroalloy production facility in year *y* (tonnes)
$CC_{PE,NPS,h}$	=	Carbon content of non product stream *h* (tC/tonnes)
H	=	Total number different types of non product streams
h	=	Types of non product streams

Project emissions from grid electricity consumption

Electricity-related project emissions are estimated based on a multiplication of maximum accountable quantity of ferroalloys produced ($QP_{PA,max,y}$), electricity consumption per tonne of ferroalloys considering the emission factor of the power grid, as follows.

$$PE_{y,elec} = QP_{PA,\max,y} * SEC_{PA,y} * EF_{y,elec} \quad \textbf{(20)}$$

Where:

$PE_{y,\ elec}$	=	Electricity-related project emissions in year *y* (tCO_2e)
$QP_{PA,\ max,y}$	=	Ferroalloys production by modified ferroalloy production facility used for estimating baseline and project emissions for year *y* (tonnes/y)
$SEC_{PA,\ y}$	=	Specific electricity consumption by modified ferroalloy production facility per ton of ferroalloys produced (MWh/tonnes)
$EF_{y,\ elec}$	=	Refer to above

The specific electricity consumption per ton of ferroalloys produced by modified ferroalloy production facility is estimated by considering the electricity consumption by modified production furnace/s (i.e. electricity consumption of both rotary kilns and electric smelting furnaces) and the quantity of ferroalloys produced in year *y*.

$$SEC_{PA,y} = \frac{EC_{PA,y}}{QP_{PA,y}} \qquad \textbf{(21)}$$

Where:

$SEC_{PA,\ y}$	=	Specific electricity consumption by modified ferroalloy production facility per ton of ferroalloys produced (MWh/tonnes)
$EC_{PA,y}$	=	Electricity consumption for the production of ferroalloys by modified ferroalloy production facility in year *y* (MWh)
$QP_{PA,y}$	=	Annual quantity of ferroalloys produced by operating modified ferroalloy production facility in year *y* (tonnes)

When IPCC values are used to determine the emission factors for calculating onsite emissions an uncertainty coefficient shall be defined based on the most recent version of the IPCC guidelines on National Greenhouse Gas Inventories and the most recent country specific information reported on the basis thereof. Where project specific values are used the overall uncertainty of the onsite emissions will be assessed based on the measurements of activity data and emission factors. The uncertainty will be assessed in line with the European Commission guidelines on monitoring and reporting of GHG emissions in iron and steel production and reported accordingly (see paragraph "Uncertainty assessment" in Section III.1).

No significant leakage is anticipated from the project activity, provided that the system is place to ensure that the replaced transformers are not used elsewhere. To demonstrate that the replaced transformers are not used, the project proponents shall provide documentary evidence that the transformers were scrapped. Verification by the DOE determining that replaced transformers have not been distributed at other places is required.

Leakage

The methodology does not anticipate any other measurable forms of positive leakage attributable to the project activity (see applicability condition). This assumption should be validated when a project is developed. The leakages mentioned in the latest version of the "Draft tool to calculate baseline, project and/or leakage emissions from electricity consumption" shall be assessed.

Emission reductions

The emission reductions (ER_y) of the project activity during a given year *y* is the difference between the baseline and project emissions, as expressed in the equation below.

$$ER_y = BE_y - PE_y \quad \textbf{(22)}$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2e)
BE_y	=	Baseline emissions in year *y* (tCO_2e)
PE_y	=	Project emissions in year *y* (tCO_2e)

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

The procedures stated in the latest version of the "Draft tool to calculate baseline, project and/or leakage emissions from electricity consumption" shall be followed.

Assessing the continued validity of the baseline

The revision at the end of the first crediting period in preparation of the next crediting period shall include an assessment of:

- The applicability conditions for the approved methodology shall still be valid at the time of the revision;
- Project participants shall evaluate the institutional and legal conditions to determine whether original baseline conditions still apply.

Data and parameters not monitored

ID Number:	1.
Parameter:	QP_i
Data unit:	tonnes
Description:	Annual quantity of ferroalloys produced in year *i* preceding the start of the project activity
Source of data:	Project participant
Measurement procedures (if any):	The annual quantity of ferroalloys produced for years preceding the project activity will be recorded in the PDD from records of the project participant. This parameter has low uncertainty since records are maintained as part of core business practice.
Any comment:	Historic calibration and maintenance reports may serve to demonstrate QA/QC procedures and assess uncertainties

ID Number:	2.
Parameter:	$QP_{BE, RA, k, i}$
Data unit:	tonnes
Description:	Annual quantity of reducing agent *k* consumed in year *i* preceding the start of the project activity

Source of data:	Project participant
Measurement procedures (if any):	The annual quantity of reducing agent *k* consumed for years preceding the project activity will be recorded in the PDD from records of the project participant. This parameter has low uncertainty since records are maintained as part of core business practice.
Any comment:	Historic calibration and maintenance reports may serve to demonstrate QA/QC procedures and assess uncertainties

ID Number:	3.
Parameter:	$QP_{BE,\ ore,\ i}$
Data unit:	tonnes
Description:	Annual quantity of ore consumed in year *i* preceding the start of the project activity
Source of data:	Project participant
Measurement procedures (if any):	The annual quantity of ore consumed for years preceding the project activity will be recorded in the PDD from records of the project participant. This parameter has low uncertainty since records are maintained as part of core business practice.
Any comment:	Historic calibration and maintenance reports may serve to demonstrate QA/QC procedures

ID Number:	4.
Parameter:	$QP_{BE,SFM,g,i}$
Data unit:	tonnes
Description:	Annual quantity of slag forming material *g* consumed in year *i* preceding the start of the project activity
Source of data:	Project participant
Measurement procedures (if any):	The annual quantity of slag forming material *g* consumed for years preceding the project activity will be recorded in the PDD from records of the project participant. This parameter has low uncertainty since records are maintained as part of core business practice.
Any comment:	Historic calibration and maintenance reports may serve to demonstrate QA/QC procedures

ID Number:	5.
Parameter:	$QP_{BE,\ NPS,\ h,\ i}$
Data unit:	tonnes
Description:	Annual quantity of non product stream *h* in year *i* preceding the start of the project activity
Source of data:	Project participant
Measurement procedures (if any):	The annual quantity of non product stream *h* for years preceding the project activity will be recorded in the PDD from records of the project participant. This parameter has low uncertainty since records are maintained as part of core business practice.
Any comment:	Historic calibration and maintenance reports may serve to demonstrate QA/QC procedures

ID Number:	6.
Parameter:	$F_{BE,FixC,\ k}$
Data unit:	tonnes C/tonnes reducing agent
Description:	Mass fraction of Fixed C in reducing agent *k* in the baseline
Source of data:	Project participants
Measurement procedures (if any):	Project participants need to differentiate between the percentages of ash and volatiles, as follows (equation 10): $F_{FixC,k} = 100\% - \%Ash - \%Volatiles$ In case of electrode paste, an external source, such as laboratory or manufacturer's test certificate, may be used to estimate the carbon content of the electrode paste. This parameter has low uncertainty since records are established as part of business practice.
Any comment:	This is based on average of historic (three years or minimum one year, if three-year data is not available) of data for different type of reducing agents.

ID Number:	7.
Parameter:	$F_{BE,volatiles,\ k}$
Data unit:	tonnes volatiles/tonnes reducing agent
Description:	Mass fraction of volatiles in reducing agent *k* in the baseline
Source of data:	Mass fraction of volatiles furnished by furnished by supplier, independent laboratory, onsite laboratory or IPCC.
Measurement procedures (if any):	Laboratory reports are used to establish the mass fraction of volatiles in reducing agent *k*. In case of electrode paste, an external source, such as laboratory or manufacturer's test certificate, may be used to estimate the carbon content of the electrode paste. This parameter has low uncertainty since records are established as part of business practice.
Any comment:	This is based on average of historic (three years or minimum one year, if three-year data is not available) of data for different type of reducing agents.

ID Number:	8.
Parameter:	$CC_{BE,V}$
Data unit:	Tonnes C/tonnes volatiles
Description:	Carbon content in volatiles in the baseline
Source of data:	Project participant, or IPCC
Measurement procedures (if any):	Unless other information is available, IPCC values should be used to estimate CC_V. In case of electrode paste, an external source, such as laboratory or manufacturer's test certificate, could be used to estimate the carbon content of the electrode paste. In the case of project specific parameters, this parameter has low uncertainty if lab analyses are undertaken in line with national or international standard to ensure accuracy and consistency.
Any comment:	This is based on average of historic (three years or minimum one year, if three-year data is not available) of data for different type of reducing agents.

ID Number:	9.
Parameter:	$CC_{BE, ore}$
Data unit:	tC/tonnes
Description:	Carbon content of ore
Source of data:	Carbon content furnished by supplier, independent laboratory, onsite laboratory or IPCC.
Measurement procedures (if any):	Preferably historic laboratory reports are used to establish the carbon content of ore. This parameter has low uncertainty if lab analyses are undertaken in line with national or international standard to ensure accuracy and consistency.
Any comment:	A project-specific value for three years (or minimum one year, if three-year data is not available) preceding the project activity is preferred to IPCC values

ID Number:	10.
Parameter:	$CC_{BE,SFM,g}$
Data unit:	tC/tonnes
Description:	Carbon content of slag forming material *g*
Source of data:	Carbon content furnished by supplier, independent laboratory, onsite laboratory or IPCC.
Measurement procedures (if any):	Preferably historic laboratory reports are used to establish the carbon content of slag forming material *g*. This parameter has low uncertainty if lab analyses are undertaken in line with national or international standard to ensure accuracy and consistency.
Any comment:	A project-specific value for three years (or minimum one year, if three-year data is not available) preceding the project activity is preferred to IPCC values

ID Number:	11.
Parameter:	$CC_{BE, FA}$
Data unit:	tC/tonnes
Description:	Carbon content of ferroalloys
Source of data:	Carbon content furnished by supplier, independent laboratory, onsite laboratory or IPCC.
Measurement procedures (if any):	Preferably historic laboratory reports are used to establish the carbon content of ferroalloys. This parameter has low uncertainty since records are established as part of core business practice.
Any comment:	A project-specific value for three years (or minimum one year, if three-year data is not available) preceding the project activity is preferred to IPCC values

ID Number:	12.
Parameter:	$CC_{BE, NPS, h}$
Data unit:	tC/tonnes
Description:	Carbon content of non product stream *h*
Source of data:	Carbon content furnished by supplier, independent laboratory, onsite laboratory or IPCC.
Measurement procedures (if any):	Preferably historic laboratory reports are used to establish the carbon content of non product stream *h*. This parameter has low uncertainty since records are established as part of business practice.

Any comment:	A project-specific value for three years preceding the project activity is preferred to measurements prior to the start of the project activity or IPCC values.

ID Number:	13.
Parameter:	EC_i
Data unit:	MWh
Description:	Annual electricity consumption for the production of ferroalloys by operating rotary kilns and smelting furnace(s) in year *i* (MWh).
Source of data:	Project participant
Measurement procedures (if any):	The annual electricity consumption for at least three years preceding the project activity will be recorded at the start of the project activity. This parameter has low uncertainty since records are established as part of business practice.
Any comment:	This data will be double checked with bills from grid operator to ensure consistency. Electricity meter historic calibration and maintenance reports may serve to demonstrate QA/QC procedures

ID Number:	14.
Parameter:	$FF_{BE,f,i}$
Data unit:	mass or volume unit
Description:	Quantity of fossil fuel type *f* combusted in rotary kilns and smelting furnaces for energy in year *i* preceding the start of the project activity
Source of data:	Project participant
Measurement procedures (if any):	The fossil fuel consumption for at least three years preceding the project activity will be recorded in the PDD from records of the project participant. This parameter has low uncertainty since records are maintained as part of core business practice.
Any comment:	

ID Number:	16.
Parameter:	$CC_{FF,f}$
Data unit:	tC/GJ
Description:	Carbon content of fossil fuel type *f*
Source of data:	Laboratory or IPCC values
Measurement procedures (if any):	This parameter has low uncertainty if lab analyses are undertaken in line with national or international standard to ensure accuracy and consistency.
Any comment:	Project-specific value is preferred to the IPCC value.

ID Number:	17.
Parameter:	$EF_{y,\ elec}$
Data unit:	tCO_2e/MWh
Description:	Electricity emissions factor (tCO_2e/MWh), estimated using the latest version of the "Draft tool to calculate baseline, project and/or leakage emissions from electricity consumption", available at the UNFCCC CDM website.
Source of data:	
Measurement procedures (if any):	

Any comment:	

ID Number:	18.
Parameter:	*Historical Quality of ferroalloy*
Data unit:	-
Description:	Quality of ferroalloy based on elementary analysis and other properties
Source of data:	Project participant or (third party) laboratory
Measurement procedures (if any):	The quality of ferroalloy, defined by certain specifications (e.g. customer composition specifications for e.g. Fe, C, Si, P, S etc.) will be recorded at the start of the project activity based on historic sampling analysis data within a vintage period of at least one year. This parameter has low uncertainty if lab analyses are undertaken in line with national or international standard to ensure accuracy and consistency.
Any comment:	If ferroalloy is further processed onsite project participants need to demonstrate that the quality remains unchanged throughout the crediting period by defining conservative specifications (i.e. percentiles of Fe, C, Si, P S, etc. allowed without negatively impacting the further processing of ferroalloy, in terms of material and/or energy additions in downstream processes).

III. MONITORING METHODOLOGY

Monitoring procedures

The monitoring methodology for the project is based on measuring the total quantity of ferroalloy production for each type of smelting furnace in operation (i.e open slag bath and submerged electric arc smelting furnace(s)) and limit this production against a historic average.

The process-related emission factor is established by monitoring the transformation of iron ore, reducing agents and slag forming material into ferroalloys and non-product streams.

QA and QC is assured by developing a monitoring manual, and by training of all personnel involved in the usage of this manual, that stipulates in detail:

- Responsibilities related to the monitoring requirements,
- How to handle in case of monitoring equipment failure,
- How to screen data for quality and potential errors.

All monitoring should be attended to by appropriate and adequate personnel, as assessed by the project developer.

Uncertainty assessment

Uncertainty shall be expressed in per cent and shall describe the confidence interval around the mean value comprising 95% of inferred values[2], for normally distributed measurements. The uncertainty associated with each measured parameter should be assessed, for example, by calculating the uncertainty as the mean deviation divided by the square root of the number of measurements, or by determining the accuracy of the equipment and/or method as a reference.

The uncertainty shall then be categorised as low (<10%), medium (10-60%) or high (>60%). If it is less than 10%, then it is considered permissible uncertainty, and no action must be taken. If not, a detailed explanation of quality assurance and quality control procedures must be described in an attempt to decrease uncertainty of the parameter, and to ensure that emissions reductions calculations are not compromised. In the case of a parameter with medium or high uncertainty, a sensitivity analysis should be performed to determine the potential of the uncertainty of the parameter to affect the emissions reduction calculation. The authenticity of the uncertainty levels will be verified by the DOE at the project verification stage.

Data / Parameter:	QP_y
Data unit:	tonnes
Description:	Monitored quantity of ferroalloys produced by *modified* and *non-modified* production facility in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The quantity of ferroalloys produced is weighed on a platform scale
Monitoring frequency:	Per production run
QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. The uncertainty of the platform scale measurements should be recorded.
Any comment:	

Data / Parameter:	$QP_{PA,y}$
Data unit:	tonnes
Description:	Annual quantity of ferroalloys produced by operating modified ferroalloy production facility in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The quantity of ferroalloys produced is weighed on a platform scale
Monitoring frequency:	Per production run
QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. The uncertainty of the platform scale measurements should be recorded.
Any comment:	

[2] Based on the COMMISSION DECISION of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, (notified under document number C(2004) 130), (Text with EEA relevance), (2004/156/EC).

Data / Parameter:	$QP_{Non\text{-}PA,y}$
Data unit:	tonnes
Description:	Quantity of ferroalloys produced by operating non-modified ferroalloy production facility in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The quantity of ferroalloys produced is weighed on a platform scale
Monitoring frequency:	Per production run
QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. The uncertainty of the platform scale measurements should be recorded.
Any comment:	

Data / Parameter:	$QP_{PE,\ RA,\ k,\ y}$
Data unit:	tonnes
Description:	Annual quantity of reducing agent *k* consumed in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	In case of coke and coal, the mass shall be weighed in continuous weigh-feeders or weigh-bridges to determine the mass fed into the furnace. Alternatively, in case of electrode paste, the mass could be estimated based on supplier specifications
Monitoring frequency:	Daily
QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (including calibration) to ensure accuracy. The uncertainty of the measurement must be estimated.
Any comment:	

Data / Parameter:	$QP_{PE,\ ore,\ y}$
Data unit:	tonnes
Description:	Annual quantity of ore consumed in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The ore shall be weighed on a platform scale or continuous weigh-feeders before it is transferred to the modified smelting furnaces and kilns
Monitoring frequency:	Per production run
QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. The uncertainty of the platform scale measurements should be recorded.
Any comment:	

Data / Parameter:	$QP_{PE,SFM,g,y}$
Data unit:	tonnes
Description:	Annual quantity of slag forming material *g* consumed in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The slag forming material shall be weighed in continuous weigh-feeders before it is transferred to the modified smelting furnaces and kilns
Monitoring frequency:	Per production run

QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. The uncertainty of the platform scale measurements should be recorded.
Any comment:	

Data / Parameter:	$QP_{PE,\ NPS,\ h,\ y}$
Data unit:	tonnes
Description:	Annual quantity of non product stream *h* in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The non product stream production is weighed on a platform scale or continuous weigh-feeders
Monitoring frequency:	Per production run
QA/QC procedures:	Measurement equipment used at the plant site should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. The uncertainty of the platform scale measurements should be recorded.
Any comment:	

Data / Parameter:	$F_{PE,FixC,\ k}$
Data unit:	tC/tonne reducing agent
Description:	Mass fraction of Fixed C in reducing agent *k* in the project activity
Source of data:	Project participants
Measurement procedures (if any):	Carbon content furnished by supplier, independent laboratory, onsite laboratory or IPCC. Project participants need to differentiate between the percentages of ash and volatiles, as follows. $F_{PE,FixC,k} = 100\% - \%Ash - \%Volatiles$
Monitoring frequency:	Monthly
QA/QC procedures:	Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	

Data / Parameter:	$F_{PE,volatiles,\ k}$
Data unit:	tonnes volatiles/tonnes reducing agent
Description:	Mass fraction of volatiles in reducing agent *k* in the project activity
Source of data:	Mass fraction of volatiles furnished by supplier, independent laboratory, or onsite laboratory
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	

Data / Parameter:	$CC_{PE,V}$
Data unit:	tC/tonnes volatiles
Description:	Carbon content in volatiles in the project activity
Source of data:	Carbon content furnished by supplier, independent laboratory, onsite laboratory or IPCC
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	Unless other information is available or IPCC (CC_V = 0.65 is used for coal and 0.80 for coke)

Data / Parameter:	$CC_{PE, ore}$
Data unit:	tC/tonnes
Description:	Carbon content of ore
Source of data:	Carbon content furnished by supplier, independent laboratory, or onsite laboratory
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	

Data / Parameter:	$CC_{PE,SFM,g}$
Data unit:	tC/tonnes
Description:	Carbon content of slag forming material *g*
Source of data:	Carbon content furnished by supplier, independent laboratory, onsite laboratory, or default IPCC value
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	Compare any measurement results with the range of default emission factors. Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	Project-specific value is preferred to the IPCC value.

Data / Parameter:	$CC_{PE, FA}$
Data unit:	tC/tonnes
Description:	Carbon content of ferroalloys
Source of data:	Carbon content furnished by independent laboratory or onsite laboratory
Measurement procedures (if any):	

Monitoring frequency:	Monthly
QA/QC procedures:	Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	

Data / Parameter:	$CC_{PE, NPS, h}$
Data unit:	tC/tonnes
Description:	Carbon content of non product stream *h*
Source of data:	Carbon content furnished by independent laboratory or onsite laboratory
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	

Data / Parameter:	$EC_{PA,y}$
Data unit:	MWh
Description:	Electricity consumption for the production of ferroalloys by modified ferroalloy production facility in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The electricity consumed by modified ferroalloy production facility shall be metered (i.e. electricity consumption of rotary kilns and electric smelting furnaces that are part of the CDM project activity).
Monitoring frequency:	Measured continuously, aggregated monthly
QA/QC procedures:	The data, along with any other data from relevant meters, will be double checked with bills from the grid operator to ensure consistency. Electricity meter will be calibrated in line with manufacturer's recommendations.
Any comment:	

Data / Parameter:	$FF_{PE,f,y}$
Data unit:	mass or volume unit
Description:	Quantity of fossil fuel type *f* combusted in rotary kilns and smelting furnaces for energy in year *y*
Source of data:	Project proponent
Measurement procedures (if any):	The fossil fuel shall be measured using an appropriate mass or volume measuring equipment
Monitoring frequency:	Continuously, aggregated monthly
QA/QC procedures:	The measuring equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurements should be estimated.
Any comment:	

Data / Parameter:	$EF_{FF,f}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *f*
Source of data:	Laboratory or IPCC values
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	Compare any measurement results with the range of default factors. Measurement equipment should be subject to a regular maintenance and testing regime (incl. calibration) to ensure accuracy. Uncertainty of the measurement should be provided by the entity undertaking the measurement.
Any comment:	Project-specific value is preferred to the IPCC value.

Data / Parameter:	*Quality of ferroalloy during project activity*
Data unit:	Text
Description:	Quality of ferroalloy based on elementary analysis and other properties
Source of data:	Project participant or (third party) laboratory
Measurement procedures (if any):	A sample will be lab analysed periodically to ensure that the quality remains between the pre-determined specifications (e.g. customer composition specifications for e.g. Fe, C, Si, P, S etc.).
Monitoring frequency:	Monthly
QA/QC procedures:	Lab analyses will be undertaken to national or international standard to ensure accuracy and consistency
Any comment:	If ferroalloy is further processed onsite project participants need to demonstrate that the quality remains unchanged throughout the crediting period by defining conservative specifications (i.e. percentiles of Fe, C, Si, P S, etc. allowed without negatively impacting the further processing of ferroalloy, in terms of material and/or energy additions in downstream processes).

References and other information

IPCC, 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 3, Chapter 4.

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History of the document

Version	Date	Nature of revision(s)
01	EB 39, Annex #, 16 May 2008	To be considered at EB 39