

Annex 6

# **Guidelines for Accounting and Reporting Greenhouse Gas Emissions**

## **China Magnesium Smelting Enterprises**

**(Trial)**

# Instruction

## I. Purpose and Significance of the Guidelines

In response to the request for “establishing and improving a system for calculating the Greenhouse Gas (GHG) emissions and gradually creating a carbon emission trading market” as made in the *Outline of the 12th Five-Year Plan*, and in response to the request for “accelerating buildup of the working systems for accounting GHG emissions at national, local and enterprise levels, and implementing a system that allows key enterprises to directly report their data on GHG emissions and energy consumption”, as spelled out in the *Work Plan for GHG Emission Control during the 12<sup>th</sup> Five-Year Plan Period* (No. 41 [2011] issued by the State Council), in order to ensure that the target of reducing the intensity of carbon dioxide emissions per unit of GDP by 40%-45% by 2020 relative to 2005 will be achieved, the National Development and Reform Commission (NDRC) has formulated the *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Magnesium Smelting Enterprises (Trial)* (the Guidelines), with an aim to help enterprises (i) scientifically calculate and report in a standard format their GHG emissions, (ii) formulate their GHG emission control plans, (iii) actively participate in carbon trading, and (iv) enhance their social responsibilities. Meanwhile the Guidelines are designed to pave the way for the competent authorities to establish and implement the reporting system for GHG emissions from key enterprises in support of decision-making process.

## II. Preparation Process

The Guidelines have been developed by Tsinghua University, as entrusted by the National Development and Reform Commission. The writing team has taken into account the research findings and practical experiences for calculating and reporting GHG emissions from relevant enterprises both in China and overseas, as well as the *Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)*, issued by NDRC General Office. Through on-site investigations, in-depth studies and experimental accounting based on individual cases as well as careful consultations with China Nonferrous Metals Industry Association, the writing team completed the development of the *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Magnesium Smelting Enterprises (Trial)*. Efforts have been made to ensure that the Guidelines are science-based, comprehensive, standardized and practical.

## III. Main Contents

The *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Magnesium Smelting Enterprises (Trial)* consist of the main text and two appendices. The seven sections of the main text have clearly elaborated the application scope of the Guidelines, cited documents and references, terminology and definition, accounting boundary, accounting methodology, quality assurance and documentation,

as well as the basic framework of enterprise-based GHG emission reports respectively. The calculated GHG is carbon dioxide. Emission sources include fuel combustions, usage of energy as raw materials, industrial production processes and consumption of net purchased power and heat. The application scope covers the enterprises with qualified legal entities and independently accounted units that are treated as legal entities, all being involved in the magnesium smelting operations.

#### **IV. Issues that Need Clarification**

The Guidelines have taken into consideration related references and data as from the *Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)* and the *China Energy Statistical Yearbook* as well as statistical data from China Nonferrous Metals Industry Association. Based on these efforts, the Guidelines provide recommended activity level accounting and emission factors for relevant enterprises that involved in magnesium smelting operations. Where possible, enterprises may apply the standard methods provided in the main text of the Guidelines to the actual measurement of average purity data of dolomite as raw materials.

Considering the fact that enterprise-based GHG emission accounting and reporting are a completely new endeavor, some inadequacies may be found in practical application of the Guidelines, and it is hoped that those application units may provide their individual feedbacks in a timely manner, all aimed at making further revisions in the future.

The Guidelines are published by the National Development and Reform Commission, which is responsible for their interpretations and revisions when appropriate.

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## 1. Application Scope

The Guidelines apply to the accounting and reporting of GHG emissions from magnesium smelting enterprises in China. Enterprises involved mainly in magnesium smelting operations within the Chinese territory may calculate and report their GHG emissions, and formulate their individual GHG emission reports by using the methods provided in the Guidelines. If an enterprise produces other products that generate GHG emission in those production activities, it should calculate and report emissions as requested in the GHG emission accounting and reporting guidelines for the enterprises in the relevant sectors.

## 2. References

The references cited or quoted in the Guidelines mainly include:

- *Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)*; and
- *China Energy Statistical Yearbook 2012*.

The following documents have been taken into consideration in the development process of the Guidelines:

- *2006 IPCC Guidelines for National Greenhouse Gas Inventories*; and
- *1996 IPCC Guidelines for National Greenhouse Gas Inventories*;

## 3. Terminology and Definitions

The following terminology and definitions apply to the Guidelines.

### 3.1 Greenhouse Gases (GHGs)

A greenhouse gas is natural or man-made atmospheric component in gaseous state that absorbs and emits radiation within the thermal infrared range. The GHGs addressed in the Guidelines refer to the six types of GHGs that are controlled under the Kyoto Protocol, and they are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O),

hydrofluorocarbons (HFCs), perfluorocarbons (PFCs, referring to CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub> and others) and sulphur hexafluoride (SF<sub>6</sub>).

### 3.2 Reporting entity

A reporting entity shall be an enterprise with a legal person status or an independently accounted unit that can be deemed as a legal person, which has performed as a GHG emission actor and therefore calculates and reports its GHG emissions.

### 3.3 Magnesium smelting enterprise

A magnesium smelting enterprise is a legal entity or an independently accounted unit that can be deemed as a legal entity, being engaged in magnesium smelting as its main operations.

### 3.4 Emission from fuel combustion

Emission from fuel combustion is the CO<sub>2</sub> emission generated from reaction of fuels such as coal, gas and diesel, to oxygen in a sufficient combustion process within various stationary or mobile combustion facilities; for example: boiler, calcinator, kiln, smelter and internal combustion engine.

### 3.5 Emissions from the usage of energy as raw materials

Emissions from the usage of energy as raw materials is the GHG emission generated from the physical or chemical changes of energy consumed as raw materials in industrial production. This emission is related to magnesium smelting enterprises, which mainly refer to CO<sub>2</sub> emissions generated from consumption of semi-coke as reductant in the production process for ferrosilicon within the boundary of a given factory. Semi-coke is an energy product.

### 3.6 Emissions from industrial production processes

Emissions from industrial production processes refer to the GHG emissions generated from physical or chemical changes of raw materials other than energy during production processes. These emissions, related to magnesium smelting enterprises, are mainly the CO<sub>2</sub> emissions from calcination and decomposition of dolomite.

### 3.7 Emissions from consumption of net purchased power and heat

Emissions from net purchased power and heat refer to the CO<sub>2</sub> emissions corresponding to the consumption of net purchased power and heat (steam and hot water) by the enterprise.

### 3.8 Activity level

Activity level refers to the quantitative amount of production or consumption activities, which lead to GHG emissions; for example, consumption of various fuels, consumption of dolomite, amount of purchased power or heat, etc.

### 3.9 Emission factor

Emission factor is used to represent the per unit activity level of GHG emissions; for example, amount of CO<sub>2</sub> emissions consumption per terajoule of fuels consumed, CO<sub>2</sub> emissions consumption per ton of dolomite consumed, amount of CO<sub>2</sub> emissions per kilowatt-hour of purchased electricity, etc.

### 3.10 Rate of oxidation

Rate of oxidation is the percentage at which carbon in fuel(s) has been oxidized in a combustion process.

## 4. Accounting Boundary

An enterprise with a legal person status or an independently accounted unit that can be deemed as a legal person is regarded as the boundary for accounting and reporting the GHG emissions generated from their production system. The production system includes direct production system, auxiliary production system and affiliated production system which directly serve the production service. The auxiliary production system consists of drive, power supply, water supply, test, machine maintenance, storehouse and transportation; and the affiliated production system includes production command system (factory headquarters) and departments and units within the factory which serve the production, such as staff canteen, workshop bathroom and healthcare centers. Emissions from the energy consumption for domestic purpose within boundary of the factory are not be covered in the accounting scope.

To be specific, the scope for accounting and reporting GHG emissions from magnesium smelting enterprises covers:

#### 4.1 Emissions from fuel combustion

Emissions from fuel combustion related to magnesium smelting enterprises refer to CO<sub>2</sub> emissions from reaction of fuels such as coal, gas and diesel, to oxygen in a combustion process within various stationary or mobile combustion facilities; for example, boiler, calcinator, kiln, smelter and internal combustion engine.

#### 4.2 Emissions from the usage of energy as raw materials

Emissions from the usage of energy as raw materials are mainly CO<sub>2</sub> emissions from consumption of semi-coke as reductant in the production process for ferrosilicon within boundary of a given factory. Semi-coke is a kind of energy product. If all the ferrosilicon consumed by the enterprise for magnesium smelting production is purchased, such emissions are not accounted for.

#### 4.3 Emissions from industrial production processes

Emissions from industrial production processes, in the case of magnesium smelting enterprises, mainly refers to CO<sub>2</sub> emissions from calcination of dolomite.

#### 4.4 Emissions from consumption of net purchased power and heat

Emissions from consumption of net purchased power and heat refers to the CO<sub>2</sub> emissions corresponding to consumption of net purchased power and heat (steam and hot water) by the enterprise. Such emissions actually take place in power and heat production enterprises.

If a reporting entity is engaged in production activities apart from magnesium smelting, and there are emissions that are not covered in these Guidelines, it should calculate and report the emissions as requested in the GHG emission accounting and reporting guidelines for the enterprises in the relevant sectors. Such emissions should be included in the total enterprise GHG emissions.

## 5. Accounting Methodology

The complete workflow for a reporting entity to account and report its GHG emissions consists of the following steps:

- I. Define the accounting boundary;
- II. Identify emission sources;
- III. Collect data for activity level;
- IV. Choose and acquire data for emission factors;
- V. Calculate emissions from fuel combustion, emissions from the usage of energy as raw materials, emissions from industrial production and emissions from consumption net purchased power and heat; and
- VI. Calculate total GHG emissions of the enterprise.

The total GHG emission of a magnesium smelting enterprise is equal to the sum of emissions from fossil fuel combustion, emissions from the usage of energy as raw materials, emissions from industrial production processes, and emissions from net purchased power and heat, all of which come from the production system within the factory boundary. It can be calculated according to Equation (1):

$$E = E_{combustion} + E_{Rawmaterials} + E_{process} + E_{power\&heat} \quad \dots \quad (1)$$

where,

$E$  represents the total GHG emissions (unit: tCO<sub>2</sub>);



$E_{combustion}$  represents the emissions from fuel combustion (unit: tCO<sub>2</sub>);

$E_{Rawmaterials}$  represents the emissions from the usage of energy as raw materials (unit: tCO<sub>2</sub>);

$E_{process}$  represents the emissions from industrial production processes (unit: tCO<sub>2</sub>); and

$E_{power\&heat}$  represents the emissions from net purchased power and heat (unit: tCO<sub>2</sub>).

The above GHG emissions should be calculated based on the following methods:

### 5.1 Emissions from fuel combustion

Emissions from fuel combustion are the sum of CO<sub>2</sub> emissions from the combustion of various fuels within the accounting and reporting period, calculated according to Equation (2).

$$E_{combustion} = \sum_{i=1}^n (AD_i \times EF_i) \quad \dots\dots(2)$$

where,

$E_{combustion}$  is the CO<sub>2</sub> emissions from fossil fuel combustion within the accounting and reporting period (unit: tCO<sub>2</sub>);

$AD_i$  is the activity level of the  $i$  type of fossil fuel within the accounting and reporting period (unit: GJ);

$EF_i$  is the emission factor for the  $i$  type of fossil fuel (unit: tCO<sub>2</sub>/GJ); and

$i$  represents a type of fossil fuel.

#### 5.1.1 Acquisition of data for activity level

The activity level of fuel combustion is the product of the consumption amount of a given fuel and its average lower calorific values, calculated according to Equation (3).

$$AD_i = NCV_i \times FC_i \quad \dots\dots(3)$$

where,

$AD_i$  is the activity level of the  $i$  type of fossil fuel within the accounting and reporting period (unit: GJ);

$NCV_i$  is the average lower calorific value of the  $i$  type of fossil fuel within the accounting and reporting period, based on the recommended values provided in Appendix II of the Guidelines; for solid or liquid fuels, the unit of the value is GJ/t; for gas fuels, the unit of the value is GJ/10<sup>4</sup> Nm<sup>3</sup>; and

$FC_i$  is the net consumption amount of the  $i$  type of fossil fuel within the accounting and reporting period, based on the enterprise econometric data, and relevant measurement instrument should comply with the *General Principles for Equipping and Managing the Energy-Measuring Instruments in Energy-Using Organizations(GB 17167)*; for solid or liquid fuels, the unit is ton (t); and for gas fuels, the unit is  $10^4\text{Nm}^3$ .

### 5.1.2 Acquisition of data for emission factor

The  $\text{CO}_2$  emission factor for fuel combustion can be derived from Equation (4).

$$EF_i = CC_i \times OF_i \times \frac{44}{12} \quad \text{.....(4)}$$

where,

$EF_i$  is the  $\text{CO}_2$  emission factor for the  $i$  type of fuel (unit:  $\text{tCO}_2/\text{TJ}$ );

$CC_i$  is the carbon content per unit of calorific value of fuel  $i$  (unit:  $\text{tC/GJ}$ ), which is based on the recommended values provided in Appendix 2 of the Guidelines; and

$OF_i$  is the rate of carbon oxidation of the  $i$  type fossil fuel (unit: %), which is based on the recommended values provided in Appendix II of the Guidelines.

### 5.2 Emissions from the usage of energy as raw materials

The  $\text{CO}_2$  emissions of the usage of energy as raw materials (the semi-coke reductant consumed in the self-owned ferrosilicon production process of the reporting entity) should be derived from Equation (5).

$$E_{Rawmaterials} = S \times EF_{Ferrosilicon} \quad \text{.....(5)}$$

where,

$E_{Raw materials}$  is the  $\text{CO}_2$  emission from the consumption of semi-coke reductant in the self-owned production process for ferrosilicon within the reporting entity the accounting and reporting period (unit:  $\text{tCO}_2$ );

$S$  is the output of self-produced ferrosilicon from the reporting entity during the accounting and reporting period (unit: t); and

$EF_{Ferrosilicon}$  is the  $\text{CO}_2$  emission factor for the consumption of semi-coke in the production of ferrosilicon (unit:  $\text{tCO}_2/\text{t-FeSi}$ ).

#### 5.2.1 Acquisition of data for activity level

The required activity level (unit: t) is the output of self-produced ferrosilicon within the accounting and reporting period, which is derived from the enterprise econometric data.

### 5.2.2 Acquisition of data for emission factor

The emission factor applies the recommended value provided by *China Nonferrous Metals Industry Association*, which is 2.79 tCO<sub>2</sub>/t-FeSi.

### 5.3 Emissions from industrial production processes

The emissions of industrial production processes, namely CO<sub>2</sub> emissions decomposed from the calcination of dolomite, can be calculated with Equation (6).

$$E_{process} = EF_{Dolomite} \times D \quad \dots(6)$$

where,

$E_{process}$  refers to the emissions from industrial production processes, namely the CO<sub>2</sub> emissions from dolomite calcination (unit: tCO<sub>2</sub>);

$EF_{Dolomite}$  is the emission factor of dolomite calcination (unit: tCO<sub>2</sub>/t-D); and

$D$  is the activity level of dolomite calcination, which is the consumption of dolomite as raw materials within the accounting and reporting period (unit: t).

#### 5.3.1 Acquisition of data for activity level

The required activity level (t) is the consumption of dolomite as raw materials within the accounting and reporting period, which should be collected according to the enterprise econometric data.

#### 5.3.2 Acquisition of data for emission factor

The CO<sub>2</sub> emission factor for dolomite calcination is calculated with Equation (7).

$$EF_{Dolomite} = DX \times 0.478 \quad \dots(7)$$

where,

$EF_{Dolomite}$  refers to the CO<sub>2</sub> emission factor for dolomite calcination (unit: tCO<sub>2</sub>/t-D);

$DX$  is the average purity of dolomite as raw materials, which is the mass percentage of magnesium carbonate (MgCO<sub>3</sub>) and calcium carbonate (CaCO<sub>3</sub>) in the dolomite (unit: %). The value of  $DX$  recommended by *China Nonferrous Metals Industry Association* is 98%. The enterprises, where possible, may conduct sample tests to every batch of dolomite according to the *Methods for Chemical Analysis of Limestone and Dolomite—Part 1: The Measurement of Calcium Oxide and MANGANESE Oxide Content* (GB/T 3286.1-2012) and calculate the annual average value; and

0.478 is the CO<sub>2</sub> theoretical emission factor for dolomite calcination (unit: tCO<sub>2</sub>/t-D).

#### 5.4 Emissions corresponding to the consumption of net purchased power and heat

The CO<sub>2</sub> emissions from the production of power or heat in correspondence with the consumption of net purchased power and heat should be calculated according to Equation (12).

$$E_{power \& \ heat} = AD_{power} \times EF_{power} + AD_{heat} \times EF_{heat} \quad \dots\dots(12)$$

where,

$E_{power \& \ heat}$  represents the CO<sub>2</sub> emission from the production of power or heat corresponding to the consumption of net purchased power and heat (unit: tCO<sub>2</sub>);

$AD_{power}$  is the net purchased power within the accounting and reporting period (unit: MWh);

$AD_{Heat}$  is the net purchased heat within the accounting and reporting period (unit: GJ);

$EF_{power}$  is the CO<sub>2</sub> emission factor for power consumption (unit: tCO<sub>2</sub>/MWh); and

$EF_{Heat}$  is the CO<sub>2</sub> emission factor for heat consumption (unit: tCO<sub>2</sub>/GJ).

##### 5.4.1 Acquisition of activity level data

The required activity level is the net purchased power and heat measured and calculated by the enterprise within the accounting and reporting period, based on purchase and sale vouchers of clearing as well as the energy balance sheet archived by the power (or heat) supplier(s) and the reporting entity, calculated with Equation (13).

$$\text{Net purchased power (heat)} = \text{Purchased power (heat)} - \text{Sold power (heat)} \quad \dots\dots(13)$$

##### 5.4.2 Acquisition of emission factor data

In accordance with the location of an enterprise and in light with the current geographical divisions of power grids, i.e. those in the Northeast, North China, East China, Central China, Northwest, and Southern China, the enterprise should choose its power supply emission factor among those published most recently by the competent national authority.

For the CO<sub>2</sub> emission factor of heat supply, the value 0.11 tCO<sub>2</sub>/GJ shall be adopted for the time being, and be updated with the official data released by the competent government department in the future.

## **6. Quality Assurance and Documentation**

A reporting entity should establish a quality assurance and documentation system for its GHG emission accounting and reporting, the content of which mainly includes:

- Establishment of rules and regulations for the accounting and reporting of GHG emissions, including the responsible organizations and staff, workflow and content, work cycle and timeline, and the designation of staff responsible for accounting and reporting GHG emissions;
- Establishment of a GHG emission source list for magnesium smelting production enterprises, with appropriate accounting methods for each source, which shall be documented and archived;
- Establishment of a sound statistical record system for enterprise GHG emissions and energy consumption;
- Establishment of a sound monitoring programme for the GHG emission parameters. Where appropriate, enterprises should monitor the average purity of dolomite that has great influence over their GHG emissions, based on the methods and frequencies provided in Part 5 of the Guidelines;
- Establishment of internal auditing system for GHG emission reports; and
- Establishment of a management mechanism for documenting GHG emissions and maintaining the emission reports and related data.

## **7. Content and Format of Report**

The reporting entity should report the following information in line with the format provided in Appendix I of the Guidelines:

### **7.1 Basic information of the reporting entity**

The basic information of the reporting entity should include the name or title, business nature, reporting year, industrial sector, Organization Code Certificate, legal representative, person responsible for filling in the report, and focal point of the reporting entity.

### **7.2 Amount of GHG emissions**

A reporting entity should report the total annual GHG emissions of the enterprise. It should also report emissions from fuel combustions, emissions from the usage of

energy as raw materials, emissions from industrial production processes and emissions from consumption of net purchased power and heat respectively.

### 7.3 Activity levels and their sources

A reporting entity should report net consumption amounts of various fuels consumed for industrial production by the enterprise during the reporting year as well as their corresponding lower calorific value; output of self-produced ferrosilicon; consumption of dolomite; net purchased power; net purchased heat; and the corresponding data sources (with the adoption of recommended values from the Guidelines or measured values).

If the reporting entity is engaged in production activities apart from magnesium smelting, and there are emissions that are not covered in the Guidelines, it should report its activity level and sources as requested in the GHG emission accounting and reporting guidelines for the enterprises in the relevant sectors.

### 7.4 Emission factors and their sources

A reporting entity should report the carbon content per unit of calorific value, and data about carbon oxidation rate of various fuels consumed for industrial production by its enterprise for the reporting year; the CO<sub>2</sub> emission factor for the consumption of semi-coke for the production of ferrosilicon; the CO<sub>2</sub> emission factor for dolomite calcination; emission factors for power and heat consumption in the location of the enterprise; and their data sources (with the adoption of recommended values in the Guidelines or measurement values).

If the reporting entity is engaged in production activities apart from magnesium smelting, and there are emissions that are not covered in the Guidelines, it should report its emission factor data and sources as requested in the GHG emission accounting and reporting guidelines for the enterprises in the relevant sectors.

## **Appendix I: Report Format Template**

# **Greenhouse Gas Emission Report China Magnesium Smelting Enterprises**

**Reporting Entity (Official Seal):**

**Reporting Year:**

**Date of Production:** (Day/Month/Year)

In accordance with the *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Magnesium Smelting Enterprises(Trial)* issued by the National Development and Reform Commission, this reporting entity has accounted the total GHG emission amount of its enterprise for the year \_\_\_\_\_, and filled in the data in the relevant tables. The entity herewith reports the relevant information as follows:

**I. Basic Information of Enterprise**

**II. Greenhouse Gas Emissions**

**III. Explanatory Description of Activity Level Data and Sources**

**IV. Explanatory Description of Emission Factors and Sources**

This report is true and reliable. If the information provided in this report fails to comply with its actual realities, this enterprise represented by its legal person will bear the corresponding legal responsibility.

Legal Person (Signature):  
(Day/Month/Year)

**Attachments:**

**Table 1-1:** Summary of Carbon Dioxide Emissions of the Reporting Entity

**Table 1-2:** Activity Level Data for the Reporting Entity

**Table 1-3:** Emission Factors and Relevant Data for the Reporting Entity



**Table 1-1: Summary of Carbon Dioxide Emissions for the Reporting Entity in Year (Unit:tCO<sub>2</sub>)**

	<b>CO<sub>2</sub> Emissions</b>
<b>Total CO<sub>2</sub> Emissions of the Enterprise</b>	
Emissions(tCO <sub>2</sub> )from fuel combustions	
Emissions(tCO <sub>2</sub> )from energy as raw materials	
Emissions (tCO <sub>2</sub> ) from industrial processes	
Emissions (tCO <sub>2</sub> ) from consumption of net purchased power and heat	

**Table 1-2: Activity Level Data for the Reporting Entity**

	Type of fuels	Net consumption (t, 10 <sup>4</sup> Nm <sup>3</sup> )	Lower calorific value (GJ/t, GJ/10 <sup>4</sup> Nm <sup>3</sup> )
<b>Fuel combustion*</b>	Anthracite		
	Bituminous coal		
	Lignite (brown coal)		
	Cleaned coal		
	Other washed coal		
	Other coal products		
	Semi-coke		
	Coke		
	Crude oil		
	Fuel oil		
	Gasoline		
	Diesel		
	General Kerosene		
	LNG		
	LPG		
	Tar		
	Coke oven gas		
	Blast furnace gas		
	Linz Donaniz Converter Gas (LDG)		
	Producer gas		
	Other gases		
	Natural gas		
Semi-coke gas			
Refinery gas			
	<b>Name of parameters</b>	<b>Value</b>	<b>Unit</b>
<b>Usage of energy as raw material**</b>	Self produced ferrosilicon		t
<b>Industrial processes**</b>	Consumption of dolomite		t
<b>Consumption of net purchased power &amp; heat</b>	Electricity bought from other enterprises		MWh
	Electricity sold to other enterprises		MWh
	Heat bought from other enterprises		GJ
	Heat sold to other		GJ

	enterprises		
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\* The reporting entity should add on its own the other types of energy actually used by the enterprise in its operations, which are not listed in this table; and

\*\* The enterprise should add on its own the other sources of GHG emission other than sources of magnesium smelting activities, which are not listed in this table.

**Table 1-3: Emission Factors and Relevant Data for the Reporting**

**Entity**

	<b>Type of fuels</b>	<b>Carbon content per unit of calorific value (tC/GJ)</b>	<b>Rate of carbon oxidation (%)</b>
<b>Fuel combustion *</b>	Anthracite		
	Bituminous coal		
	Lignite (brown coal)		
	Cleaned coal		
	Other washed coal		
	Other coal products		
	Semi-coke		
	Coke		
	Crude oil		
	Fuel oil		
	Gasoline		
	Diesel		
	General Kerosene		
	LNG		
	LPG		
	Tar		
	Coke oven gas		
	Blast furnace gas		
	Linz Donaniz Converter Gas (LDG)		
	Producer gas		
	Other gases		
Natural gas			
Semi-coke gas			
Refinery gas			
	<b>Name of parameters</b>	<b>Value</b>	<b>Unit</b>
<b>Usage of energy as raw material**</b>	Emission factor for the semi-coke consumed for ferrosilicon production		tCO <sub>2</sub> /t-ferrosilicon
<b>Industrial processes**</b>	Average dolomite purity		%
<b>Consumption of net</b>	Emission factor for electricity consumption		tCO <sub>2</sub> /MWh

<b>purchased electricity/heat</b>	Emission factor for heat consumption		tCO <sub>2</sub> / GJ
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\* The reporting entity should add on its own the other types of energy actually used by the enterprise in its operations, which are not listed in this table; and

\*\* The enterprise should add on its own the other sources of GHG emissions other than sources of magnesium smelting activities, which are not listed in this table.

## Appendix II: Relevant Default Values

**Table 2-1: Recommended Values for Relevant Parameters of Common Fossil Fuels**

Type of fuel		Unit	Lower calorific value (GJ/t, GJ/10 <sup>4</sup> Nm <sup>3</sup> )	Carbon content per unit of calorific value (tC/TJ)	Rate of carbon oxidation
Solid fuel	Anthracite	Ton	20.304	27.49	94%
	Bituminous coal	Ton	19.570	26.18	93%
	Lignite (brown coal)	Ton	14.080	28.00	96%
	Cleaned coal	Ton	26.344	25.40	90%
	Other washed coal	Ton	8.363	25.40	90%
	Other coal products	Ton	17.460	33.60	90%
	Semi-coke	Ton	28.435	29.42	93%
	Coke	Ton	28.447	29.50	93%
Liquid fuel	Crude oil	Ton	41.816	20.10	98%
	Fuel oil	Ton	41.816	21.10	98%
	Gasoline	Ton	43.070	18.90	98%
	Diesel	Ton	42.652	20.20	98%
	General Kerosene	Ton	44.750	19.60	98%
	LNG	Ton	41.868	17.20	98%
	LPG	Ton	50.179	17.20	98%
	Tar	Ton	33.453	22.00	98%
Gaseous fuel	Coke oven gas	10 <sup>4</sup> m <sup>3</sup>	173.540	12.10	99%
	Blast furnace gas	10 <sup>4</sup> m <sup>3</sup>	33.000	70.80	99%
	Linz Donaniz Converter Gas (LDG)	10 <sup>4</sup> m <sup>3</sup>	84.000	49.60	99%
	Producer gas	10 <sup>4</sup> m <sup>3</sup>	52.270	12.20	99%
	Other gases	10 <sup>4</sup> m <sup>3</sup>	52.270	12.20	99%
	Natural gas	10 <sup>4</sup> m <sup>3</sup>	389.31	15.30	99%
	Semi-coke gas	10 <sup>4</sup> m <sup>3</sup>	81.000	11.96	99%

	Refinery gas	10 <sup>4</sup> m <sup>3</sup>	45.998	18.20	99%
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Data sources: 1. *China Energy Statistical Yearbook 2012*; 2. *Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)*; 3. Data from industrial investigation

**Table 2-2: Recommended Emission Factors for Energy as Raw Material**

Parameter	Unit	Emission factor
Semi-coke consumption for ferrosilicon production	tCO <sub>2</sub> / t-FeSi	2.79

Data source: China Non-ferrous Industrial Association

**Table 2-3: Recommended Emission Factors for Industrial Processes**

Parameter	Unit	Emission factor
Average dolomite purity		98%

Data source: China Non-ferrous Industrial Association

**Table 2-4: Other Recommended Factors**

Parameter	Unit	CO <sub>2</sub> emission factor
Powerconsumption	tCO <sub>2</sub> /MWh	Most recent published by national competent authorities
Heatconsumption	tCO <sub>2</sub> /GJ	0.11