Annex3

# Guidelines for Accounting and Reporting Greenhouse Gas Emissions

# China Iron and Steel Production 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 the key enterprises to directly report their data on GHG emissions and energy consumption", in the *Work Plan for GHG Emission Control during the 12$^{th}$ 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 Iron and Steel Production Enterprises (Trial)* (the Guidelines), with the aim to help enterprises (i) scientifically calculate and report in a standard format their GHG emissions, (ii) formulate their GHG emissions 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 processes.

## II. Preparation Process

The Guidelines have been developed by experts from the National Center for Climate Change Strategy and International Cooperation, as entrusted by the NDRC. 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 the NDRC General Office. Through field investigations, in-depth studies and trial accounting based on individual cases, the writing team completed the development of the *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Iron and Steel Production Enterprises (Trial).* Efforts have been made to ensure that the Guidelines are science-based, comprehensive, standardized and practical. In the course of its preparation, the writing team has received strong support from relevant experts from the China Iron and Steel Association, Central Iron & Steel Research Institute, China Metallurgical Industry Planning and Research Institute and other industrial associations and research institutes.

## III. Main Contents

The Guidelines contain seven sections and appendices. These sections have elaborated the application scope of the Guidelines, cited documents and references, terminology and definition, accounting boundary, accounting methodology, quality assurance and documentation requirements as well as report contents and format respectively. The calculated GHG emissions for the purposes of the Guidelines include carbon dioxide (for the present emissions of other GHGs are not calculated as emissions of methane and nitrous oxide are both below 1%). Emission sources include fossil fuel combustion, industrial production processes, the import and export of power and heat, and carbon-sequestering products with implicit CO2 emissions. 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 production of iron and steel products.

## IV. Issues that Need Clarification

The Guidelines have taken into consideration such related authoritative data at home and abroad as from the *Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)*, the *China Energy Statistical Yearbook,* and the *User Guide on $CO_2$Emission Data Collection* by the World Steel Association. The Guidelines provided recommended values of some parameters and emission factors required for calculation. Where possible, enterprises may use actual measurement data.

Considering the fact that enterprise-based GHG emissions accounting and reporting are a completely new and complicated 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 interpretation and revision when appropriate.

# Contents

# 1. Application Scope

The Guidelines apply to the accounting and reporting of GHG emissions from iron and steel production enterprises in China. Enterprises operating in iron and steel production within the Chinese territory may calculate and report their GHG emissions, and formulate their individual GHG emissions reports by using the methods provided in the Guidelines. If an iron and steel production enterprise produces other products that generate GHG emissions in those production activities, it should calculate and report the emissions as requested in the GHG emissions 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);*

*China Energy Statistical Yearbook 2012*;

*China's Studies on Greenhouse Gas Emission Inventories*; and

*World Steel Association User Guide on $CO_2$Emission Data Collection (Version 6)*

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

*2006 IPCC Guidelines for National Greenhouse Gas Inventories*;

*Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition in 2004)*;

*Calculation Method of Carbon Dioxide Emission Intensity from Iron and Steel Production—Part 1: Steel Plant with Blast Furnace* (ISO 14404-1);

*Calculation Method of Carbon Dioxide Emission Intensity from Iron and Steel Production—Part 2: Steel Plant with Electric Arc Furnace* (ISO 14404-2); and

*Guidelines for Quantifying and Reporting Greenhouse Gas Emissions from Industrial Enterprises.*

# 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 which are controlled under the Kyoto Protocol, and they are carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$).

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 Iron and steel production enterprise

An iron and steel production enterprise refers to one which operates ferrous metal smelting, rolling, processing and product manufacturing. Based on the product, the enterprises can be divided into enterprises for iron and steel products and enterprises for iron and steel machined products; based on the production process, enterprises can be divided into joint enterprises for iron and steel production, electric arc furnace process enterprises, iron-making enterprises, steel-making enterprises and steel processing enterprises.

3.4 Emissions from fuel combustion

Emissions from fuel combustion are the GHG emissions generated from the reaction of fossil fuel to oxygen in a combustion process.

3.5 Emissions from industrial production processes

Emissions from industrial production processes are the GHG emissions generated by making physical or chemical changes to raw materials (other than fuel combustion) during industrial production processes.

3.6 Emissions from consumption of net purchased electricity and heat

Emissions from consumption of net purchased electricity and heat are the GHG emissions generated from the electricity or heat generation process corresponding to the consumption of net purchased electricity and heat(e.g. steam) by the enterprise.

3.7 Implicit emissions from carbon-sequestering products

Implicit emissions from carbon-sequestering products refer to $CO_2$ emissions corresponding to the carbon sequestrated in such products as crude steel and methyl alcohol.

3.8 Activity level

Activity level refers to the quantitative amount of production or consumption activities, which lead to GHG emissions or removals, for example, consumption of

various fuels, consumption of electrodes, amount of purchased power and amount of purchased steam, etc.

3.9 Emission factor

Emission factor refers to the factor used to quantify the GHG emissions per unit of activity level. An emission factor is usually derived from sample measurements or statistical analysis, indicating the representative emission rate at a particular activity level under given operating conditions.

3.10 Rate of carbon oxidation

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

# 4. Accounting Boundary

A reporting entity should calculate and report all the GHG emissions from its facilities and operations. The scope of facilities and operations includes direct production systems, auxiliary production systems and affiliated production systems which directly serve the production service. Auxiliary production systems consist of drive, power supply, water supply, test, machine maintenance, storehouse and transportation; and the affiliated production system includes the production command system (factory headquarters) and departments and units within the factory which serve the production service, such as staff canteen, workshop bathroom and healthcare centers. Figure 1 shows the GHG emissions from iron and steel production enterprises and the accounting boundary.

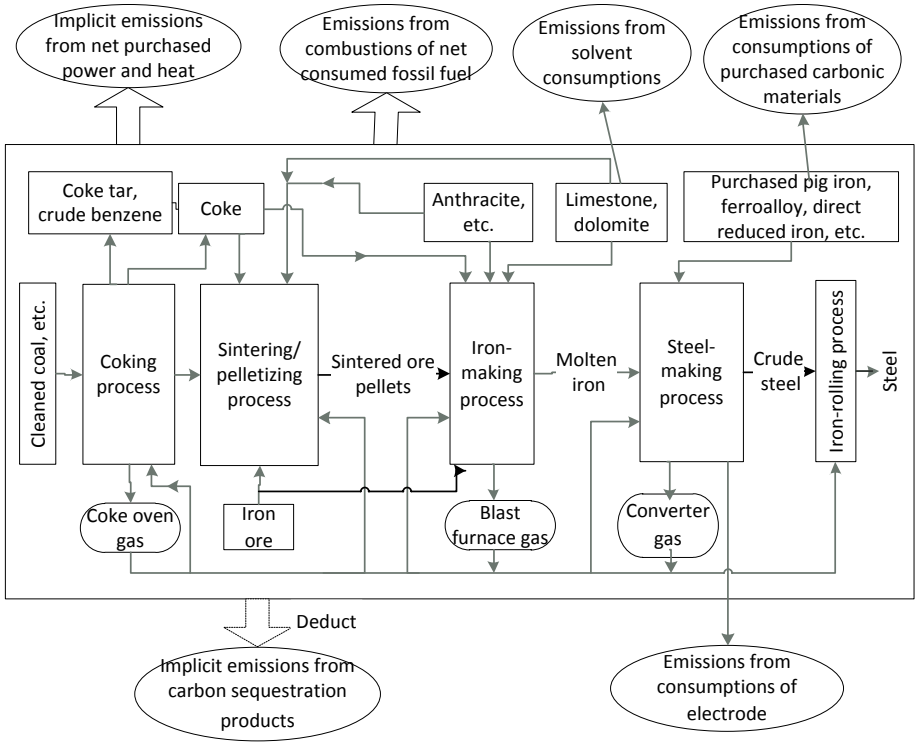

Figure 1 GHG emissions from iron and steel production enterprises and the accounting boundary

The accounting and reporting scope of GHG emissions from iron and steel production enterprises include specifically:

### 4.1 Emissions from fuel combustion

Emissions from fuel combustion are the GHG emissions generated from combustion of net consumed fossil fuels, including emissions from stationary sources within the iron and steel production enterprise (e.g. coke oven, sintering machine, blast furnace, industrial boiler and other stationary combustion facilities) and emissions from mobile sources used for production (e.g. transport vehicles and handling equipment within the factory).

### 4.2 Emissions from industrial production processes

Emissions from industrial production processes come from the decomposition and oxidation of other purchased carbonaceous materials (e.g. electrode, pig iron, ferroalloy, direct reduced iron, etc.) and solvents in such processes as sintering, iron-making and steel-making of an iron and steel production enterprise.

### 4.3 Emissions from consumption of net purchased electricity and heat

Emissions from consumption of net purchased electricity and heat are imputed from the net purchased electricity and heat (e.g. steam). Such emissions actually take place in electricity and heat production enterprises.

### 4.4 Implicit emissions from carbon-sequestering products

A small quantity of carbon is sequestrated in the pig iron, crude steel and other products in the process of iron and steel production, while another small quantity of carbon is sequestrated in such carbon-sequestering products as methyl alcohol which is made from by-product gas. The $CO_2$ emissions corresponding to such product-sequestrated carbon should be excluded from accounting.

# 5. Accounting Methodology

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

I. Define the accounting boundary;

II. Identify emission sources;

III. Collect data for activity level;

IV. Select and acquire data for emission factors;

V. Calculate emissions from fuel combustion, emissions from industrial production processes, emissions corresponding to consumption of net purchased power and heat and implicit emissions from carbon-sequestering products; and

VI. Calculate total GHG emissions of the enterprise

The total $CO_2$ emissions of an iron and steel production enterprise are equal to the sum of emissions from all the fossil fuel combustion within the enterprise boundary, emissions from industrial production processes and implicit emissions corresponding to net purchased electricity and heat, less the implicit emissions from carbon-sequestering products. It can be calculated according to the Equation (1):

$$E_{co_2}=E_{Combustion}+E_{Process}+E_{Power\ \&\ heat}-E_{Carbon\ sequestration}$$

…… (1)

where,

$E_{co2}$ represents the total $CO_2$ emissions with ton (t) as the unit ($tCO_2$);

$E_{combustion}$ refers to the $CO_2$ emissions of all the net consumed fossil fuel combustion activities, with tons (t) as the unit ($tCO_2$);

$E_{process}$ means the $CO_2$ emissions of industrial production processes, with tons (t) as the unit ($tCO_2$);

$E_{power\&heat}$ is the $CO_2$ emissions corresponding to the net purchased power and heat by the enterprise, with tons (t) as the unit ($tCO_2$); and

$E_{Carbon\ sequestration}$ is the implicit $CO_2$ emissions of carbon-sequestering products by the enterprise, with tons (t) as the unit ($tCO_2$).

5.1 Emissions from fuel combustion

5.1.1 Calculation equation

Emissions from fuel combustion activities are the sum of $CO_2$ emissions from combustion of various fuels within the accounting and reporting period, which can be calculated according to Equation (2).

$$E_{combustion}=\sum_{i=1}^{n}(AD_i\times EF_i) \qquad \text{……(2)}$$

where,

$E_{combustion}$ is the $CO_2$ emissions of fossil fuel combustion within the accounting and reporting period, with ton (t) as the unit ($tCO_2$);

$AD_i$ 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: $tCO_2/GJ$); and

*i* represents a type of fossil fuels that is consumed on a net basis.

The activity level $AD_i$of the *i* type of fossil fuel consumed within the accounting and reporting period can be calculated according to Equation (3).

$$AD_i = NCV_i \times FC_i \quad \text{……(3)}$$

where,

$NCV_i$ is the average lower calorific value of the *i* type of fossil fuel within the accounting and reporting period; for solid or liquid fuels, the unit of the value is GJ/t; for gas fuels, the unit of the value is $GJ/10^4 Nm^3$; and

$FC_i$ is the net consumption amount of fossil fuel type *i* within the accounting and reporting period; for solid or liquid fuels, the unit of consumption is ton (t); and for gas fuels, the unit of consumption is $10^4Nm^3$.

The $CO_2$ emission factor for fossil fuels should be derived from Equation (4).

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

where,

$CC_i$ is the carbon content per unit of calorific value of fossil fuel type *i* (unit: tC/GJ); and

$OF_i$ is the rate of carbon oxidation of fossil fuel(unit: %).

5.1.2 Acquisition of data for activity level

The net consumption of various fossil fuels can be determined according to the purchase amount, sales amount and stock change of various fossil fuels and other consumption other than that used for iron and steel production within the accounting and reporting period. Data for the purchased amount and sold amount are provided in such vouchers of clearing as purchase orders and sales orders; the amount of stock change should be determined with readings on the measurement instruments or other methods that meet the requirements; and other consumption amounts other than that used for iron and steel production should be acquired based on the enterprise energy balance sheet. The net consumption of fossil fuels should be derived from Equation (5).

*Net Consumption = Purchased amount + (Initial stock – Ending stock) – other consumption other than that used for iron and steel production – sold amount*

……(5)

The enterprise can apply the default average lower calorific values provided in the Guidelines, as presented in the Table 2.1. Where possible, enterprises can make their own measurement or entrust qualified professional institutions to implement

measurement. Alternatively, they may adopt measured values provided in the voucher of clearing written with the interested party. On the condition of actual measurement, lower calorific values of fossil fuels should be identified according to related standards, for example, *Determination of Calorific Value of Coal (GB/T 213)*, *Determination of Calorific Value of Petroleum Products (GB/T 384)* and *Energy Determination for Natural Gas (GB/T 22723)*.

5.1.3 Acquisition of data for emission factor

Enterprises may use the default values for carbon content per unit of calorific value and the rate of carbon oxidation provided in the Guidelines, for example, as shown in Table 2.1.

5.2 Emissions from industrial production processes

5.2.1 Calculation

$CO_2$ emissions from industrial production processes can be calculated according to Equations (6)-(9).

$$E_{Process} = E_{Solvent} + E_{Electrode} + E_{Raw\ materials} \quad \text{……(6)}$$

5.2.1.1 $CO_2$ Emissions from solvent consumption

$$E_{Solvent} = \sum_{i=1}^{n} (P_i \times EF_i) \quad \text{……(7)}$$

where,

$E_{Solvent}$ is the $CO_2$ emissions from solvent consumption (unit: $tCO_2$);

$P_i$ is the net consumption of the *i* type of solvent within the accounting and reporting period (unit: t);

$EF_i$ means the $CO_2$ emissions factor for the *i* type of solvent (unit: $tCO_2$/t solvent); and

*i* represents the type of solvent consumed (e.g. dolomite and limestone).

5.2.1.2 $CO_2$ Emissions from electrode consumption

$$E_{Electrode} = P_{Electrode} \times EF_{Electrode} \quad \text{……(8)}$$

where,

$E_{Electrode}$ is the $CO_2$ emissions from electrode consumption (unit: $tCO_2$);

$P_{Electrode}$ is the amount of electrode consumed for electric-arc-furnace(EAF)-based steel making and by the refining furnace within the accounting and reporting period (unit: t); and

$EF_{Electrode}$ means the $CO_2$ emission factor for electrode consumed for the use of EAF-based steel making and the refining furnace (unit: $tCO_2$/t electrode).

5.2.1.3 $CO_2$ Emissions from consumption of such carbonaceous materials as purchased pig iron

$$E_{Raw\ materials} = \sum_{i=1}^{n} (M_i \times EF_i) \quad \text{……(9)}$$

where,

$E_{Raw\ materials}$ is the $CO_2$ emissions from consumption of other carbonaceous materials such as purchased pig iron, ferroalloy and direct reduced iron (unit: $tCO_2$);

$M_i$ is the purchased amount of the *i* type of carbonaceous materials within the accounting and reporting period (unit: t);

$EF_i$ means the $CO_2$ emission factor for the *i* type of purchased carbonaceous materials (unit: $tCO_2$/t raw material); and

*i* represents the type of purchased carbonaceous material (e.g. pig iron, ferroalloy and direct reduced iron).

5.2.2 Acquisition of data for activity level

The net consumption of solvent and electrode are calculated with Equation (5), and for the purchased amount of carbonaceous materials, the data provided in such vouchers of clearing as purchase orders can be used.

5.2.3 Acquisition of data for emission factor

With respect to $CO_2$ emission factors for solvent, electrode, pig iron, direct reduced iron and some ferroalloy, relevant default values provided in the *World Steel Association User Guide on $CO_2$Emission Data Collection (Version 6)*should be adopted, as shown in Table 2.2. Where possible, enterprises may entrust qualified professional institutions to implement an appropriate test. Alternatively, they may adopt measured values provided in the voucher of clearing written with the interested party. Emission factors for limestone and dolomite should be determined based on *Methods for Chemical Analysis of Limestone and Dolomite: The Determination of Carbon Dioxide Content*; the emission factor for carbonaceous materials can be converted from the corresponding carbon content, which should be determined according to such standards as *Iron, Steel and Alloy –Determination of Carbon Contents: Gas-volumetric Method after Combustion in the Pipe Furnace (GB/T 223.6)*, *Iron, Steel and Alloy –Determination of Total Carbon*

*Content—Infrared Absorption Method after Combustion in an Induction Furnace (GB/T 223.86)*, *Ferrochromium and Silicochromium—Determination of Carbon Content–Infrared Absorption Method and Gravimetric Method (GB/T 4699.4)*, *Methods for Chemical Analysis of Ferrosilicon—The Infrared Absorption Method for the Determination of Carbon Content (GB/T 4333.10)*, *Methods for Chemical Analysis of Ferrotungsten—The Infrared Absorption Method for the Determination of Carbon Content (GB/T 7731.10)*, *Ferrovanadium—Determination of Carbon Content—The Infrared Absorption Method and the Gasometric Method (GB/T 8704.1)*, *Methods for Chemical Analysis of Ferrophorus—The Infrared Absorption Method for the Determination of Carbon Content (YB/T 5339)*; and *Methods for Chemical Analysis of Ferrophorus—The Gasometric Method for the Determination of Carbon Content (YB/T 5340).*

5.3 Emissions from consumption of net purchased electricity and heat

5.3.1 Calculation equation

$CO_2$ emissions generated implicitly from consumption of net purchased electricity and heat can be calculated according to Equation (10).

$$E_{Power\ \&\ heat} = AD_{Power} \times EF_{Power} + AD_{Heat} \times EF_{Heat} \quad \text{……(10)}$$

where,

$E_{Power\&heat}$ represents the implicit $CO_2$ emissions from consumption of net purchased electricity and heat (unit: $tCO_2$);

$AD_{Power}$ and $AD_{Heat}$ are the net purchased electricity and heat (e.g.,steam) amount within the accounting and reporting period respectively, with MWh and GJ as the respective units; and

$EF_{Power}$ *and* $EF_{Heat}$ are the $CO_2$ emission factors for electricity and heat (i.e. steam) respectively, with $tCO_2$/MWh and $tCO_2$/GJ as the respective units.

5.3.2 Acquisition of activity level data

Based on purchase and sale vouchers of clearing as well as the energy balance sheet within the accounting and reporting period archived by the power (or heat) supplier(s) and the iron and steel production enterprise, the activity level can be calculated according to Equation (11).

Net purchased electricity(heat) = Purchased electricity (heat) – Electricity (heat) consumed for non-iron-steel production – Sold electricity (heat)

……(11)

5.3.3 Acquisition of emission factor data

In accordance with the location of an enterprise and in light with the current geographical divisions of electricity grids, i.e. those in the Northeast, North China, East China, Central China, Northwest, and Southern China, the enterprise should choose its electricity supply emission factor among those published most recently by the competent national authority for calculation. The $CO_2$ emission factor for heat supply shall adopt the value 0.11 $tCO_2/GJ$ for the time being for the GHG emissions accounting, and should be updated with the official data released by the competent government department.

5.4 Implicit emissions from carbon-sequestering products

5.4.1 Calculation equation

$CO_2$ emissions generated implicitly from carbon-sequestering products can be calculated according to Equation (12).

$$R_{Carbon\ sequestration} = \sum_{i=1}^{n} \left( AD_{Carbon\ sequestration} \times EF_{Carbon\ sequestration} \right) \quad \cdots\cdots (12)$$

where,

$R_{Carbonsequestration}$ represents the implicit $CO_2$ emissions from carbon-sequestering products (unit: $tCO_2$);

$AD_{Carbonsequestration}$ is the output of the *i* type of carbon-sequestering product (unit: t);

$EF_{Carbonsequestration}$is the emission factor for the *i* type of carbon-sequestering product (unit: $tCO_2/t$); and

*i* is the type of carbon-sequestering product (e.g. crude steel ormethyl alcohol).

5.4.2 Acquisition of activity level data

The output of various carbon-sequestering products should be determined according to their sales volume and stock change within the accounting and reporting period. Data for the sales are provided in such vouchers of clearing as purchase orders; and the amount of stock change should be determined with readings on the measurement instruments or other methods that meet the requirements. The net consumption of various carbon-sequestering products can be derived from Equation (13).

*Output = Sales volume + (Ending stock - Initial stock)* ……(13)

5.4.3 Acquisition of emission factor data

With respect to the $CO_2$ emission factor for pig iron, the default value provided in the *World Steel Association User Guide on $CO_2$Emissions Data Collection (Version 6)*should be adopted as shown in Table 2.2. The $CO_2$ emission factor for crude steel may apply the default value in Table 2.3. $CO_2$ emission factors for carbon-sequestering products should be calculated with the theoretical molar mass ratio. For example, the $CO_2$ emission factor for methyl alcohol is 1.375 t$CO_2$/t methyl alcohol.

# 6. Quality Assurance and Documentation

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

- Designation of special staff responsible staff for the accounting and reporting of GHG emissions;
- Establishment of a sound monitoring programme for GHG emissions. Qualified enterprises should regularly monitor such parameters as the lower calorific value and carbon content of major fossil fuels and the rate of carbon oxidation of key combustion facilities (i.e. coke oven, sintering machine and blast furnace);
- Establishment of a sound statistical record system for enterprise GHG emissions and energy consumption;
- Establishment of a management mechanism for documenting and archiving GHG emissions data and documents; and
- Establishment of internal auditing for GHG emissions reports.

# 7. Content and Format of Report

The reporting entity should report the following information in line with the format provided in the AppendixI:

## 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 GHG emissions of the enterprise for the accounting and reporting period. It should also report emissions from fossil fuel combustion, emissions from industrial production processes and emissions corresponding to consumption of net purchased electricity and heat respectively, minus the negative emissions from carbon-sequestering products.

7.3 Activity level and their sources

A reporting entity should report the net consumption of various fossil fuels consumed for the production of all products by the enterprise as well as their corresponding lower calorific value; consumption of solvent and electrode; purchased amount of carbon materials; net purchased electricity and heat; and output of carbon-sequestering crude steel and methyl alcohol.

If an iron and steel production enterprise produces other products, it should report its activity level and sources as requested in the GHG emissions accounting and reporting guidelines for enterprises in the relevant sectors.

7.4 Emission factors and their sources

A reporting entity should report the data of carbon content per unit of calorific value and carbon oxidation rate of various fossil fuels; the $CO_2$ emission factors for solvent, electrode and carbonaceous materials; $CO_2$ emission factors for power and heat; and $CO_2$ emission factors for carbon-sequestering products, such as crude steel and methyl alcohol.

If an enterprise produces other products, it should report its emission factor data and sources as requested in the GHG emissions accounting and reporting guidelines for the enterprises in the relevant sectors.

## Appendix I: Report Format Template

# Greenhouse Gas Emissions Report

# China Iron and Steel Production 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 Iron and Steel Production Enterprises(Trial)*(the Guidelines) issued by the National Development and Reform Commission (NDRC), this reporting entity has accounted the total GHG emissions amount of its enterprise for the year _____, and filled in the data in the relevant tables. The reporting 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 reflect the reality, this enterprise represented by its legal person will bear the corresponding legal responsibility.

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

**Attachments:**

**Table 1-1**: Carbon Dioxide Emissions Report of a Reporting Entity in Year __

**Table 1-2**: Emissions Activity Level Data of a Reporting Entity

**Table 1-3**: Emission Factors and Calculation Co-efficient of a Reporting Entity

## Table1-1: Carbon Dioxide Emissions Report of a Reporting Entity in Year

| **Total $CO_2$Emissions ($tCO_2$) of the Reporting Entity** | |
|---|---|
| Emissions ($tCO_2$) from fuel combustion | |
| Emissions ($tCO_2$) from industrial processes | |
| Emissions ($tCO_2$) from consumptions of net purchased electricity and heat | |
| Implicit emissions ($tCO_2$) from carbon-sequestering products | |

## Table 1-2: Emissions Activity Level Data

| | | Net consumption （t, $10^4Nm^3$） | Lower calorific value ($GJ/t, GJ/10^4Nm^3$) |
|---|---|---|---|
| **Fossil fuel combustion** * | Anthracite | | |
| | Bituminous coal | | |
| | Lignite (brown coal) | | |
| | Cleaned coal | | |
| | Other washed coal | | |
| | Other coal products | | |
| | Coke | | |
| | Crude oil | | |
| | Fuel oil | | |
| | Gasoline | | |
| | Diesel | | |
| | General Kerosene | | |
| | LNG | | |
| | LPG | | |
| | Tar | | |
| | Crude benzene | | |
| | Coke oven gas | | |
| | Blast furnace gas | | |
| | Linz Donaniz Converter Gas (LDG) | | |
| | Other gases | | |
| | Natural gas | | |
| | Refinery gas | | |
| | | **Data** | **Unit** |
| **Industrial processes** | Net consumption of limestone | | t |
| | Net consumption of dolomite | | t |
| | Net consumption of electrode | | t |
| | Purchased amount of pig iron | | t |
| | Purchased amount of direct reduced iron | | t |
| | Purchased amount of inconel | | t |
| | Purchased amount of ferrochrome | | t |

| | | | |
|---|---|---|---|
| | Purchased amount of molybdenum alloy | | t |
| **Consumption of net purchased electricity& heat** | | **Data** | **Unit** |
| | Net purchased electricity | | MWh |
| | Net purchased heat | | GJ |
| **Carbon sequestration** | | **Data** | **Unit** |
| | Pig iron output | | t |
| | Crude steel output | | t |
| | Methanol output | | t |
| | Outputs of other carbon sequestration product and byproduct | | t |

* The enterprise should add any other types of energy actually used by the enterprise in its operations, which are not listed in this table.

## Table 1-3: Emission Factors and Calculation Coefficients

| | | Carbon content per unit of calorific value （tC/GJ） | Rate of carbon oxidation （%） |
|---|---|---|---|
| **Fossil fuel combustion** * | Anthracite | | |
| | Bituminous coal | | |
| | Lignite (brown coal) | | |
| | Cleaned coal | | |
| | Other washed coal | | |
| | Other coal products | | |
| | Coke | | |
| | Crude oil | | |
| | Fuel oil | | |
| | Gasoline | | |
| | Diesel | | |
| | General Kerosene | | |
| | LNG | | |
| | LPG | | |
| | Tar | | |
| | Crude benzene | | |
| | Coke oven gas | | |
| | Blast furnace gas | | |
| | Linz Donaniz Converter Gas (LDG) | | |
| | Other gases | | |
| | Natural gas | | |
| | Refinery gas | | |
| **Industrial processes** | | **Data** | **Unit** |
| | Limestone | | $tCO_2/t$ |
| | Dolomite | | $tCO_2/t$ |
| | Electrode | | $tCO_2/t$ |
| | Pig iron | | $tCO_2/t$ |
| | Direct reduced iron | | $tCO_2/t$ |
| | Inconel | | $tCO_2/t$ |
| | Ferrochrome | | $tCO_2/t$ |
| | Molybdenum alloy | | $tCO_2/t$ |
| **Net purchased electricity/heat** | | **Data** | **Unit** |
| | Electricity | | $tCO_2/MWh$ |
| | Heat | | $tCO_2/GJ$ |
| | | **Data** | **Unit** |
| | Pig iron | | $tCO_2/t$ |

| | | | |
|---|---|---|---|
| **Carbon sequestration** | Crude steel | | $tCO_2/t$ |
| | Methanol | | $tCO_2/t$ |
| | other carbon sequestration product and byproduct | | $tCO_2/t$ |

* The enterprise should add any other types of energy actually used by the enterprise, which are not listed in this table.

## AppendixII Relevant Default Values

### Table 2-1:Default Values for Relevant Parameters of Common Fossil Fuels

| Type of fuel | | Unit | Lower calorific value（GJ/t，GJ/$10^4$Nm$^3$） | 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% |
| | 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% |
| | Crude benzene | ton | 41.816 | 22.70 | 98% |
| Gaseous fuel | Coke oven gas | $10^4$m$^3$ | 173.540 | 12.10 | 99% |
| | Blast furnace gas | $10^4$m$^3$ | 33.000 | 70.80 | 99% |
| | Linz Donaniz Converter Gas (LDG) | $10^4$m$^3$ | 84.000 | 49.60 | 99% |
| | Other gases | $10^4$m$^3$ | 52.270 | 12.20 | 99% |
| | Natural gas | $10^4$m$^3$ | 389. 31 | 15.30 | 99% |
| | Refinery gas | $10^4$m$^3$ | 45.998 | 18.20 | 99% |

Notes:

1.Ifenterprises purchase coking or thermal coal directly, they should split them according to the classification listed in the table;

2.The lower calorific values for cleaned coal, crude oil, fuel oil, gasoline, diesel, liquefied petroleum gas, natural gas, refinery gas, crude benzeneand tarare derived from the *China Energy Statistical Yearbook2012*, values for other fuels from *China's Studies on Greenhouse Gas Inventories*;

3. The carbon content of per unit of calorific value of crude benzene comes from the World Steel Association, such values for tar, coke oven gas, blast furnace gas and converter gas are derived from *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, and others are referred to *Guidance for Compiling Provincial Greenhouse Gas Emissions Inventory (Trial)*; and

4.The carbonoxidation rates are derived from the *Guidance for Compiling Provincial Greenhouse Gas Emissions Inventory (Trial).*