Annex10

# Guidelines for Accounting and Reporting Greenhouse Gas Emissions

# China Civil Aviation Enterprises

# (Trial)

# Instructions

## 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 Civil Aviation 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 Sino Carbon Innovation & Investment Co., Ltd. (SCII), 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 on-site investigations, in-depth studies and experimental accounting based on individual cases, SCII completed the development of the *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Civil Aviation Enterprises(Trial).* Efforts have been made to ensure that the Guidelines are science-based, comprehensive, standardized and practical. In the course of its preparation, SCII has received strong support from relevant experts from the Civil Aviation Administration of China, China Eastern Airlines Company Ltd., Beijing Capital International Airport Company Ltd., and the Civil Aviation University of China among others.

## III. Main Contents

The Guidelines consist of the main text and two appendices. The seven sections of the main text have clearly defined the application scope of the Guidelines, cited documents and references, terminology and definition, accounting boundary, accounting methodology, quality assurance and documentation, as well as report contents and format. The calculated

GHG is carbon dioxide (without calculating emissions of other GHGs), and emission sources include fuel combustion and consumption of net purchased electricity 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 civil aviation transport operations.

## IV. Issues that Need Clarification

The *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Civil Aviation Enterprises (Trial)*provide the recommended values of the parameters and emission factors as required for the accounting, and these values have taken into consideration such authoritative data as from the *Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)*and the *China Energy Statistical Yearbook.* In addition, as for the activity level data of aircraft fuel combustion, domestic flights and international flights have been calculated separately on a statistical basis in the Guidelines.

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 civil aviation enterprises in China. The civil aviation enterprises referred to in the Guidelines include public aviation transport, general aviation and airport enterprises. Enterprises operating in civil aviation transport 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 the civil aviation enterprises also produce other products leading to GHG emissions, they should calculate and report those emissions according to the GHG emission accounting and reporting guidelines for the relevant sectors.

# 2. References

The references cited or quoted in the Guidelines mainly include:

*Guidance for Compiling Provincial Greenhouse Gas Emission Inventory;*

*China Energy Statistical Yearbook*; and

*China's Studies on Greenhouse Gas Emission Inventory*.

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

*2006 IPCC Guidelines for National Greenhouse Gas Inventories*;

*GHG Protocol: A Corporate Accounting and Reporting Standard (2004)*; and

*European Union Guidelines for Monitoring and Reporting GHG Emissions from EU ETS Installations*.

# 3. Terminology and Definitions

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 is 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 should calculate and report its GHG emissions.

3.3 Public aviation transport enterprise

A public aviation transport enterprise is a legal entity that transports passengers, luggage, mails or goods using civil aircraft for the purpose of profit-making.

3.4 General aviation

General aviation refers to all civil aviation activities using civil aircraft other than public aviation transport, including flight operations for industry, agriculture, forestry, fishery and construction, and flight activities for medical and health care, hazard or disaster relief and rescue, meteorological sounding, oceanic monitoring, scientific experiment, education and training, cultural and sport events, etc.

3.5 Airport enterprises

Airport enterprises refer to the civil airports that are social or economic organizations with qualified legal entities (or being deemed as legal entities), which have the actual authority to operate civil airports.

3.6 Emissions from fuel combustion

Emissions from fuel combustion refer to the GHG emissions generated from reaction of fuel to oxygen in a combustion process, for example, the GHG emissions from combustion of fossil fuels or bio-blend fuels.

3.7 $CO_2$ emissions from consumption of net purchased electricity and heat

$CO_2$ emissions from consumption of net purchased electricity and heat refer to the $CO_2$ emissions from electricity or heat generation process corresponding to the consumption of net purchased electricity and heat (steam, hot water) by a civil aviation enterprise.

3.8 Activity level

Activity level refers to the quantitative amount of production or consumption activities, which lead to GHG emissions or removals, for examples, amount of fossil fuel combustion, amount of purchased power, 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

Rate of carbon oxidation is the ratio at which carbon in fuel(s) has been oxidized into $CO_2$ in a combustion process.

# 4. Accounting Boundary

A reporting entity should regard its legal entity as the boundary for indentifying, calculating and reporting all relevant emissions from production and operations within it, while any double or missing accounts should be avoided. If the reporting entity produces other products that cause GHG emissions, it should calculate and report its emissions

according to the GHG emission accounting and reporting guidelines for the corresponding sectors.

The scope of GHG emission accounting and reporting by civil aviation enterprises include$CO_2$ emissions from fuel combustion, i.e. all $CO_2$ emissions generated from full combustion of fuel(s) in reaction to oxygen in various fixed or mobile combustion chambers (e.g. boilers, aircraft, gas source vehicles, electric vehicles, transport vehicles, etc.); as well as $CO_2$ emissions generated from consumption of net purchased electricity and heat.

# 5. Accounting Methodology

The total GHG emissions of a civil aviation enterprise equals the $CO_2$ emissions from fuel combustion and consumption of the net purchased electricity and heat within the boundary of the accounted enterprise, as indicated in Equation(1):

$$E = E_{\text{combustion}} + E_{\text{electricity \& heat}} \quad \text{……(1)}$$

where,

$E$ is the total $CO_2$ emissions of the enterprise (t);

$E_{\text{combustion}}$ gives the total $CO_2$ emissions from fuel combustion (t), including $CO_2$ emissions from combustion of fossil fuels and bio-blend fuels; and

$E_{\text{electricity \& heat}}$ represents the total $CO_2$ emissions from consumption of the net purchased electricity and heat by the enterprise(t).

## 5.1 $CO_2$ emissions from fuel combustion

The $CO_2$ emissions from fuel combustion in the civil aviation enterprises include the $CO_2$ emissions from combustion of avgas, jet fuel No.3 and bio-blend fuels consumed by aircraft in the flights operated by both public and general aviation transport enterprises, as well as the $CO_2$ emissions from fossil fuel combustion in other mobile and fixed sources for ground operations of the civil aviation enterprises. The equation used for calculating the total $CO_2$ emissions from fuel combustion in the civil aviation enterprises is given in the following equation:

$$E_{\text{combustion}} = \sum_{i} (AD_{\text{fossil},i} \times EF_{\text{fossil},i}) + \sum_{j} (AD_{\text{bio-blend},j} \times EF_{\text{fossil},j}) \quad \text{…… (2)}$$

where,

$AD_{\text{fossil},I}$ is the activity level (TJ) of $i$ type of fossil fuel;

$EF_{\text{fossil},i}$ is the emission factor ($tCO_2$/TJ) of $i$ type of fossil fuel;

$i$ represents a type of fossil fuels;

$AD_{\text{bio-blend},j}$ is the activity level (TJ) of $j$ type of bio-blend fuel;

$EF_{\text{fossil},j}$ is the emission factor ($tCO_2$/TJ) when the bio-blend fuel type$j$ is completely fossil fuel; here it refers to the emission factor of avgas and jet fuel No. 3; and

$j$ represents a type of bio-blend fuel.

### 5.1.1 Data and sources of activity level

The activity level of fuel combustion within a civil aviation enterprise includes two components: the activity level of fossil fuel combustion, and the activity level of bio-blend fuel combustion.

5.1.1.1 Activity level of fossil fuel combustion

The fossil fuels consumed by a civil aviation enterprise include aviation fuels consumed in flights of civil aviation transport and fossil fuel consumption from other mobile and fixed sources in ground operations. Their activity level is calculated in the following equation:

$$AD_{\text{fossil},\,I} = FC_{\text{fossil},\,i} \times NCV_{\text{fossil},\,I} \times 10^{-6} \quad \ldots\ldots(3)$$

where,

$AD_{\text{fossil},\,I}$ is the activity level (TJ) of the*i* type of fossil fuel;

$FC_{\text{fossil},\,i}$ is the consumption amount of the*i* type of fossil fuel; for solid or liquid fuels, the unit of consumption is ton (t); and for gas fuels, the unit of consumption is $10^3 m^3$;

$NCV_{\text{fossil},\,I}$ is the lower calorific value of the*i* type of fossil fuel; for solid or liquid fuels, the unit of the value is kJ/kg; for gas fuels, the unit of the value is $kJ/m^3$; and

*i* represents a type of fossil fuel.

Since the amounts of aviation fuel consumed by a civil aviation enterprise for its transport flights are aggregated with the statistical data derived from all individual civil aviation flight missions, the consumption of aviation fuels should include the fuel consumption by all aircraft operated by a civil aviation enterprise (including all aircraft chartered by the enterprise). A civil aviation enterprise should provide statistics of aviation fuel consumption calculated for its domestic and international flights separately.

For the lower calorific values of aviation fuels, refer to Table 2.1 in AppendixII.

The consumption amount of fossil fuels used in other mobile and fixed sources of a civil aviation enterprise in its ground operations should be derived from the energy consumption records or statistical statements of the enterprise. The standard adopted in specific instruments for measuring fuel consumption shall comply with relevant regulations provided in the *General Principles for Equipping and Managing the Energy-Measuring Instruments in Energy-Using Organizations (GB 17167-2006)*.

For the lower calorific values of the fossil fuels used in other mobile and fixed sources of a civil aviation enterprise in its ground operations, refer to Table 2.1 in AppendixII.

5.1.1.2 Activity level of bio-blend fuel combustion

The activity level of bio-blend fuels used by a civil aviation enterprise for transport flights should be calculated with the following equation.

$$AD_{\text{bio-blend},J} = FC_{\text{bio-blend},j} \times NCV_{\text{bio-blend},J} \times 10^{-6} \times (1 - BF_j) \quad \ldots\ldots(4)$$

where,

$AD_{\text{bio-blend},J}$ is the activity level (TJ) of the*j* type of bio-blend fuel;

$FC_{\text{bio-blend},j}$ is the consumption amount of the *j* type of bio-blend fuel (unit: t);

$NCV_{\text{bio-blend},J}$ is the lower calorific value of the *j* type of bio-blend fuel (unit: kJ/kg);
$BF_j$ is the biomass content in the *j* type of bio-blend fuel (%); and
*j* represents a type of bio-blend fuel.

The consumption amount of bio-blend fuels should be determined according to the energy consumption records or statistical statements of a civil aviation enterprise, which should also provide statistics of aviation fuel consumption calculated for its domestic and international flights separately. The standard adopted in specific instruments for measuring fuel consumption shall comply with relevant regulations provided in the *General Principles for Equipping and Managing the Energy-Measuring Instruments in Energy-Using Organizations(GB 17167-2006)*.

The lower calorific values and the biomass contents of the bio-blend fuels should be determined according to the fuel purchase records, and a civil aviation enterprise should provide the statistics of these two types of data calculated for its domestic and international flights separately.

5.1.2 Data and sources for emission factor

The $CO_2$ emission factor for combustion of fossil fuels consumed by a civil aviation enterprise, and for combustion of bio-blend fuels when they are completely fossil fuels should be derived from such parameters as carbon content per unit of calorific value and carbon oxidation rate of a particular fossil fuel, etc., using the equation given below:

$$EF_i = CC_i \times OF_I \times 44/12 \quad \ldots\ldots(5)$$

where,
$EF_i$ is the $CO_2$ emission factor ($tCO_2/TJ$) of the *i* type fossil fuel;
$CC_i$ is the carbon content (tC/TJ) per unit of calorific value of the *i* type fossil fuel;
$OF_i$ is the rate of carbon oxidation (%) of the *i* type fossil fuel;
44/12 shows the ratio of $CO_2$ to carbon molecule weight; and
*i* represents a type of fossil fuel.

For carbon contents per unit of calorific value, and rate of carbon oxidation of various fossil fuels, refer to Table 2.1 in AppendixII.

5.2 Emissions from consumption of net purchased electricity and heat

The $CO_2$ emissions from consumption of the net purchased electricity by a civil aviation enterprise should be derived from the following equation:

$$E_{electricity} = AD_{electricity} \times EF_{electricity} \quad \ldots\ldots(6)$$

where,
$E_{electricity}$ is the $CO_2$ emission amount (t) from electricity generation process corresponding to consumption of the net purchased electricity by the enterprise;
$AD_{electricity}$ is the net-purchased electricity (MWh) by the enterprise; and

$EF_{electricity}$ is the $CO_2$ emission factor ($tCO_2$/MWh) for the annual mean electricity supply by the regional electricity grids;

The $CO_2$ emissions from consumption of the net purchased heat by a civil aviation enterprise should be calculated with the following equation:

$$E_{heat} = AD_{heat} \times EF_{heat} \quad \ldots\ldots(7)$$

where,

$E_{heat}$ is the $CO_2$ emission amount (t) from heat generation process corresponding to consumption of the net purchased heat by the enterprise;

$AD_{heat}$ is the net-purchased heat (GJ) by the enterprise; and

$EF_{heat}$ is the $CO_2$ emission factor ($tCO_2$/GJ) for the heat supply.

### 5.2.1 Data and sources for activity level

The data of net-purchased electricity amount consumed by a civil aviation enterprise should be accurately accounted based on recorded readings of the electricity meters installed in the enterprise. If they are not available, the data appearing on the power-purchase invoices or official statements of accounts provided by the electricity supplier(s) may be used. The enterprise should make statistics of the net purchased electricity amounts consumed from different electricity grids separately.

The net purchased heat data of a civil aviation enterprise should be precisely accounted according to the measurement readings of the heat meters installed in the enterprise. If they are not available, the data showing on the heat-purchase invoices or official statements of accounts provided by the heat supplier(s) may be used.

### 5.2.2 Data and sources for emission factor

The emission factor for the annual mean electricity supply from the regional electricity grid(s)should be calculated in accordance with the location of an operating civil aviation enterprise in relation to the current geographical divisions of electricity grids, i.e. those in the Northeast, North China, East China, Central China, Northwest, and Southern China, using the emission factor(s) of the relevant regional electricity grid(s) published by the competent national authority for the most recent year. For the $CO_2$ emission factor of heat supply, the emission factor provided by the heat supplier should be first adopted. If it is not available, the value should be assumed to be 0.11 $tCO_2$/GJ.

## 6. Quality Assurance and Documentation

A reporting entity from civil aviation industry should establish a quality assurance and documentation system for its GHG emission reports, the content of which includes:

- Designation of special staff responsible for accounting and reporting GHG emissions;

- Establishment of a sound statistical record system for enterprise GHG emissions and energy consumption;
- Establishment of a management mechanism for documenting and archiving GHG data; and
- Establishment of internal auditing for GHG emission reports.

# 7. Content and Format of Report

The reporting entity from the civil aviation industry 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 fuel combustion and emissions from consumption of net purchased electricity and heat separately.

7.3 Activity level and their sources

A reporting entity should report net consumption amounts of various fossil fuels and bio-blend fuels consumed by the enterprise as well as their corresponding lower calorific values.

If a civil aviation enterprise produces other products, it should report its activity level data 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 fossil fuels consumed by its enterprise, and it should also report emission factors adopted by the enterprise for calculating its electricity and heat consumption.

If a civil aviation enterprise produces other products, 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 Civil Aviation 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 Civil Aviation 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 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 Emission Report of a Reporting Entity in Year __

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

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

## Table 1-1: Carbon Dioxide Emission Report of a Reporting Entity in Year __

| **Total $CO_2$ Emissions($tCO_2$) of an Enterprise** | |
|---|---|
| Emissions ($tCO_2$) from fuel combustion | |
| Emissions ($tCO_2$) from consumption of net purchased electricity and heat | |

# Table1-2: Emission Activity Level Data of a Reporting Entity

| | | Consumption ($t, 10^3 m^3$) | Lower calorific value ($kJ/kg, kJ/m^3$) | |
|---|---|---|---|---|
| **Fossil fuel combustion**[*1] | Anthracite | | | |
| | Bituminous coal | | | |
| | Lignite (brown coal) | | | |
| | Mould coal | | | |
| | Coke | | | |
| | Crude oil | | | |
| | Fuel oil | | | |
| | Petrol (gasoline) | | | |
| | Diesel | | | |
| | General Kerosene | | | |
| | Avgas(domestic) | | | |
| | Avgas(international) | | | |
| | Jet fuelNo.3 (domestic) | | | |
| | Jet fuelNo.3(international) | | | |
| | Liquefied Natural Gas | | | |
| | Liquefied petroleum gas | | | |
| | Refinery gas | | | |
| | Naphtha | | | |
| | Petroleum coke | | | |
| | Other petroleum products | | | |
| | Natural gas | | | |
| | Coke oven gas | | | |
| | Other gases | | | |
| **Bio-blend fuel combustion**[*2] | | **Consumption (t)** | **Lower calorific value (kJ/kg)** | **Biomass content (%)** |
| | Bio-blend fuel (domestic) | | | |
| | Bio-blend fuel (international) | | | |
| **Consumption of net purchased electricity & heat** | | **Data** | **Unit** | |
| | Net-purchased electricity | | MWh | |
| | Net-purchased heat | | GJ | |

**Notes:**

[*1]A civil aviation enterprise should add any other types of energy actually used by the enterprise in its operations, which are not listed in this table, and it should also provide the statistics on consumption of fossil fuels by its aircraft for transport flights in domestic and international routes separately.

[*2]The enterprise should provide the statistics on consumption of bio-blend fuels by its aircraft for transport flights in domestic and international routes separately, including the lower calorific values and biomass contents of the bio-blend fuels used.

# Table1-3: Emission factors and Calculation Coefficients of a Reporting Entity

| | | Carbon content per unit of calorific value (tC/GJ) | Rate of carbon oxidation (%) |
|---|---|---|---|
| **Fossil fuel combustion*** | Anthracite | | |
| | Bituminous coal | | |
| | Lignite (brown coal) | | |
| | Mould coal | | |
| | Coke | | |
| | Crude oil | | |
| | Fuel oil | | |
| | Petrol (gasoline) | | |
| | Diesel | | |
| | General Kerosene | | |
| | Avgas (domestic) | | |
| | Avgas (international) | | |
| | Jet fuel No. 3 (domestic) | | |
| | Jet fuel No. 3(international) | | |
| | Liquefied Natural Gas | | |
| | Liquefied petroleum gas | | |
| | Refinery gas | | |
| | Naphtha | | |
| | Petroleum coke | | |
| | Other petroleum products | | |
| | Natural gas | | |
| | Coke oven gas | | |
| | Other gases | | |
| **Bio-blend fuel combustion** | | **Carbon content per unit of calorific value (tC/GJ)** | **Rate of carbon oxidation (%)** |
| | Bio-blend fuel (domestic) | | |
| | Bio-blend fuel (international) | | |
| **Net purchased electricity & heat** | | **Data** | **Unit** |
| | Power | | $tCO_2$/MWh |
| | Heat | | $tCO_2$/ GJ |

**Note:**

* A civil aviation enterprise should add on its own the other types of energies actually used by the enterprise in its operations, which are not included in this table.

# Appendix II: Relevant Default Values

## Table2-1: Relevant Default Values for Commonly Used Fossil Fuels

| Type of fuel | | Unit | Lower calorific value | Carbon content per unit of calorific value | Carbon oxidation rate |
|---|---|---|---|---|---|
| Solid fuels | Anthracite | ton | 23210 kJ/kg② | 27.4 t-C/TJ① | 0.94① |
| | Bituminous coal | ton | 22350 kJ/kg② | 26.1 t-C/TJ① | 0.93① |
| | Lignite (brown coal) | ton | 14080 kJ/kg② | 28.0 t-C/TJ① | 0.96① |
| | Mould coal | ton | 17460 kJ/kg② | 33.6 t-C/TJ① | 0.90① |
| | Coke | ton | 28435 kJ/kg④ | 29.5 t-C/TJ① | 0.93① |
| Liquid fuels | Crude oil | ton | 41816 kJ/kg④ | 20.1 t-C/TJ① | 0.98① |
| | Fuel oil | ton | 41816 kJ/kg④ | 21.1 t-C/TJ① | 0.98① |
| | Petrol (gasoline) | ton | 43070 kJ/kg④ | 18.9 t-C/TJ① | 0.98① |
| | Diesel | ton | 42652 kJ/kg④ | 20.2 t-C/TJ① | 0.98① |
| | General kerosene | ton | 43070 kJ/kg④ | 19.6 t-C/TJ① | 0.98① |
| | Avgas | ton | 44300 kJ/kg③ | 19.1 t-C/TJ③ | 1③ |
| | Jet fuel No.3 | ton | 44100 kJ/kg③ | 19.5 t-C/TJ① | 1③ |
| | Liquefied natural gas | ton | 41868 kJ/kg③ | 17.2 t-C/TJ① | 0.98① |
| | Liquefied petroleum gas | ton | 50179 kJ/kg④ | 17.2 t-C/TJ① | 0.98① |
| | Refinery gas | ton | 45998 kJ/kg④ | 18.2 t-C/TJ① | 0.98① |
| | Naphtha | ton | 44500 kJ/kg③ | 20.0 t-C/TJ① | 0.98① |
| | Petroleum coke | ton | 32500 kJ/kg③ | 27.5 t-C/TJ① | 0.98① |
| | Other petroleum products | ton | 40200kJ/kg③ | 20.0 t-C/TJ① | 0.98① |
| Gaseous fuels | Natural gas | 10,000 $m^3$ | 38931 kJ/$m^3$④ | 15.3 t- C/TJ① | 0.99① |
| | Coke oven gas | 10,000 $m^3$ | 17406 kJ/$m^3$② | 13.6 t-C/TJ① | 0.99① |
| | Other gases | 10,000 $m^3$ | 15758.4 kJ/$m^3$② | 12.2 t-C/TJ① | 0.99① |

**Note:** The listed data are derived from the following sources:
①*Guidance for Compiling Provincial Greenhouse Gas Emission Inventory (Trial)*;
②*China's Studies on Greenhouse Gas Emission Inventory (2007)*;
③*IPCC Guidelines for National Greenhouse Gas Inventories*(2006); and
④*China Energy Statistical Yearbook 2011.*

## Table2-2: Other Emission Factors and Default Values

| **Category** | **Emission Factor Unit** | **Carbon Dioxide Emission Factor** |
|---|---|---|
| Power | $tCO_2$/MWh | The most updated value shall be adopted |
| Heat | $tCO_2$/ GJ | 0.11 |