

Guidelines for Accounting and Reporting

Greenhouse Gas Emissions

China Food, Tobacco, Alcohol, Beverages and

Purified Tea Manufacturing Enterprises

(Trial)

Instructions

I. Purposes and Significance of the Guidelines

The Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Food, Tobacco, Alcohol, Beverages and Purified Tea Manufacturing Enterprises (Trial)(the Guidelines), formulated by the National Development and Reform Commission (NDRC), to achieve the aim of cutting carbon dioxide emissions per unit GDP by 40% - 45% by 2020 from the 2005 level. The Guidelines were drafted according to the demands of “establishing the statistical accounting system and building up carbon emission trading market” put forward in the 12th Five-Year Plan Outline, and “accelerating the establishment of national, local, enterprise three-level accounting system of greenhouse gas emission and system of requiring key enterprises to directly submit data of greenhouse gas emission and energy consumption” put forward in *12th Five-Year Plan Work Program to Control Greenhouse Gas Emission* (No. 41 Document in 2011 of the State Council).The Guidelines endeavor to help enterprises (i) scientifically calculate and report their own greenhouse gas emission, (ii) make control plans of greenhouse gas emission, (iii) take active part in carbon emission trading and (iv) strengthen enterprises’ social responsibilities. Meanwhile, the Guidelines pave the way for competent departments to establish and implement the system of key enterprises reporting greenhouse gas emissions, and accordingly make relevant policies.

II. Preparation Process

The Guidelines have been drafted by Sino Carbon Innovation & Investment Co., Ltd, entrusted by the National Development and Reform Commission. The drafting group used research results and practical experiences from home and abroad about accounting report on greenhouse gas emissions, referred to the *Guidelines for Provincial Greenhouse Gas Inventories* issued by the General Office of the NDRC, conducted field research findings, in-depth studies and pilot tests, and finally finished drafting *the*

Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Food, Tobacco, Alcohol, Beverages and Purified Tea Manufacturing Enterprises (Trial). The Guidelines strive to pursue a scientific, comprehensive, standardized and practical approach. In the course of its preparation, Sino Carbon Innovation & Investment Co., Ltd has received strong support from relevant experts from China Association for Light Industry, China Biotech and Fermentation Industry Association, China Tobacco Yunnan Industrial Co., Ltd, and China Beverage Industry Association among many others.

III. Main Contents

The *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Food, Tobacco, Alcohol, Beverages and Purified Tea Manufacturing Enterprises (Trial)* includes seven sections and two appendices , elaborating respectively on the Guidelines' application scope, references, technical terminology, accounting boundary, accounting method, quality guarantee, record-keeping requirements and reporting content and forms. The greenhouse gases to be accounted under the Guidelines include carbon dioxide and methane. Emission sources accounted include fossil fuel burning, industrial processes, anaerobic wastewater treatment, and consumption of net purchased electricity and heat. The Guidelines apply to manufacturing enterprises with legal person status and independent accounting units regarded as legal persons engaged in food, tobacco, alcohol, beverages and purified tea production.

IV. Issues that Need Clarification

The *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Food, Tobacco, Alcohol, Beverages and Purified Tea Manufacturing Enterprises (Trial)*define parameters and emission factor recommended values needed in the process of accounting, while the drafting team has taken into account relevant data from authoritative materials including *Guidelines for Provincial Greenhouse Gas Inventories*, *China Statistical Year Book 2013*, and *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

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 revision in the future.

The National Development and Reform Commission issued the Guidelines and is responsible for their explanation and revision where appropriate.

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1. Application Scope

The present guidelines apply to the accounting and reporting of greenhouse gas emissions from food, tobacco and alcohol, beverage and purified tea enterprises in China. Any enterprise engaged in the production of food, tobacco and alcohol, beverages and purified tea within the Chinese territory can make reference to the approaches in the Guidelines to account and report the enterprise's greenhouse gas emissions. If these enterprises also produce other products apart from food, tobacco and alcohol, beverages and purified tea production that lead to GHG emissions, they should calculate and report those emissions according to the GHG emissions accounting and reporting guidelines for the relevant sectors.

2. References

Documents cited in the Guidelines mainly include:

Provincial Guidance on the Compilation of Greenhouse Gas Inventories (Trial);

China Energy Statistical Yearbook; and

The People's Republic of China National Greenhouse Gas Inventory.

The following documents were used for reference in the development of the Guidelines:

2006 IPCC Guidelines for National Greenhouse Gas Inventories;

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

EU ETS Guideline- Methodology for GHG Monitoring and Reporting.

3. Terminology and Definitions

For the purpose of the Guidelines, the following terminology and definitions apply.

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, namely, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆).

The Guidelines account the emissions of CO₂ and CH₄ in the production process of food, tobacco and alcohol, beverages and purified tea enterprises.

3.2 Food, tobacco and alcohol, beverages and purified tea enterprises

Food, tobacco and alcohol, beverages and purified tea enterprises refer to the enterprises engaged in producing food, tobacco and alcohol, beverages and purified tea, in accordance with *Classification of National Economy Industries (GB/T 4754-2011)*. Food manufacturing enterprises include: bakery products manufacturing enterprises (141), candy, chocolate and preserved fruits manufacturing enterprises (142), convenient food manufacturing enterprises (143), dairy products manufacturing enterprises (144), canned food manufacturing enterprises (145), condiment and fermented products manufacturing enterprises (146), other food manufacturing enterprises (149). Tobacco manufacturing enterprises include: tobacco stemming and redrying enterprises (161), cigarettes manufacturing enterprises (162) and other tobacco manufacturing enterprises (169). Alcohol, beverages and purified tea enterprises include: alcohol manufacturing enterprises (151), beverages manufacturing enterprises (152) and purified tea manufacturing enterprises (153).

3.3 Reporting entities

Reporting entities refers to corporate enterprises or independent accounting units regarded as legal persons, with greenhouse gas emissions involved in their activities.

3.4 Emissions from fossil fuel burning

Emissions from fossil fuel burning refer to greenhouse gas emissions generated in the combustion reaction between fossil fuels and oxygen.

3.5 Emissions from industrial production

Emissions from industrial production refer to greenhouse gas emissions generated by physical or chemical changes of raw materials, except for combustion.

3.6 Emissions from anaerobic wastewater treatment

Emissions from anaerobic wastewater treatment refer to emissions of carbon dioxide, methane and nitrous oxide from anaerobic wastewater treatment. Only methane emissions from anaerobic wastewater treatment are calculated under the Guidelines.

3.7 CO₂ emissions from net purchased electricity and heat

CO₂ emissions from net purchased electricity and heat refer to greenhouse gas emissions generated from enterprises' consumption of net purchased electricity and heat (steam and hot water).

3.8 Activity level

Activity level is the quantification of production or consumption activities causing greenhouse gas emissions, including consumption of various fuels, use of raw materials, purchased electricity, purchased steam etc.

3.9 Emission factors

Emission factor is the quantified rate of greenhouse gas emissions per unit of activity. Emission factors are usually obtained through sampling measurement or statistical analysis, indicating the representative emission ratio of a particular activity under given operating conditions.

3.10 Carbon oxidation rate

Carbon oxidation rate is the percentage of total carbon in fuels containing carbon oxidized in the process of combustion.

4. Accounting Boundary

The reporting entities should be limited to enterprise legal persons. They shall identify, account and report the greenhouse gas emissions from all the production facilities within enterprise boundary. Production facilities include main production system, ancillary production system and affiliated production system. Ancillary production system includes power, electricity supply, water supply, tests, machine maintenance, storerooms, transportation etc. Affiliated production system includes production command system (factory headquarters) and departments and units that are serving production (like staff canteen, workshop bathroom, health station and so on). At the same time, double counting and omission shall be avoided. If the reporting entity conducts production activities other than food, tobacco and alcohol, beverages and purified tea that cause GHG emissions, it should calculate and report its emissions according to the GHG emissions accounting and reporting guidelines for those corresponding sectors.

Specifically, for enterprises producing food, tobacco and alcohol, beverages and purified tea, the scope of their greenhouse gas emissions accounting and reporting is:

4.1 Emissions from fossil fuel combustion

CO₂ emission from the combustion of net consumed fossil fuels, including emissions from stationary sources in the enterprises (for example, stationary combustion equipment such as boilers) and emissions from mobile sources used in production (like transport vehicle and handling equipment within factory).

4.2 Emissions from industrial production

CO₂ emissions from enterprises' consumption of purchased carbonaceous raw materials like carbonate or CO₂ in production process (such as the production of organic acid, bakery, filling and so on).

Given that CO₂ emissions from raw materials may be caused from both industrial and non-industrial processes, only that resulting from industrial production is calculated while that obtained by means of air separation and bio-fermentation is not.

4.3 Emissions from anaerobic wastewater treatment

Methane emissions resulting from anaerobic wastewater treatment conducted by enterprises.

4.4 Emissions from net purchased electricity and heat

CO₂ emissions implicitly generated in enterprises' net purchased electricity and net purchased heat. This part of emissions is actually caused during the enterprises producing electricity and heat.

Schematic diagrams of greenhouse gas emissions and accounting boundary of the enterprises engaged in typical production of food, tobacco and alcohol, beverages and purified tea. See Figures 1, 2 and 3.

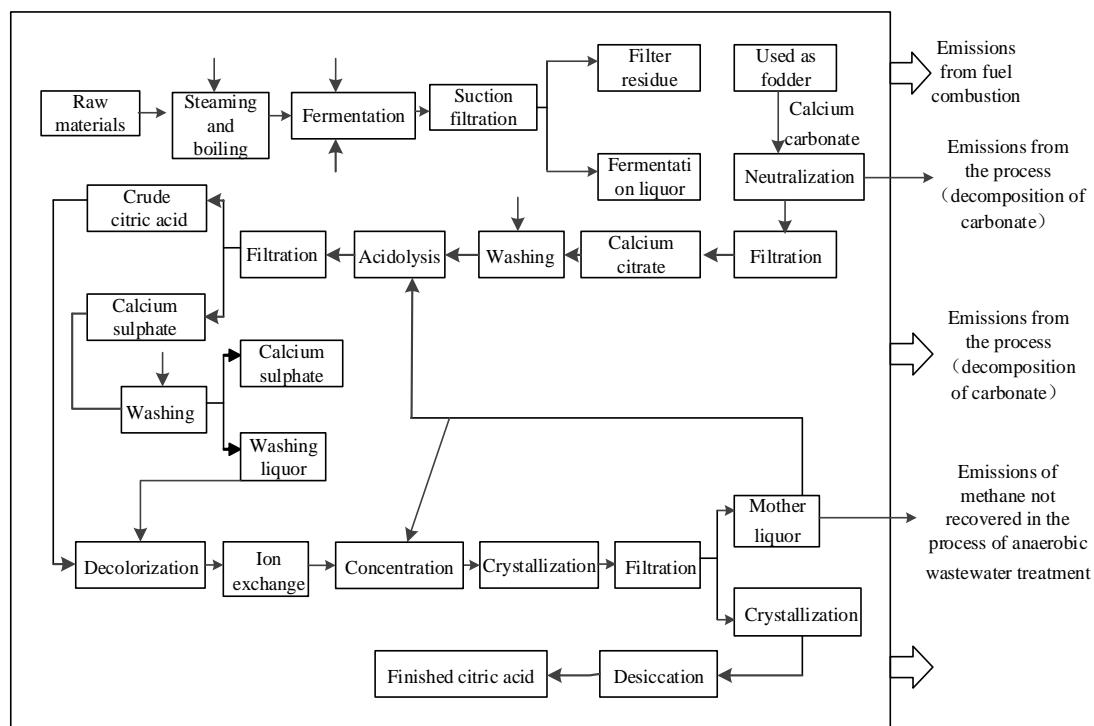


Figure 1 Typical greenhouse gas emissions from the production process of food

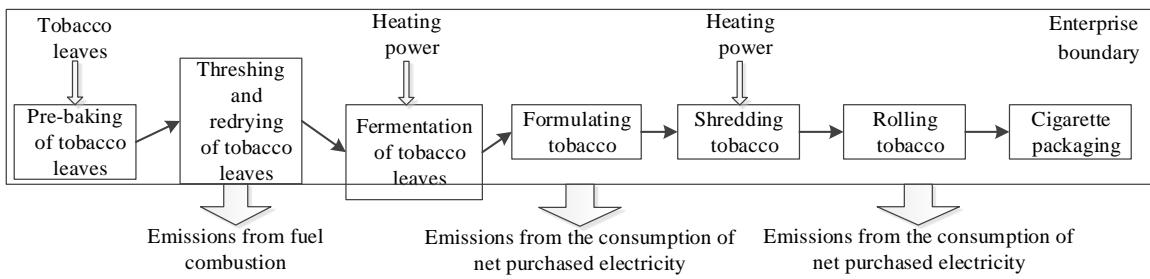


Figure 2 Typical greenhouse gas emissions from the production process of tobacco

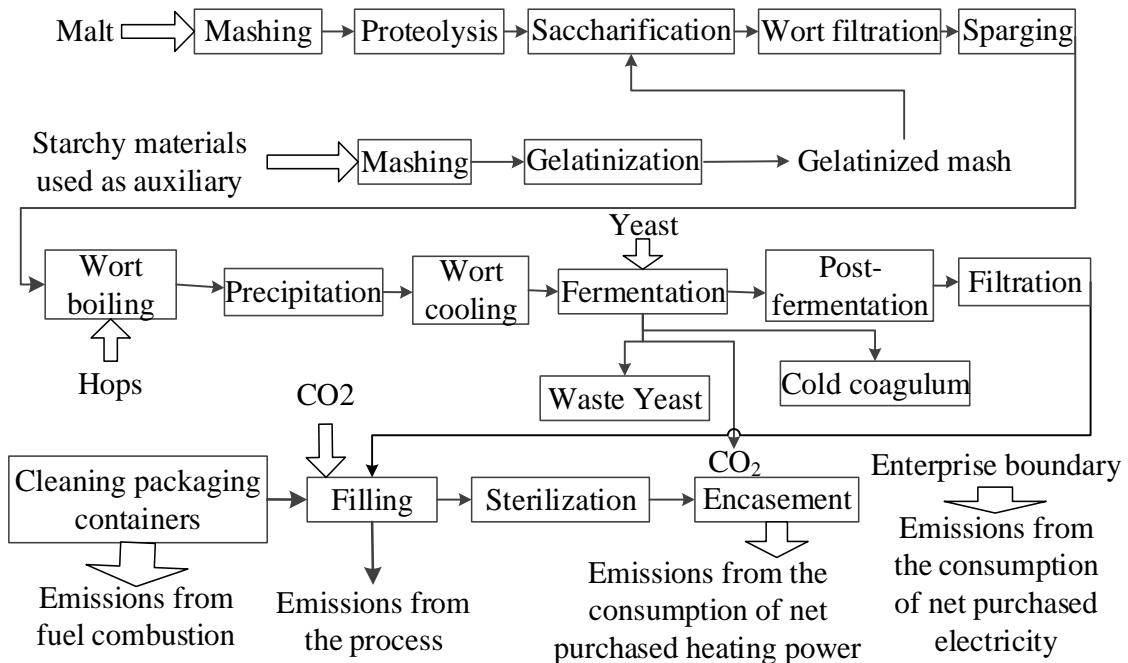


Figure 3 Typical greenhouse gas emissions from the production process of alcohol, beverages and purified tea

5. Accounting Methodology

Total emissions by manufacturing enterprises of food, tobacco and alcohol, beverages and purified tea include: CO₂ emissions from fossil fuel burning, CO₂ emissions in the process of industrial production, methane emissions from anaerobic waste water treatment and CO₂ emissions from net purchased electricity and heat. As

for CO₂ emissions from biomass mixing fuel burning, the reporting enterprises should only count that from fossil fuel (e.g. coal) in the mixing fuel.

The complete work flow for reporting enterprises to account and report the greenhouse gas emissions includes the following steps:

- (1) Setting the accounting boundary;
- (2) Identifying emission sources and types of gases;
- (3) Collecting activity level data;
- (4) Selecting and obtaining data of emission factors;
- (5) Calculating separately emissions from fossil fuel burning, industrial production, anaerobic waste water treatment and net purchased electricity and heat; and
- (6) Adding up the total greenhouse gas emissions by enterprises

Total greenhouse gas emissions by manufacturing enterprises of food, tobacco and alcohol, beverages and purified tea equal the sum of CO₂ emissions from fossil fuels burning, industrial production, anaerobic waste water treatment and net purchased electricity and heat. Calculate the total greenhouse gas emissions according to Equation(1):

$$E_{GHG} = E_{CO_2_burning} + E_{CO_2_process} + E_{GHG_waste\ water} + E_{CO_2_electricity} + E_{CO_2_heat} \quad (1)$$

where,

E_{GHG} —total CO₂ emissions (ton)

$E_{CO_2_burning}$ —CO₂ emissions from fossil fuel burning (ton);

$E_{CO_2_process}$ —CO₂ emissions in the process of industrial production(ton);

$E_{GHG_waste\ water}$ —the equivalent CO₂ emissions of methane emission from anaerobic waste water treatment (ton);

$E_{CO_2_electricity}$ —CO₂ emissions of purchased and consumed electricity(ton); and

$E_{CO_2_heat}$ —CO₂ emissions from purchased and consumed heat(ton).

5.1 Fossil fuel emissions

CO₂ emissions by manufacturing enterprises of food, tobacco and alcohol, beverages and purified tea from fuel burning include: CO₂ emissions from fuel burning by equipment such as steam boiler and gasifier furnace; CO₂ emissions from fossil fuel burning by mobile or stationary sources involved during the transportation of materials or intermediate transfer of product. As for the CO₂ emissions from compound biomass mixing fuel burning, the reporting enterprises should only count that from fossil fuel (e.g. coal) in it. The CO₂ emissions from pure biomass mixing fuel burning are excluded.

To calculate CO₂ emissions from fossil fuel burning, follow Equation(2):

$$E_{CO_2_burning} = \sum_i (AD_{fossil,i} \times EF_{fossil,i}) \quad (2)$$

where,

$E_{CO_2_burning}$ —CO₂ emissions from fossil fuel burning(ton);

AD_i —Consumption of No.*i* fossil fuel(GJ);

EF_i — Emission factors of No.*i* fossil fuel burning (tCO₂/GJ); and

i— type of fossil fuel.

5.1.1 Activity level data and their sources

AD_i , the consumption of NO.*i*fossil fuel, is calculated according to Equation(3):

$$AD_{fossil,i} = FC_{fossil,i} \times oNCV_{fossil,i} \quad (3)$$

where,

AD_i —The consumption of No.*i* fossil fuel(GJ), in the form of calorific value;

FC_i —The consumption of No.*i* fossil fuel(ton for solid/liquid10,000Nm³ for gas);

NCV_i —The average Net Calorific Value (NCV) (GJ/ton, GJ/10,000Nm³); and

i —type of fossil fuel.

5.1.1.1 Fuel consumption

Consumption of fossil fuel by manufacturing enterprises of food, tobacco and alcohol, beverages and purified tea will be confirmed by their energy consumption standing book or statistical report. The measuring instruments for fuel consumption should be in line with the related provisions in GB17167-2006—*General Principles for Equipping and Managing of the Measuring Instrument of Energy in Organizations of Energy Consumption*.

5.1.1.2 Net Calorific Value (NCV)

The enterprises can use the default value of fossil fuel average NCV in the present Guidelines, as enclosed in Table 2.1 in Appendix II. Qualified enterprises can carry out actual measurement, or entrust specialized agencies to do the test, or use test results provided in the voucher of clearing by relevant parties. If the enterprise were to carry out actual measurements, the NCV test of fossil fuel should follow the standards in GB/T 231 *Determination of Calorific Value Coal*, GB/T 384 *Determination of Calorific Value of Petroleum Products*, and GB/T 22723 *Energy Determination for Natural Gas*.

5.1.2 Acquisition of emission factors data and their sources

EF_i , NO.*i* fuel's emission factor, can be calculated according to Equation(4):

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

where,

EF_i — Emission factor of No.*i* fuel(tCO₂/GJ);

CC_i — unit carbon content in NCV of NO.*i* fuel (tC/GJ);

OF_i — Carbon oxidation rate of NO.*i* fuel (%); and

44/12 — the ratio of molecular weight between CO₂ and C.

Enterprises can use unit carbon content in NCV and carbon oxidation rate provided in the Guidelines, as shown in Table 2.1 in Appendix II. Qualified enterprises can carry out actual measurement of unit carbon content in NCV and carbon oxidation rate, entrust specialized agencies to do the test, or use the test results provided in the voucher of clearing by relevant parties.

5.2 Emissions from industrial production

Greenhouse gas emissions during industrial production, including carbon dioxide emissions from the consumption of carbonates, emissions from wear and tear and the use of industrially produced carbon dioxide as raw material, taking no account of carbon dioxide created by air separation and biological fermentation.

The equation is as follows:

$$E_{CO_2_process} = \sum_i (AD_i \times EF_i \times PUR_i) + AD_j \times \quad (5)$$

where:

$E_{CO_2_process}$ — CO₂ emissions in industrial production;

AD_i — Consumption of carbonate i (t);

EF_i — Emission factor of carbonate i (tonnes of carbon dioxide / t carbonate);

PUR_i — Purity of carbonate (%);

- i* — Carbonate;

- AD_j — Consumption of purchased, industrial produced carbon dioxide (tons); and

- EF_j — Ratio of wear and tear of carbon dioxide (%) .

5.2.1Activity level data and their sources

The total consumption of each carbonate is determinedbased on account or statistical statement. If not available, data in invoices or statements provided by suppliers can by used. The purity of carbonate can be tested periodically by the enterprise itself or by a qualified professional institution. Data can also be obtained from suppliers; if not available, a default value of 98% can be used.

If industrially produced carbon dioxide is used as raw material, itsamount should be determined bythe account or statistical statement; if not available,data from invoices or statements and other settlement vouchers provided by suppliers can be used.

5.2.2Data of emission factors and their sources

Data of the carbon dioxide emission factorof carbonate can be calculated according to its chemical composition, molecular formula, and the number of CO_3^{2-} ions. Enterprises can testthe chemical composition of cabonate, its purity and data on its carbon dioxide emission factor, entrust a professional institutionto test the result, or use data of commodity properties provided by suppliers.For carbon dioxide emission factors of some common carbonate, enterprises can also refer to Table 2.2 in Appendix II for default values.

In cases where industrially produced carbon dioxide is used as raw material, the ratio of wear and tear should be determined according to its amount during actual

production; if it can not be determined, enterprises can refer to Table 2.3 in Appendix II for default values.

5.3 Anaerobic wastewater treatment and discharge

Methane emissions from anaerobic treatment of industrial wastewater generated during production is calculated as follows.

$$E_{GHG_{wastewater}} = E_{CH_4_{wastewater}} \times GWP_{CH_4} \times 10^{-3} \quad (6)$$

where,

$E_{GHG_{wastewater}}$ — Carbon dioxide emissions produced during anaerobic wastewater treatment (t);

$E_{CH_4_{wastewater}}$ — Methane emissions during anaerobic wastewater treatment (kg); and

GWP_{CH_4} — Global warming potential (GWP) values of methane. According to the *Guidelines for Provincial Greenhouse Gas Inventories*, the value is 21.

$$E_{CH_4_{wastewater}} = (TOW - S) \cdot EF - R \quad (7)$$

where:

$E_{CH_4_{wastewater}}$ — Methane emissions during anaerobic wastewater treatment (kg);

TOW — Total organics removed by anaerobic wastewater treatment (kg COD);

S — Total organics (kg COD) eliminated in the form of sludge;

EF — Methane emission factor (kg methane / kg COD); and

R — Methane recovery (kg methane).

5.3.1 Activity data and their sources

Activity data include total organic matter (TOW) removed by anaerobic wastewater treatment, total organic matter (S) eliminated in the form of sludge and methane recovery (R).

5.3.1.1 Acquisition of data of total organic matter(TOW) removed by anaerobic wastewater treatment:

If an enterprise has the statistics of chemical oxygen demand (COD) removed by anaerobic wastewater treatment system, it can be used directly as total organic matter removed by anaerobic wastewater treatment. If COD statistics are not available, Equation(8) can be used for calculation:

(8)

$$TOW = W * (COD_{in} - COD_{out})$$

W — Wastewater volume (cubic meters) produced during anaerobic treatment; Use data from enterprises;

COD_{in} — COD concentration in wastewater entering anaerobic wastewater treatment system (kg COD / m), using the average detection value of the enterprise; and

- COD_{out} — COD concentration in wastewater exiting anaerobic wastewater treatment system (kg COD / m), using the average detection value of the enterprise.

5.3.1.2 Acquisition of data of the total organic matter (S) eliminated in the form of sludge:

Use data from enterprises. If the total amount of organic matter eliminated in the form of sludge can not be determined, use the default value of zero.

5.3.1.3 Acquisition of data of the amount of methane recovery (R):

Use data from enterprises, which should be determined according to accounts and statistical reports.

5.3.2 Data of emission factors and their sources

Methane emission factor is calculated against Equation(9):

$$EF = Bo * MCF$$

(9)

- Bo — Maximum production capacity of methane of anaerobic wastewater treatment system (kg methane / kg COD); and

- MCF — Methane correction factor, which represents maximum methane generation capacity (B_o) by different approaches or treatments and disposal system, also reflects anaerobic degree of the system.

As for the maximum production capacity of methane (B_o) of the wastewater treatment system, priority is given to data published by the state; if not available, default value of 0.25 kg methane/kg COD can be adopted. As for the methane correction factor MCF, refer to Table 2.4 in Appendix II for recommended values.

Qualified enterprises can carry out the measurement on its own, or entrust a professional institution to do the test.

5.4 Emissions produced by net purchased electricity and heat

Carbon dioxide emissions generated by net purchased electricity can be calculated by net purchased volume multiplying emission factor of average power supply in the regional grid, according to Equation(10).

For emissions generated by net purchased heat, multiply net purchased volume of heat consumption and emission factor of heat supply in the region, according to Equation(11).

$$E_{CO_2_electricity} = AD_{electricity} \times EF_{electricity} \quad (10)$$

$$E_{CO_2_heat} = AD_{heat} \times EF_{heat} \quad (11)$$

where:

$E_{CO_2_electricity}$ — Carbon dioxide emissions (tons) generated by net purchased electricity;

$E_{CO_2_heat}$ — Carbon dioxide emissions (tons) generated by net purchased heat;

$AD_{electricity}$ — Consumption of net purchased electricity (MWh) of the enterprise;

AD_{heat} — Consumption of net purchased heat (MWh) of the enterprise (1,001,000 coke);

$EF_{\text{electricity}}$ — Annual average emission factor (ton of carbon dioxide/MWh) of regional grid; and

EF_{heat} — Emission factor of heat supply (ton of carbon dioxide/million kJ).

5.4.1 Activity data and their sources

Volume of net purchased electricity is based on electricity meter records. If no records are available, data in the electricity bill or statements provided by suppliers can be adopted. The enterprise should calculate net purchased electricity data from different grids separately.

Volume of net purchased heat is based on thermal meter records. If no records are available, data from the thermal bill or statements provided by suppliers can be adopted.

5.4.2 Data and sources of emission factors

Average emission factors of regional power grids should be determined in accordance with the location of the enterprise, in relation to the current geographical division of electricity grids, i.e. those in the Northeast, North China, East China, Central China, Northwest, and Southern China. The emission factor of the relevant electricity grid published by the national authority in the most recent year should be chosen. Regional emission factors in corresponding areas released by the national authorities should be used for calculation. CO₂ emission factor by heat is assumed to be 0.11 tCO₂/GJ for the time being until official data is released by the government authority and should remain updated.

For specifics, refer to Table 2.5 in Appendix II.

6. Quality Assurance and Documentation

Reporting entities should set up a quality guarantee and filing system for reports on greenhouse gas emissions, which includes:

- 6.1 Appointing professionals to take charge of the accounting and reporting of the company's greenhouse gas emissions;
- 6.2 Making greenhouse gas emission monitoring plans. Companies, if permitted, can monitor on a regular basis NCV and carbon content of main fuels, key raw materials and products, carbon oxygenation rate of key combustion equipment, total organic matters removed by anaerobic treatment, wastewater as a result of anaerobic treatment, chemical oxygen demand concentration of the wastewater entering the anaerobic treatment system, chemical oxygen demand concentration of the wastewater exiting the anaerobic treatment system, total organic matter removed in the form of sludge;
- 6.3 Establishing and improving the account system of greenhouse gas emissions and energy consumption;
- 6.4 Setting up the management system for saving and filing greenhouse gas data and documents;
- 6.5 Setting up an internal auditing system for greenhouse gas reports.

7. Content and Format of Reports

Reports should include contents according to the format specified in Appendix I:

7.1 Basic information of the reporting entity

Basic information of the reporting entity should include the name of the entity, its nature of business, reporting year, industry involved, organization code, legal representative, person in charge and contact information.

7.2 Greenhouse gas emissions

Reporting entities should report the total amount of greenhouse gas emissions during the period of business accounting and reporting, as well as the amount of fossil fuel burning and discharge, emissions during industrial production, emissions equivalent

during anaerobic treatment, and emissions from net purchase of electricity and heating power.

7.3 Activity level and its sources

Reporting entities should report the consumption of fossil fuels and their corresponding NCV during production, consumption of carbonates, total organic matters removed by anaerobic treatment, wastewater as a result of anaerobic treatment, chemical oxygen demand concentration of the wastewater entering the anaerobic treatment system, chemical oxygen demand concentration of the wastewater exiting the anaerobic treatment system, total organic matters removed in the form of sludge and methane recovery, and the net quantity of electricity and heat purchased.

7.4 Emission factors and their sources

Reporting entities should report calculation parameters such as the amount of unit carbon content in NCV, carbon oxidation rate, methane emission factor, maximum methane productive capacity of anaerobic wastewater treatment system, methane correction factor, annual average emission factors of power supply in regional power grids, and emission factors of heat power supply corresponding to each activity data. Entities should also clarify the source of data, reference, and reasons of selection.

If companies are engaged in productions other than food, tobacco, alcohol, beverages, and purified tea, they should report their data of emission factors and sources of emission according to the requirements listed in greenhouse gas emission accounting and reporting guidelines for relevant companies.

Appendix I: Report Format Template

Greenhouse Gas Emissions Report

**China Food, Tobacco, Alcohol, Beverages and Purified Tea
Manufacturing Enterprises**

Reporting Entity (Seal):

Reporting Year:

Date: Day/ Month/ Year

Based on the *Guidelines for Accounting and Reporting Greenhouse Gas Emissions from China Food, Tobacco, Alcohol, Beverages and Purified Tea Manufacturing Enterprises (Trial)* issued by the National Development and Reform Commission, the entity has checked the amount of greenhouse gas emissions in the year of ____ and completed related data tables. The reporting entity herewith reports the relevant information as follows:

I. Basic Information of the Company

II. Greenhouse Gas Emissions

III. Activity Level Data and Source

IV. Data of Emission Factors and their Source

This report is true and reliable. If the information provided in this report fails to reflect the reality, this enterprise will bear the corresponding legal responsibility.

Legal Representative (Signature):

Day/ Month/ Year

Attachments:

Table 1.1: Carbon Dioxide Emission Report of a Reporting Entity

Table 1.2: Activity Level Data of a Reporting Entity

Table 1.3: Emission Factors and Calculation Coefficients of a Reporting Entity

Table 1-1: Carbon Dioxide Emission Report of the Reporting Entity for the year

Types of Sources	Mass of Greenhouse Gas (Unit: ton)	CO₂ Equivalent (Unit: ton CO₂ equivalent)
CO ₂ emissions from fossil fuel burning		
CO ₂ emissions from industrial production		
Methane emissions from anaerobic wastewater treatment		
CO ₂ emissions from net purchase of electricity		
CO ₂ emissions from net purchase of heat power		
Total CO ₂ emissions of companies (Ton of CO ₂ equivalent)		

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

		Net consumption (t, 0000Nm³)	NCV (GJ/t, GJ/10000Nm³)
Fossil Fuel Burning*	Blind coal		
	Soft coal		
	Brown coal		
	Cleaned coal		
	Other washed coal		
	Other coal products		
	Coke		
	Crude oil		
	Fuel oil		
	Gasoline		
	Diesel		
	Ordinary kerosene		
	Liquefied natural gas		
	Liquefied petroleum gas		
	Tar		
	Crude benzene		
	Coke oven gas		
	Blast furnace gas		
	Converter gas		
	Other coal gas		
	Natural gas		

	Refinery dry gas		
Industrial Production Process**		Data	Unit
	Consumption of carbonate		t
	Consumption of CO ₂ in industrial production		t
Anaerobic Wastewater Treatment		Data	Unit
	Total organic matters removed by anaerobic wastewater treatment		kg COD
	wastewater produced in anaerobic treatment		m ³
	chemical oxygen demand concentration of the wastewater entering the anaerobic treatment system		kg COD/m ³
	chemical oxygen demand concentration of the wastewater exiting the anaerobic treatment system		kg COD/m ³
	total organic matters removed in the form of sludge		kg COD
	methane recovery		kg
Net Purchase of Electricity and Heat		Data	Unit
	Net purchase of electricity		MWh
	Net purchase of heat		GJ

* The company should add other types of energy actually consumed but not listed in the table.

** The company should add other types of carbonate raw materials actually consumed but not listed in the table.

Table 1-3: Emission Factors and Calculation Coefficients

Fuel Types	Unit carbon content in NCV (tC/GJ)	Carbon oxidation rate (%)
Fossil Fuel Burning	Blind coal	
	Soft coal	
	Brown coal	
	Cleaned coal	
	Other washed coal	
	Other coal products	
	Coke	
	Crude oil	
	Fuel oil	
	Gasoline	
	Diesel	
	Ordinary kerosene	
	Liquefied natural gas	
	Liquefied petroleum gas	
	Tar	
	Crude benzene	
	Coke oven gas	
	Blast furnace gas	
	Converter gas	
	Other coal gas	

	Natural gas		
	Refinery dry gas		
Industrial Production Process**		Data	Unit
	Emission factors of carbonate		tCO ₂ /t
	Depletion rate of CO ₂		%
Anaerobic Wastewater Treatment		Data	Unit
	Mass methane productive capacity in the anaerobic wastewater treatment system		kg CH ₄ / kg COD
	Methane correction factor		-
Net Purchase of Electricity and Heat		Data	Unit
	Electricity		tCO ₂ /MWh
	Heat		tCO ₂ /GJ

Appendix II: Relevant Default Values

Table 2-1: Default value of characteristic parameters of ordinary fossil fuels

Types of fuel		Unit of measurement	NCV (GJ/t, GJ/ $\times 10^4 \text{Nm}^3$)	Unit carbon content in NCV (tC/GJ)	Carbon oxidation rate of fuels
Solid Fuels	Blind coal	t	26.7 ^c	$27.4^b \times 10^{-3}$	94%
	Soft coal	t	19.570 ^d	$26.1^b \times 10^{-3}$	93%
	Brown coal	t	11.9 ^c	$28.0^b \times 10^{-3}$	96%
	Cleaned coal	t	26.334 ^a	$25.41^b \times 10^{-3}$	90%
	Other washed coal	t	12.545 ^a	$25.41^b \times 10^{-3}$	90%
	Other coal products	t	17.460 ^d	$33.60^d \times 10^{-3}$	90%
	Petroleum coke	t	32.5 ^c	$27.5^b \times 10^{-3}$	100%
	Coke	t	28.435 ^a	$29.5^b \times 10^{-3}$	93%
Liquid Fuel	Crude oil	t	41.816 ^a	$20.1^b \times 10^{-3}$	98%
	Fuel oil	t	41.816 ^a	$21.1^b \times 10^{-3}$	98%
	Petroleum	t	43.070 ^a	$18.9^b \times 10^{-3}$	98%
	Diesel	t	42.652 ^a	$20.2^b \times 10^{-3}$	98%
	Kerosene	t	43.070 ^a	$19.6^b \times 10^{-3}$	98%
	Liquefied natural gas	t	44.2 ^c	$17.2^b \times 10^{-3}$	98%
	Liquefied petroleum gas	t	50.179 ^a	$17.2^b \times 10^{-3}$	98%
	Refinery dry gas	t	45.998 ^a	$18.2^b \times 10^{-3}$	98%
Gas	Coke oven gas	10^4Nm^3	179.81 ^a	$13.58^b \times 10^{-3}$	99%

Fuel	Blast furnace gas	10^4Nm^3	33.000 ^d	$70.8^c \times 10^{-3}$	99%
	Converter gas	10^4Nm^3	84.000 ^d	$49.60^d \times 10^{-3}$	99%
	Other coal gas	10^4Nm^3	52.270 ^a	$12.2^b \times 10^{-3}$	99%
	Natural gas	10^4Nm^3	389.31 ^a	$15.3^b \times 10^{-3}$	99%

Notes:

a: *China Energy Statistical Yearbook 2013*; b: *Guidance for Compiling Provincial Greenhouse Gas Emissions Inventory (Trial)*; c: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*; d: Industrial experience data

Table 2-2: Common Carbonate Emission Factors

Carbonate	Emission Factor (t CO ₂ /t Carbonate)
CaCO ₃	0.440
MgCO ₃	0.552
Na ₂ CO ₃	0.415
BaCO ₃	0.223
Li ₂ CO ₃	0.596
K ₂ CO ₃	0.318
SrCO ₃	0.298
NaHCO ₃	0.524
FeCO ₃	0.380

Table 2.3 Depletion Rate of CO₂

Production Procedure	Suggested depletion rate	depletion range

First Filling	40%	40%~60%
Second Filling	60%	40%~60%

Table 2-4:Recommended Value of MCF in Industries of Food, Tobacco and Alcohol, Beverages, and Purified Tea

Industry	Recommendation value of MCF	Range of MCF
Food Manufacturing (including alcohol production)	0.7	0.6-0.8
Tobacco Manufacturing	0.3	0.2-0.4
Alcohol, Beverages and Purified Tea Manufacturing	0.5	0.4-0.6

Table 2.5 Recommended Value of Other Emission Factors

Name	Unit	Emission Factor of CO ₂
Net Purchase of Electricity	tCO ₂ /MWh	the latest national value adopted
Net Purchase of Heat	tCO ₂ /GJ	0.11