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Evaluation standard of Zero Carbon Factory

零碳工厂评价标准

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Foreword

This document is drafted in accordance with the rules of GB/T 1.1—2020 *Directives for standardization—Part 1: Rules for the structure and drafting of standardizing documents*.

The evaluation standards series for Zero Carbon China are an integrated whole composed of fundamental common standards and specific assessment standards. This document is the specific evaluation standard of the Zero Carbon China evaluation standard series, which guides the evaluation of Zero Carbon Factory.

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. The issuing body of this document shall not be held responsible for identifying any or all such patent rights.

This standard was proposed and prepared by Investment Association of China.

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Evaluation standard of Zero Carbon Factory

1 Scope

This document specifies the evaluation boundaries, basic requirements, evaluation indicators, evaluation methodology and evaluation processes of the Zero Carbon Factory.

This document is applicable to the evaluation of the Zero Carbon Factory.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 23331, *Energy management systems—Requirements with guidance for use*

GB/T 24256, *General principle and requirements of eco-design for products*

GB/T 32150, *General guideline of the greenhouse gas emissions accounting and reporting for industrial enterprises*

GB/T 36132, *General principles for assessment of green factory*

GB/T 50878, *Evaluation standard for green industrial building*

GB/T 51350, *Technical standard for nearly zero energy buildings*

ISO 14067, *Greenhouse gases—Carbon footprint of product—Requirements and guidelines for quantification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

Zero Carbon Factory

A factory that integrates various measures such as energy-saving, emission reduction, carbon sequestration, carbon sinks, and carbon trading to achieve a basic balance between carbon emissions and absorption during the evaluation period, utilizes energy resources efficiently, has a rational production site layout and operates with intelligent and efficient management

3.2

Renewable energy

A type of primary energy source that can be replenished to some

extent by natural processes on Earth

NOTE Primary energy includes solar energy, hydropower, wind energy, biomass energy, ocean energy, geothermal energy, etc.

[Source: GB/T 32910.4—2021, 3.3]

3.3

Green power certificates

Green certificates

The electronic certificates with unique code identification issued by the National Renewable Energy Information Management Center to qualified renewable energy power generation companies based on the grid-connected renewable energy volume, in accordance with the relevant administrative regulations of the National Energy Administration, through the Renewable Energy Power Generation Project Information Management Platform of the National Energy Administration

[Source: Green power certificates issuance and voluntary subscription rules (Trial Implementation), Article 2]

3.4

Chinese certified emission reduction; CCER

The amount of greenhouse gas emission reduction that have been quantitatively certified for renewable energy, forestry carbon sink, methane utilization and other projects within the terri-

tory of China and registered in the national greenhouse gas voluntary emission reduction trading registry system

[Source: Administrative Measures for Carbon Emissions Trading (Trial Implementation), Article 42]

4 Evaluation boundaries

The evaluation boundaries of the Zero Carbon Factory shall include all of the following:

- a) All direct emission processes that occur within the physical boundary of the factory (including greenhouse gas emissions from fossil fuels used in the factory-owned or controlled boilers, furnaces, vehicles, etc., and greenhouse gas emissions from production processes).
- b) All indirect emission processes that occur within the physical boundary of the factory (including greenhouse gas emissions caused by purchased electricity, heating and cooling).

NOTE The physical boundary refers to a factory with legal boundaries, scope and unified management body, or blocks that can be counted independently.

- c) The greenhouse gases covered in this document are mainly carbon dioxide (CO_2), other greenhouse gases such as nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), nitrogen trifluoride (NF_3), hydrofluorocarbons (HFC_s), perfluoro-

rocarbons (PFC_s) may be included depending on the energy consumption and processes of the factory.

5 Basic requirements

5.1 The factory shall have clear physical boundaries, normal production and operation, and no major safety, environmental protection, quality and other accidents in the past three years.

5.2 The production site of the factory shall have a reasonable layout, and the functional area shall be clearly identified.

5.3 The factory shall use low-carbon raw materials, adopt advanced and applicable processes, and shall not use or apply outdated equipment and processes that are prohibited by law.

5.4 The factory shall comply with the requirements of relevant laws, regulations, standards, and policies on energy conservation and carbon emission control.

5.5 The discharge indexes of various pollutants in the factory shall comply with current requirements of national or local standards.

5.6 The factory shall identify the implementation path and scheme for zero carbon emission and propose annual energy-saving and carbon reduction targets.

5.7 Total energy consumption and/or intensity performance

shall exceed national, sectoral and local energy consumption limits.

6 Evaluation indicators

The evaluation indicator system of Zero Carbon Factory consists of primary indicators and secondary indicators. The evaluation indicator system is shown in Table 1.

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Table 1—Zero Carbon Factory evaluation indicator system

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
Energy and resources	Energy utilization	The proportion of non-fossil energy consumption in primary energy consumption shall reach 25%; if it is not reached, the score shall be scaled down	Choose one of two	8
		The utilization rate of renewable energy (including purchased green power) shall reach 50%; if it is not reached, the score should be scaled down		
		The factory should establish an economic micro-power system (e.g., photovoltaic power station, smart microgrid) that improves energy efficiency and power supply safety		
		An energy management center shall be established	Choose one of two	5
	Waste heat and residual pressure shall be recycled if it is valuable to the production system	The energy utilization efficiency of the production system has continuously improved in the past two years		

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
Energy and resources	Energy utilization	<p>Measures shall be taken to improve the thermal efficiency of the heating system (In addition to the recycling of waste heat and residual pressure)</p> <p>Measures shall be taken to improve the efficiency of power generation systems</p>	Choose one of two	3
	Resources utilization	The consumption of main raw materials meets the advanced value requirements of relevant national, sector, and local standards, or performs better than the top 20% level of the industry	Mandatory	4
Infrastructure	Buildings	<p>Buildings of the factory production area shall meet the requirements of relevant laws and regulations and green-related standards according to the industry characteristics</p> <p>Buildings of the factory production supporting area shall meet the requirements of the relevant standards for zero carbon (near zero carbon) building</p>	Mandatory	2

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
	Buildings	Greening and site: (1) Pedestrian corridors with shade and shelter are provided on-site; (2) The greening of the factory is suitable, giving priority to planting native plants, plants with less maintenance and strong weather resistance and cost reduction of daily maintenance; (3) The proportion of outdoor permeable floor area to total outdoor area is not less than 30%	Mandatory	1
Infrastructure	Transportation	The proportion of green transportation in the factory is not less than 50%	Mandatory	3
	Lighting	The lighting of each room or place in the factory should utilize natural light as much as possible, and all the lamps in the factory shall adopt energy-saving lamps Lighting in different places shall be graded to different levels according to operating requirements. The lighting system of the large-scale factory shall be controlled intelligently	Mandatory	2
			Mandatory	1

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
	Energy management	An energy management system shall be established and operated in accordance with GB/T 23331	Mandatory	1
		Energy management system certificates shall be obtained	Mandatory	1
Comprehensive management		Top managers shall commit and support zero carbon management of the factory, and ensure that zero carbon management requirements are integrated into the business process of the factory	Mandatory	1
	Carbon management	Zero carbon management agency shall be set up for the construction of the Zero Carbon Factory system, implementation and evaluation of the Zero Carbon Factory	Mandatory	1
		There shall be a sound carbon emission management system	Mandatory	1
		Medium and long-term plannings, annual emission reduction targets and implementation plans for the Zero Carbon Factory shall be in place	Mandatory	1

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
	Carbon management	Third-party verification agencies shall be delegated to carry out carbon emission verification	Mandatory	1
		Employees shall be trained on low-carbon technologies, products, and projects at least twice a year	Mandatory	1
		Information on emission facilities, carbon emissions, carbon emission reduction targets, and carbon reduction projects shall be disclosed on relevant platforms	Mandatory	1
Comprehensive management	Digital management	Carry out the construction of digital and intelligent factories, build big data platforms, and collect data automatically	Mandatory	3
		Timely monitoring and statistical analysis of energy usage and carbon emission data and data visualization functions shall be implemented	Mandatory	3
	Operation management	The actual operating efficiency or operating parameters of the equipment and system shall meet the requirements for the economic operation of the equipment	Mandatory	1

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
Carbon reduction technology and measures	Processes and equipment	General equipment shall use energy-saving products with energy efficiency grade 2 or above Special equipment shall comply with the requirements of relevant industry specifications and conditions and shall have energy-saving and efficient emission-reduction measures	Mandatory	5
	Clean energy technology	Adopt at least one of the clean energy technologies in wind power, solar power, hydropower, geothermal heating and power generation, biomass fuel power generation, and nuclear fuel power generation	Mandatory	5
	Technology for the clean and efficient utilization of fossil energy	Adopt traditional fossil energy (coal, oil, natural gas) clean and efficient utilization technologies for effective emission reduction, and follows the requirements of relevant policy documents and standards, the efficient utilization of technical indexes shall reach the industry benchmark level [e.g.: the coal efficient utilization index has reached <i>The benchmark level stipulated in the benchmark level and baseline level of key areas of clean and efficient utilization of coal (2022 edition)</i>]	Choose one of two	5

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score	
Carbon reduction technology and measures	Carbon Capture Utilization and Storage (CCUS)	Adopt the carbon capture utilization and storage (CCUS) technology	Choose one of two	5	
	Number of projects	No less than three energy-saving and carbon-reduction projects were implemented in the past two years			
	Photovoltaic installation	The proportion of photovoltaic installed on the building roof is not less than 90%	Mandatory	4	
	Substitution and recycling of raw materials		Recycled materials shall be used for reuse, recyclable materials to replace raw materials, non-recyclable materials	Mandatory	3
			Replace high global warming potential materials with low global warming potential materials	Mandatory	3

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
Product	Ecological design	Ecological design of the products produced shall be carried out in accordance with GB/T 24256	Mandatory	3
	Carbon footprint	Adopt ISO 14067 and other applicable standards or specifications to calculate or verify the carbon footprint of products and use the results to improve carbon footprint of products	Mandatory	3
Carbon reduction performance	The achievement of the carbon reduction target	Achieve energy saving and emission reduction targets in the past three years	Mandatory	3
	Energy consumption	The comprehensive energy consumption per unit production (or output value) meets the advanced value requirements of relevant national and sectoral standards. If relevant standards have not been prepared, the energy consumption per unit production shall perform better than the top 20% of the industry	Choose one of two	5

Table 1 (continued)

Primary indicators	Secondary indicators	Evaluation requirements	Note	Score
Carbon reduction performance	Energy consumption	The comprehensive energy consumption of per production (or output value) meets the advanced value requirements of relevant national and sector standards. If relevant standards have not been prepared, the average annual unit product (or output value) has dropped by more than 3% in the past three years	Choose one of two	5
	Carbon emission intensity	The carbon emission intensity of the factory is superior to the top 20% of the industry The annual average carbon emission intensity has dropped by more than 5% in the past three years	Choose one of two	5

7 Evaluation methodology

7.1 The factory participating in the evaluation shall first meet all the requirements specified in Clause 5.

7.2 After meeting the requirements of Clause 5, the factory is evaluated according to Table 1.

7.3 The grade of Zero Carbon Factory is divided into three grades from high to low, namely Zero Carbon Factory three stars, Zero Carbon Factory two stars, and Zero Carbon Factory one star. The grades of Zero Carbon Factory is shown in Table 2.

Table 2—The grades of Zero Carbon Factory

Grade	Grading index	Equivalence Level
Zero Carbon Factory three stars (★★★)	$S \geq 95$	Zero carbon
Zero Carbon Factory two stars (★★)	$95 > S \geq 85$	Near zero carbon
Zero Carbon Factory one star (★)	$85 > S \geq 70$	Low carbon

7.4 The evaluation of the Zero Carbon Factory is valid for five years and shall be re-evaluated upon expiration. Within the validity period of the evaluation, the third-party evaluation agency shall conduct a re-evaluation in the third year and remain or adjust the grade according to the results of the re-evaluation. For the Zero Carbon Factory with any of the following circum-

stances, the evaluation results shall be canceled:

- Failing to participate in the re-evaluation as required;
- Providing false materials and data;
- Having been penalized by the relevant administrative departments for major safety, environmental and quality accidents.

8 Evaluation processes

8.1 Preparation stage

8.1.1 Proposal the Zero Carbon Factory implementation plan

The factory shall sort out its basic conditions, elements, organizations, etc., evaluate the low carbon development level of the factory, formulate Zero Carbon Factory implementation plans, form documents, and release. The content of the implementation plan shall contain at least the following information:

- a) The statement of the Zero Carbon Factory commitment;
- b) Carbon emission accounting boundary of the Zero Carbon Factory;
- c) Target and timetable for the planned realization of the Zero Carbon Factory;

- d) Plan strategies to reduce greenhouse gas emissions, including the specific content and reasons for selection, emission reduction baseline, and emission reduction targets;
- e) Carbon removal and/or carbon offset strategies that plan to achieve the Zero Carbon Factory and maintain carbon neutrality, including details and reasons for selection.

8.1.2 Establishment of greenhouse gas management system and institution

The factory shall establish the greenhouse gas emission management system in accordance with relevant laws, regulations, policies, and standards, as well as its scale, capacity, and demand.

8.2 Implementation stage

8.2.1 Implement greenhouse gas emission reduction

The factory shall adopt appropriate greenhouse gas emission reduction strategies to ensure the realization of the emission reduction targets set out in the plan, and the measures include but are not limited to:

- a) Implement direct emission reduction measures. Adopt appropriate greenhouse gas emission reduction strategies according to its own situation, such as improving the substitution of renewable energy and the substitution of carbon-containing raw materials, adopting process upgrading,

energy saving measures, and other measures;

- b) Implement indirect emission reduction measures. According to its own capability to independently develop carbon emission reduction projects outside the boundaries.

8.2.2 Implementation of carbon offsets

8.2.2.1 Purchase of carbon credits

The factory can purchase carbon credits to offset the remaining emission reduction after the implementation of the emission reduction activities. Available carbon credits include but are not limited to:

- a) CCER;
- b) Emission reductions of carbon-inclusive projects approved, filed, or recognized by the government;
- c) Voluntary Emission Reductions (VER) of the Gold Standard (GS), Verified Carbon Units (VCU) of the Verified Carbon Standard (VCS), Certified Emission Reductions (CER) of the Clean Development Mechanism (CDM), etc.
- d) Other carbon credits approved, recorded, or recognized by authoritative institutions.

8.2.2.2 Purchase of green certificates

For the carbon emissions generated by electricity, the factory can offset it by purchasing green certificates.

8.2.2.3 Self-developed carbon emission reduction projects

The factory can independently develop emission reduction projects outside the physical boundary for carbon offsets, and the self-developed projects may include but are not limited to the following ways.

- a) Certified emission reductions generated by self-developed emission reduction projects outside the boundary;
- b) Developing and adopting GHG sinks/offsets, which means independently construction certified GHG sinks outside the accounting boundaries.

8.3 Evaluation stage

8.3.1 Evaluation method

8.3.1.1 The evaluation of Zero Carbon Factories can be implemented by the first party, the second party, or the third party organization. When the evaluation results are used for external claims, the evaluators shall be third party organizations that are independent of the factory and has appropriate capabilities.

8.3.1.2 Before carrying out the second-party or third-party evaluation, the evaluation subject shall complete self-evaluation. Institutions implementing the third party evaluation shall collect evaluation evidence by checking report documents, statistical reports, and original records, also depending on the actual situation, conducting relevant personnel interviews, using field sur-

veys, sample surveys and other methods to ensure the integrity and accuracy of the evidence.

8.3.1.3 The evaluation of the Zero Carbon Factory should be implemented after one year in which the factory has passed the acceptance and normal operation. The evaluation cycle is one natural year.

8.3.2 Evaluation Certificate

The factory that passes the third-party evaluation can obtain the Zero Carbon Factory certificate, which includes but is not limited to the following contents:

- a) Code and name of this document;
- b) Basic information about the factory;
- c) Greenhouse gas accounting boundaries of the factory;
- d) The grade of the Zero Carbon Factory;
- e) The validity period of the factory's zero carbon certificate.

8.4 Continuous improvement stage

The factory should continuously improve the greenhouse gases management within the boundary, and ultimately achieve or continue to maintain the zero carbon emission status.

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