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**Guidance for evaluation of zero carbon factory in machinery
industry**

机械行业零碳工厂评价导则

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Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020, Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents.

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

1 Scope

This document provides guidance on the principles of evaluation, the mode and methods of evaluation, the evaluation indicators, the evaluation procedure and the evaluation report for zero carbon factories in the machinery industry.

This document applies to the evaluation of zero carbon factories in the machinery industry.

2 Normative references

The following documents contain provisions which, through normative reference in this text, constitute indispensable provisions 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 24001, Environmental management systems - Requirements with guidance for use

GB/T 45001, Occupational health and safety management systems - Requirements with guidance for use

3 Terms and definitions

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

3.1 greenhouse gas - a gaseous constituent of the atmosphere, both natural and produced by human activity, that absorbs and re-emits radiation of wavelengths within the infrared spectrum emitted by the surface of the earth, by the atmosphere and by clouds. Note: unless stated otherwise, the greenhouse gases in this document are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆) and nitrogen trifluoride (NF₃). [Source: GB/T 32150-2025, 3.1]

3.2 zero carbon factory - a factory whose greenhouse gas emissions fall continuously over a given period through reductions of its own, and whose residual emissions are offset 100 % in some way. [Source: GB/T 46737-2025, 3.2, modified]

3.3 carbon credit - a tradable certificate representing a quantity of greenhouse gas emissions, generated by a greenhouse gas emission reduction or removal project. Note: one unit of carbon credit certificate corresponds to one tonne of carbon dioxide equivalent. [Source: GB/T 46737-2025, 3.3]

3.4 carbon offset - balancing the carbon emissions of the factory by cancelling carbon credits. [Source: GB/T 46737-2025, 3.4]

3.5 residual greenhouse gas emission - the greenhouse gas emissions that remain after the factory has implemented every technically and economically feasible greenhouse gas reduction scheme or measure. [Source: GB/T 46737-2025, 3.8]

3.6 renewable energy - a class of primary energy which, to a certain degree, can be regenerated on earth by natural processes. Note: it includes solar, hydro, wind, biomass, ocean and geothermal energy. [Source: GB/T 32910.4-2021, 3.3, modified]

4 Principles of evaluation

The evaluation of a zero carbon factory in the machinery industry follows these principles: a) the evaluation indicators are comprehensive, systematic and scientifically sound; b) the basis of the evaluation is complete, accurate and credible; c) the evaluation process is reasonable and follows the rules; d) the evaluation documents are complete, consistent,

clear and traceable; e) the results of the evaluation are objective, accurate and impartial.

5 Mode and methods of evaluation

The evaluation may be carried out by a first party (the factory itself), by a second party (a partner) or by a third-party organization. Where the results are to be published externally, the party carrying out the evaluation should include a third-party organization independent of the factory and having the corresponding evaluation capability. The evaluation combines quantitative and qualitative indicators, and a composite score is obtained by weighting the indicators.

6 Evaluation indicators

6.1 Composition of the indicator system. The indicator system for evaluating a zero carbon factory is made up of the basic requirements and the evaluation indicators: a) the basic requirements cover management responsibility, the management system and the state of residual emissions; b) the evaluation indicators comprise four classes of first-level indicator - energy structure, management capability, effectiveness of carbon reduction, and responsibility and industrial extension. Under each first-level indicator there are several second-level indicators, and third-level indicators are added according to the characteristics of the particular sector. The third-level indicators are the ones scored directly, and according to whether they are quantitative or qualitative and whether they correlate positively or negatively with the performance of a zero carbon factory they fall into four classes: positive quantitative, positive qualitative, negative quantitative and negative qualitative. The table of evaluation indicators for the machinery industry is given in Annex A, and the methods for calculating the quantitative indicators in Annex B.

6.2 Basic requirements. The basic requirements a zero carbon factory meets include but are not limited to: a) no violation of safety, quality or environmental protection rules in the past three years; b) the responsibilities of the management concerned with the zero carbon factory are clearly defined, and a medium- and long-term development plan and annual quantified targets for the zero carbon factory are drawn up; c) environmental, energy and occupational health and safety management systems are established, implemented, maintained and continually improved according to GB/T 23331, GB/T 24001, GB/T 45001 or other standards applicable to the sector, and a dedicated carbon management system should be established; d) within the evaluation period, residual emissions are offset 100 % in some way.

6.3 Evaluation indicators. 6.3.1 Energy structure. Indicators are proposed for the non-fossil energy structure, distributed photovoltaics and the microgrid system; according to the characteristics of the sector, the rate of use of renewable energy, the photovoltaic coverage of usable building roofs and the state of construction of the microgrid system may be selected as the main indicators. 6.3.2 Management capability. Indicators are proposed for

the energy and carbon management platform, the product, the process and equipment, and the buildings; the functions of the energy and carbon management platform, the use of waste energy, the energy consumption per unit of product, the use of raw and auxiliary materials, the carbon footprint of the product and ultra-low energy buildings may be selected as the main indicators.

6.3.3 Effectiveness of carbon reduction. Indicators are proposed for industrial added value, autonomous carbon reduction and carbon offsetting; the state of industrial added value, the rate of reduction of carbon dioxide emissions per unit of industrial added value, the comprehensive energy consumption per unit of product, the rate of reduction of the carbon footprint of key industrial products and the state of carbon offsetting may be selected as the main indicators. 6.3.4 Responsibility and industrial extension. Indicators are proposed for supply chain management, circular use and the disclosure of carbon emission information; the construction and evaluation of supply chain management, the comparison of the comprehensive utilization rate of industrial solid waste, the guidance documents on circular use, remanufacturing production and the state of disclosure of carbon emission information may be selected as the main indicators.

7 Evaluation procedure

The organization carrying out the evaluation shall establish a proper working procedure, as shown in Figure 1, comprising: a) setting up the evaluation working group, made up of people with the corresponding skills and capability, able to undertake the evaluation work, with outside experts engaged where necessary; b) drawing up the evaluation scheme, choosing a scheme suited to the actual circumstances of the enterprise; c) the conformity evaluation, carrying out a compliance check against the requirements of 6.2 and against the relevant national and sector laws, regulations, standards and specifications; d) the indicator evaluation, evaluating the four classes of first-level indicator - energy structure, management capability, effectiveness of carbon reduction, and responsibility and industrial extension - by reference to Annex A and Annex B; e) preparing the evaluation report, setting out the process and the results systematically in a formal report; f) closing the evaluation, with an independent review carried out and the evaluation report published.

8 Evaluation report

The content of the evaluation report of a zero carbon factory in the machinery industry includes but is not limited to: a) the name, the registered address and the operating address of the reporting entity carrying out the evaluation; b) the date of the report; c) the purpose, the criteria and the scope of the evaluation; d) an introduction to the basic circumstances of the entity evaluated; e) the evaluation process, including but not limited to information on the evaluation group, the process of collecting information, the state of the documentary and on-site evaluation, and the preparation and internal technical review of the report; f) the