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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

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Template for comments and secretariat observations

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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

DRAFT INTERNATIONAL STANDARD

ISO/DIS 50006

ISO/TC 301

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Voting begins on:
2022-01-07

Voting terminates on:
2022-04-01

Energy management systems — Evaluating energy performance using energy baselines and energy performance indicators

ICS: 27.015

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is Technical Committee ISO/TC 301, *Energy management and energy savings*.

This second edition cancels and replaces the first edition (ISO 50006:2014), which has been technically revised. The main changes compared to the previous edition are as follow:

- Harmonization of concepts and technical aspects with new revision of ISO 50001:2018;
- Definitions in [Section 3](#) have been updated according to new revision of ISO 50001:2018 and consider new approach for general harmonization under ISO/TC 301;
- Upgrades related to normalization of energy performance indicators (EnPIs) and corresponding energy baselines (EnBs);
- Upgrades and new considerations related to new definition of energy performance improvement.

Introduction

0.1 Background

Energy performance monitoring is a tool which applies to all types of organizations and can be used to evaluate the results of its efforts in energy management. Relevant variables affect the energy consumption and energy efficiency of organisations and their processes. To effectively monitor energy performance, the effects of relevant variables should be taken into account by using the process of normalization.

Measuring and monitoring of energy performance and demonstration of energy performance improvement can be challenging because of the complexity of determining energy performance indicators (EnPIs) and corresponding energy baselines (EnBs) which are appropriate for an organization to better understand the energy within the facilities, equipment, systems or energy-using processes.

Improving energy performance helps organizations to become more competitive by reducing their energy costs. In addition, improving energy performance can help organizations to reduce their energy-related greenhouse gas emissions. Climate change and the need for decarbonisation are major global concerns. Reducing greenhouse gas emissions associated with energy consumption is a significant tool in tackling climate change. Methods for monitoring and measuring energy performance to ensure appropriate results are key aspects of this activity.

In those activities or processes in which no energy performance improvement has been planned, benefits can also be obtained by using EnPIs and EnBs to manage operational control, identify maintenance needs or identify significant deviations in energy performance.

Establishing and communicating the energy performance of the organization and its processes to appropriate person(s) in the organization is a key element for success. It is also a key to building ongoing commitment and engagement from the top management including the allocation of resources for energy management activities including effective implementation of EnPIs and EnBs.

ISO 50001 requires an organization to measure, monitor, analyse and evaluate its energy performance and energy performance improvement and to demonstrate continual improvement in energy performance using EnBs and EnPIs.

ISO 50001 requires organizations to carry out normalization of the EnPI values and/or corresponding EnBs where data indicates that relevant variables significantly affect energy performance.

0.2 Overview of contents

This document provides organizations with practical guidance related to managing energy performance, including its evaluation, control and continual improvement through the establishment, use and maintenance of EnPIs and the corresponding EnBs.

This document gives guidance on the selection of appropriate EnPIs according to the objectives of the organization. Organizations can achieve significant benefits by implementing appropriate EnPIs according to this document.

This document is intended to guide an organization in establishing, using and maintaining EnPIs and EnBs in accordance with the requirements in ISO 50001.

The process described in this document can provide benefits to any organization, including those that do not have an EnMS. Nevertheless, maximum benefits can be obtained if this process is embedded within an EnMS according to ISO 50001.

Energy management systems — Evaluating energy performance using energy baselines and energy performance indicators

1 Scope

This document provides guidance on how to establish, use and maintain energy performance indicators (EnPIs) and energy baselines (EnBs) in any organization including those using ISO 50001. This includes how to monitor and evaluate energy performance and demonstrate energy performance improvement.

The guidance in this document is applicable to any organization, regardless of its type, size, complexity, geographical location, organizational culture, the products and services it provides or its level of maturity in the field of energy management.

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.

ISO 50001:2018, *Energy management systems — Requirements with guidance for use*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1

baseline period

period of time used for comparison with reporting period

Note 1 to entry: The purpose of the comparison can be monitoring of actual versus energy consumption and/or EnPI(s) or evaluation of energy performance or energy performance improvement

3.1.2

boundary

physical, virtual and/or organizational limits as defined by the entity for a stated purpose

Note 1 to entry: The entity may be an organization, group of organizations, region(s), subset of an organization or other depending on the application

EXAMPLE 1 Physical can be equipment, systems, a building, a process, a group of processes, a site, or multiple sites, under the control of an organization

EXAMPLE 2 Organizational can be a function, a division, or an entire organization

3.1.3

energy

electricity, fuels, steam, heat, compressed air, and other similar media

Note 1 to entry: For the purposes of this document, energy refers to the various types of energy, including renewable, which can be purchased, stored, treated, used in equipment or in a process, or recovered.

[SOURCE: ISO 50001:2018, 3.5.1]

3.1.4

energy baseline

EnB

value used for comparison of *energy performance* ([3.1.9](#))

Note 1 to entry: The EnB is based on the data from a specified period of time and/or conditions

Note 2 to entry: An EnB can be normalized using *relevant variables* ([3.1.16](#)) impacting *energy consumption* ([3.1.5](#)) or *energy efficiency* ([3.1.6](#)), e.g., production level, degree days (outdoor temperature)

Note 3 to entry: Where the EnB is normalized it can be referred to as normalized EnB

3.1.5

energy consumption

quantity of *energy* ([3.1.3](#)) applied

Note 1 to entry: *Energy consumption* ([3.1.5](#)) can be represented in volume and mass flow or weight units (e.g., fuel) or converted into units (e.g. GJ, kWh).

3.1.6

energy efficiency

ratio or other quantitative relationship between an output of process and an input of *energy* ([3.1.3](#))

EXAMPLE Conversion efficiency; energy required/energy used; output/input; theoretical energy used to operate/energy used to operate.

Note 1 to entry: The output of a process can be products, services, or energy

Note 2 to entry: Both input and output should be clearly specified in terms of quantity and quality (e.g., fuel content of calorific value) and be measurable.

3.1.7

energy end-use

application of *energy* ([3.1.3](#))

EXAMPLE Ventilation; lighting; heating; cooling; transportation; data storage; production process.

Note 1 to entry: Energy use is sometimes referred to as *energy end-use* ([3.1.7](#)).

3.1.8

energy model

Mathematical representation based on a data set describing the relationship between *relevant variables* ([3.1.16](#)) and *energy consumption* ([3.1.5](#)) or *energy efficiency* ([3.1.6](#)) over a specified period of time

Note 1 to entry: The specified period of time can represent different perspectives of time such as *baseline period* ([3.1.1](#)), *reporting period* ([3.1.17](#)), or period that reflects standard conditions

3.1.9

energy performance

measurable result(s) related to *energy efficiency* ([3.1.6](#)), *energy end-use* ([3.1.7](#)) and *energy consumption* ([3.1.5](#))

3.1.10 energy performance indicator EnPI

measure used to express a quantitative value of *energy performance* (3.1.9)

Note 1 to entry: If the EnPI is used for the demonstration of *energy performance improvement* (3.1.11) it refers to *energy efficiency* (3.1.6) or *energy consumption* (3.1.5)

Note 2 to entry: The EnPI is defined by the organization

Note 3 to entry: The quantitative value can be calculated or measured

Note 4 to entry: EnPI(s) can be expressed by using a mathematical relationship between energy efficiency or energy consumption and *relevant variables* (3.1.16)

3.1.11 energy performance improvement

improvement in measurable results of *energy efficiency* (3.1.6) or *energy consumption* (3.1.5) related to *energy end-use* (3.1.7), compared to the *energy baseline* (3.1.4)

3.1.12 energy target

quantifiable objective of *energy performance improvement* (3.1.11)

Note 1 to entry: An *energy target* (3.1.12) can be included within an objective.

[SOURCE: ISO 50001:2018, 3.4.15]

3.1.13 facility

single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organization unit or production process

[SOURCE: ISO 14064-3:2019, 3.6.14]

3.1.14 independent variable

quantifiable factor that affects *energy consumption* (3.1.5) and routinely changes

3.1.15 normalization

process to enable comparison of *energy performance* (3.1.9) under equivalent conditions

Note 1 to entry: Normalization can be used for purpose of comparison of *energy performance* (3.1.9) or *energy performance improvement* (3.1.11).

Note 2 to entry: Equivalent conditions refer to the conditions in both the *baseline period* (3.1.1) and *reporting period* (3.1.17). It is up to the entity to determine how to make the conditions equivalent.

3.1.16 relevant variable

quantifiable factor that significantly impacts *energy performance* (3.1.9) and routinely changes

Note 1 to entry: Significance criteria are determined by the organization.

EXAMPLE Weather conditions, operating conditions (indoor temperature, light level), working hours, production output.

[SOURCE: ISO 50001:2018, 3.4.9]

3.1.17

reporting period

defined period of time selected for determination of *energy performance* (3.1.9)

EXAMPLE The period which an organization determines is suitable to assess changes in *EnPIs* (3.1.10) relative to the *baseline period* (3.1.1).

3.1.18

significant energy use

SEU

energy end-use (3.1.7) accounting for substantial *energy consumption* (3.1.5) and/or offering considerable potential for *energy performance improvement* (3.1.11)

Note 1 to entry: Significance criteria are determined by the organization.

Note 2 to entry: SEUs can be facilities, systems, processes or equipment.

[SOURCE: ISO 50001:2018, 3.5.6]

3.1.19

static factor

identified factor that significantly impacts *energy performance* (3.1.9) and does not routinely change

Note 1 to entry: Significance criteria are determined by the organizations.

EXAMPLE Facility size; design of installed equipment; number of weekly shifts; range of products.

[SOURCE: ISO 50001:2018, 3.4.8]

3.2 Abbreviated terms

EnMS energy management system

EnB energy baseline

EnPI energy performance indicator

EPIA energy performance improvement action

SEU significant energy use

SEC specific energy consumption

4 Overview of EnPIs, EnBs and energy performance

An organization establishes EnPIs and EnBs to measure and monitor energy performance and demonstrate energy performance improvement.

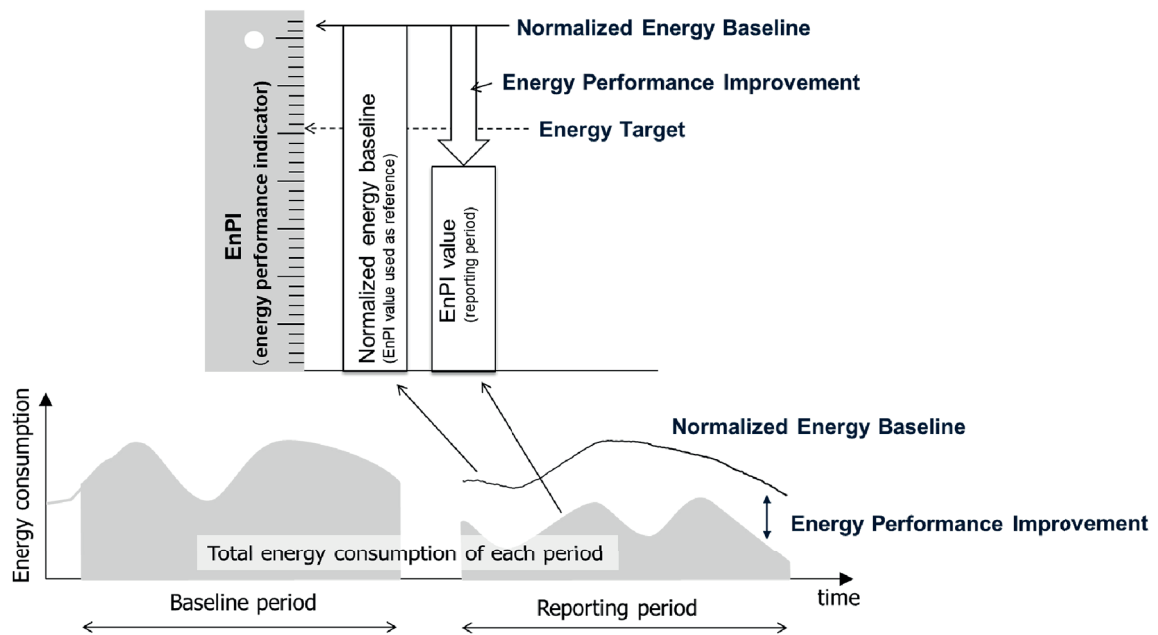
EnPIs should be determined by an organization to provide relevant energy performance information to various interested parties (e.g. internal users, supply chain, etc), to understand its energy performance and take actions for its control and improvement.

EnPI values quantify the energy performance of the whole organization or its various parts (e.g. facilities, equipment, systems or energy using processes). Potential EnPIs need to be analysed to decide if they are appropriate before being selected. EnPIs can be expressed in units of energy consumption (e.g. GJ, kWh), dimensionless ratios (e.g. energy efficiency), etc.

Energy consumption of an organization is significantly affected by relevant variables such as weather, production, etc. If appropriate, normalization should be used to modify energy data to account for the changes in the relevant variables to monitor and evaluate energy performance and demonstrate energy performance improvement.

Energy targets in an organization may be set by the top management or based on identified and planned energy performance improvement opportunities. Normalised EnBs can also be used to establish energy targets.

[Figure 1](#) illustrates an example of the relationship between energy performance improvement, EnPI, EnB, EnPI value and energy target. [Figure 1](#) also illustrates how energy performance improvement is achieved when an EnPI value improves compared with the normalized EnB, whether or not energy targets are met.



NOTE The changing trend of energy consumption indicates that there are relevant variables and normalization is required.

Figure 1 — Example of conceptual relationship between Energy performance, EnPIs, EnBs and energy targets

An overview of the process to develop, use and update EnPIs and EnBs is illustrated in [Figure 2](#) and described in detail in [clauses 5](#) to [10](#). This process helps the organization to monitor and evaluate energy performance and demonstrate energy performance improvement. The processes within the energy planning are iterative (see the boxes in the dashed line in [Figure 2](#)).

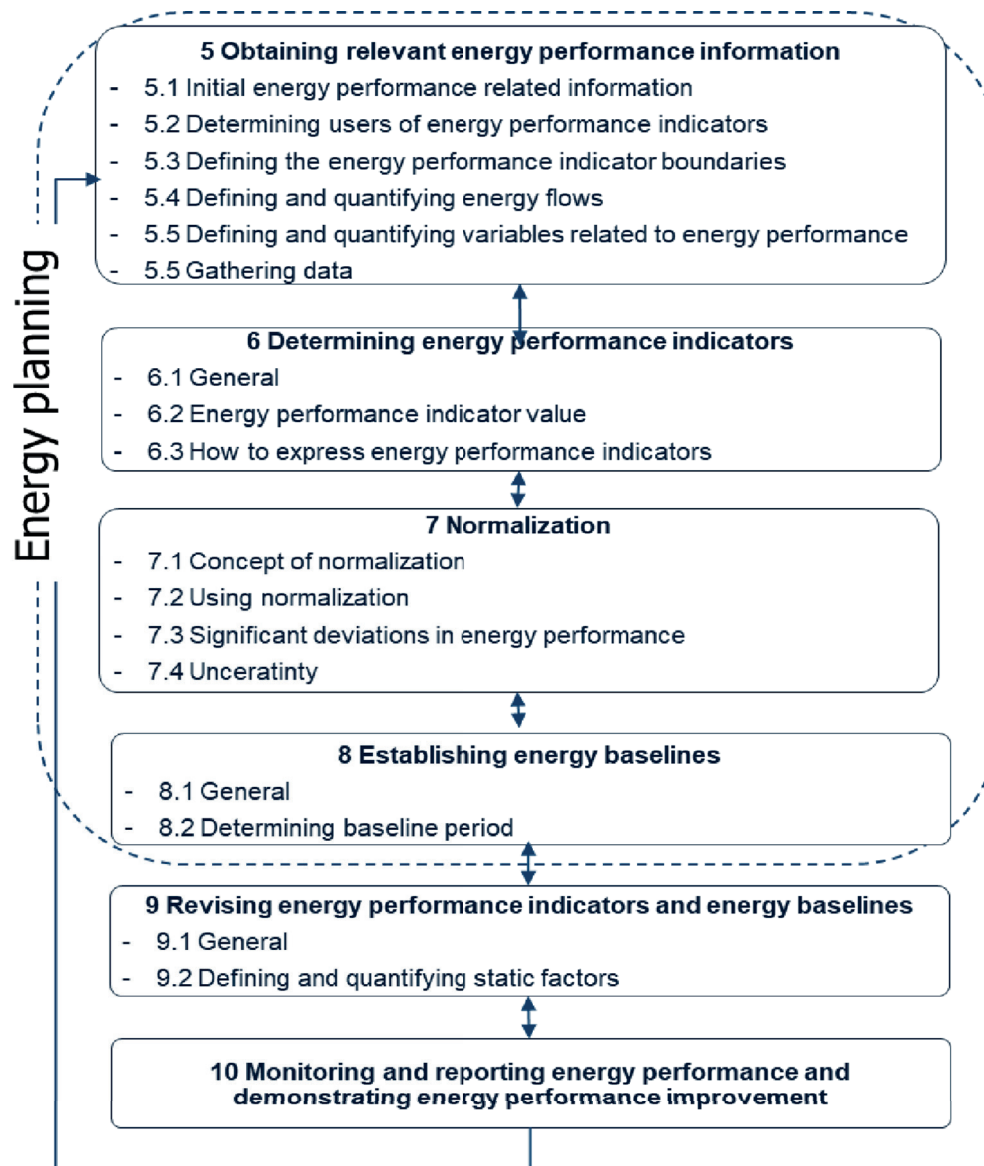


Figure 2 — Overview of energy performance management processes

5 Obtaining relevant energy performance information

5.1 Initial energy performance related information

Organizations should collect information on current types of energy used and current and past energy consumption and energy efficiency.

This process helps to identify the significant energy uses (SEUs) and prioritize opportunities for energy performance improvement.

NOTE This process in ISO 50001 is defined in [clause 6.3](#) energy review

5.2 Determining users of energy performance indicators

EnPIs should be developed to meet the needs of different end users and be easily understandable.

Multiple EnPIs may be required to meet user needs. Aligning the EnPI boundaries with functional roles can ensure that the EnPIs meet user needs and that responsibility for managing the EnPI can be effectively assigned.

EnPIs can be developed for internal or external users. Internal users typically use EnPIs to manage improvement in energy performance. External interested parties typically use EnPI values to meet information requirements derived from legal requirements and other requirements (e.g., sustainability reports). Simple (non-normalised) EnPIs and EnBs required for external purposes, such as those for government reporting, may not be sufficient for demonstrating energy performance improvement under ISO 50001 as they may not account for changes in relevant variables. [Table 1](#) describes some common users.

Table 1 — EnPI users

Types of EnPI users	Description and examples
Top management	Top management need information from EnPIs to understand energy performance of the organisation and to support energy performance improvement.
Energy management team	Group who supports the organization (group of EnPI owners including top management in (a) setting up an EnPI, (b) maintaining an EnPI, (c) monitoring EnBs, current EnPI values, values of all relevant variables in predetermined intervals, (d) setting targets and calculating target EnPI values, (e) conducting normalizations and comparisons of current EnPI values with normalized EnBs and normalized target EnPI values, (f) reporting of EnPI values and deviations, and (g) interpreting the results.
Plant or facility management	Typically controls resources within the plant or facility and is accountable for results. The plant or facility manager should understand both planned energy performance and significant deviations from desired performance both in terms of energy performance and in financial terms. Plant or facility managers may use all of the EnPIs in their plant or facility including the EnPI regarding its SEU, and comparable EnPIs from other sites for benchmarking purposes.
Operation and maintenance personnel	Responsible for using EnPIs to control and ensure efficient operation by taking actions for significant deviations in energy performance, eliminating energy waste and undertaking preventive maintenance. Operation and maintenance personnel may use the EnPIs relevant to the process or equipment which they have responsibility for.
Process engineer	Plan, execute and evaluate an energy performance improvement action using suitable EnPI for the action and its evaluation method.
External users	May include regulatory bodies, professional and sector associations, EnMS auditors, customers, or other organizations.
EnPI owner	Person who is responsible for monitoring, analysing and reporting an EnPI and its values.

5.3 Defining the energy performance indicator boundaries

To measure energy performance, suitable measurement boundaries for each EnPI should be defined. When defining an EnPI boundary, the organization should consider:

- organizational responsibilities in relation to energy management, including the level of control and/or influence which the organization has over its energy performance;
- the significant energy uses (SEUs);
- facilities, equipment, system or energy-using processes that the organization wishes to isolate and manage;
- the users of the EnPI and their needs (see [5.4](#));
- the ease of isolating the EnPI boundary by measuring energy consumption and relevant variables;
- the EnMS boundary;
- available data for energy consumption and relevant variables.