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متن انگلیسی استاندارد بین المللی ISO 50001 ویرایش ۲۰۱۸

ISO 50001:2018

استاندارد ایزو مدیریت انرژی

National foreword

This British Standard is the UK implementation of EN ISO 50001:2018. It is identical to ISO 50001:2018. It supersedes BS EN ISO 50001:2011, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee SEM/1, Energy Management.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2018

ISBN 978 0 580 93443 8

ICS 13.020.10; 03.100.70; 03.100.99; 27.015

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2018.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 50001

August 2018

ICS 03.100.70; 27.015

Supersedes EN ISO 50001:2011

English version

Energy management systems - Requirements with guidance for use (ISO 50001:2018)

Systèmes de management de l'énergie - Exigences et recommandations pour la mise en oeuvre (ISO 50001:2018)

Energiemanagementsysteme - Anforderungen mit Anleitung zur Anwendung (ISO 50001:2018)

This European Standard was approved by CEN on 6 August 2018.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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CEN-CENELEC Management Centre:
Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 50001:2018) has been prepared by Technical Committee ISO/TC 301 "Energy management and energy savings" in collaboration with Technical Committee CEN/CLC/JTC 14 “Energy management, energy audits, energy savings” the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2019, and conflicting national standards shall be withdrawn at the latest by February 2019.

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

This document supersedes EN ISO 50001:2011.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 50001:2018 has been approved by CEN as EN ISO 50001:2018 without any modification.

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 301, *Energy management and energy savings*.

This second edition cancels and replaces the first edition (ISO 50001:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

— adoption of ISO's requirements for management system standards, including a high-level structure, identical core text, and common terms and definitions, to ensure a high level of compatibility with other management system standards;

— better integration with strategic management processes;

— clarification of language and document structure;

— stronger emphasis on the role of top management;

— adoption of context order for the terms and their definitions in Clause 3 and update of some definitions;

— inclusion of new definitions, including energy performance improvement;

— clarification on exclusions of energy types;

— clarification of "energy review";

— introduction of the concept of normalization of energy performance indicators [EnPI(s)] and associated energy baselines [EnB(s)];

— addition of details on the energy data collection plan and related requirements (previously energy measurement plan);

— clarification of text related to energy performance indicators [EnPI(s)] and energy baselines [EnB(s)] in order to provide a better understanding of these concepts.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

0.1 General

The aim of this document is to enable organizations to establish the systems and processes necessary to continually improve energy performance, including energy efficiency, energy use and energy consumption. This document specifies the energy management system (EnMS) requirements for an organization. Successful implementation of an EnMS supports a culture of energy performance improvement that depends upon commitment from all levels of the organization, especially top management. In many instances, this involves cultural changes within an organization.

This document applies to the activities under the control of the organization. Its application can be tailored to fit the specific requirements of the organization, including the complexity of its systems, degree of documented information and available resources. This document does not apply to product use by end-users outside of the scope and boundaries of the EnMS, nor does it apply to product design outside of facilities, equipment, systems or energy-using processes. This document does apply to the design and procurement of facilities, equipment, systems or energy-using processes within the scope and boundaries of the EnMS.

Development and implementation of an EnMS includes an energy policy, objectives, energy targets and action plans related to its energy efficiency, energy use, and energy consumption while meeting applicable legal requirements and other requirements. An EnMS enables an organization to set and achieve objectives and energy targets, to take actions as needed to improve its energy performance, and to demonstrate the conformity of its system to the requirements of this document.

0.2 Energy performance approach

This document provides requirements for a systematic, data-driven and facts-based process, focused on continually improving energy performance. Energy performance is a key element integrated within the concepts introduced in this document in order to ensure effective and measurable results over time. Energy performance is a concept which is related to energy efficiency, energy use and energy consumption. Energy performance indicators (EnPIs) and energy baselines (EnBs) are two interrelated elements addressed in this document to enable organizations to demonstrate energy performance improvement.

0.3 Plan-Do-Check-Act (PDCA) cycle

The EnMS described in this document is based on the Plan-Do-Check-Act (PDCA) continual improvement framework and incorporates energy management into existing organizational practices, as illustrated in Figure 1.

In the context of energy management, the PDCA approach can be outlined as follows.

— **Plan**: understand the context of the organization, establish an energy policy and an energy management team, consider actions to address risks and opportunities, conduct an energy review, identify significant energy uses (SEUs) and establish energy performance indicators (EnPIs), energy baseline(s) (EnBs), objectives and energy targets, and action plans necessary to deliver results that will improve energy performance in accordance with the organization's energy policy.

— **Do**: implement the action plans, operational and maintenance controls, and communication, ensure competence and consider energy performance in design and procurement.

— **Check**: monitor, measure, analyse, evaluate, audit and conduct management review(s) of energy performance and the EnMS.

— **Act**: take actions to address nonconformities and continually improve energy performance and the EnMS.

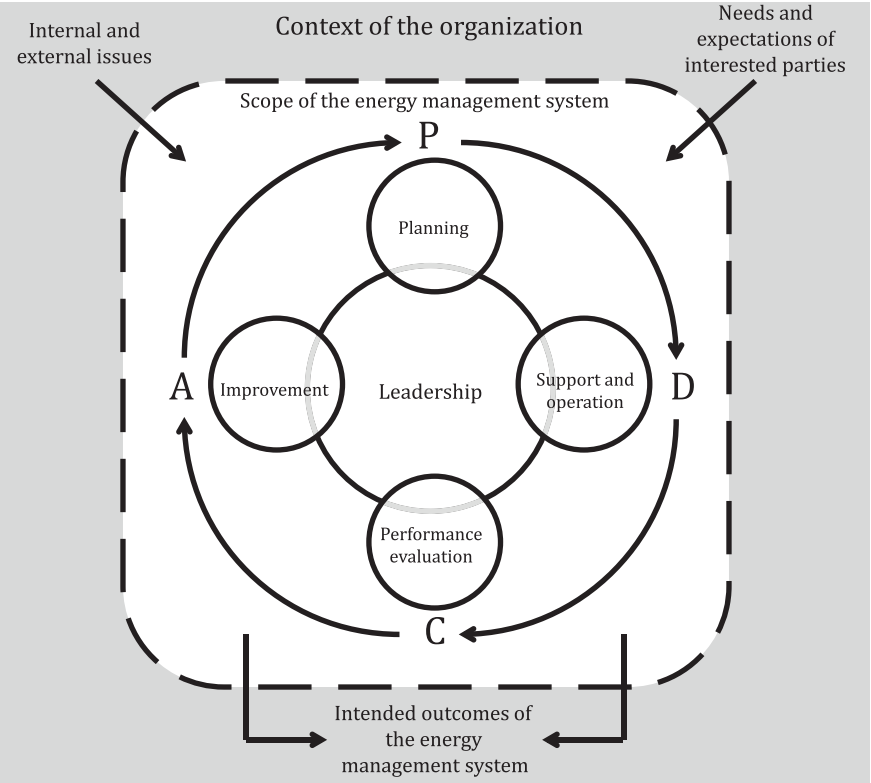

Figure 1 — Plan-Do-Check-Act Cycle

0.4 Compatibility with other management system standards

This document conforms to ISO's requirements for management system standards, including a high-level structure, identical core text, and common terms and definitions, thereby ensuring a high level of compatibility with other management system standards. This document can be used independently; however, an organization can choose to combine its EnMS with other management systems, or integrate its EnMS in the achievement of other business, environmental or social objectives. Two organizations carrying out similar operations, but having different energy performance, can both conform to the requirements of ISO 50001.

This document contains the requirements used to assess conformity. An organization that wishes to demonstrate conformity with this document can do so by:

— making an evaluation and self-declaration, or

— seeking confirmation of its conformance or self-declaration by interested parties, such as customers, or

— seeking certification/registration of its EnMS by an external organization.

In this document, the following verbal forms are used:

— “shall” indicates a requirement;

— “should” indicates a recommendation;

— “can” indicates a possibility or a capability;

— “may” indicates a permission.

Information marked as “NOTE” is intended to assist the understanding or use of the document. “Notes to entry” used in Clause 3 provide additional information that supplements the terminological data and can contain requirements relating to the use of a term.

0.5 Benefits of this document

Effective implementation of this document provides a systematic approach to improvement of energy performance that can transform the way organizations manage energy. By integrating energy management into business practice, organizations can establish a process for continual improvement of energy performance. By improving energy performance and associated energy costs, organizations can be more competitive. In addition, implementation can lead organizations to meet overall climate change mitigation goals by reducing their energy-related greenhouse gas emissions.

Energy management systems — Requirements with guidance for use

1 Scope

This document specifies requirements for establishing, implementing, maintaining and improving an energy management system (EnMS). The intended outcome is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance and the EnMS.

This document:

a) is applicable to any organization regardless of its type, size, complexity, geographical location, organizational culture or the products and services it provides;

b) is applicable to activities affecting energy performance that are managed and controlled by the organization;

c) is applicable irrespective of the quantity, use, or types of energy consumed;

d) requires demonstration of continual energy performance improvement, but does not define levels of energy performance improvement to be achieved;

e) can be used independently, or be aligned or integrated with other management systems.

Annex A provides guidance for the use of this document. Annex B provides a comparison of this edition with the previous edition.

2 Normative references

There are no normative references in this document.

3 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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms related to organization

3.1.1
organization
person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its *objectives* (3.4.13)

Note 1 to entry: The concept of organization includes, but is not limited to, sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.

3.1.2
top management
person or group of people who directs and controls an *organization* (3.1.1) at the highest level

Note 1 to entry: Top management is empowered to delegate authority and provide resources within the organization.

Note 2 to entry: If the scope of the *management system* (3.2.1) covers only part of an organization, then top management refers to those who direct and control that part of the organization.

Note 3 to entry: Top management controls the organization as defined within the *EnMS scope* (3.1.4) and *boundaries* (3.1.3) of the *energy management system* (3.2.2).

3.1.3
boundary
physical or organizational limits

EXAMPLE A *process* (3.3.6); a group of processes; a site; multiple sites under the control of an organization, or an entire *organization* (3.1.1).

Note 1 to entry: The organization defines the boundary(ies) of its EnMS.

3.1.4
energy management system scope
EnMS scope
set of activities, which an *organization* (3.1.1) addresses through an *energy management system* (3.2.2)

Note 1 to entry: The EnMS scope can include several *boundaries* (3.1.3) and can include transport operations.

3.1.5
interested party (preferred term)
stakeholder (admitted term)
person or *organization* (3.1.1) that can affect, be affected by, or perceive itself to be affected by a decision or activity

3.2 Terms related to management system

3.2.1
management system
set of interrelated or interacting elements of an *organization* (3.1.1) to establish *policies* (3.2.3) and *objectives* (3.4.13) and *processes* (3.3.6) to achieve those objectives

Note 1 to entry: A management system can address a single discipline or several disciplines.

Note 2 to entry: The system elements include the organization's structure, roles and responsibilities, planning and operation.

Note 3 to entry: In some management systems, the scope of a management system can include the whole of the organization, specific and identified functions of the organization, specific and identified sections of the organization, or one or more functions across a group of organizations. The *EnMS scope* (3.1.4) includes all energy types within its *boundaries* (3.1.3).

3.2.2
energy management system
EnMS
management system (3.2.1) to establish an *energy policy* (3.2.4), *objectives* (3.4.13), *energy targets* (3.4.15), action plans and *process(es)* (3.3.6) to achieve the objectives and energy targets

3.2.3
policy
intentions and direction of an *organization* (3.1.1), as formally expressed by its *top management* (3.1.2)

3.2.4
energy policy
statement by the *organization* (3.1.1) of its overall intention(s), direction(s), and commitment(s) related to its *energy performance* (3.4.3), as formally expressed by *top management* (3.1.2)

3.2.5
energy management team
person(s) with responsibility and authority for effective implementation of an *energy management system* (3.2.2) and for delivering *energy performance improvement* (3.4.6)

Note 1 to entry: The size and nature of an *organization* (3.1.1) and available resources are taken into account when determining the size of an energy management team. A single person can perform the role of the team.

3.3 Terms related to requirement

3.3.1
requirement
need or expectation that is stated, generally implied or obligatory

Note 1 to entry: "Generally implied" means that it is custom or common practice for the *organization* (3.1.1) and *interested parties* (3.1.5) that the need or expectation under consideration is implied.

Note 2 to entry: A specified requirement is one that is stated, for example in *documented information* (3.3.5).

3.3.2
conformity
fulfilment of a *requirement* (3.3.1)

3.3.3
nonconformity
non-fulfilment of a *requirement* (3.3.1)

3.3.4
corrective action
action to eliminate the cause of a *nonconformity* (3.3.3) and to prevent recurrence

3.3.5
documented information
information required to be controlled and maintained by an *organization* (3.1.1) and the medium on which it is contained

Note 1 to entry: Documented information can be in any format and media, and from any source.

Note 2 to entry: Documented information can refer to:

— the *management system* (3.2.1), including related *processes* (3.3.6);

— information created in order for the organization to operate (documentation);

— evidence of results achieved (records).

3.3.6
process
set of interrelated or interacting activities which transform inputs into outputs

Note 1 to entry: A process related to an *organization's* (3.1.1) activities can be

— physical (e.g. energy-using processes, such as combustion), or

— business or service (e.g. order fulfilment).

3.3.7
monitoring
determining the status of a system, a *process* (3.3.6) or an activity

Note 1 to entry: To determine the status, there can be a need to check, supervise or critically observe.

Note 2 to entry: In an *energy management system* (3.2.2), monitoring can be a review of energy data.

3.3.8
audit
systematic, independent and documented *process* (3.3.6) for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled

Note 1 to entry: An audit can be an internal audit (first party) or an external audit (second party or third party), and it can be a combined audit (combining two or more disciplines).

Note 2 to entry: An internal audit is conducted by the *organization* (3.1.1) itself, or by an external party on its behalf.

Note 3 to entry: "Audit evidence" and "audit criteria" are defined in ISO 19011.

Note 4 to entry: The term "audit" as defined here and as used in this document means the internal audit of an *energy management system* (3.2.2). This is different from an "energy audit". In this definition, "audit evidence" means evidence from an internal audit of the energy management system, and not evidence from an energy audit.

3.3.9
outsource (verb)
make an arrangement where an external *organization* (3.1.1) performs part of an organization's function or *process* (3.3.6)

Note 1 to entry: While an external organization is outside the scope of the *management system* (3.2.1), the outsourced function or process is within the scope.

3.4 Terms related to performance

3.4.1
measurement
process (3.3.6) to determine a value

Note 1 to entry: See ISO/IEC Guide 99 for additional information on measurement-related concepts.

3.4.2
performance
measurable result

Note 1 to entry: Performance can relate either to quantitative or qualitative findings.

Note 2 to entry: Performance can relate to the management of activities, *processes* (3.3.6), products (including services), systems or *organizations* (3.1.1).

3.4.3
energy performance
measurable result(s) related to *energy efficiency* (3.5.3), *energy use* (3.5.4) and *energy consumption* (3.5.2)

Note 1 to entry: Energy performance can be measured against the *organization's* (3.1.1) *objectives* (3.4.13), *energy targets* (3.4.15) and other energy performance requirements.

Note 2 to entry: Energy performance is one component of the *performance* (3.4.2) of the *energy management system* (3.2.2).

3.4.4
energy performance indicator
EnPI
measure or unit of *energy performance* (3.4.3), as defined by the *organization* (3.1.1)

Note 1 to entry: EnPI(s) can be expressed by using a simple metric, ratio, or a model, depending on the nature of the activities being measured.

Note 2 to entry: See ISO 50006 for additional information on EnPI(s).

3.4.5
energy performance indicator value
EnPI value
quantification of the *EnPI* (3.4.4) at a point in or over a specified period of time

3.4.6
energy performance improvement
improvement in measurable results of *energy efficiency* (3.5.3), or *energy consumption* (3.5.2) related to *energy use* (3.5.4), compared to the *energy baseline* (3.4.7)

3.4.7
energy baseline
EnB
quantitative reference(s) providing a basis for comparison of *energy performance* (3.4.3)

Note 1 to entry: An energy baseline is based on data from a specified period of time and/or conditions, as defined by the *organization* (3.1.1).

Note 2 to entry: One or more energy baselines are used for determination of *energy performance improvement* (3.4.6), as a reference before and after, or with and without implementation of energy performance improvement actions.

Note 3 to entry: See ISO 50015 for additional information on measurement and verification of energy performance.

Note 4 to entry: See ISO 50006 for additional information on EnPIs and EnBs.

3.4.8
static factor
identified factor that significantly impacts *energy performance* (3.4.3) and does not routinely change

Note 1 to entry: Significance criteria are determined by the *organization* (3.1.1).

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

[SOURCE: ISO 50015:2014, 3.22, modified — Note 1 to entry and EXAMPLE 1 have been modified and EXAMPLE 2 has been deleted.]

3.4.9
relevant variable
quantifiable factor that significantly impacts *energy performance* (3.4.3) and routinely changes

Note 1 to entry: Significance criteria are determined by the *organization* (3.1.1).

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

[SOURCE: ISO 50015:2014, 3.18, modified — Note 1 to entry has been added and wording of examples has been modified.]

3.4.10
normalization
modification of data to account for changes to enable comparison of *energy performance* (3.4.3) under equivalent conditions

3.4.11
risk
effect of uncertainty

Note 1 to entry: An effect is a deviation from the expected – positive or negative.

Note 2 to entry: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood.

Note 3 to entry: Risk is often characterized by reference to potential "events" (as defined in ISO Guide 73) and "consequences" (as defined in ISO Guide 73), or a combination of these.

Note 4 to entry: Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated "likelihood" (as defined in ISO Guide 73) of occurrence.

3.4.12
competence
ability to apply knowledge and skills to achieve intended results

3.4.13
objective
results to be achieved

Note 1 to entry: An objective can be strategic, tactical, or operational.

Note 2 to entry: Objectives can relate to different disciplines (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and *process* (3.3.6)).

Note 3 to entry: An objective can be expressed in other ways, e.g. as an intended outcome, a purpose, an operational criterion, as an energy objective, or by the use of other words with similar meaning (e.g. aim, goal).

Note 4 to entry: In the context of *energy management systems* (3.2.2), objectives are set by the *organization* (3.1.1), consistent with the *energy policy* (3.2.4), to achieve specific results.

3.4.14
effectiveness
extent to which planned activities are realized and planned results achieved

3.4.15
energy target
quantifiable *objective* (3.4.13) of *energy performance improvement* (3.4.6)

Note 1 to entry: An energy target can be included within an objective.

3.4.16
continual improvement
recurring activity to enhance *performance* (3.4.2)

Note 1 to entry: The concept relates to the improvement of *energy performance* (3.4.3) and the *energy management system* (3.2.2).

3.5 Terms related to energy

3.5.1
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 an equipment or in a process, or recovered.

3.5.2
energy consumption
quantity of *energy* (3.5.1) applied

3.5.3
energy efficiency
ratio or other quantitative relationship between an output of *performance* (3.4.2), service, goods, commodities, or *energy* (3.5.1), and an input of energy

EXAMPLE Conversion efficiency; energy required/energy consumed.

Note 1 to entry: Both input and output should be clearly specified in terms of quantity and quality and be measurable.

3.5.4
energy use
application of *energy* (3.5.1)

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

Note 1 to entry: Energy use is sometimes referred to as "energy end-use".

3.5.5
energy review
analysis of *energy efficiency* (3.5.3), *energy use* (3.5.4) and *energy consumption* (3.5.2) based on data and other information, leading to identification of *SEUs* (3.5.6) and opportunities for *energy performance improvement* (3.4.6)

3.5.6
significant energy use
SEU
energy use (3.5.4) accounting for substantial *energy consumption* (3.5.2) and/or offering considerable potential for *energy performance improvement* (3.4.6)

Note 1 to entry: Significance criteria are determined by the *organization* (3.1.1).

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

4 Context of the organization

4.1 Understanding the organization and its context

The organization shall determine external and internal issues that are relevant to its purpose and that affect its ability to achieve the intended outcome(s) of its EnMS and improve its energy performance.

4.2 Understanding the needs and expectations of interested parties

The organization shall determine:

a) the interested parties that are relevant to energy performance and the EnMS;

b) the relevant requirements of these interested parties;

c) which of the identified needs and expectations the organization addresses through its EnMS.

The organization shall:

— ensure that it has access to the applicable legal requirements and other requirements related to its energy efficiency, energy use and energy consumption;

— determine how these requirements apply to its energy efficiency, energy use and energy consumption;

— ensure that these requirements are taken into account;

— review at defined intervals its legal requirements and other requirements.

NOTE For additional information on compliance management, see ISO 19600.

4.3 Determining the scope of the energy management system

The organization shall determine the boundaries and applicability of the EnMS to establish its scope.

When determining the EnMS scope, the organization shall consider:

a) the external and internal issues referred to in 4.1;

b) the requirements referred to in 4.2.

The organization shall ensure that it has the authority to control its energy efficiency, energy use and energy consumption within the scope and boundaries. The organization shall not exclude an energy type within the scope and boundaries.

The EnMS scope and boundaries shall be maintained as documented information (see 7.5).

4.4 Energy management system

The organization shall establish, implement, maintain and continually improve an EnMS, including the processes needed and their interactions, and continually improve energy performance, in accordance with the requirements of this document.

NOTE The processes needed can differ from one organization to another due to:

— the size of organization and its type of activities, processes, products and services;

— the complexity of processes and their interactions;

— the competence of personnel.

5 Leadership

5.1 Leadership and commitment

Top management shall demonstrate leadership and commitment with respect to continual improvement of its energy performance and the effectiveness of the EnMS, by:

a) ensuring that the EnMS scope and boundaries are established;

b) ensuring that the energy policy (see 5.2), objectives and energy targets (see 6.2) are established and are compatible with the strategic direction of the organization;

c) ensuring the integration of the EnMS requirements into the organization's business processes;

NOTE Reference to "business" in this document can be interpreted broadly to mean those activities that are core to the purposes of the organization's existence.

d) ensuring that action plans are approved and implemented;

e) ensuring that the resources needed for the EnMS are available;

f) communicating the importance of effective energy management and of conforming to the EnMS requirements;

g) ensuring that the EnMS achieves its intended outcome(s);

h) promoting continual improvement of energy performance and the EnMS;

i) ensuring the formation of an energy management team;

j) directing and supporting persons to contribute to the effectiveness of the EnMS and to energy performance improvement;

k) supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility;

l) ensuring that the EnPI(s) appropriately represent(s) energy performance;

m) ensuring that processes are established and implemented to identify and address changes affecting the EnMS and energy performance within the scope and boundary of the EnMS.

5.2 Energy policy

Top management shall establish an energy policy that:

a) is appropriate to the purpose of the organization;

b) provides a framework for setting and reviewing objectives and energy targets (see 6.2);

c) includes a commitment to ensure the availability of information and necessary resources to achieve objectives and energy targets;

d) includes a commitment to satisfy applicable legal requirements and other requirements (see 4.2) related to energy efficiency, energy use and energy consumption;

e) includes a commitment to continual improvement (see 10.2) of energy performance and the EnMS;

f) supports the procurement (see 8.3) of energy efficient products and services that impact energy performance;

g) supports design (see 8.2) activities that consider energy performance improvement.

The energy policy shall:

— be available as documented information (see 7.5);

— be communicated within the organization;

— be available to interested parties, as appropriate;

— be periodically reviewed and updated as necessary.

5.3 Organization roles, responsibilities and authorities

Top management shall ensure that the responsibilities and authorities for relevant roles are assigned and communicated within the organization.

Top management shall assign the responsibility and authority to the energy management team for:

a) ensuring that the EnMS is established, implemented, maintained and continually improved;

b) ensuring that the EnMS conforms to the requirements of this document;

c) implementing action plans (see 6.2) to continually improve energy performance;

d) reporting on the performance of the EnMS and improvement of energy performance to top management at determined intervals;

e) establishing criteria and methods needed to ensure that the operation and control of the EnMS are effective.

6 Planning

6.1 Actions to address risks and opportunities

6.1.1 When planning for the EnMS, the organization shall consider the issues referred to in 4.1 and the requirements referred to in 4.2 and review the organization's activities and processes that can affect energy performance. Planning shall be consistent with the energy policy and shall lead to actions that result in continual improvement in energy performance. The organization shall determine the risks and opportunities that need to be addressed to:

— give assurance that the EnMS can achieve its intended outcome(s), including energy performance improvement;

— prevent or reduce undesired effects;

— achieve continual improvement of the EnMS and energy performance.

NOTE A concept diagram illustrating the energy planning process is shown in Figure A.2.

6.1.2 The organization shall plan:

a) actions to address these risks and opportunities;

b) how to:

1) integrate and implement the actions into its EnMS and energy performance processes;

2) evaluate the effectiveness of these actions.

6.2 Objectives, energy targets and planning to achieve them

6.2.1 The organization shall establish objectives at relevant functions and levels. The organization shall establish energy targets.

6.2.2 The objectives and energy targets shall:

a) be consistent with the energy policy (see 5.2);

b) be measurable (if practicable);

c) take into account applicable requirements;

d) consider SEUs (see 6.3);

e) take into account opportunities (see 6.3) to improve energy performance;

f) be monitored;

g) be communicated;

h) be updated as appropriate.

The organization shall retain documented information (see 7.5) on the objectives and energy targets.

6.2.3 When planning how to achieve its objectives and energy targets, the organization shall establish and maintain action plans that include:

— what will be done;

— what resources will be required;

— who will be responsible;

— when it will be completed;

— how the results will be evaluated, including the method(s) used to verify energy performance improvement (see 9.1).

The organization shall consider how the actions to achieve its objectives and energy targets can be integrated into the organization's business processes. The organization shall retain documented information on action plans (see 7.5).

6.3 Energy review

The organization shall develop and conduct an energy review.

To develop the energy review, the organization shall:

a) analyse energy use and consumption based on measurement and other data, i.e.:

   1) identify current types of energy (see 3.5.1);

   2) evaluate past and current energy use(s) and consumption;

b) based on the analysis, identify SEUs (see 3.5.6);

c) for each SEU:

   1) determine relevant variables;

   2) determine current energy performance;

   3) identify the person(s) doing work under its control that influence or affect the SEUs;

d) determine and prioritize opportunities for improving energy performance;

e) estimate future energy use(s) and energy consumption.

The energy review shall be updated at defined intervals, as well as in response to major changes in facilities, equipment, systems or energy-using processes.

The organization shall maintain as documented information (see 7.5) the methods and criteria used to develop the energy review, and shall retain documented information of its results.

6.4 Energy performance indicators

The organization shall determine EnPIs that:

a) are appropriate for measuring and monitoring its energy performance;

b) enable the organization to demonstrate energy performance improvement.

The method for determining and updating the EnPI(s) shall be maintained as documented information (see 7.5). Where the organization has data indicating that relevant variables significantly affect energy performance, the organization shall consider such data to establish appropriate EnPI(s).

EnPI value(s) shall be reviewed and compared to their respective EnB(s), as appropriate. The organization shall retain documented information (see 7.5) of EnPI value(s).

6.5 Energy baseline

The organization shall establish (an) EnB(s) using the information from the energy review(s) (see 6.3), taking into account a suitable period of time.

Where the organization has data indicating that relevant variables significantly affect energy performance, the organization shall carry out normalization of the EnPI value(s) and corresponding EnB(s).

NOTE Depending on the nature of the activities, normalization can be a simple adjustment, or a more complex procedure.

EnB(s) shall be revised in the case of one or more of the following:

a) EnPI(s) no longer reflect the organization's energy performance;

b) there have been major changes to the static factors;

c) according to a pre-determined method.

The organization shall retain information of EnB(s), relevant variable data and modifications to EnB(s) as documented information (see 7.5).

6.6 Planning for collection of energy data

The organization shall ensure that key characteristics of its operations affecting energy performance are identified, measured, monitored and analysed at planned intervals (see 9.1). The organization shall define and implement an energy data collection plan appropriate to its size, its complexity, its resources and its measurement and monitoring equipment. The plan shall specify the data necessary to monitor the key characteristics and state how and at what frequency the data shall be collected and retained.

Data to be collected (or acquired by measurement as applicable) and retained documented information (see 7.5) shall include:

a) the relevant variables for SEUs;

b) energy consumption related to SEUs and to the organization;

c) operational criteria related to SEUs;

d) static factors, if applicable;

e) data specified in action plans.

The energy data collection plan shall be reviewed at defined intervals and updated as appropriate.

The organization shall ensure that the equipment used for measurement of key characteristics provides data which are accurate and repeatable. The organization shall retain documented information (see 7.5) on measurement, monitoring and other means of establishing accuracy and repeatability.

7 Support

7.1 Resources

The organization shall determine and provide the resources needed for the establishment, implementation, maintenance and continual improvement of energy performance and the EnMS.

7.2 Competence

The organization shall:

a) determine the necessary competence of person(s) doing work under its control that affects its energy performance and EnMS;

b) ensure that these persons are competent on the basis of appropriate education, training, skills or experience;

c) where applicable, take actions to acquire the necessary competence, and evaluate the effectiveness of the actions taken;

d) retain appropriate documented information (see 7.5) as evidence of competence.

NOTE Applicable actions can include, for example, the provision of training to, the mentoring of, or the reassignment of currently employed persons; or the hiring or contracting of competent persons.

7.3 Awareness

Persons doing work under the organization's control shall be aware of:

a) the energy policy (see 5.2);

b) their contribution to the effectiveness of the EnMS, including achievement of objectives and energy targets (see 6.2), and the benefits of improved energy performance;

c) the impact of their activities or behaviour with respect to energy performance;

d) the implications of not conforming with the EnMS requirements.

7.4 Communication

The organization shall determine the internal and external communications relevant to the EnMS, including:

a) on what it will communicate;

b) when to communicate;

c) with whom to communicate;

d) how to communicate;

e) who communicates.

When establishing its communication process(es), the organization shall ensure that information communicated is consistent with information generated within the EnMS and is dependable.

The organization shall establish and implement a process by which any person(s) doing work under the organization's control can make comments or suggest improvements to the EnMS and to energy performance. The organization shall consider retaining documented information (see 7.5) of the suggested improvements.

7.5 Documented information

7.5.1 General

The organization's EnMS shall include:

a) documented information required by this document;

b) documented information determined by the organization as being necessary for the effectiveness of the EnMS and to demonstrate energy performance improvement.

NOTE The extent of documented information for an EnMS can differ from one organization to another due to:

— the size of organization and its type of activities, processes, products and services;

— the complexity of processes and their interactions;

— the competence of persons.

7.5.2 Creating and updating

When creating and updating documented information, the organization shall ensure appropriate:

a) identification and description (e.g. a title, date, author or reference number);

b) format (e.g. language, software version, graphics) and media (e.g. paper, electronic);

c) review and approval for suitability and adequacy.

7.5.3 Control of documented information

Documented information required by the EnMS and by this document shall be controlled to ensure:

a) it is available and suitable for use, where and when it is needed;

b) it is adequately protected (e.g. from loss of confidentiality, improper use, loss of integrity).

For the control of documented information, the organization shall address the following activities, as applicable:

— distribution, access, retrieval and use;

— storage and preservation, including preservation of legibility;

— control of changes (e.g. version control);

— retention and disposition.

Documented information of external origin determined by the organization to be necessary for the planning and operation of the EnMS shall be identified, as appropriate, and controlled.

NOTE Access can imply a decision regarding the permission to view the documented information only, or the permission and authority to view and change the documented information.

8 Operation

8.1 Operational planning and control

The organization shall plan, implement and control the processes, related to its SEUs (see 6.3), needed to meet requirements and to implement the actions determined in 6.2, by:

a) establishing criteria for the processes, including the effective operation and maintenance of facilities, equipment, systems and energy-using processes, where their absence can lead to a significant deviation from intended energy performance;

NOTE Significant deviation criteria are determined by the organization.

b) communicating (see 7.4) the criteria to relevant person(s) doing work under the control of the organization;

c) implementing control of the processes in accordance with the criteria, including operating and maintaining facilities, equipment, systems and energy-using processes in accordance with established criteria;

d) keeping documented information (see 7.5) to the extent necessary to have confidence that the processes have been carried out as planned.

The organization shall control planned changes and review the consequences of unintended changes, taking actions to mitigate any adverse effects, as necessary.

The organization shall ensure that outsourced SEUs or processes related to its SEUs (see 6.3) are controlled (see 8.3).

8.2 Design

The organization shall consider energy performance improvement opportunities and operational control in the design of new, modified and renovated facilities, equipment, systems and energy-using processes that can have a significant impact on its energy performance over the planned or expected operating lifetime.

Where applicable, the results of the energy performance consideration shall be incorporated into specification, design and procurement activities.

The organization shall retain documented information of the design activities related to energy performance (see 7.5).

8.3 Procurement

The organization shall establish and implement criteria for evaluating energy performance over the planned or expected operating lifetime, when procuring energy using products, equipment and services which are expected to have a significant impact on the organization's energy performance.

When procuring energy using products, equipment and services that have, or can have, an impact on SEUs, the organization shall inform suppliers that energy performance is one of the evaluation criteria for procurement.

Where applicable, the organization shall define and communicate specifications for:

a) ensuring the energy performance of procured equipment and services;

b) the purchase of energy.

9 Performance evaluation

9.1 Monitoring, measurement, analysis and evaluation of energy performance and the EnMS

9.1.1 General

The organization shall determine for energy performance and the EnMS:

a) what needs to be monitored and measured, including at a minimum the following key characteristics:

   1) the effectiveness of the action plans in achieving objectives and energy targets;

   2) EnPI(s);

   3) operation of SEUs;

4) actual versus expected energy consumption;

b) the methods for monitoring, measurement, analysis and evaluation, as applicable, to ensure valid results;

c) when the monitoring and measurement shall be performed;

d) when the results from monitoring and measurement shall be analysed and evaluated.

The organization shall evaluate its energy performance and the effectiveness of the EnMS (see 6.6).

Improvement in energy performance shall be evaluated by comparing EnPI value(s) (see 6.4) against the corresponding EnB(s) (see 6.5).

The organization shall investigate and respond to significant deviations in energy performance. The organization shall retain documented information on the results of the investigation and response (see 7.5).

The organization shall retain appropriate documented information on the results from monitoring and measurement (see 7.5).

9.1.2 Evaluation of compliance with legal requirements and other requirements

At planned intervals, the organization shall evaluate compliance with legal and other requirements (see 4.2) related to its energy efficiency, energy use, energy consumption and the EnMS. The organization shall retain documented information (see 7.5) on the results of the evaluation of compliance and any actions taken.

9.2 Internal audit

9.2.1 The organization shall conduct internal audits of the EnMS at planned intervals to provide information on whether the EnMS:

a) improves energy performance;

b) conforms to:

— the organization's own requirements for its EnMS;

— the energy policy (see 5.2), objectives and energy targets (see 6.2) established by the organization;

— the requirements of this document;

c) is effectively implemented and maintained.

9.2.2 The organization shall:

a) plan, establish, implement and maintain (an) audit programme(s) including the frequency, methods, responsibilities, planning requirements and reporting, which shall take into consideration the importance of the processes concerned and the results of previous audits;

b) define the audit criteria and scope for each audit;

c) select auditors and conduct audits to ensure objectivity and the impartiality of the audit process;

d) ensure that the results of the audits are reported to relevant management;

e) take appropriate actions in accordance with 10.1 and 10.2;

f) retain documented information (see 7.5) as evidence of the implementation of the audit programme(s) and the audit results.

9.3 Management review

9.3.1 Top management shall review the organization's EnMS, at planned intervals, to ensure its continuing suitability, adequacy, effectiveness and alignment with the strategic direction of the organization.

9.3.2 The management review shall include consideration of:

a) the status of actions from previous management reviews;

b) changes in external and internal issues and associated risks and opportunities that are relevant to the EnMS;

c) information on the EnMS performance, including trends in:

   1) nonconformities and corrective actions;

   2) monitoring and measurement results;

   3) audit results;

   4) results of the evaluation of compliance with legal requirements and other requirements;

d) opportunities for continual improvement, including those for competence;

e) energy policy.

9.3.3 The energy performance inputs to management review shall include:

— the extent to which objectives and energy targets have been met;

— energy performance and energy performance improvement based on monitoring and measurement results including the EnPI(s);

— status of the action plans.

9.3.4 The outputs of the management review shall include decisions related to continual improvement opportunities and any need for changes to the EnMS, including:

a) opportunities to improve energy performance;

b) the energy policy;

c) the EnPI(s) or EnB(s);

d) objectives, energy targets, action plans or other elements of the EnMS and actions to be taken if they are not achieved;

e) opportunities to improve integration with business processes;

f) the allocation of resources;

g) the improvement of competence, awareness and communication.

The organization shall retain documented information as evidence of the results of management reviews.

10 Improvement

10.1 Nonconformity and corrective action

When a nonconformity is identified, the organization shall:

a) react to the nonconformity and, as applicable:

   1) take action to control and correct it;

   2) deal with the consequences;

b) evaluate the need for action to eliminate the cause(s) of the nonconformity, in order that it does not recur or occur elsewhere, by:

   1) reviewing the nonconformity;

   2) determining the causes of the nonconformity;

   3) determining if similar nonconformities exist, or can potentially occur;

c) implement any action needed;

d) review the effectiveness of any corrective action taken;

e) make changes to the EnMS, if necessary.

Corrective actions shall be appropriate to the effects of the encountered nonconformities.

The organization shall retain documented information of:

— the nature of the nonconformities and subsequent actions taken;

— the results of any corrective action.

10.2 Continual improvement

The organization shall continually improve the suitability, adequacy and effectiveness of the EnMS. The organization shall demonstrate continual energy performance improvement.

Annex A
(informative)

Guidance for use

A.1 General

The additional text given in this annex is strictly informative and is intended to prevent misinterpretation of the requirements in this document. While this information addresses and is consistent with the requirements, it is not intended to add to, subtract from, or in any way modify these requirements.

A.2 Relationship between energy performance and the EnMS

This document addresses both energy performance improvement and a management system approach to managing energy. The EnMS utilizes interrelated elements such as energy performance indicators (EnPIs) and energy baselines (EnBs) as a means to demonstrate measurable improvements in energy efficiency or energy consumption, related to energy use (see Figure A.1).

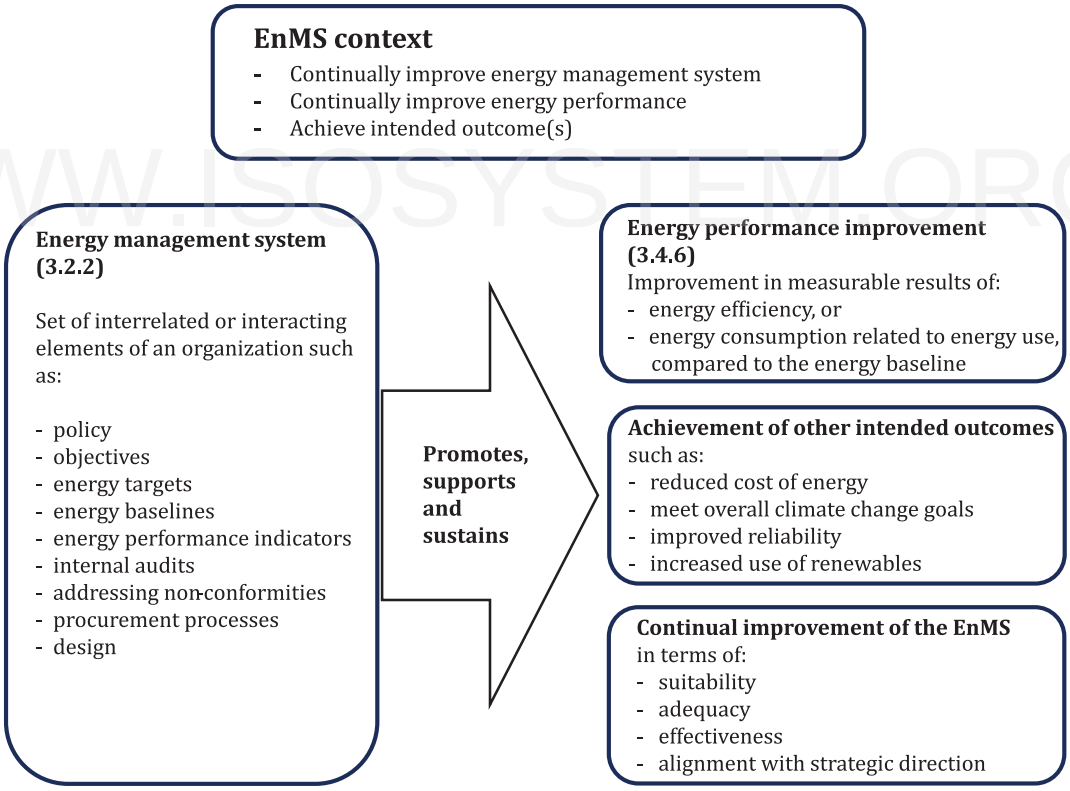

Figure A.1 — Relationship between energy performance and EnMS

While this document requires demonstration of energy performance improvement, it is the organization that defines its energy performance and energy targets as well as how energy performance improvement will be demonstrated.

A.3 Clarification of terminology

The clause structure and some of the terminology of this document have been changed from the previous edition to improve alignment with other management system standards. There is, however, no requirement in this document for its clause structure or terminology to be applied to an organization's EnMS documentation. There is no requirement to replace the terms used by an organization with the terms used in this document. Organizations can choose to use terms that suit their business and needs, or to use those found in this document.

— In this document, the use of the word "any" implies selection or choice.

— The words "appropriate" and "applicable" are not interchangeable. "Appropriate" means suitable (for, to) and implies some degree of freedom, while "applicable" means relevant or possible to apply and implies that if it can be done, it needs to be done.

— The word "consider" means it is necessary to think about the topic but it can be excluded, whereas "take into account" means it is necessary to think about the topic but it cannot be excluded.

— The word "ensure" means the responsibility can be delegated, but not the accountability.

— This document uses the term "interested party"; the term "stakeholder" is a synonym as it represents the same concept.

This edition uses some new terminology. A brief explanation is given below.

As part of the alignment with other management system standards, a common clause on documented information has been adopted without significant change or addition (see 7.5). Consequently, the terms "documented procedure" and "record" have both been replaced throughout the text by "documented information".

— "Documented information" replaces the nouns "documentation", "documents" and "records" used in previous editions of this document. To distinguish the intent of the generic term "documented information", this document now uses the phrase "retain documented information..." to mean records, and "maintain documented information" to mean documentation other than records that is kept up to date.

— The phrase "intended outcome" is what the organization intends to achieve by implementing its EnMS and working toward improved energy performance.

— The phrase "person(s) doing work under its control" includes persons working for the organization and those working on its behalf for which the organization has responsibility (e.g. contractors, service providers). It replaces the phrase "persons working for it or on its behalf" and "persons working for or on behalf of the organization" used in the previous edition of this document. The intent of this new phrase does not differ from that of the previous edition.

A.4 Context of the organization

The analysis of organizational context will provide a high-level conceptual understanding of the external and internal issues that can affect, either positively or negatively, energy performance and the EnMS of the organization.

Examples of external issues can include:

— issues related to interested parties such as existing national or sector objectives, requirements or standards;

— restrictions or limitations on energy supply, security and reliability;

— energy costs or the availability of types of energy;

— effects of weather;

— effects of climate change;

— effect on greenhouse gas (GHG) emissions.

Examples of internal issues can include:

— core business objectives and strategy;

— asset management plans;

— financial resource (labour, financial, etc.) affecting the organization;

— energy management maturity and culture;

— sustainability considerations;

— contingency plans for interruptions in energy supply;

— maturity of existing technology;

— operational risks and liability considerations.

Demonstrating continual energy performance improvement across the scope and within the boundaries of the EnMS does not mean all EnPI values improve. Some EnPI values improve, and others do not; but across the scope of the EnMS, the organization demonstrates energy performance improvement.

A.5 Leadership

A.5.1 Leadership and commitment

Top management has the overall responsibility for meeting the requirements of this document. Even if it delegates some responsibilities, the overall accountability still stays with top management.

When communicating to those in the organization, top management can emphasize the importance of energy management through employee involvement activities such as empowerment, motivation, recognition, training, rewards and participation.

A.5.2 Energy policy

An energy policy is the foundation for developing an organization's EnMS through all phases of planning, implementation, operation, performance evaluation and improvement. The energy policy can be a brief statement that members of the organization can readily understand and apply to their work activities.

A.5.3 Organization roles, responsibilities and authorities

No additional guidance is given.

A.6 Planning

A.6.1 Actions to address risks and opportunities

Considerations of risk and opportunities are part of high-level strategic decision-making in an organization. By identifying risks and opportunities when planning the EnMS, an organization can anticipate potential scenarios and consequences so that undesired effects can be addressed before they occur. Similarly, favourable considerations or circumstances that can offer potential advantages or beneficial outcomes can be identified and pursued.

Figure A.2 provides a conceptual diagram to improve understanding of the energy planning process. Figure A.2 does not represent the details of a specific organization. The information in Figure A.2 is

illustrative but is not meant to be exhaustive, and there can be other details specific to the organization or to particular circumstances.

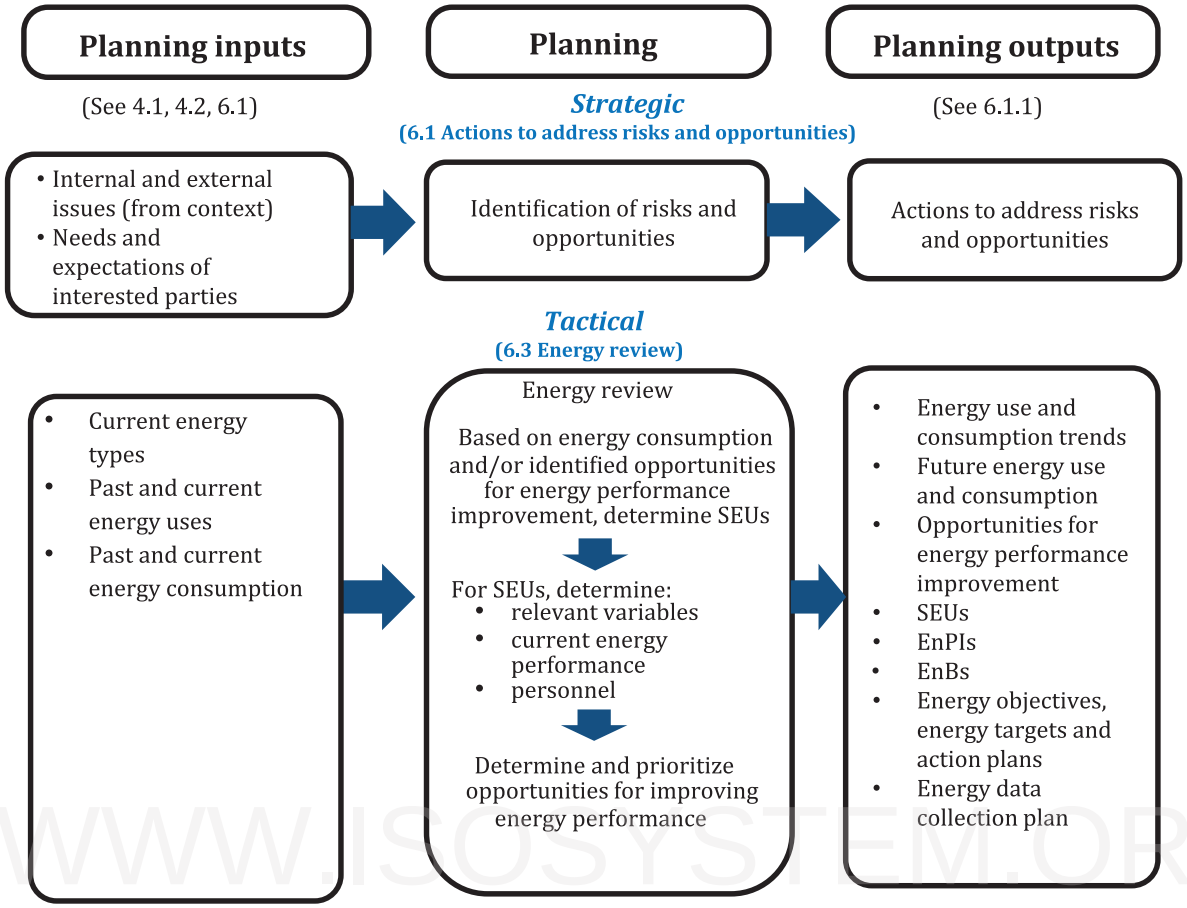

Figure A.2 — Energy planning process

A.6.2 Objectives, energy targets and planning to achieve them

Objectives can include both overall improvements to an EnMS and specific, measurable energy performance improvement targets. While some objectives will be quantifiable and have targets for energy performance improvement (e.g. reduce electricity consumption by 3 % by the end of the year, 2 % plant efficiency improvement by fourth quarter), other objectives can be qualitative (e.g. relating to energy behaviour, cultural change). It is often possible to provide some quantitative values for qualitative objectives, through surveys or other similar mechanisms.

A.6.3 Energy review

The process of identification of energy types and evaluation of energy use and energy consumption leads the organization to determine areas of significant energy use and identify opportunities for improving energy performance. In determining its SEUs, the organization determines the criteria for what is substantial energy consumption and/or what is a considerable potential for energy performance improvement. SEUs can be defined depending on the needs of the organization, such as by facility (e.g. warehouse, factory, office), by process or system (e.g. lighting, steam, transport, electrolysis, motor-driven) or equipment (e.g. motor, boiler). Once identified, the management and control of SEUs are an integral part of the EnMS.

Person(s) working under the control of the organization can include service contractors, part-time personnel and temporary staff.

Updating the energy review includes updating the data and information related to the analysis of energy use and energy consumption, determination of SEUs and identification of opportunities for improving energy performance. Not all parts of the energy review need to be updated at the same time. A formal energy audit can be used to assist in identifying opportunities for energy performance improvement in detail.

An energy audit can provide information on one or more parts of the energy review. The scope of an energy audit can comprise a detailed review of the energy performance of an organization, SEU(s), systems, energy-using processes and/or equipment. It is typically based on appropriate measurement and observation of actual energy performance for the defined energy audit scope. Energy audit outputs typically include information on current energy consumption and energy performance, and they can be accompanied by a series of specific recommendations ranked by energy performance improvement or financial return on investment, based on analysis of specific site data and operating conditions.

When looking for energy performance improvement opportunities, organizations should consider the extent to which energy is required for a particular process, or is recoverable. Even where a process such as a chemical reaction has limited improvement opportunities due to the energy requirements based on scientific laws, the auxiliary equipment can offer significant energy performance improvement potential, as can improved process control or equipment scheduling. Opportunities can also emerge over time due to changes in operating loads and parameters, equipment degradation and improvements in available technologies and techniques. Opportunities can also be identified in how equipment and systems are operated and maintained.

The installation of a renewable energy type within the scope and boundaries of the EnMS, as defined by the organization, does not represent an energy performance improvement. Energy consumption across the boundary can decrease, however, there will be no measurable improvement in energy efficiency or energy consumption related to energy use as a result of the change. The consumption of renewable energy can have a positive environmental effect and other benefits and an organization can have an objective to increase its installation of renewable energy. In such cases, an organization needs to assess the renewable energy production separately.

Where appropriate, an energy review can also consider security and availability of energy supply.

A.6.4 Energy performance indicators

An EnPI is a “ruler” that is used to compare energy performance before (reference EnPI value) and after (resultant or current EnPI value) the implementation of action plans and other actions (see Figure A.3). The difference between the reference value and the resultant value is a measure of a change in energy performance.

When business activities or EnBs change, the organization can update its EnPI(s), where relevant.

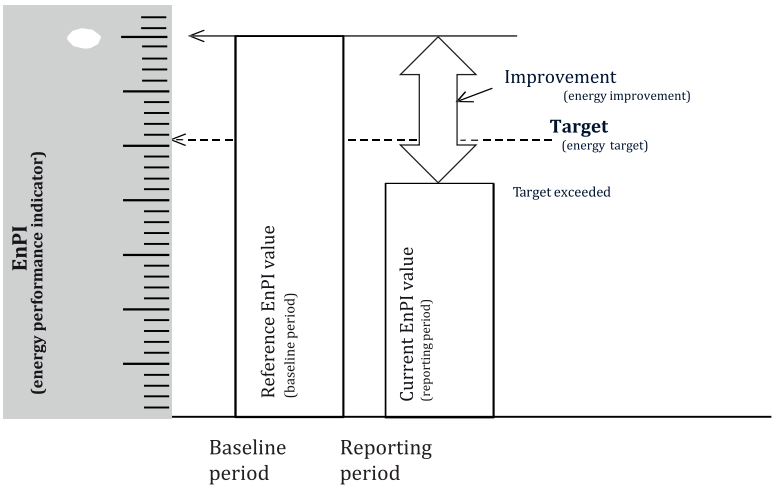

Figure A.3 — EnPI and EnPI value

A.6.5 Energy baseline

A suitable period of time means the organization accounts for operating cycles, regulatory requirements or variables that affect the energy consumption and energy efficiency, so that the data period adequately demonstrates a full range of performance. Data that the organization has can be data that it has generated (e.g. via measurement) or data which it has access to (e.g. public domain weather data).

The purpose of normalization is to enable reliable comparisons. Normalization of an EnPI value that considers changes in relevant variables provides a more accurate indication of energy performance.

When an energy use that consumes a significant amount of energy is removed or introduced within the scope and boundaries of the EnMS, the EnB should be modified accordingly.

A.6.6 Planning for collection of energy data

Data are critically important in monitoring and continually improving energy performance. Planning for which data to collect, how to collect them and how often to collect them helps ensure the availability of the data needed to maintain the energy review and the monitoring, measurement, analysis and evaluation processes.

Data can range from a simple numerical count up to complete monitoring and measurement systems connected to a software application capable of consolidating data and delivering automatic analysis.

A.7 Support

A.7.1 Resources

Resources include human resources, specialized skills, technology, data collection infrastructure and financial resources.

A.7.2 Competence

Competence requirements should be appropriate to the function, level and role of persons (including top management) doing work, which affects energy performance and the EnMS. Competence requirements are determined by the organization.

Training is one of the many methods for achieving competency. EnMS team members should be encouraged to continually develop, maintain and improve their knowledge, skills and expertise. Where relevant national or local qualification schemes (or equivalent) are available, certification can be considered.

A.7.3 Awareness

No additional guidance is given.

A.7.4 Communication

No additional guidance is given.

A.7.5 Documented information

This document provides details on what documented information is required to be maintained or retained. The organization can choose to develop additional documented information as it deems necessary to effectively demonstrate energy performance and support the EnMS. Documented information of external origin can include laws, regulations, standards, equipment manuals, weather data and data in support of static factors and relevant variables.

A.8 Operation

A.8.1 Operational planning and control

No additional guidance is given.

A.8.2 Design

Considering energy performance over the operating lifetime does not require a lifecycle analysis or lifecycle management. This document applies to the design of facilities, equipment, systems or energy-using processes within the scope and boundaries of the EnMS.

For new facilities, improved technologies and techniques, alternative energy such as renewables or less polluting types of energy options should be considered.

A.8.3 Procurement

Procurement is an opportunity to improve energy performance through the use of more efficient energy using products and services. It provides an opportunity to work with the supply chain and influence its energy behaviour.

The applicability of energy purchasing specifications can vary from market to market. Specifications for purchases of energy can include energy quality, quantity, reliability, availability, cost structure, environmental impact and alternative types of energy. The organization can use the specification proposed by an energy supplier, as appropriate.

A change to, or increase in, procurement of renewable energy from outside the scope of the EnMS does not affect energy consumption, nor does it improve energy performance, but it can have positive environmental impacts. Organizations can choose to include renewable energy procurement as one of their energy procurement criteria or specifications.

A.9 Performance evaluation

A.9.1 Monitoring, measurement, analysis and evaluation for energy performance and the EnMS

This clause involves implementation of the data collection plan (see 6.6) and evaluation of both energy performance improvement and effectiveness of the EnMS.

Effectiveness of the EnMS can be demonstrated by improvement in energy performance and other intended outcomes. Energy performance improvement can be demonstrated by improvements in EnPI values over time, relative to the corresponding EnB. There can be situations where energy performance improvement is achieved from an activity that is not related to an SEU or key characteristic. In those instances, an EnPI and EnB can be established to demonstrate energy performance improvement.

When conducting analysis, the limitations of the data (accuracy, precision, measurement uncertainty) and consistency of energy accounting should be taken into account before reaching final conclusions.

A.9.2 Internal audit

Internal audits of an EnMS can be performed by employees of the organization, or by external persons selected by the organization and working on its behalf. Auditor independence can be demonstrated by an auditor being free from responsibility for the activity being audited.

An energy audit or energy assessment is not the same concept as an internal audit of an EnMS.

A.9.3 Management review

The management review covers the entire scope of the EnMS, although not all elements of the EnMS need to be reviewed at once. The review process can take place over a period of time.

A.10 Improvement

"Continual" implies occurrence over a period of time, but can include intervals of interruption (unlike "continuous" which indicates occurrence without interruption). In the context of continual improvement, the expectation is that improvements occur periodically, over time. The rate, extent and timescale of actions that support continual improvement are determined by the organization, in light of its context, economic factors and other circumstances.

Energy performance improvement can be demonstrated in several ways, such as:

a) reduction in normalized energy consumption for the scope and boundaries of the EnMS;

b) progress toward the energy target(s) and management of the SEUs.

It is recognized that improvements are achieved based on the priorities of the organization.

Examples of continual energy performance improvement include, but are not limited to, the following.

— Total energy consumption decreases over time under similar conditions, e.g. a commercial building in a region where the temperature does not vary significantly.

— Total energy consumption increases, but the measure of energy performance as defined by the organization improves. In this case, a simple ratio where there is one relevant variable and no baseload.

— Equipment has a predicted reduction in energy performance as it ages. A delay or reduction in the performance reduction curve due to proper operational and maintenance controls can demonstrate improved energy performance as defined by the organizational EnPIs.

— In resource extraction industries where energy performance tends to decline as resources are depleted, e.g. in a mining facility where the depth and production both vary, reducing the rate of decline relative to the EnB can be considered a performance improvement.

— In most situations and organizations, there are multiple relevant variables requiring normalization, e.g. a dairy producing three different products (milk, cheese, yogurt) and affected by weather.

Annex B
(informative)

Correspondence between ISO 50001:2011 and ISO 50001:2018

Table B.1 — Correspondence between ISO 50001:2011 and ISO 50001:2018

ISO 50001:2011	ISO 50001:2018
Introduction	Introduction
1 Scope	1 Scope
2 Normative references	2 Normative references
3 Terms and definitions	3 Terms and definitions
	4 Context of the organization
	4.1 Understanding the organization and its context
4 Energy management system requirements	
4.1 General requirements	4.3 Determining the scope of the energy management system 4.4 Energy management system
4.2 Management responsibility	5.1 Leadership and commitment
4.2.1 Top management	4.3 Determining the scope of the energy management system 5.1 Leadership and commitment 7.1 Resources
4.2.2 Management representative	5.1 Leadership and commitment 5.3 Organizational roles, responsibilities and authorities
4.3 Energy policy	5.2 Energy policy
4.4 Energy planning	6 Planning
4.4.1 General	6.1 Actions to address risks and opportunities
4.4.2 Legal requirements and other requirements	4.2 Understanding the needs and expectations of interested parties
4.4.3 Energy review	6.3 Energy review
	6.1 Actions to address risks and opportunities
4.4.4 Energy baseline	6.5 Energy baseline
4.4.5 Energy performance indicators	6.4 Energy performance indicators
4.4.6 Energy objectives, energy targets and energy management action plans	6.2 Objectives, energy targets and planning to achieve them
4.5 Implementation and operation	7 Support 8 Operation
4.5.1 General	
4.5.2 Competence, training and awareness	7.2 Competence 7.3 Awareness
4.5.3 Communication	7.4 Communication
4.5.4 Documentation	7.5 Documented information
	7.5.1 General
	7.5.2 Creating and updating
	7.5.3 Control of documented information

Table B.1 *(continued)*

ISO 50001:2011	ISO 50001:2018
4.5.5 Operational control	8.1 Operational planning and control
4.5.6 Design	8.2 Design
4.5.7 Procurement of energy services, products, equipment and energy	8.3 Procurement
4.6. Checking	9 Performance evaluation
4.6.1 Monitoring, measurement and analysis	9.1 Monitoring, measurement, analysis and evaluation of energy performance and the EnMS 6.6 Planning for collection of energy data
4.6.2 Evaluation of compliance with legal requirements and other requirements	9.1.2 Evaluation of compliance with legal requirements and other requirements
4.6.3 Internal audit of the EnMS	9.2 Internal audit
4.6.4 Nonconformities, correction, corrective action and preventive action	10.1 Nonconformity and corrective action
4.6.5 Control of records	7.5 Documented information (see above under Documentation)
4.7 Management review	9.3 Management review
	10.2 Continual improvement
Annex A (informative) Guidance on the use of this International Standard	Annex A (informative) Guidance for use
Annex B (informative) Correspondence between ISO 50001:2011, ISO 9001:2008, ISO 14001:2004 and ISO 22000:2005	Annex B (informative) Correspondence between ISO 50001:2011 and ISO 50001:2018
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Alphabetical list of terms

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