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Energy management systems — Guidelines for a phased implementation

bsi.

National foreword

This British Standard is the UK implementation of EN ISO 50005:2022. It is identical to ISO 50005:2021. It supersedes BS ISO 50005:2021, which is withdrawn.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 committee manager.

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May 2022

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English version

Energy management systems - Guidelines for a phased implementation (ISO 50005:2021)

Systèmes de management de l'énergie - Lignes directrices pour une mise en œuvre par étapes (ISO 50005:2021)

Energiemanagementsysteme - Leitfaden für eine phasenweise Umsetzung (ISO 50005:2021)

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European foreword

The text of ISO 50005:2021 has been prepared by Technical Committee ISO/TC 301 "Energy management and energy savings" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 50005:2022 by Technical Committee CEN-CENELEC/ JTC 14 "Energy management and energy efficiency in the framework of energy transition" 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of an identical text or by endorsement, at the latest by November 2022, and conflicting national standards shall be withdrawn at the latest by November 2022.

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

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Endorsement notice

The text of ISO 50005:2021 has been approved by CEN-CENELEC as EN ISO 50005:2022 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).

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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*.

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

It is important to engage all types of organizations and, in particular, small and medium-sized organizations (SMOs) into the broad scale implementation of energy management because of the significant potential such organizations have for energy performance improvement, associated energy cost savings and reductions in greenhouse gas (GHG) emissions.

This document is intended to enable organizations to initiate and improve energy management practices by following a systematic approach with appropriate effort given their resources and context, resulting in continual energy performance improvement.

This document provides practical guidance to undertake a phased implementation of an energy management system (EnMS), e.g. by using in-house capacity. The functioning EnMS can subsequently be extended to meet the requirements of ISO 50001. A well-planned phased implementation of an EnMS can reduce costs and the use of other resources while providing near-term success on which to build. This can help in overcoming barriers for implementation in organizations with limited resources, such as SMOs.

This document explains a phased implementation approach using twelve core elements based on ISO 50001:2018. It outlines the content of the elements and describes four different levels of maturity for each element. Annex A includes best practices for continual improvement of an EnMS by using a phased approach. An organization can select appropriate tools to find an effective and efficient approach to achieve the desired maturity of its EnMS. The element(s) and the corresponding maturity level(s) targeted depend on the organization's objectives and strategic direction. The EnMS can be integrated with other management systems to benefit from common structures.

In this document, both terms "energy performance improvement" (as defined in ISO 50001:2018) and "energy savings" are used. Energy savings is considered as a subset of energy performance improvement in this document.

0.2 Advantages of a phased implementation

Implementing an EnMS in an organization can be a challenge. Organizations can have limited resources (e.g. knowledge and availability of personnel) in order to successfully implement an EnMS. A phased implementation results in several benefits to the organization. The phased implementation described in this document offers flexibility that allows an organization to:

— decide the scope and pace of its EnMS implementation to suit available resources and organizational needs;

— decide on the elements to target and the desired maturity level(s);

— start with areas that indicate the greatest potential for energy performance improvement, return on investment or align with current operational practices;

— stimulate a positive culture towards energy management;

— deliver simple and/or low-cost energy performance improvements and associated energy cost savings, emission reductions and other benefits;

— build initial successes to increase credibility and thus secure commitment and support for further development of the EnMS;

— build a strong foundation to expand an existing EnMS towards meeting the requirements of ISO 50001.

INTERNATIONAL STANDARD ISO 50005:2021(E)

Energy management systems — Guidelines for a phased implementation

1 Scope

This document gives guidance for organizations on establishing a phased approach to implement an energy management system (EnMS). This phased approach is intended to support and simplify the implementation of an EnMS for all types of organizations, in particular for small and medium-sized organizations (SMOs).

This document gives guidance on the use of twelve core elements with four levels of maturity for each element to establish, implement, maintain and improve an EnMS that results in energy performance improvement.

It enables the user of this document to implement a phased approach to achieve a level of energy management appropriate to its objectives and to build a strong foundation which can subsequently be extended towards meeting the requirements of ISO 50001:2018. This document is consistent with ISO 50001:2018 but does not cover all of its requirements.

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 and definitions

For the purposes of this document, the terms and definitions given in ISO 50001:2018 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 http://www.electropedia.org/

4 The maturity model approach to implementing an EnMS

4.1 Explanation and structure of the maturity model

Using a maturity model helps an organization to assess the effectiveness of its current business processes in order to follow a systematic and organized approach in achieving improved performance. The maturity model that forms the basis of this document consists of twelve core elements of energy management with four levels of maturity for each element.

The elements in this document either refer to a clause of ISO 50001:2018 or an important subclause such as energy review.

The maturity model provides a simplified, systematic framework to implement and improve an EnMS suitable to the organization's needs and capabilities by using a phased approach. It describes criteria including detailed behaviours, practices and processes. The organization initially uses the maturity

model to understand its current state and to establish initial improvement goals. Then the organization can implement EnMS improvements in phases.

As the organization progresses from its individual starting point towards the desired level of EnMS maturity, it should improve energy performance. This improved energy performance is understood as an improvement in energy efficiency or energy consumption related to energy use which can result in reduced energy costs. The twelve elements of the maturity model are described in Clause 5. For each level in an element, the given criteria describe(s) "what" needs to be in place at that level. Where not stated otherwise, the criteria are addressed to the organization. This model does not provide specific approaches on "how" the level can be achieved. The elements are divided into topics for clarity and to make it easier for the user to implement the criteria for the elements.

Based on the analysis of the current state of energy management practices, the organization can choose an appropriate speed of implementation and the desired level of maturity for each element. Whatever be the starting point, the organization needs to work on each element. It is possible that the organization needs additional resources (e.g. time, personnel, knowledge, budget).

Predictability, effectiveness and control of the EnMS should improve as the organization moves up to higher levels in each element. The maturity model provides a continuum along which progress can be made incrementally from one level to the next. The four levels represent a progression from a low level of energy management experience to a level approaching ISO 50001 conformity. The four levels can generally be described as follows.

a) Level 1: Enabling energy management: initial management support, some awareness and understanding of energy use and opportunities for energy savings, collection of some energy data (e.g. energy bills), no systematic energy management practices.

b) Level 2: Enhancing energy management: energy policy in place, formal team, conduct basic analysis of energy consumption and energy cost data, evaluate opportunities for energy savings, some systematic energy management practices.

c) Level 3: Emerging EnMS: systematic energy management practices, energy management becomes strategic, monitoring and review improved, legal compliance is part of the EnMS, the organization learns.

d) Level 4: Established EnMS: continual improvement of the EnMS and energy performance, core elements of ISO 50001 implemented, ready for gap analysis versus ISO 50001, if desired.

NOTE Reaching Level 4 for all twelve elements does not necessarily lead to meeting all the requirements of ISO 50001:2018.

When using the maturity model, the organization should consider that for each topic under an element the criteria for a certain level can include the criteria of the previous levels in a cumulative manner. Although the levels build on each other, they do not necessarily have to be implemented in four sequential steps. If, for example, the organization has planned to reach Level 3 of a certain element, it does not have to first implement Level 1, Level 2 and then Level 3. It can implement Level 3 directly, taking into account the criteria of Levels 1 and 2.

Where there are blanks in the element tables, no criteria (e.g. see Figure 1 Level 1) or no additional criteria (e.g. see Figure 1 Level 3) are required at that level. This means to maintain the criteria implemented at the previous level.

For organizations that want to enhance their EnMS, additional advice and best practices are given in Annex A. A level version of the maturity model is given in Annex B. The twelve elements of the maturity model are described in Tables 1 to 12 in Clause 5.

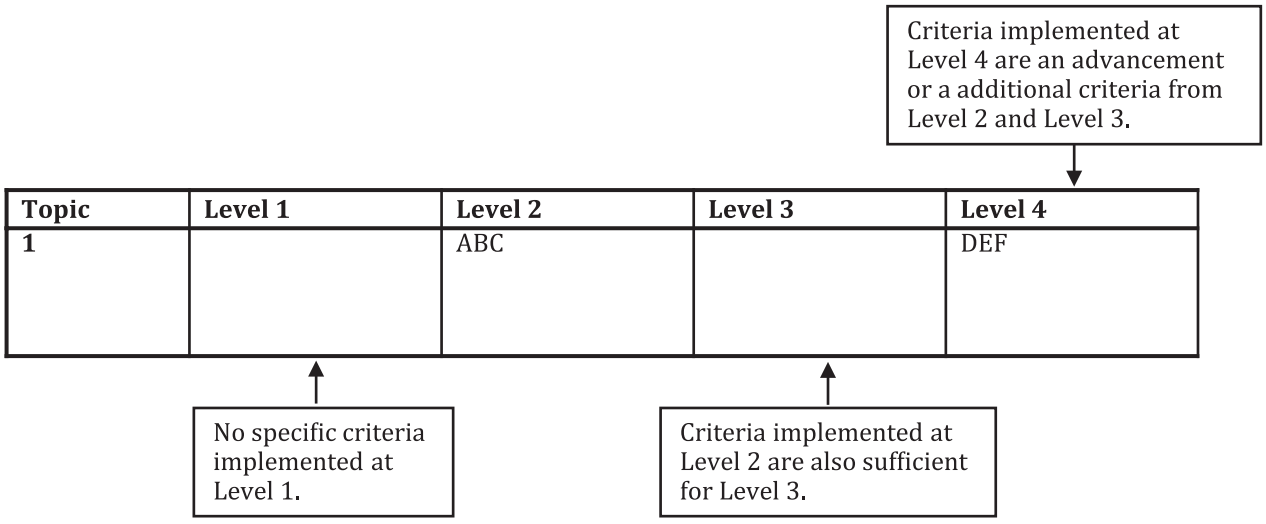


Figure 1 — Interpretation of "blanks" in the element tables

4.2 Phased implementation of an EnMS using the maturity model

4.2.1 General

The phased implementation is a project guideline consisting of elements and levels that target the desired state of an EnMS. The starting point depends on the previous experience and situation of the organization. It is also possible to focus only on some of the elements or topics individually. Nevertheless, if all elements, topics and criteria for each level are implemented, then conformity to ISO 50001 can be achieved with some additions and adjustments (see 4.2.7). An example of a practical procedure for the phased implementation is given in 4.2.2 to 4.2.7.

4.2.2 Assess the organization's initial situation

If the organization has no experience with a management system or specifically an EnMS, it is difficult to estimate the work that lies ahead. The practical guidance to a phased implementation approach provided in this document is based on the fact that every organization has some kind of energy management in place. However, perhaps it is not well structured or does not cover all elements of good practice of energy management.

It is often the case that some elements of an EnMS, such as energy performance improvement actions, are in place at some level, but are not yet systematically implemented in the context of a management system. The described elements and levels can be used as a self-assessment tool. A simple table can be created for this purpose that gives an overview of which elements and topics are already addressed in the organization and, if they do exist, at what level they are functioning with respect to the planned EnMS (see Figure 2). The organization can assess what has already been implemented and what steps still need to be taken.

Element: XYZ

		Criteria			
Topic	nothing yet	Level 1	Level 2	Level 3	Level 4
1	√	-	-	-	-
2		√	-	-	-
…	…	…	…	…	…

Figure 2 — Initial process

Self-assessment is a good starting point to show to top management where the organization stands with regard to an EnMS. Self-assessment should be used to determine the organization's status, as well as best practices both at an overall level and at the level of each element.

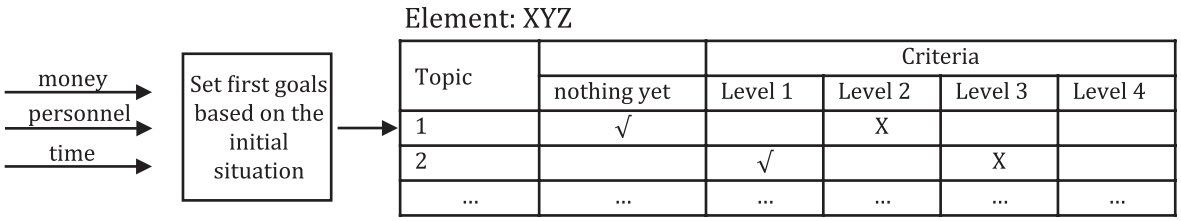
A level of a certain topic of an element is considered to be achieved when all listed criteria at that level for the topic have been fulfilled. Achievement of a particular level of a certain topic of the element requires that all lower-level criteria have been fulfilled.

The next step to pursue is determined by the goal of the organization for the phased implementation.

4.2.3 Set and confirm a goal for the phased implementation

There are several ways of defining an EnMS implementation goal. This subclause describes two useful approaches. They should be coordinated with top management so that the results and strategic direction resulting from the development of a business case (see 4.2.4) can be taken into account.

Each level corresponds to an increasing progression for each criteria of a topic under an element. The first step is to define the desired level for each topic. Before setting a goal, it is necessary to ensure that resources such as money, time and personnel are available to complete the desired element level and whether it will be advantageous to the organization. This process is presented in Figure 3.



Key

√ achieved level

X set goal

Figure 3 — Set first goals

The organization has the choice between two approaches to define and schedule the specific goals depending on the desired outcome. The first one is an individual way where the goal for each topic is set at an individual level. The second approach is to choose a given level as a goal for all topics. Figure 4 shows an example of how a simple overview can look.

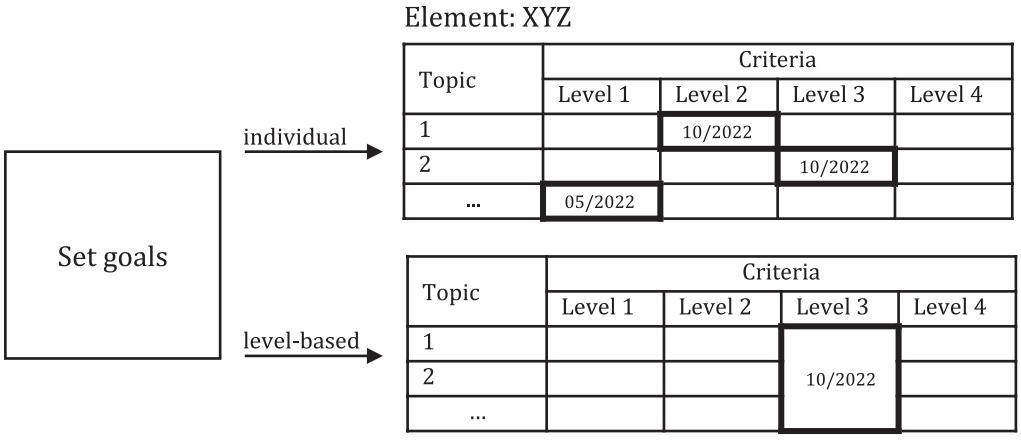


Figure 4 — Different approaches to define goals

The individual approach can suffer from the problem of interdependence between the processes described in the topics. The organization should ensure that it takes into account these interdependencies.

Given the individual approach in the example in Figure 4, Level 2 in Topic 1 and Level 3 for Topic 2 is expected to be reached in October 2022 while others are scheduled for May 2022. This also illustrates that different levels can be reached at the same time. If a level-based procedure is chosen, all topics reach the same level at the same time, e.g. in October 2022. Ultimately, the agreed goal should be adopted and approved by the top management. This ensures a certain security and support in the implementation of the necessary measures.

4.2.4 Set up a simple business case

Effective implementation of an EnMS can provide net benefits to most organizations. This means that a business case can be developed for the implementation of an EnMS. Although it is not easy to set up a very detailed business case directly at the beginning of the implementation process, it is crucial to get a first overview of potential benefits as a basis for further decisions or setting goals. Thus, a preliminary estimate of the costs and benefits and the connected investments should be developed.

4.2.5 Set up a project plan

The organization should develop a project plan with the number of elements and levels that will allow the desired goals to be achieved. The project plan should include tasks, responsibilities, resources, a timeline (e.g. GANTT chart), milestones, the aim and management reviews. The project plan should be approved by top management.

4.2.6 Monitor the implementation of the project plan

The following steps should be taken:

— regularly review ongoing project management activities;

— complete the implementation towards the goal;

— review the process;

— reassess the maturity model framework (e.g. bi-annually);

— improve and, if appropriate, set a new goal.

4.2.7 Gap analysis versus ISO 50001:2018

Achieving Level 4 in the maturity model for all elements does not mean that the organization's EnMS meets all the requirements of ISO 50001:2018. In the maturity model, core elements of ISO 50001:2018 have been selected. However, there can be other requirements to be met in order to achieve conformity to ISO 50001:2018 in addition to these. If the organization wishes to demonstrate conformity to ISO 50001:2018, a gap analysis will generally be needed.

5 Description of elements and levels

5.1 Element 1 — Context of the organization

To be aware of its own context, the organization needs to determine:

— external and internal issues such as resources, personnel capacities and energy types;

— needs and expectations of its interested parties such as legal requirements and agreements with suppliers.

External and internal issues as well as the needs and expectations and associated risks and opportunities that are relevant to the EnMS should be considered by the organization. Building on that analysis, the organization can take action to address identified opportunities (e.g. external funding of energy performance improvement actions such as incentives and subsidies) and risks (e.g. insufficient resources to implement the EnMS) in order to achieve the best possible outcome from its EnMS.

The organization should determine how legal requirements and other requirements apply to its EnMS. Common business practices in the industry sector in which the organization functions can also affect the design and implementation of the EnMS. The criteria related to the element "context of the organization" are shown in Table 1.

The content of this element relates to ISO 50001:2018, 4.1, 4.2 and 6.1.

Table 1 — Context of the organization

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Context	Create some awareness within the organization about energy-related environmental and other impacts.	Collect information about energy-related environmental and other impacts within the organization.	Determine energy-related external and internal issues that affect the organization's ability to improve energy performance.	Top management ensures that the energy-related needs and expectations of the relevant interested parties are determined.
Risks and opportunities	—	—	Identify the risks and opportunities associated with external and internal issues that affect the organization's ability to improve energy performance.	Top management ensures that risks and opportunities associated with the energy-related needs and expectations of interested parties are determined in order to ensure that the EnMS achieves its intended outcomes. Top management ensures that measures to address the determined risks and opportunities are established. The organization determines changes in external and internal issues and associated risks and opportunities that are relevant to the EnMS and energy performance improvement.

Table 1 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Legal requirements and other requirements	Create an awareness about the applicable legal requirements and other requirements related to energy.	—	Determine how legal requirements and other requirements apply to the organization's EnMS.	Establish a system to apply legal requirements and other requirements throughout the processes of the EnMS. Review at defined intervals the organization's legal requirements and other requirements.

5.2 Element 2 — Leadership

It is essential that top management demonstrates its leadership and commitment with respect to continual improvement of energy performance and effectiveness of the EnMS. In this element, the tasks of top management are described to demonstrate ongoing engagement and commitment. An energy policy gives evidence of the support and commitment of the leadership to implement and improve the organization's EnMS and energy performance.

Top management should assign the responsibility to at least one person for leading the implementation of an EnMS. Depending on the size and complexity of the organization, the person(s) to whom the responsibility is assigned should form a team to execute the necessary tasks. In this document, the term "energy management team (EnMT)" is used although a single person can perform the role of the team in some organizations. The EnMT should comprise personnel representing different functions of the organization forming an interdisciplinary team. This helps to get a broader view of the energy-related topics within the organization and to promote acceptance of the EnMS.

The responsibility and authority of the EnMT should be set out clearly by top management. This can be greatly facilitated if top management supports resource allocation within the organization for the formation of the EnMT. Active involvement of the relevant personnel who can impact energy performance or the EnMS is essential for a successful implementation of an EnMS. The criteria related to the element "leadership" are shown in Table 2.

The content of this element relates to ISO 50001:2018, 4.3, 4.4, 5.1, 5.2 and 5.3.

Table 2 — Leadership

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
	Top management:	**Top management ensures that:**	**Top management ensures that:**	**Top management demonstrates leadership and commitment by:**
Energy policy	Provides verbal support for energy management. Ensures that informal policies or commitments relating to energy management are in place.	An energy policy is established.	The energy policy includes a commitment to continual improvement of energy performance and the EnMS.	Ensuring that the energy policy is periodically reviewed and updated as necessary. Ensuring that the energy policy is compatible with the strategic direction of the organization.

Table 2 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
	Top management:	**Top management ensures that:**	**Top management ensures that:**	**Top management demonstrates leadership and commitment by:**
Scope and boundaries	—	—	The EnMS scope and boundaries are established.	Reviewing the EnMS scope and boundaries and updating as appropriate.
Objectives and energy targets	—	Energy targets are established.	Objectives and energy targets are established.	Ensuring that objectives and energy targets are compatible with the strategic direction of the organization. Ensuring that the action plans are approved and implemented.
EnMS performance	—	—	The EnMS is improving in order to meet the targets for each element.	Promoting continual improvement of energy performance and the EnMS.
Responsibilities and authorities	Enables the formation of an EnMT.	Responsibilities and authorities to the EnMT are assigned. NOTE The tasks of the EnMT are described in Element 3 “resources”.	Responsibilities and authorities for relevant roles (beyond the members of the EnMT) are assigned.	Ensuring that responsibilities and authorities for all relevant roles are assigned, reviewed and updated as appropriate.
Communication	—	The energy policy is communicated within the organization. The roles, responsibilities and composition of the EnMT are communicated within the organization.	Responsibilities and authorities for relevant roles are communicated within the organization.	Communicating the importance of the effectiveness of the EnMS and of conforming to the EnMS requirements. Ensuring that responsibilities and authorities for all relevant roles are communicated within the organization. Making the energy policy available to interested parties, as appropriate.
Documented information	—	The energy policy is available as documented information.	The scope and boundaries are available as documented information.	—

5.3 Element 3 — Resources

Top management should ensure that the resources needed for the EnMS are available. Otherwise, the implementation can fail. Resources include personnel, specialized skills, technology, data collection

infrastructure and financial resources for implementing energy performance improvement actions (e.g. energy savings projects). The criteria related to the element "resources" are shown in Table 3.

The content of this element relates to ISO 50001:2018, 5.3 and 7.1.

Table 3 — Resources

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
EnMT	Establish an informal EnMT.	Establish an EnMT. EnMT begins to collect information that can be used on energy performance and energy performance improvement.	EnMT ensures that the EnMS is established, implemented, maintained and continually improved. EnMT implements action plans to continually improve energy performance. EnMT monitors the energy performance of the organization. EnMT regularly communicates energy performance and achievements within the organization.	EnMT monitors the status of the action plans. EnMT reports to top management on the performance of the EnMS and the improvement of energy performance at determined intervals.
Budget	Allocate some budget for energy management activities.	Allocate the budget necessary for initial training and implementation.	Absorb costs for the EnMS into existing capital and/or operational expense budget(s).	Determine and allocate the budget needed for continual improvement of energy performance and the EnMS.

5.4 Element 4 — Energy review

The energy review is a process that enables the organization to learn how energy is used and how it affects its facilities. It is part of the energy planning process and consists of a set of activities.

One result of the energy review is the identification of significant energy uses (SEUs). These are identified by energy uses accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement. The criteria for what makes an energy use "significant" are determined by the organization. If measured energy consumption data are limited, organizational knowledge, e.g. data sheets, can be used to identify SEUs.

Another result of the energy review is the estimation of future energy use(s) and energy consumption. This information can be useful in the preparation of annual budgets of the organization.

An energy audit in accordance with ISO 50002 or similar national standards can provide information on many parts of the energy review.

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

To develop and conduct the energy review, the organization analyses energy use and consumption data based on measurements and other data. Sources of data to be collected or acquired by measurement include:

— measuring instruments (local or remote);

— data sheets of equipment;

— technical documents;

— discussions with operations and maintenance (O&M) personnel.

For the analysis, there should be a breakdown by energy type. Where practical, energy meters should be installed. The extent of metering typically depends on what is being measured and on the required accuracy and repeatability. The criteria related to the element "energy review" are shown in Table 4.

The content of this element relates to ISO 50001:2018, 6.3 and 6.6.

Table 4 — Energy review

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Energy use and consumption	Identify current energy types and energy use(s).	Evaluate past and current energy use(s) and energy consumption and energy cost data.	Make preliminary estimates of future energy use(s) and energy consumption.	Estimate future energy use(s) and energy consumption. Update the energy review at defined intervals as well as in response to major changes in facilities, equipment, systems or energy-using processes.
SEUs	—	Identify SEUs.	Determine current energy performance of each SEU.	Identify the person(s) doing work that influence or affect each SEU.
Energy savings opportunities	Identify energy savings opportunities that are either based on common knowledge at the facility or are simple and/or low-cost (e.g. compressed air leaks, steam leaks, idling equipment).	Evaluate opportunities for energy savings.	Prioritize energy savings opportunities.	Identify routinely new energy savings opportunities, analyse and evaluate them, and implement selected measures on a continual basis.
Energy data collection	Collect energy data (e.g. by using energy bills).	Install permanent or temporary energy consumption meters wherever resources are available. Store energy data in easily accessible formats and make it available to relevant personnel.	Define energy data collection plans that include energy consumption, relevant variable data and operational criteria for the SEU(s) and energy consumption for the organization. Incorporate measurement needs into planning (e.g. purchasing/ installing submeters).	Ensure that equipment used for measurement provides data which are accurate and repeatable. Review the energy data collection plans at defined intervals and update, as appropriate.

Table 4 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Documented information	Ensure that energy consumption and cost data (e.g. energy bills) are available as documented information.	—	Ensure that the results of the energy review are available as documented information.	Ensure that the methods and criteria used to develop and conduct the energy review are available as documented information.

5.5 Element 5 — Energy performance indicators and energy baselines

The energy performance indicator (EnPI) is the measure or unit of energy performance. EnPIs can be expressed by using a simple metric, ratio or a model. Energy baselines (EnBs) are quantitative reference(s) for comparison of energy performance. Using EnPI values and EnBs can help to establish and quantify energy performance improvements and can also identify any abnormal situations where energy performance significantly deviates from the expected value.

As an introduction, a regular recording of energy consumption data (e.g. monthly) and an analysis of the data, e.g. in an accounting spreadsheet, can be helpful to identify energy trends.

The following procedure describes how to develop EnPIs effectively:

— consider the level at which the EnPI can be applied (facility, equipment, system or energy using processes);

— brainstorm all potential variables (e.g. production volume, weather) based on practical knowledge of the energy consumption within the EnPI boundary;

— collect historical energy consumption data and variables that are potentially relevant;

— establish criteria that will be used to determine if a variable is relevant or not;

— conduct a preliminary analysis to determine which variables need to be analysed against the established criteria (e.g. correlation analysis using scatter diagrams);

— identify and define which variables are significantly impacting energy performance and do routinely change, and are thus relevant;

— establish EnPIs, considering the identified relevant variables;

— establish a baseline (e.g. annual energy consumption) that accounts for the impacts of relevant variables on energy performance;

— document the changes of the EnPI values compared to the EnBs.

NOTE For more information, see ISO 50006.

The criteria related to the element “energy performance indicators and energy baselines” are shown in Table 5.

The content of this element relates to ISO 50001:2018, 6.4 and 6.5.

Table 5 — Energy performance indicators and energy baselines

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Relevant variables	Brainstorm possible variables based on practical knowledge.	Quantify potentially relevant variables. Conduct a preliminary analysis of energy consumption based on a single variable.	Conduct a more thorough review of variables that significantly impact energy consumption using simple regression analysis.	Determine all relevant variables for each SEU.
EnPIs	—	Determine EnPIs at the facility level.	Create EnPIs that are aligned with energy targets. Determine EnPIs at the SEU level. Review EnPIs periodically to ensure that they reflect energy performance and update them, if necessary.	Ensure that EnPIs are appropriate for measuring and monitoring energy performance and for demonstrating energy performance improvement.
EnBs	Conduct a preliminary analysis of energy data (e.g. by using the historical data).	Establish an EnB for each energy type (e.g. by using one year of energy bills).	Establish EnB(s) by using the information from the data of the energy review (e.g. daily, weekly or monthly) energy consumption and relevant variable data.	Revise EnB(s) in the following cases: a) EnPI(s) no longer reflect(s) the organization's energy performance; b) there have been major changes to the static factors; c) according to a pre-determined method. Use relevant variables for the normalization of the EnB(s).
Communication	—	—	EnMT reports EnPI value(s) regularly, including progress against energy targets and/or EnB(s).	EnMT reports EnPI value(s) at determined intervals, including progress against energy targets and/or EnB(s).
Documented information	—	—	Ensure that EnBs, EnPI value(s), relevant variable data and information on revision(s) of EnB(s) are available as documented information.	Ensure that the method to determine and update the EnPI(s) is available as documented information. Ensure that the modifications to EnB(s) are available as documented information.

5.6 Element 6 — Objectives, energy targets and action plans

Objectives are results to be achieved such as intended results or operational criteria. Objectives can directly relate to energy performance, although this is not necessarily the case. Energy targets are the quantifiable objectives of energy performance improvement and can be included within an objective.

As a first step, the organization should consider which objectives and energy targets it would like to achieve. It is possible that there are already some initial ideas by which energy consumption can be reduced and energy efficiency increased. The action plan is the link between objectives, opportunities, the associated measures and a plan for implementation, including resource planning.

An action plan defines the activities to be carried out in order to achieve the objectives and energy targets. It includes what will be done, who will be responsible, what resources will be required, when it will be completed and how the results will be evaluated. The plan designates the responsibilities and deadlines. It is the driver for continual improvement of the EnMS and energy performance. The criteria related to the element "objectives, energy targets and action plans" are shown in Table 6.

The content of this element relates to ISO 50001:2018, 6.2.

Table 6 — Objectives, energy targets and action plans

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Objectives and energy targets	Set energy targets using an ad hoc or informal approach.	Formally set energy targets.	Ensure that the objectives and energy targets are consistent with the energy policy, take into account energy performance improvement opportunities and are updated as appropriate.	Ensure that objectives and energy targets consider SEUs and take into account applicable requirements. Ensure that objectives and energy targets are measurable and monitored.
Action plans	Select and implement energy savings projects and energy efficiency measures using an ad hoc or informal approach.	Establish a basic plan for the implementation of energy savings projects and energy efficiency measures including required resources, responsibilities and timelines.	Ensure that action plans take into account risks, barriers and financial evaluation and include how the results will be evaluated. Analyse and prioritize energy savings projects and efficiency measures. Evaluate the results of the implemented energy savings projects and energy efficiency measures.	Select and implement energy savings projects and efficiency measures to ensure that they result in improved energy performance. Review the effectiveness of action plans and the achievement of energy targets at planned intervals.
Integration	—	—	—	Consider how actions to achieve objectives and energy targets can be integrated into business processes.

Table 6 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Communication	—	—	Inform employees regularly about the extent to which objectives and energy targets have been met.	Communicate and update objectives and energy targets, as appropriate.
Documented information	—	Ensure that action plans for energy savings projects are available as documented information.	Ensure that objectives, energy targets and action plans are available as documented information.	—

5.7 Element 7 — Competence and awareness

The organization should raise awareness among employees, and inform and motivate them, so that their daily activities can help in the improvement of energy performance.

In addition, the organization should identify competence gaps based on the level of current competence (education, skill, training or experience) and necessary competence related to the EnMS and energy performance and should take actions to fill the identified gaps. The criteria related to the element "competence and awareness" are shown in Table 7.

The content of this element relates to ISO 50001:2018, 7.2, 7.3 and 7.4.

Table 7 — Competence and awareness

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Employee awareness	—	Ensure that all employees are aware of the energy policy. Ensure that employees understand how their actions can impact energy consumption.	Ensure that employees engage in energy awareness through campaigns and promotional events. Review or analyse employee awareness.	Ensure that employees are aware of their contribution to the effectiveness of the EnMS and the implications of not conforming to the EnMS requirements.
Competence	—	Train members of the EnMT in specific energy management issues, as necessary.	Identify competence gaps for the EnMT based on the level of current competence and necessary competence related to the EnMS and energy performance. Take actions to fill the identified gaps for the EnMT.	Identify competence gaps for other relevant personnel based on the level of current competence and necessary competence related to the EnMS and energy performance. Take actions to fill the identified gaps for other relevant personnel.

Table 7 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Improvement suggestions	—	—	Encourage employees to make comments or suggest ideas about energy performance improvement actions.	Top management implements an employee and contractor suggestion scheme for the improvement of energy performance and the EnMS.
Documented information	—	—	—	Ensure that evidence of competence of all personnel involved in the EnMS is available as documented information. Consider keeping documented information on the suggested improvements.

5.8 Element 8 — Operations and maintenance

Optimization of planning, implementation and control of O&M processes related to SEUs can lead to an improvement in energy performance. Effective control of the O&M of the infrastructure is important to maintain and prevent a deterioration in energy performance. Establishing O&M criteria for facilities, equipment, systems and processes is a key activity in an EnMS.

The organization should be receptive to proposed operational improvements and seek to test and incorporate those that add value, whether the improvement is a change in work practice, a minor enhancement to process or a major equipment upgrade. The criteria related to the element "operations and maintenance" are shown in Table 8.

The content of this element relates to ISO 50001:2018, 8.1.

Table 8 — Operations and maintenance

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
O&M criteria	—	Partially establish O&M criteria for processes related to energy performance.	Establish and maintain O&M criteria for the processes related to the energy performance of SEUs.	Monitor O&M criteria for the processes related to the energy performance of SEUs to support timely action when significant deviations from intended energy performance occur.

Table 8 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
O&M processes	Consider some O&M impacts on energy consumption.	Ensure that the energy impacts of O&M processes are understood by personnel. O&M personnel identify some no-cost and low-cost energy performance improvement actions.	Ensure that some O&M processes are in place.	Control outsourced O&M processes. Ensure that the O&M of externally provided SEUs or processes related to SEUs are controlled. Ensure that all O&M processes are in place for SEUs.
Communication	—	—	Communicate criteria established for the processes related to SEUs to relevant personnel.	—
Documented information	—	—	—	Ensure that evidence to the extent necessary that O&M processes related to SEUs have been carried out as planned is available as documented information.

5.9 Element 9 — Procurement and design

Procurement and design activities for facilities, equipment, systems and energy-using processes often provide opportunities to improve an organization's energy performance. Organizations should conduct these activities to ensure that energy performance improvement opportunities are evaluated by balancing both long- and short-term benefits. Metrics which can be considered are pay-back period, net present value or internal rate of return.

This can be done at the design stage by considering energy performance as part of the project goals. Design considerations can take varied forms such as energy efficient technologies, heat recovery and peak power management to minimize life cycle costs.

Suppliers of products, equipment and services are to be informed that energy performance is one of the evaluation criteria in making procurement decisions. Common metrics for the evaluation include assessing the benefits (including reduced energy costs) and costs (including higher initial cost) for major business investments. The criteria related to the element "procurement and design" are shown in Table 9.

The content of this element relates to ISO 50001:2018, 8.2 and 8.3.

Table 9 — Procurement and design

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Design	—	Consider energy performance occasionally in design.	Consider energy performance consistently in design.	Consider energy performance improvement opportunities and operational control in design.

Table 9 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Procurement	—	Consider energy consumption occasionally in procurement.	Consider energy performance consistently in procurement. Engage equipment suppliers and contractors to provide energy efficient solutions. Ensure that some standard procedures are in place for the procurement of energy types.	Ensure that purchasing decisions follow established criteria for evaluating energy performance over the planned or expected operating lifetime. Account for the impact that contractors and outsourced processes have on energy performance.
Communication	—	—	Begin informing suppliers that energy performance is one of the evaluation criteria for procurement.	Inform suppliers that energy performance is one of the evaluation criteria for procurement. Ensure that the results of the energy performance consideration of the design stage are incorporated into specifications of the procurement documents and are communicated to suppliers.
Documented information	—	—	—	Ensure that information on design activities related to energy performance are available as documented information.

5.10 Element 10 – Process for communication and control of documented information

The organization should establish a process to control the documented information. The extent of documented information for an EnMS can differ from one organization to another depending on the size of the organization, its activities, products and services, the complexity of its processes and the competence of personnel. Documented information can be in any format and media (e.g. paper, video, audio, photos, electronic). Some of the elements include a topic called "documented information" which describes the minimum documented information that an organization should have in its EnMS. Documented information can be internal (e.g. manuals, drawings, purchase specification, maintenance plans, results of monitoring and measurement, results of calibration of instruments) and external (e.g. energy bills, laws and regulations, communications to/from legal authorities).

The organization should establish processes for internal and external communication. The communication can be done using different modes, e.g. by emails, intranet or internet, meetings, posters or competitions. Some of the elements include a topic called "communication" which describes the minimum information that an organization should communicate. Communication can be with internal (e.g. relevant personnel, top management, EnMT) or external (e.g. suppliers, customers, legal

authorities) interested parties. The criteria related to the element "process for communication and control of documented information" are shown in Table 10.

The content of this element relates to ISO 50001:2018, 7.4 and 7.5.

Table 10 — Process for communication and control of documented information

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Documentation process	Keep some documented information (e.g. energy bills).	Issue and maintain some documented information (e.g. energy policy, energy review, energy data collection plan, initial training activities).	Identify all documented information that is needed to support the EnMS.	Create, manage, review, update and control EnMS-related documented information.
Communication process	Communicate on energy-related issues using an ad hoc or informal approach.	Ensure planned communication on energy-performance-related issues.	Determine the internal communication relevant to the EnMS including what to communicate, when to communicate, recipients of that communication, how to communicate and who is responsible for communication.	Determine the external communications relevant to the EnMS.

5.11 Element 11 — Monitoring, measurement, analysis and evaluation of energy performance

The extent to which planned activities are realized and the intended results of the organization are achieved requires ongoing monitoring of energy performance, evaluation of energy performance improvement and investigation of significant deviations. Monitoring and measurement provides information to determine the effectiveness of the energy management activities, if action plans are being implemented and when corrective action is necessary.

The organization monitors and measures at a minimum the following key characteristics:

— operation of SEUs;

— EnPI(s);

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

— actual versus expected energy consumption;

— compliance with legal requirements and other requirements.

This also enables evaluation of energy performance improvement and comparison with energy targets, signalling corrective action if the activities fall short of expected energy performance improvement and energy targets. Ultimately, evaluating energy performance at defined intervals enables the organization to demonstrate continual improvement of energy performance. The criteria related to the element "monitoring, measurement analysis and evaluation of energy performance" are shown in Table 11.

The content of this element relates to ISO 50001:2018, 9.1.1 and 9.1.2.

Table 11 — Monitoring, measurement analysis and evaluation of energy performance

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Monitoring and measurement	Monitor energy consumption (e.g. at facility level using energy bills).	Review energy performance (including costs) occasionally.	Monitor and measure key characteristics including actual versus expected energy consumption and EnPIs.	Ensure that equipment used for the measurement of key characteristics provides data which are accurate and repeatable.
Analysis and evaluation	—	—	Analyse the results of monitoring and measurements. Identify significant deviations in energy performance.	Evaluate energy performance and energy performance improvement. Investigate and respond to significant deviations in energy performance.
Legal requirements and other requirements	—	—	—	Evaluate compliance with legal requirements and other requirements at planned intervals.
Documented information	—	—	Ensure that results from monitoring and measurement are available as documented information.	Ensure that the results of the investigation and response to significant deviations in energy performance are available as documented information. Ensure that documented information on the accuracy and repeatability of the measurements is available. Ensure that the results of the evaluation of compliance with legal requirements and other requirements is available as documented information.

5.12 Element 12 — Management review and improvement

Top management should determine if the EnMS is effective, if the expected results have been achieved, if changes to the EnMS are needed and if allocation of resources have to be made available. The first step can be a review in the form of a management review, at least annually. In this way, the continuing effectiveness of the EnMS can be checked.

It is very important to conduct an internal audit prior to the management review to determine if there is room for improvement and to ascertain whether the EnMS is functioning. The outcome should be presented to top management. The internal audit is conducted to provide information on whether

the EnMS conforms to the energy policy and the objectives and energy targets established by the organization, and if the EnMS is functioning effectively and energy performance is improved.

When a deviation from an expected result is identified, the organization should determine the cause, take remedial action to bring it back to normal and, for future activities, find solutions to prevent recurrence.

Continual improvement promotes, supports and sustains energy performance improvement and the achievement of other intended results. Continual improvement can be applied to any or all of the processes of the EnMS. The criteria related to the element "management review and improvement" are shown in Table 12.

The content of this element relates to ISO 50001:2018, 9.2, 9.3, 10.1 and 10.2.

Table 12 — Management review and improvement

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Review of energy performance	—	Top management reviews energy consumption and energy costs at least on an annual basis.	Top management reviews the extent to which objectives and energy targets have been met and takes actions when they are not achieved. Top management reviews the status of action plans.	Top management reviews energy performance and energy performance improvement based on monitoring and measurement results including the EnPIs.
Review of the EnMS	—	—	Top management reviews the EnMS at defined intervals. Identify and monitor EnMS elements (e.g. using an organizational scorecard or energy management assessment). Top management reviews trends in nonconformities and corrective actions. Top management reviews the effectiveness of the EnMT.	Review the EnMS at planned intervals internally to ensure that relevant employees are following its requirements. Continually identify, assess and implement opportunities to improve the EnMS.
Internal audit	—	—	—	Plan, implement and maintain internal audit programme(s). Top management reviews trends in audit results.

Table 12 *(continued)*

Topics	Criteria			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Nonconformity and corrective actions	—	Identify deviations from expected results (e.g. in energy consumption trends) and take action to control and correct them.	Determine the causes of nonconformities and take actions, if needed, in order to prevent their recurrence or occurrence elsewhere.	Review the effectiveness of any corrective action taken and their appropriateness to the effects of the identified nonconformities. Make changes to the EnMS, if required.
Continual improvement	—	—	—	Demonstrate continual energy performance improvement. Continually improve the effectiveness of the EnMS.
Documented information	—	—	—	Ensure that the results of the management review are available as documented information. Ensure that the nature of nonconformities and the results of corrective actions taken are available as documented information.

Annex A
(informative)

Continual improvement and advancing of the EnMS

A.1 Satisfying ISO 50001:2018 requirements

This document will assist organizations in implementing energy management practices to manage their energy. It is possible that the resulting EnMS does not fully meet the requirements of ISO 50001:2018 after completing Level 4 of the maturity model in the phased approach. Each organization determines the appropriate level or goals to achieve. However, once the organization reaches Level 4, a natural progression can be to consider conformity to ISO 50001 as a goal.

As indicated in 4.2.7, the first step to establishing a plan to meet the requirements of this goal is to conduct a gap analysis between Level 4 and ISO 50001. Since each organization implements the maturity levels based on their needs, the gaps to ISO 50001 will be unique to the organization and their own implementation of energy management practices to get to Level 4. Following the methodology of this document, the next step is the development of an action plan towards closing those gaps. This would allow organizations to self-declare conformity to ISO 50001 or seek certification if that is their goal.

When determining these actions, the organization can come across different ways to conform to ISO 50001 requirement(s); some can be very simple, others can be more complex but should always add value to the organization. Consistent with management systems, continual improvement is a feature that helps the organization ensure that their systems improve and continue to deliver benefits over time.

A.2 Best practices

A.2.1 General

This subclause provides some more actions that can be taken at any stage of the development of the EnMS. The actions are aligned with the elements presented throughout the document and can help organizations to get a more robust and reliable EnMS. It also gives guidance to organizations on some approaches that can be used to assist them in either further improvement of their existing EnMS in meeting the requirement for continual improvement of energy performance over time and integrating the EnMS into the strategic levels of the organization and social responsibility concerns.

A.2.2 Element 2 — Leadership

Actions that can be taken:

— reference energy management in annual reports (e.g. annual organization report, sustainability report, website);

— ensure that EnMT is attached to the management board;

— ensure that the organization's top-level strategic goals and plans explicitly include energy performance;

— top management ensures commitment to:

  — using alternative energy sources/technologies;

  — establishing supply chain energy management;

— using energy to support sustainable development (e.g. through global initiatives/targets).

A.2.3 Element 3 — Resources

Actions that can be taken:

— use succession planning for EnMT.

A.2.4 Element 5 — Energy performance indicators and energy baselines

Actions that can be taken:

— explicitly embed EnPIs in the top-level organizational scorecard.

A.2.5 Element 7 — Competence and awareness

Actions that can be taken:

— ensure that relevant employees have energy targets in personal objectives;

— ensure that employees periodically take time off from standard jobs to investigate energy savings opportunities (e.g. energy Kaizen events);

— provide general non-work energy efficiency opportunity information to employees;

— recognize and reward employee energy improvement ideas.

A.2.6 Element 8 — Operations and maintenance

Actions that can be taken:

— integrate effective O&M practices of SEUs into business processes;

— ensure that preventive/predictive maintenance activities that improve efficiency associated with SEUs are in place;

— manage maintenance activities in a maintenance system;

— monitor control systems regularly to ensure optimal operations;

— ensure that O&M processes, including outsourced O&M, are controlled;

— ensure that operations personnel actively seek energy savings measures and verify specific energy goals within the organization.

A.2.7 Element 9 — Procurement and design

Actions that can be taken:

— ensure that procurement and design employees are part of the EnMT;

— ensure that procurement works with O&M personnel to ensure that energy efficiency targets are met;

— consider waste heat recovery alongside purchased utility energy, as appropriate;

— ensure that financial metrics for energy projects account for long-term energy savings;

— consider best available technology in procurement and design activities;

— integrate energy efficient design into all relevant design projects.

A.2.8 Element 10 — Process for communication and control of documented information

Actions that can be taken:

— communicate routinely with the community regarding energy.

A.2.9 Element 11 — Monitoring, measurement, analysis and evaluation of energy performance

Actions that can be taken:

— ensure that submetering is in place for all processes and equipment that are SEUs;

— train all relevant personnel on energy analysis.

A.2.10 Element 12 — Management review and improvement

Actions that can be taken:

— be agile and responsive to unplanned changes;

— factor data trends, supplier information and preventive action information into energy project planning;

— ensure that each department or functional area has a team member involved in the management review.

Annex B
(informative)

Level version of the maturity model

This annex shows the criteria in a level-based manner in Tables B.1 to B.4. The tables also show the connection between the clauses and subclauses of ISO 50001:2018 to the elements given in this document.

Table B.1 — Maturity model — Level 1

			Criteria
ISO 50001:2018 reference	**No.**	**Element**	**Level 1**
4. Context of the organization	1	Context of the organization	— Create some awareness within the organization about energy-related environmental and other impacts. — Create an awareness about the applicable legal requirements and other requirements related to energy.
5. Leadership	2	Leadership	Top management: — provides verbal support for energy management; — ensures that informal policies or commitments relating to energy management are in place; — enables the formation of an EnMT.
	3	Resources	— Establish an informal EnMT. — Allocate some budget for energy management activities.
6. Planning	4	Energy review	— Identify current energy types and energy use(s). — Identify energy savings opportunities that are either based on common knowledge at the facility or are simple and/or low-cost (e.g. compressed air leaks, steam leaks, idling equipment). — Collect energy data (e.g. by using energy bills).
	5	Energy performance indicators and energy baselines	— Brainstorm possible variables based on practical knowledge. — Conduct a preliminary analysis of energy data (e.g. by using the historical data). — Ensure that energy consumption and cost data (e.g. energy bills) are available as documented information.
	6	Objectives, energy targets and action plans	— Set energy targets using an ad hoc or informal approach. — Select and implement energy savings projects and energy efficiency measures using an ad hoc or informal approach.

Table B.1 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element**	**Level 1**
7. Support and 8. Operation	7	Competence and awareness	—
	8	Operations and maintenance	— Consider some O&M impacts on energy consumption.
	9	Procurement and design	—
	10	Process for communication and control of documented information	— Keep some documented information (e.g. energy bills). — Communicate on energy-related issues using an ad hoc or informal approach.
9. Performance evaluation	11	Monitoring, measurement, analysis and evaluation of energy performance	— Monitor energy consumption (e.g. at facility level using energy bills).
10. Improvement	12	Management review and improvement	—

Table B.2 — Maturity model — Level 2

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 2**
4. Context of the organization	1	Context of the organization	— Collect information about energy-related environmental and other impacts within the organization.
5. Leadership	2	Leadership	Top management ensures that: — an energy policy is established; — energy targets are established; — responsibilities and authorities to the EnMT are assigned (the tasks of the EnMT are described in Element 3 “resources”); — the energy policy is communicated within the organization; — the roles, responsibilities and composition of the EnMT are communicated within the organization; — the energy policy is available as documented information.
	3	Resources	— Establish an EnMT. — The EnMT begins to collect information that can be used on energy performance and energy performance improvement. — Allocate the budget necessary for initial training and implementation.

Table B.2 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 2**
6. Planning	4	Energy review	— Evaluate past and current energy use(s) and energy consumption and energy cost data. — Identify SEUs. — Evaluate opportunities for energy savings. — Install permanent or temporary energy consumption meters wherever resources are available. — Store energy data in easily accessible formats and make it available to relevant personnel.
	5	Energy performance indicators and energy baselines	— Quantify potentially relevant variables. — Conduct a preliminary analysis of energy consumption based on a single variable. — Determine EnPIs at the facility level. — Establish an EnB for each energy type (e.g. by using one year of energy bills).
	6	Objectives, energy targets and action plans	— Formally set energy targets. — Establish a basic plan for the implementation of energy savings projects and energy efficiency measures including required resources, responsibilities and timelines. — Ensure that action plans for energy savings projects are available as documented information.
7. Support and 8. Operation	7	Competence and awareness	— Ensure that all employees are aware of the energy policy. — Ensure that employees understand how their actions can impact energy consumption. — Train members of the EnMT in specific energy management issues, as necessary.
	8	Operations and maintenance	— Partially establish O&M criteria for processes related to energy performance. — Ensure that the energy impacts of O&M processes are understood by personnel. — O&M personnel identify some no-cost and low-cost energy performance improvement actions.
	9	Procurement and design	— Consider energy performance occasionally in design. — Consider energy consumption occasionally in procurement.
	10	Process for communication and control of documented information	— Issue and maintain some documented information (e.g. energy policy, energy review, energy data collection plan, initial training activities). — Ensure planned communication on energy-performance-related issues.

Table B.2 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 2**
9. Performance evaluation	11	Monitoring, measurement, analysis and evaluation of energy performance	— Review energy performance (including costs) occasionally.
10. Improvement	12	Management review and improvement	— Top management reviews energy consumption and energy costs at least on an annual basis. — Identify deviations from expected results (e.g. in energy consumption trends) and take action to control and correct them.

Table B.3 — Maturity model — Level 3

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 3**
4. Context of the organization	1	Context of the organization	— Determine energy-related external and internal issues that affect the organization's ability to improve energy performance. — Identify the risks and opportunities associated with external and internal issues that affect the organization's ability to improve energy performance. — Determine how legal requirements and other requirements apply to the organization's EnMS.
5. Leadership	2	Leadership	Top management ensures that: — the energy policy includes a commitment to continual improvement of energy performance and the EnMS; — the EnMS scope and boundaries are established; — objectives and energy targets are established; — the EnMS is improving in order to meet the targets for each element; — responsibilities and authorities for relevant roles (beyond the members of the EnMT) are assigned; — responsibilities and authorities for relevant roles are communicated within the organization; — the scope and boundaries are available as documented information.

Table B.3 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 3**
	3	Resources	— EnMT ensures that the EnMS is established, implemented, maintained and continually improved. — EnMT implements action plans to continually improve energy performance. — EnMT monitors the energy performance of the organization. — EnMT regularly communicates energy performance and achievements within the organization. — Absorb costs for the EnMS into existing capital and/or operational expense budget(s).
6. Planning	4	Energy review	— Make preliminary estimates of future energy use(s) and energy consumption. — Determine current energy performance of each SEU. — Prioritize energy savings opportunities. — Define energy data collection plans that include energy consumption, relevant variable data and operational criteria for the SEU(s) and energy consumption for the organization. — Incorporate measurement needs into planning (e.g. purchasing/installing submeters). — Ensure that the results of the energy review are available as documented information.
	5	Energy performance indicators and energy baselines	— Conduct a more thorough review of variables that significantly impact energy consumption using simple regression analysis. — Create EnPIs that are aligned with energy targets. — Determine EnPIs at the SEU level. — Review EnPIs periodically to ensure that they reflect energy performance and update them, if necessary. — Establish EnB(s) by using the information from the data of the energy review (e.g. daily, weekly or monthly) energy consumption and relevant variable data. — EnMT reports EnPI value(s) regularly, including progress against energy targets and/or EnB(s). — Ensure that EnBs, EnPI value(s), relevant variable data and information on revision(s) of EnB(s) are available as documented information.

Table B.3 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 3**
	6	Objectives, energy targets and action plans	— Ensure that the objectives and energy targets are consistent with the energy policy, take into account energy performance improvement opportunities and are updated as appropriate. — Ensure that action plans take into account risks, barriers and financial evaluation and include how the results will be evaluated. — Analyse and prioritize energy savings projects and efficiency measures. — Evaluate the results of the implemented energy savings projects and energy efficiency measures. — Inform employees regularly about the extent to which objectives and energy targets have been met. — Ensure that objectives, energy targets and action plans are available as documented information.
7. Support and 8. Operation	7	Competence and awareness	— Ensure that employees engage in energy awareness through campaigns and promotional events. — Review or analyse employee awareness. — Identify competence gaps for the EnMT based on the level of current competence and necessary competence related to the EnMS and energy performance. — Take actions to fill the identified gaps for EnMT. — Encourage employees to make comments or suggest ideas about energy performance improvement actions.
	8	Operations and maintenance	— Establish and maintain O&M criteria for the processes related to energy performance of SEUs. — Ensure that some O&M processes are in place. — Communicate criteria established for the processes related to SEUs to relevant personnel.
	9	Procurement and design	— Consider energy performance consistently in design. — Consider energy performance consistently in procurement. — Engage equipment suppliers and contractors to provide energy efficient solutions. — Ensure that some standard procedures are in place for the procurement of energy types. — Begin informing suppliers that energy performance is one of the evaluation criteria for procurement.
	10	Process for communication and control of documented information	— Identify all documented information that is needed to support the EnMS. — Determine the internal communication relevant to the EnMS including what to communicate, when to communicate, recipients of that communication, how to communicate and who is responsible for communication.

Table B.3 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 3**
9. Performance evaluation	11	Monitoring, measurement, analysis and evaluation of energy performance	— Monitor and measure key characteristics including actual versus expected energy consumption and EnPIs. — Analyse the results of monitoring and measurements. — Identify significant deviations in energy performance. — Ensure that results from monitoring and measurement are available as documented information.
10. Improvement	12	Management review and improvement	— Top management reviews the extent to which objectives and energy targets have been met and takes actions when they are not achieved. — Top management reviews the status of action plans. — Top management reviews the EnMS at defined intervals. — Identify and monitor EnMS elements (e.g. using an organizational scorecard or energy management assessment). — Top management reviews trends in nonconformities and corrective actions. — Top management reviews the effectiveness of the EnMT. — Determine the causes of nonconformities and take actions, if needed, in order to prevent their recurrence or occurrence elsewhere.

Table B.4 — Maturity model — Level 4

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 4**
4. Context of the organization	1	Context of the organization	— Top management ensures that the energy-related needs and expectations of the relevant interested parties are determined. — Top management ensures that risks and opportunities associated with the energy-related needs and expectations of interested parties are determined in order to ensure that the EnMS achieves its intended results. — Top management ensures that measures to address the determined risks and opportunities are established. — The organization determines changes in external and internal issues and associated risks and opportunities that are relevant to the EnMS and energy performance improvement. — Establish a system to apply legal requirements and other requirements throughout the processes of the EnMS. — Review at defined intervals the organization's legal requirements and other requirements.

Table B.4 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 4**
5. Leadership	2	Leadership	Top management demonstrates leadership and commitment by: — ensuring that the energy policy is periodically reviewed and updated as necessary; — ensuring that the energy policy is compatible with the strategic direction of the organization; — reviewing the EnMS scope and boundaries and updating as appropriate; — ensuring that objectives and energy targets are compatible with the strategic direction of the organization; — ensuring that the action plans are approved and implemented; — promoting continual improvement of energy performance and the EnMS; — ensuring that responsibilities and authorities for all relevant roles are assigned, reviewed and updated as appropriate; — communicating the importance of the effectiveness of the EnMS and of conforming to the EnMS requirements; — ensuring that responsibilities and authorities for all relevant roles are communicated within the organization; — making the energy policy available to interested parties, as appropriate.
	3	Resources	— EnMT monitors the status of the action plans. — EnMT reports to top management on the performance of the EnMS and the improvement of energy performance at determined intervals. — Determine and allocate the budget needed for continual improvement of energy performance and the EnMS.

Table B.4 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 4**
6. Planning	4	Energy review	— Estimate future energy use(s) and energy consumption. — Update the energy review at defined intervals as well as in response to major changes in facilities, equipment, systems or energy-using processes. — Identify the person(s) doing work that influence or affect each SEU. — Identify routinely new energy savings opportunities, analyse and evaluate them, and implement selected measures on a continual basis. — Ensure that equipment used for measurement provides data which are accurate and repeatable. — Review the energy data collection plans at defined intervals and update, as appropriate. — Ensure that the methods and criteria used to develop and conduct the energy review are available as documented information.
	5	Energy performance indicators and energy baselines	— Determine all relevant variables for each SEU. — Ensure that EnPIs are appropriate for measuring and monitoring energy performance and for demonstrating energy performance improvement. — Revise EnB(s) in the following cases: a) EnPI(s) no longer reflect(s) the organization's energy performance; b) there have been major changes to the static factors; c) according to a pre-determined method. — Use relevant variables for the normalization of the EnB(s). — EnMT reports EnPI value(s) at determined intervals, including progress against energy targets and/or EnB(s). — Ensure that the method to determine and update the EnPI(s) is available as documented information. — Ensure that the modifications to EnB(s) are available as documented information.

Table B.4 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 4**
	6	Objectives, energy targets and action plans	— Ensure that objectives and energy targets consider SEUs and take into account applicable requirements. — Ensure that objectives and energy targets are measurable and monitored. — Select and implement energy savings projects and efficiency measures to ensure that they result in improved energy performance. — Review the effectiveness of action plans and the achievement of energy targets at planned intervals. — Consider how actions to achieve objectives and energy targets can be integrated into business processes. — Communicate and update objectives and energy targets, as appropriate.
7. Support and 8. Operation	7	Competence and awareness	— Ensure that employees are aware of their contribution to the effectiveness of the EnMS and the implications of not conforming to the EnMS requirements — Identify competence gaps for other relevant personnel based on the level of current competence and necessary competence related to the EnMS and energy performance. — Take actions to fill the identified gaps for other relevant personnel. — Top management implements an employee and contractor suggestion scheme for the improvement of energy performance and the EnMS. — Ensure that evidence of competence of all personnel involved in the EnMS is available as documented information. — Consider keeping documented information on the suggested improvements.
	8	Operations and maintenance	— Monitor O&M criteria for the processes related to the energy performance of SEUs to support timely action, when significant deviations from intended energy performance occur. — Control outsourced O&M processes. — Ensure that the O&M of externally provided SEUs or processes related to SEUs are controlled. — Ensure that all O&M processes are in place for SEUs. — Ensure that evidence to the extent necessary that O&M processes related to SEUs have been carried out as planned is available as documented information.

Table B.4 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 4**
	9	Procurement and design	— Consider energy performance improvement opportunities and operational control in design. — Ensure that purchasing decisions follow established criteria for evaluating energy performance over the planned or expected operating lifetime. — Account for the impact that contractors and outsourced processes have on energy performance. — Inform suppliers that energy performance is one of the evaluation criteria for procurement. — Ensure that the results of the energy performance consideration of the design stage are incorporated into specifications of the procurement documents and are communicated to suppliers. — Ensure that information on design activities related to energy performance are available as documented information.
	10	Process for communication and control of documented information	— Create, manage, review, update and control EnMS-related documented information. — Determine the external communications relevant to the EnMS.
9. Performance evaluation	11	Monitoring, measurement, analysis and evaluation of energy performance	— Ensure that equipment used for the measurement of key characteristics provides data which are accurate and repeatable. — Evaluate energy performance and energy performance improvement. — Investigate and respond to significant deviations in energy performance. — Evaluate compliance with legal requirements and other requirements at planned intervals. — Ensure that the results of the investigation and response to significant deviations in energy performance are available as documented information. — Ensure that documented information on the accuracy and repeatability of the measurements is available. — Ensure that the results of the evaluation of compliance with legal requirements and other requirements is available as documented information.

Table B.4 *(continued)*

			Criteria
ISO 50001:2018 reference	**No.**	**Element title**	**Level 4**
10. Improvement	12	Management review and improvement	— Top management reviews energy performance and energy performance improvement based on monitoring and measurement results including the EnPIs. — Review the EnMS at planned intervals internally to ensure that relevant employees are following its requirements. — Continually identify, assess and implement opportunities to improve the EnMS. — Plan, implement and maintain internal audit programme(s). — Top management reviews trends in audit results. — Review the effectiveness of any corrective action taken and their appropriateness to the effects of the identified nonconformities. — Make changes to the EnMS, if required. — Demonstrate continual energy performance improvement. — Continually improve the effectiveness of the EnMS. — Ensure that the results of the management review are available as documented information. — Ensure that the nature of nonconformities and the results of corrective actions taken are available as documented information.

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