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Energy management and energy savings — Building energy data management for energy performance — Guidance for a systemic data exchange approach

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Foreword

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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

The successful implementation of an energy management system (EnMS), particularly ISO 50001, requires information to complete almost every action. In some situations, the data required to provide this information will be readily available or easy to access; whereas in other situations the required data can be difficult to obtain. The availability of data may affect which energy performance goals or indicators can be used by the organization. Establishing regular information transfers for an EnMS, whether based on ISO 50001 or another similar approach, is often one of the most challenging implementation tasks. This document provides a process for the energy management team (EnMT) to use in situations where the required data are difficult to obtain. It also provides high-level guidance useful for planning and maintaining information access. This document is about the management process and not the technology of data measurement or transfer.

Establishing regular information collection or data transfers for an EnMS, for example to determine, calculate or evaluate the values of energy performance indicators (EnPIs), may require the EnMT to work with other parts of the organization to obtain the necessary data. Regular information or data transfers can be facilitated by implementing a formal data interface or transfer capabilities as part of the organization's standard business practices. These capabilities can be described in a data management plan (DMP). In the best case, data transfers can be automated. Formal data transfer capabilities, whether automated or not, can increase uniformity and consistency, and can reduce the risks, costs and errors associated with the implementation of an EnMS.

In presenting guidance on management processes, this document emphasizes that when the decision is made to incorporate specific data into the EnMS, particular attention should be paid to:

a) management need for that data (e.g. objectives, targets) as used in the organization's EnMS;

b) data definition, attributes and formats.

The aim of this document is to facilitate the work of the EnMT. Since data often comes from outside their activities, the providers of these data can also be interested in the requirements of the EnMT. Accordingly, users of this document can include:

— EnMTs, including those implementing ISO 50001 or calculating EnPIs;

— building energy managers;

— equipment manufacturers and instrumentation engineers;

— building information system (BIS) managers;

— organizations that operate buildings.

This document provides guidance on documenting data and the associated processes.

Figure 1 shows the relationship of this document to ISO 50001, which uses the Plan-Do-Check-Act (PDCA) cycle and concept of an EnPI. The straight arrows in the figure indicate where data may be needed in the PDCA process.

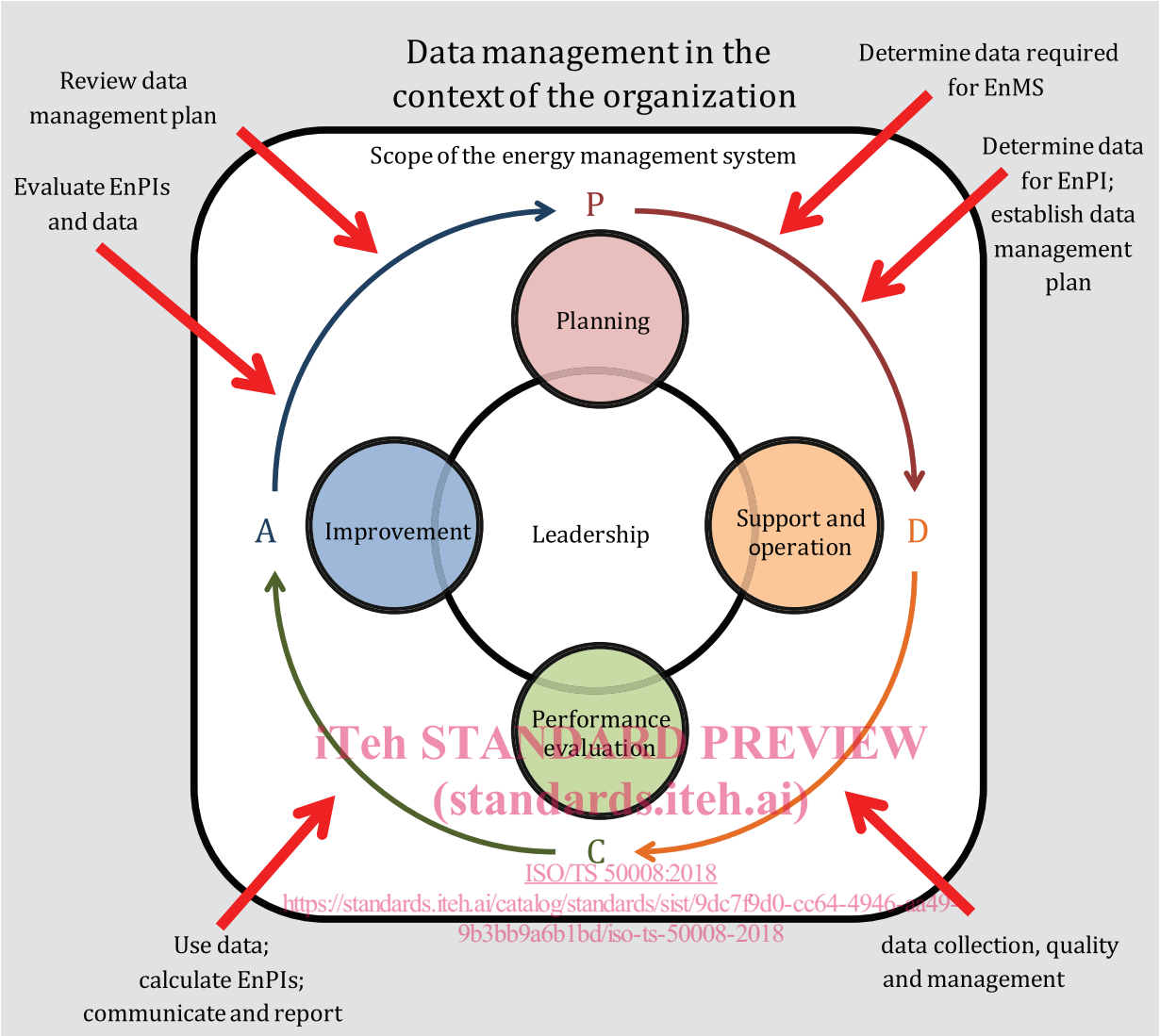

Figure 1 — Relationship to ISO 50001

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1 Scope

This document gives guidelines for how the energy management team (EnMT) in an organization can define, request and regularly access the data and information needed to implement an energy management system (EnMS) designed to continually improve energy performance in buildings.

It is applicable to data provided by human processes or by building automation, control, information technology, or even accounting systems. If the building information system (BIS) is accessible by the EnMT, the BIS can facilitate the provision of data and information. This could include data used in determining significant energy uses (SEUs), managing to improve energy performance (including energy consumption, energy use and energy efficiency) through to the use of energy performance indicators (EnPIs).

This document does not apply to:

— residential or industrial buildings;

— buildings containing an industrial process where the industrial processes cannot be separated from other uses.

However, many of the principles in this document can be applied to these or other types of buildings.

NOTE Industrial processes can include manufacturing, packaging, transportation, assembly, etc.

It does not apply to building automation data communication protocols themselves.

It is does not consider the selection of energy management software, hardware and control algorithms for automatically managing buildings.

2 Normative reference

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 http://www.electropedia.org/

3.1
building information system
BIS
systems, processes and sources of data about a building or its pattern of use

Note 1 to entry: This may include data output from a building management system (BMS), lighting management system, or other automated systems, as well as from security, control, information technology or even accounting systems.

Note 2 to entry: Elements of a BIS can be computerized or may require manual data collection.

3.2
data management plan
DMP
plan prepared by the *energy management team* (3.4) covering the determination, collection, maintenance and storage of *energy data* (3.3)

Note 1 to entry: ISO 50001 refers to an energy data collection plan, which covers some of the elements of a DMP.

3.3
energy data
data including energy consumption and other variables used to calculate or evaluate energy performance

Note 1 to entry: Energy data are collected and used for *energy performance improvement actions* (3.6) to evaluate energy performance.

Note 2 to entry: "Other variables" can include *relevant variables* (3.9) and *static factors* (3.10).

3.4
energy management team
EnMT
person(s) with the responsibility and authority for effective implementation of EnMS activities and for delivering energy performance improvement

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

[SOURCE: ISO 50001:2018, 3.2.5, modified — The abbreviation "EnMT" has been added and "an energy management system" has been changed to "EnMS activities".]

3.5
energy performance improvement action
EPIA
action or measure or group of actions or measures implemented or planned within an organization intended to achieve energy performance improvement through technological, management, behavioural, economic, or other changes

[SOURCE: ISO 50015:2014, 3.5]

3.6
energy performance indicator
EnPI
measure or unit of energy performance, as defined by the organization

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

[SOURCE: ISO 50001:2018 3.4.4, modified — Note 2 to entry has been deleted.]

3.7
energy use
application of energy

EXAMPLE Ventilation, lighting, heating, cooling, transportation, data storage.

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

[SOURCE: ISO 50001:2018, 3.5.4, modified — In the example, "production process" has been deleted.]

3.8
relevant variable
quantifiable factor that impacts energy performance and routinely changes

EXAMPLE Weather conditions, operating conditions (indoor temperature, light level), working hours, number of occupants, etc.

[SOURCE: ISO 50015:2014, 3.18 modified — In the example, "number of occupants, etc." has replaced "production output".]

3.9
significant energy use
SEU
energy use (3.7) accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement

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

[SOURCE: ISO 50001:2018, 3.5.6, modified — Note 2 to entry has been deleted.]

3.10
static factor
identified factor that impacts energy performance and does not routinely change

EXAMPLE Facility size, design of installed equipment, gross floor area vacancy, weekly operating hours, seasonal extended hours of operation.

[SOURCE: ISO 50001:2018, 3.4.8, modified — Note 1 to entry has been deleted, and in the example, "gross floor area vacancy, weekly operating hours, seasonal extended hours of operation" has replaced "number of weekly shifts; range of products".]

4 The process of obtaining and managing data

4.1 General

This clause presents a management process that the EnMT can use to determine the sources of data needed to implement an EnMS, and the subsequent collection of those data. This process assumes that the EnMT is in place and has identified the essential quantitative parameters to be used for energy management. While there are a number of approaches to energy management, the basic management approaches are very similar, and generally make use of similar data elements. To provide a specific example of the data under discussion, the typical data elements used in an ISO 50001 implementation are listed in Annex A.

In this document, the term "data" refers to any data, including energy data, necessary to accomplish successful implementation of an EnMS. Collection of those data may require the EnMT to work with individuals or organizations that already obtain or control that data. These data may be within the same organization (e.g. building operators or their staff) or organizations outside the organization (e.g. weather service data).

The data that the EnMT determines to be necessary to implement the EnMS should be listed in a DMP. The DMP includes basic descriptors of the data, the source and contact information, and the manner and timing with which the data will be provided or can be accessed.

NOTE For implementation of ISO 50001, the guidance in ISO 50004 on collecting data can be used.

The automated collection of data can often lead to potential resource savings. Particularly when data collection is automated, a common understanding of the needs and constraints is important for efficient data communication. This includes data semantics, formats and attributes for managing data that describes building energy performance.

4.2 Process for defining data needs for energy management

4.2.1 General

Different approaches to energy management use a similar sequence of activities. Typically, these follow a continual improvement approach, such as PDCA. For the implementation of ISO 50001, the typical data needs are given in Annex A. The data needs are best met by following structured processes for identifying data and its availability, as shown in Figure 2.

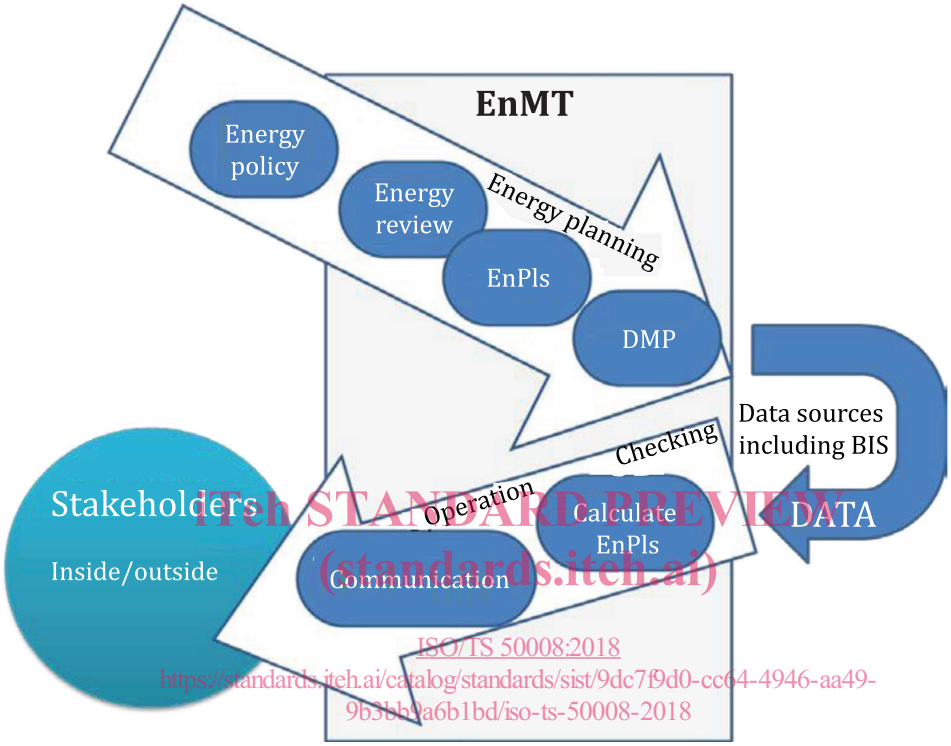

Figure 2 — Representation of typical energy management process

Figure 2 shows a single cycle of an ongoing EnMS. An energy policy will have been established. The energy review periodically identifies energy flows and other relevant variables before the EnMT selects EnPIs appropriate for each stakeholder. EnPIs can be used to set energy targets consistent with the energy policy. The EnMT specifies the data needed for calculating the EnPIs, arranges for the availability of the data and collects those data from its sources, including a BIS. The EnMT calculates the EnPIs and communicates the results to stakeholders inside and outside the organization.

The data collection can be manual, automatic or a combination of both, depending on the configuration and structure of the existing data sources, e.g. weather data or occupancy data from sensors, a security system, a point of sale activity within the building.

4.2.2 Determination of a data management plan

The EnMT determines the data requirements for EnMS activities. These requirements can be included in the DMP using the following steps:

a) identify data and their attributes;

b) identify the entities that can provide and exchange data (e.g. EnMT, external sources);

c) identify the types of data defined, stored and used by each entity that can provide data;

d) identify who will gather, maintain and store data;

e) determine the availability of data based on structure, configuration and limitations (e.g. equipment, cost, time, resources).

Data requirements can include building energy data and data about relevant variables, such as occupancy or internal temperatures. Data requirements also can include static factors, such as the building area or operating hours.

The EnMT should also allow for the fact that data, particularly BIS data, may be available with attributes specific to its source. For BIS data, this can be related to building operation and management. Data will usually have to be transformed into data formats and attributes compatible with EnMS activities before they can be used.

The EnMT should determine whether the BIS is able to make available the necessary energy data, or other data, in a format that can be directly used. If so, these data can be converted by the automation system into formats which are compatible with EnMS activities.

When the BIS or automation system is not able to produce data that the EnMT can directly use, those data might need to be processed (e.g. the EnMT needs daily average temperature, rather than hourly readings from the BIS). Some of the common situations that the EnMT can encounter are discussed in Clause 5.

4.3 Characteristics of data to be recorded in a data management plan

The DMP records the data characteristics, sources and agreements for data needed by the EnMT. Its development can take into account the existing BIS configuration and its capabilities to provide and process data. It is advised to consider the context information provided by the attributes associated with the data provided by the BIS. The DMP also specifies the characteristics of each data element.

For each element of data, the following should be recorded:

a) the name and description of what is to be provided to the EnMT;

b) the reason these particular data (e.g. temperature) are to be provided to the EnMT (e.g. which EnPI or other use requires these data);

c) the person responsible for recording or measuring the data;

d) the person responsible for its calibration and maintenance;

e) how it is recorded or measured;

f) how often it is recorded;

g) how the time of measurement will be recorded;

h) the values or range of values expected;

i) what constitutes a significant deviation from the anticipated values;

j) what actions are taken for values that show a significant deviation from the anticipated values;

k) the format of the recorded data;

l) how the data will be processed before they are provided to the EnMT;

m) the person responsible for that processing;

n) the agreement on how the data are to be provided to the EnMT;

o) for each of the data provided to the EnMT, who on the EnMT will receive it;

p) if the data are to be provided electronically, the technical specification of the data that will be provided to the EnMT;