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GUIDE

colour inside

Inclusion of energy efficiency aspects in electrotechnical publications

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Inclusion of energy efficiency aspects in electrotechnical publications

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INCLUSION OF ENERGY EFFICIENCY ASPECTS IN ELECTROTECHNICAL PUBLICATIONS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This first edition of IEC Guide 118 has been prepared, in accordance with ISO/IEC Directives, Part 1, Annex A, by the IEC Advisory Committee on Energy Efficiency (ACEE). This is a non-mandatory guide in accordance with SMB Decision 136/8.

The text of this IEC Guide is based on the following documents:

Four months' vote	Report on voting
C/1979A/DV	C/2002/RV

Full information on the voting for the approval of this IEC Guide can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Energy efficiency is key to addressing the challenge to support energy policies while preserving the environment.

Many energy efficient technologies and solutions are already available and cost-effective; nevertheless, a variety of barriers inhibits the deployment of these technologies and impedes harvesting their energy efficiency potential.

Standardization can play an important role to help overcome these barriers and to disseminate and promote energy efficient technologies, solutions and services.

This Guide aims to give advice to technical committees on the way energy efficiency should be considered and included in IEC publications.

IEC publications may deal exclusively with energy efficiency or may include clauses specific to energy efficiency; however technical committees are encouraged to:

- consider energy efficiency in their standardization work;
- identify which aspects of energy efficiency are relevant for their standardization;
- use a structured approach when addressing energy efficiency;
- use a systems approach when addressing energy efficiency.

This Guide helps to fulfil IEC Energy Efficiency Policy[1] by indicating how energy efficiency can be included in electrotechnical publications.

In this Guide, the term “technical committees” also includes subcommittees and system committees. The term “publication” includes “International Standard”, “Technical Report”, “Technical Specification” and “Guide”. In addition, the term “product” includes “process”, “service” and combinations thereof, commonly known as “systems”.

Technical committees dealing with subjects relating to energy efficiency for the whole, or for a specific part of their activities, are invited by SMB Decision 136/8 to follow the provisions of this Guide.

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1 White Paper: Coping with the Energy Challenge. The IEC’s role from 2010 to 2030. Smart electrification – The key to energy efficiency.

INCLUSION OF ENERGY EFFICIENCY ASPECTS IN ELECTROTECHNICAL PUBLICATIONS

1 Scope

This Guide is intended for technical committees and gives guidance on how to consider energy efficiency aspects when preparing IEC publications.

Its purpose is:

- to describe the contributions of IEC publications to energy efficiency;
- to describe the concept of an energy efficiency aspect;
- to provide categories of energy efficiency aspects and a list of energy efficiency aspects to be considered by technical committees.

This Guide:

- helps in harmonizing the approach to energy efficiency;
- raises awareness that provisions in IEC publications can affect the energy performance of the product itself (taken individually) and of the entire application (embedding the product), in both negative and positive ways;
- helps technical committees to identify energy efficiency aspects that contribute to energy efficiency improvement of the product itself and of the entire application;
- promotes the use of a systematic approach when addressing energy efficiency in the context of standardization;
- promotes the use of a systems approach when addressing energy efficiency aspects in the context of standardization.

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/IEC 13273-1:2015, *Energy efficiency and renewable energy sources – Common international terminology – Part 1: Energy efficiency*

IEC Guide 119, *Preparation of energy efficiency publications and use of basic energy efficiency publications and group energy efficiency publications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 13273-1 and the following apply.

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

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

3.1
energy efficiency
ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy

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

Note 1 to entry: Both input and output need to be clearly specified in quantity and quality, and be measurable.

[SOURCE: ISO/IEC 13273-1:2015, 3.4.1]

3.2
energy performance
measurable results related to energy efficiency, energy use and energy consumption

[SOURCE: ISO/IEC 13273-1:2015, 3.3.1]

3.3
energy efficiency improvement
increase in energy efficiency as a result of technological, design, behavioural or economic changes

[SOURCE: ISO/IEC 13273-1:2015, 3.4.3]

3.4
relevant variable
quantifiable factor that impacts energy performance and routinely changes

EXAMPLE Production parameters (production, volume, production rate); weather conditions (outdoor temperature, degree days); operating hours; operating parameters (operational temperature, light level).

[SOURCE: ISO 50006:2014, 3.14]

3.5
static factor
identified factor that impacts energy performance and does not routinely change

EXAMPLE 1 Facility size; design of installed equipment; the number of weekly production shifts; the number or type of occupants (e.g. office workers); range of products.

EXAMPLE 2 A change of a static factor could be a change in manufacturing process raw material, from aluminium to plastic.

[SOURCE: ISO 50006:2014, 3.17]

4 Standardization and energy efficiency

4.1 General considerations

Standardization plays a key role in promoting energy efficiency as it:

- supports the dissemination of energy efficient technologies;
- accelerates the uptake of the next generation of energy efficient technologies;

- creates the prerequisites for energy efficiency through enabling technologies;
- enables conformity assessment;
- helps overcome market barriers to energy efficiency.

Energy efficiency is a horizontal topic spanning the IEC domain and may be dealt with in IEC publications in various forms across a wide range of technologies and for different products, processes and services.

The horizontal nature of the topic and increasing integration of products, processes and services entering the market requires that technical committees identify which aspects of energy efficiency are relevant for standardization and when doing that:

- use a structured approach;
- adopt a systems approach (see 4.3 and IEC Guide 119).

4.2 The concept of energy efficiency

Energy efficiency relates the output of an activity to its energy input, for a given service. The input can be expressed in various energy units (kilowatt-hours, joules, tonnes of oil equivalent, etc.). In contrast, the output may not necessarily be expressed in energy units and covers a wide range of activities and services – production of cement, floor area, passenger-kilometres, employees, etc. – expressed in many units (tonnes, square metres, kilometres, number of employees, etc.).

It is key for energy efficiency to not reduce the given service but to optimize the energy input for a given service.

NOTE 1 Examples of an activity include processes, services, etc.

NOTE 2 Energy performance and energy efficiency are different concepts. The concept of energy performance includes energy use and energy consumption; energy performance, for instance, can be improved without necessarily affecting energy efficiency. Energy efficiency is one aspect of energy performance and is a frequently used metric for measuring energy performance.

NOTE 3 Implementation of energy efficiency measures can be based on energy price consideration.

Evaluation of energy efficiency should consider several important factors. Crucial are boundaries which define the scope for energy efficiency improvement.

The description of the boundaries may be conceptual or physical.

In evaluating energy efficiency, all relevant energy inputs and outputs across the boundaries need to be identified as well as the key performance indicators (KPIs) used to measure it. For the complete definition of the context necessary for energy efficiency assessment, driving parameters should also be defined (see Figure 1).

NOTE 4 Driving parameters, other than internal process parameters, are all factors that affect energy efficiency and include weather, operating parameters (indoor temperature, lighting levels, etc.), production volume, range of products, etc.; this concept includes the concept of relevant variable and static factors as defined by ISO 50006.

The definition of energy efficiency may vary when boundaries change.

EXAMPLE The energy efficiency of an electric motor, the energy efficiency of that motor driving a pump, the energy efficiency of the pumping system made of that motor and pump.

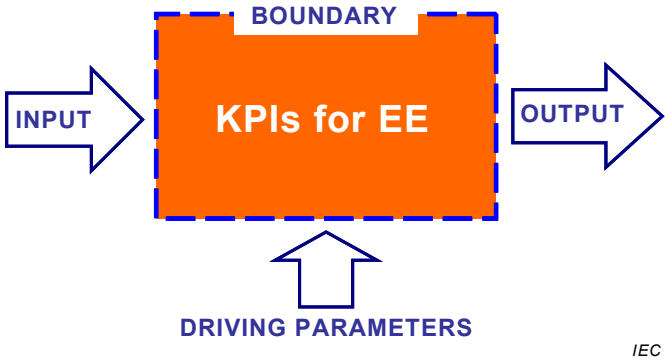

Figure 1 – Key elements in energy efficiency definition

For more details on boundary definition, see Clause B.2 and refer to IEC Guide 119.

Energy efficiency may vary and degrade over time.

4.3 Systems approach

Energy efficiency of a system needs to be analysed using a systems approach.

A systems approach to energy efficiency does not only consider the energy performance of the single components, but, and essentially, how efficiently these components are used within the application and boundary.

A systems approach to energy efficiency implies that the energy efficiency of one or more components may be de-optimized in order to achieve the maximum efficiency in the considered application and boundary.

A systems approach to energy efficiency is likely to optimize energy efficiency improvements as:

- the components and the application are considered together;
- the gains in energy efficiency of an optimized system may be much higher than the gains of an optimized individual component;
- an energy efficiency improvement at component level can be totally spoiled if this high efficiency component is used in poor operating conditions.

4.4 Contribution of standardization to energy efficiency

Standardization can play a role in overcoming some of the barriers to the implementation of energy efficient technologies and solutions. Examples include:

- common measurement and test methods to assess the use of energy and reductions attained through new technologies and processes;
- calculation methods so that sound comparisons of alternatives can be made in specific situations and can help with adaptation of infrastructure to integrate new technologies and interoperability;
- means to codify best practices and management processes for efficient energy use and energy conservation;
- design checklists and guides that can be applied to both the design of new systems as well as the retrofit of existing systems;

- common efficiency classifications, tolerances and minimum energy performance standards;
- the definition of possible energy efficiency metrics.

When developing IEC publications, barriers to energy efficiency should be considered, with the goal to contribute in overcoming such barriers through standardization activity. Annex A provides examples.

5 Energy efficiency aspects in IEC publications

5.1 General

This Guide proposes a systematic procedure for the identification of energy efficiency aspects to be considered for inclusion in IEC publications, when this is relevant for the technical committees.

This procedure is based on a general description of the energy efficiency improvement process. In this context, energy efficiency aspects are elements that are necessary to support this process. Energy efficiency aspects include tools, methods, activities, measures, checklists or guides.

Although this Guide is intended for use by technical committees, the principles of this procedure are general and may be used whenever improving energy efficiency is being considered during the life cycle.

5.2 Energy efficiency improvement process

A process to achieving energy efficiency improvements is shown in Figure 2.

In this energy efficiency improvement process as well as in the whole document the term "loss" is not to be interpreted solely in strict physical terms nor with a negative connotation only. The term "loss" includes also any kind of opportunity for energy efficiency improvement which is currently not implemented.