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BSI Standards Publication

Preparation of energy efficiency publications and the use of basic energy efficiency publications and group energy efficiency publications

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National foreword

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Preparation of energy efficiency publications and the use of basic energy efficiency publications and group energy efficiency publications

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PREPARATION OF ENERGY EFFICIENCY PUBLICATIONS AND THE USE OF BASIC ENERGY EFFICIENCY PUBLICATIONS AND GROUP ENERGY EFFICIENCY PUBLICATIONS

FOREWORD

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This first edition of IEC Guide 119 has been prepared, in accordance with ISO/IEC Directives, Part 1, Annex A, by the IEC Advisory Committee on Energy Efficiency (ACEE). Clauses 5 through 8 of this guide are mandatory, 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/1980A/DV	C/2003/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

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.

In this Guide, the term “technical committee” (TC) 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”.

PREPARATION OF ENERGY EFFICIENCY PUBLICATIONS AND THE USE OF BASIC ENERGY EFFICIENCY PUBLICATIONS AND GROUP ENERGY EFFICIENCY PUBLICATIONS

1 Scope

This Guide defines procedures for the preparation of energy efficiency (EE) publications and describes the relationship between technical committees (TCs) with group EE functions.

In the context of this Guide, “EE” refers to energy efficiency of products, systems and organizations.

It uses the boundary concept to address energy efficiency aspects (see IEC Guide 118) in the context of a systems approach.

This Guide is relevant to every TC which would like to publish a document dealing with EE.

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.

IEC Guide 118, *Inclusion of energy efficiency aspects in electrotechnical publications*

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

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
basic EE publication
publication covering energy efficiency aspects (EEA), applicable to products within the scope of two or more TCs

3.2
group EE publication
publication covering energy efficiency aspects (EEA), applicable to a specific boundary including products within the scope of two or more TCs

3.3
EE publication
publication covering energy efficiency aspects (EEA)

Note 1 to entry: An EE publication can be a basic EE publication, a group EE publication or a product publication.

[SOURCE: IEC 60050-901:2013, 901-02-12, modified – The term and definition have been modified for the specific context of energy efficiency.]

3.4
energy efficiency
EE
ratio or other quantitative relationship between an output of performance, service, goods or energy and an input of energy taking into account the driving parameters and the boundaries

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, modified – “taking into account the driving parameters and the boundaries” has been added to the definition.]

3.5
group EE function
task assigned to a TC to prepare group EE publications

3.6
horizontal EE function
task assigned to a TC to prepare basic EE publications

4 Systems approach

4.1 General considerations

Energy efficiency should be a requirement for products, systems and organizations.

EE measures shall not compromise safety nor affect the level of services.

Implementation of relevant EE measures should be in balance with economic and market constraints.

It may not be sufficient to improve the energy efficiency of a single product without considering its application.

EE of a product should be in balance to the depletion or voiding of environmental resources that have been used to produce it.

Conversely, it can be necessary to accept the higher losses of one product if they are off-set by an overall improvement of energy efficiency in the entire system, considering its environment, economy and application. Clause 4 explains how technical committees should consider the systems approach in their work where several TCs have to collaborate. This Guide proposes a way of collaboration between TCs on the bases of the boundaries between their respective responsibilities.

The main part of this approach is a standardized description of this boundary which defines the object of energy efficiency evaluation and improvement as well as the interfaces between the TCs.

The description of the boundary (physical or conceptual) should include information about the service(s) that are to be provided. This description will make no assumptions about physical implementation needed to realize the service(s). Examples of services are, for example, providing steam, producing metallic parts, converting heat.

4.2 Boundary description

4.2.1 General

The boundary description should be understood by each TC.

Boundaries should be defined in terms of:

- intended use (relevant applications),
- energy inputs,
- outputs,
- driving parameters other than internal process parameters (relevant variables, static factors),
- key performance indicator (KPI),

  KPIs are related to EE.
- interactions between components of the system,
- possible interactions with other systems.

Boundaries can include a device, a product or a system depending on the application considered. Physical product boundaries include:

- the physical limits of the product,
- power inputs or outputs,
- communication interfaces,
- any measurable inputs or outputs.

Functional boundaries (e.g. in the case of a service) include:

- the starting of a specification,
- the conclusion of a specification,
- the defined transfer of information, of material, or of other services,
- status of operation.

4.2.2 Elements of the boundary description

The boundary description and its elements are shown in Figure 1.

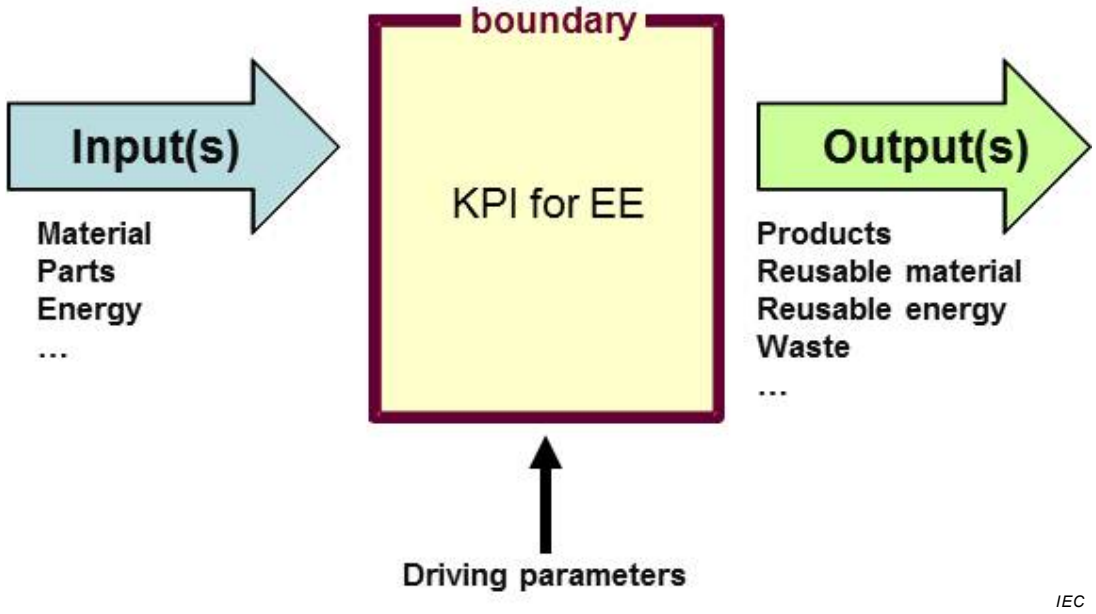


Figure 1 – Boundary description and its elements

The boundary description may include a list of services (conceptual boundary) or a list of the technical elements and their relation (technical implementation) that are within the chosen boundary. The further elements of the boundary description are given in 4.2.3 to 4.2.6.

4.2.3 Input(s)

The boundary description has input(s) necessary to perform the intended service, which can be defined by the following elements:

- type of input,
- quality of input,
- quantity of input.

Examples are materials, parts or energy.

4.2.4 Output(s)

The boundary description has output(s) as result(s) of the intended service which can be defined by the following elements:

- type of output,
- quality of output,
- quantity of output

Examples are products, service (including information), reusable material, reusable energy, and waste.

4.2.5 Driving parameters

The driving parameters should be defined. These are all external factors that affect energy efficiency. Examples include: regulation, environmental conditions, occupancy, energy prices

and management requirements, mode of operation, duty cycle, load curves, state, operating parameters, indoor temperature, lighting levels, production volume, range of products, etc.

NOTE Driving parameters concept includes the concept of relevant variable and static factors as defined by ISO 50002 and ISO 50006, respectively.

4.2.6 Energy efficiency related KPI(s)

The key performance indicators (KPI) such as those defined in IEC Guide 118 should be provided in the publications. All KPIs related to energy efficiency will be dependent on the boundary description (see examples in Annex A).

4.3 Broader boundary description – systems approach

Elements of the broader boundary description are shown in Figure 2.

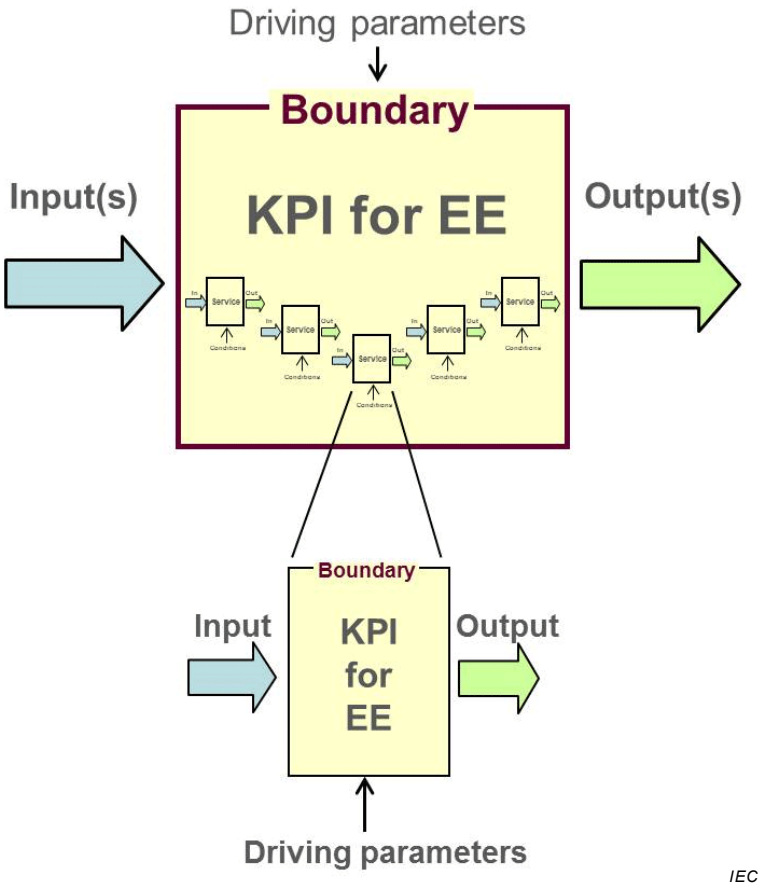


Figure 2 – Broader boundary description

The choice of the boundary is central for the possible EE improvements. The energy efficiency of a complex system needs to be analysed using a systems approach instead by seeking to optimize the performances of each single component. This means that it is advisable to consider wider boundary descriptions including several services and components in order to achieve further improvements. An example of this approach is shown in Annex A.

In these cases several TCs will need to collaborate in order to sufficiently deal with the product (including systems, processes) under consideration. Ideally this includes all TCs which deal with significant energy use components that are part of the boundary description. Together the TCs need to develop the individual boundary descriptions of all elements of the wider boundary description. This includes the services and elements, inputs, outputs and boundary conditions to perform the intended service. All inputs and outputs, including energy

loss, and the boundary conditions of the individual boundary descriptions inside the wider boundary description are also important to be exchanged so that a systematic solution can be assessed.

The boundary will also give an indication whether a single TC is able to deal with analysing the boundary themselves or whether collaboration with other TCs is necessary.

Annex B describes the systems approach as a collaborative example. Whenever a group of TCs is necessary to develop a boundary description, this should be done in a group EE publication.

If an individual TC is able to develop a boundary description for a product in its own scope, this should be done in the product publication.

5 Assignment of horizontal energy efficiency functions and of group EE functions

The assignment of horizontal EE functions and group EE functions is the responsibility of the Advisory Committee on Energy Efficiency (ACEE), subject to confirmation by the SMB (Standardization Management Board). Assignments are periodically reviewed by ACEE. For the structure of IEC EE publications and function assignment, see Figure 3.

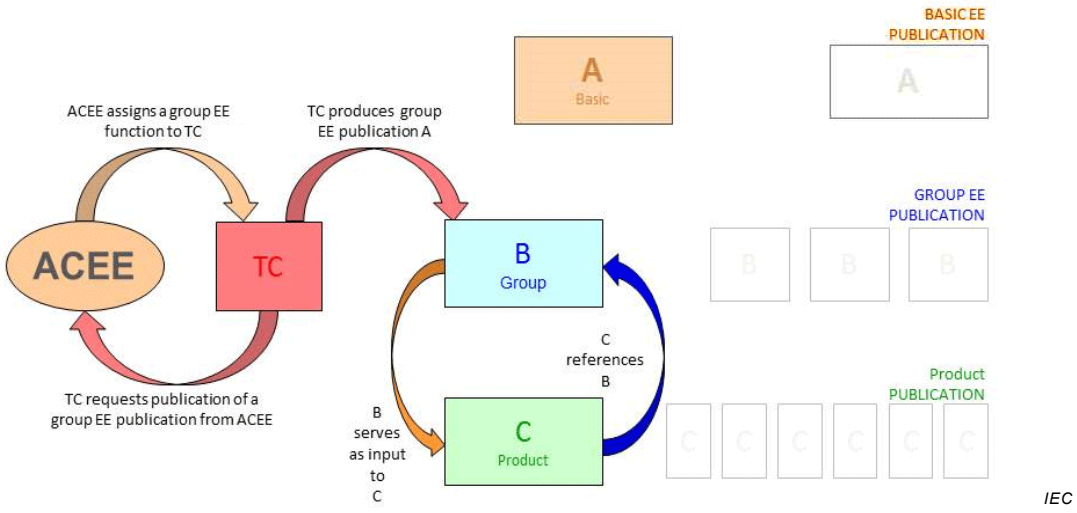


Figure 3 – Structure of IEC EE publications and function assignment

The assignment of a horizontal EE function or group EE function to a TC is made with the purpose of:

- ensuring the consistency of IEC publications relating to EEA common to a number of TCs by avoiding duplication of work and contradictory requirements;
- reducing the size of IEC publications by avoiding duplication of texts;
- improving mutual understanding among members.

A horizontal EE function or a group EE publication may be assigned to a TC for the whole or for a specific part of its activities. Annex B describes the extended product approach as a collaborative example.

The IEC Catalogue and website shall be used for identifying basic EE publications and group EE publications.

6 Energy efficiency publications

6.1 Basic EE publications and group EE publications

6.1.1 General

It is recommended to consult IEC Guide 118 when producing EE publications.

Basic and group EE publications shall contain aspects relevant to the horizontal or group EE function and shall be written in a manner understandable by the TCs. General and horizontal requirements, methodologies, measurement, benchmarking, KPI calculations, etc. shall be defined in a way applicable to all TCs in the area.

6.1.2 Basic EE publications

The EEA retained from IEC Guide 118 shall be listed in basic EE publications.

Basic EE publications shall explain the principles on which they are based in order to assist TCs. Guidance shall be given to TCs on how to apply a basic EE publication. Standardized methods for representing common characteristics which are used for evaluation and improvement of overall energy efficiency could be an example of a basic EE publication.

The focus of basic EE publications is the general tools and agreed methods for describing or achieving EE improvement in a defined boundary. These publications shall therefore describe EEA like measurement, calculation and further methods like benchmarking, KPI calculation for EE as described in IEC Guide 118.

A basic EE publication shall include in its scope the essence of the text given below:

"This basic EE publication is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 119 and IEC Guide 118. It is not intended for use by manufacturers or certification bodies."

One of the responsibilities of a TC is, wherever applicable, to make use of basic EE publications in the preparation of its publications. The publications shall define the EEA which apply for the whole of IEC work for EE: test methods, conditions, measurement, conformity assessment, definition of system boundaries, load profile, key performance indicator, etc.

In a few cases, a basic EE publication can, in addition, be intended for use as a standalone publication. In such cases, the first paragraph shall be modified accordingly.

A basic EE publication shall include IEC Guide 119 and IEC Guide 118 in its list of normative references.

It is essential that a basic EE publication not be frequently amended or frequently revised so that the involved TCs have some given time to align their related publications.

6.1.3 Group EE publications

Group EE publications may be primarily intended as EE publications, but shall also be used by other TCs in applying their provisions. In addition, guidance shall be given to TCs on how to apply information from a group EE publication, for example, how to define boundaries for a particular application (interrelation between light fixture, motion detector, outside shading, etc.).

A group EE publication shall include in its scope the essence of the text given below:

"This group EE publication is primarily intended to be used as an EE standard for the products mentioned in the scope, but is also intended to be used by technical committees in the preparation of publications for products similar to those mentioned in the scope of this standard, in accordance with the principles laid down in IEC Guide 119 and IEC Guide 118."

A group EE publication shall include IEC Guide 119 and IEC Guide 118 in its list of normative references.

It is essential that group EE publications not be frequently amended or frequently revised because TCs must be given time to align their publications with the current edition.

6.2 Product publications

EEA specific for an individual product in the scope of a TC are described in product publications, especially providing information about boundary, input (energy), output (service), additional information (e.g. mode of operation, duty cycle, state) and KPIs in a standardized way.

A product publication related to EE shall cover all relevant EEAs of the products within its scope.

NOTE IEC Guide 118 contains a list of EEA.

Safety aspects and EEA should not be covered in the same publication, as this makes it difficult to assess conformity with EE requirements alone. If there are reasons to cover them in the same publication, EEA and the other aspects should be clearly distinguished from each other. If there are EE criteria which have safety implications, these are considered safety aspects and should be clear in the publication.

A product publication related to EE should not include requirements which unnecessarily restrict design or construction, or impede technical progress and development. Products should be designed to allow the installation of additional EE components (e.g. measurements, sensors, etc.) for future improvements.

6.3 References to other publications

Where possible, references to particular text should be used instead of repeating the original source material, since repetition increases the possibility of errors in quoting, and adds to the length of publication. If it is not possible to avoid repetition of original material, its source should be identified.

7 Responsibilities of TCs with horizontal EE functions and group EE functions

7.1 Liaison with other TCs

Secretaries of TCs with a horizontal EE function or a group EE function shall inform IEC Central Office of any new work item proposal (NP) relating to a basic EE publication or group EE publication and indicate as far as possible those TCs which may be affected. These TCs shall be listed when circulated.

A TC with a horizontal EE function or a group EE function shall respond to requests for liaison from TCs (see 8.1), and keep informed about the progress of relevant work.

7.2 Requests from TCs for new work

A TC with a horizontal or group EE function shall consider any request from an initiating TC (see 8.4) within an appropriate time. It may be necessary to handle such requests by correspondence.

The TC with the EE function shall inform the TC whether or not it considers that the proposals are appropriate and sufficiently general to be included in a basic EE publication or a group EE publication. If they are considered to be appropriate, it shall develop a further basic EE publication or group EE publication, or amendments to an existing publication, in close liaison with the TC.

If the proposals are not considered appropriate by the TC with the EE function, it shall, in close liaison with the relevant TC, make an alternative proposal to cover the needs of TCs. Such proposals shall not conflict with the basic principles explained in the basic EE publication or group EE publication.

If, after consultation, agreement still cannot be reached between the TCs involved, the matter shall be referred to ACEE with the necessary technical explanation. If the matter cannot be resolved by ACEE, it will be referred to the Standardization Management Board for resolution.

8 Responsibilities of TCs

8.1 General

TCs shall determine which existing basic EE publications and group EE publications are relevant to their work, and establish and maintain liaison with the TCs responsible for preparing those publications.

TCs shall indicate their interest in NPs relating to a basic EE publication or group EE publication to the TC with the EE function and be encouraged to contribute to the development of the NP by, for example, participating in working groups and submitting comments on drafts.

8.2 Application of basic EE publications

TCs, when preparing, amending, or revising EE publications, shall make use of any relevant basic EE publications. They may select from such publications relevant requirements, test methods and test conditions specific to their product area, but shall not modify them except as specified in 8.4.

Where a TC incorporates in its publication an amended version of a requirement, test method or test condition of a basic EE publication, in accordance with 8.4, a note in the foreword shall indicate the changes which have been made. In addition, there shall be references to the foreword at the places where changes have been made.

If it is not practicable for a TC to align an existing publication immediately with the relevant requirements, test methods or test conditions of a new, amended or revised basic EE publication, alignment shall be carried out when the product publication is next amended or revised.

8.3 Application of group EE publications

When preparing, amending or revising any EE publication in a product area falling within the scope of one or more of the group EE functions as listed in the IEC Catalogue, TCs shall make use of the relevant group EE publications. They may, after consultation with the TC with the group EE function, modify requirements, test methods and test conditions as appropriate for the products concerned.

If it is not practicable for a TC to align an existing publication immediately with the relevant requirements, test methods or test conditions of a new, amended or revised group EE publication, alignment shall be carried out when the product publication is next amended or revised.

A practical example is shown in Annex B.

8.4 New work requests to TCs with horizontal or group EE functions

A TC can have a need for requirements, test methods or test conditions falling within a horizontal EE function or group EE function but which are not adequately covered in existing EE publications. In this case, the TC shall submit proposals, including a date for completion, for the development of a new basic EE publication or a group EE publication, or for amendments to an existing publication. If appropriate, this can be in the form of an NP.

The proposals will be considered by the TC with a horizontal EE function or a group EE function, as detailed in 7.2.

In some cases, a TC with a horizontal EE function or a group EE function may not accept a proposal for new work or may accept it but be unable to offer completion by a date acceptable to the TC. In other cases, a TC may not consider that the text provided by the TC with a horizontal EE function or a group EE function is suitable for incorporation in its publication.

In the above circumstances, the matter shall be referred to ACEE, who may authorize the TC to undertake the task itself. Relevant documents generated in the course of the development of these requirements, test methods or test conditions shall be sent to the TC with the horizontal EE function or group EE function.

If relevant requirements, test methods or test conditions are later included in a basic EE publication or a group EE publication, the TC shall align its own publications with them, as detailed in 8.1.

Annex A
(informative)

Boundary examples

One typical way of boundary definition is picking up an individual service clearly identified as a significant energy user. For example, as shown in Figure A.1, three specific services such as machining, cleaning and steam generating can be separated boundaries where energy efficiency is evaluated with its own inputs, outputs and KPI as an example. The EE improvements are independently assessed and implemented.

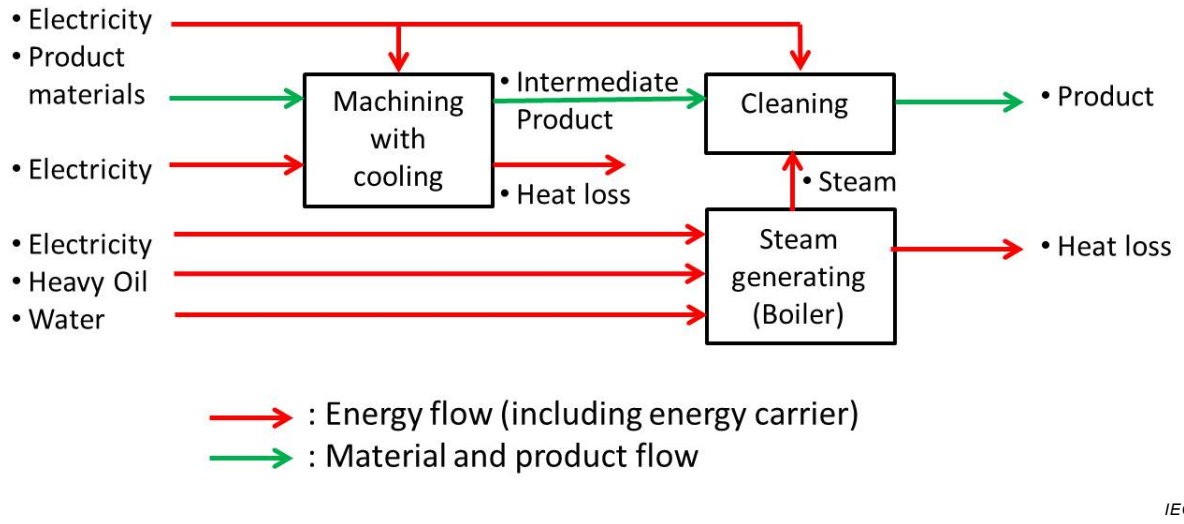


Figure A.1 – Boundary setting example: three boundaries for independent solution

Another way is to define a wider boundary with one combined service “machining and cleaning” to produce the same output. Machining and cleaning are parts of one group in this view. (Figure A.2).

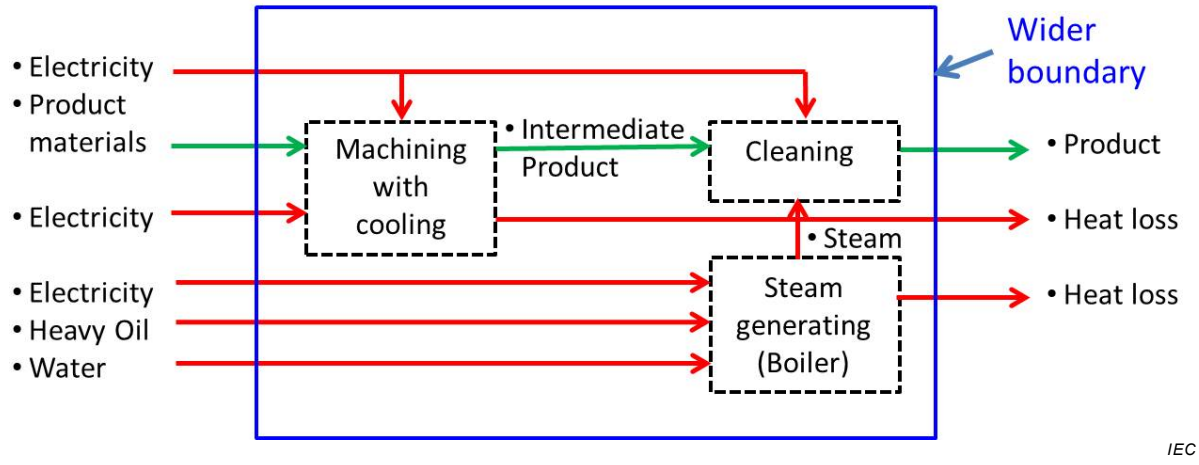


Figure A.2 – Boundary setting example: a boundary of a group

Once this kind of group boundary is defined, more systematic solutions, which might not be considered with individual services, can be raised and assessed.

In the example of machining and cleaning boundary, replacing the boiler with a heat exchanger is one of the solutions for the problem that heat (energy) is lost while heat (steam) is generated (Figure A.3).

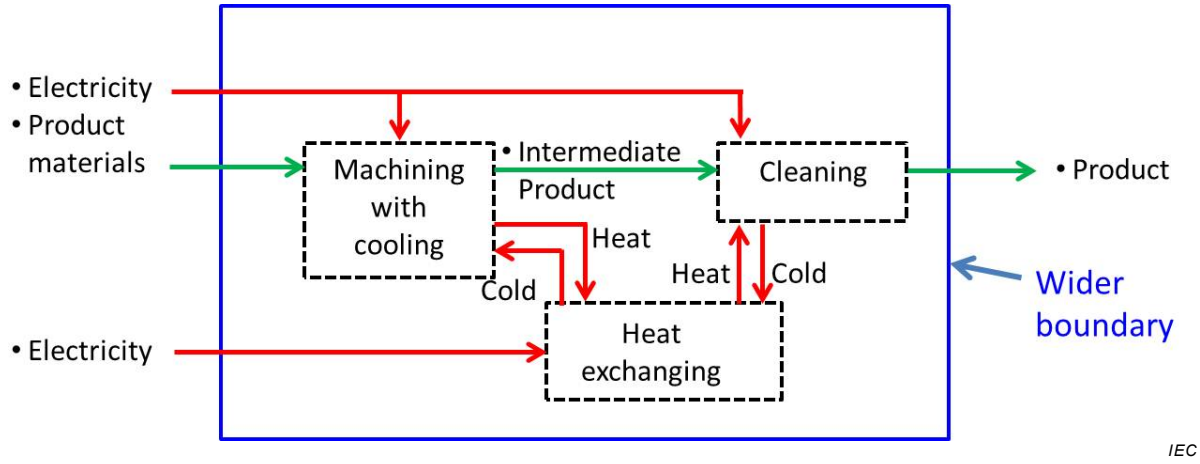


Figure A.3 – A boundary of group with systematic solution

Depending on the situation, group energy efficiency view can help to achieve much more efficiency than that by individual efforts.

Annex B
(informative)

The extended product approach as a collaborative example (reference IEC 61800-9-1)

B.1 Sharing the TC responsibilities

B.1.1 General

Annex B gives an example of how in a practical case the contributing TCs may find a common understanding on how to collaborate in energy efficiency.

B.1.2 Practical case

Figure B.1 illustrates how different components may be integrated as a system or equipment in a real production plant.

The first step consists of defining the different boxes included in the EE publication to be developed. An example is shown in Figure B.1. It also represents the different levels of responsibilities of the dedicated TCs.

The example is drawn from a production plant consisting of different equipment which includes a pump system.

The dedicated responsibilities will be limited to each product boundary to be handled.

This pump system consists of a motor system and a pump unit. The motor system itself contains a converter and a motor and the pump unit contains an impeller and housing.

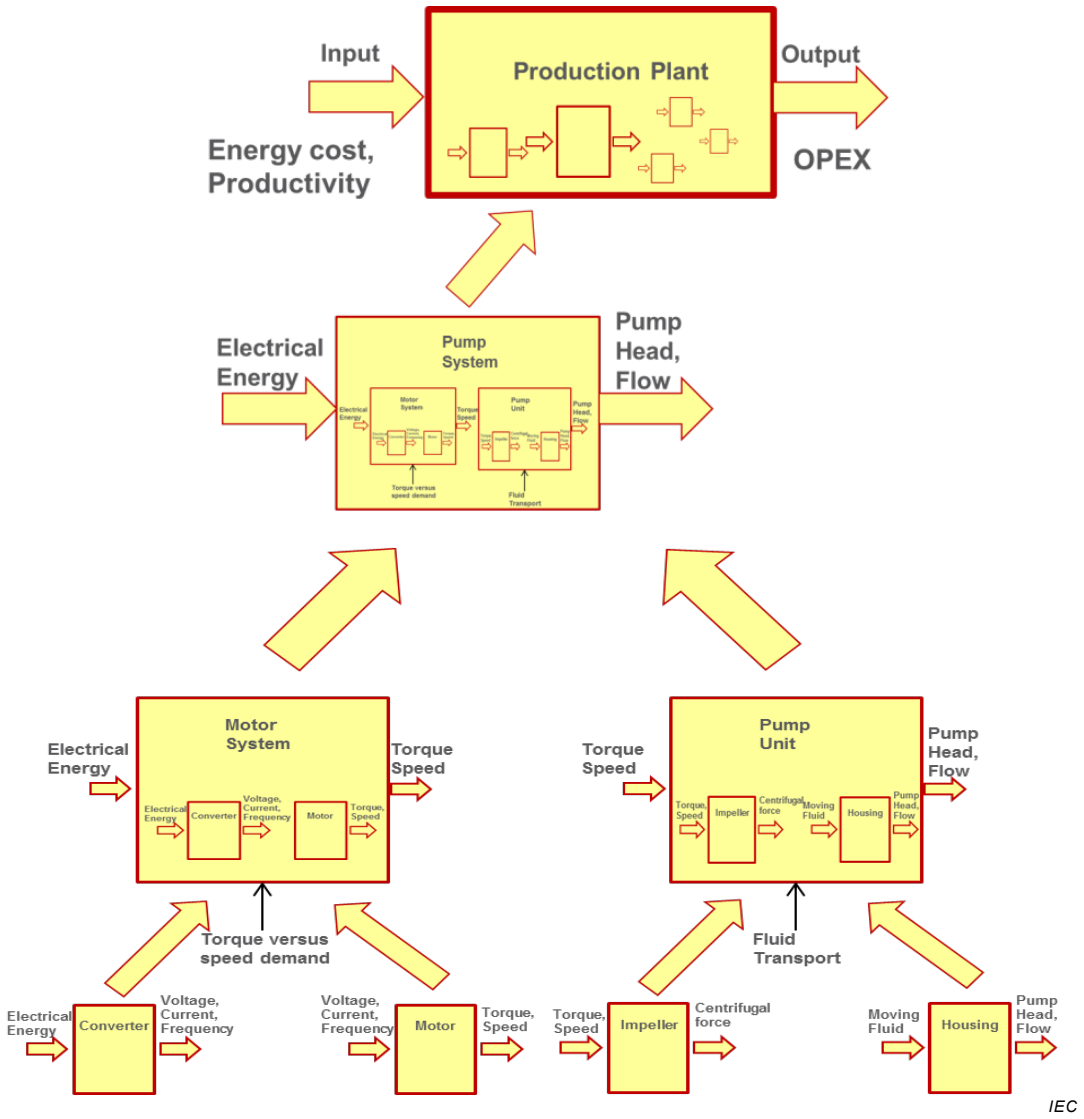


Figure B.1 – Relation between different components at different levels

Energy efficiency publications would be possible for each and every box as an individual classification publication or individual loss calculations dependent on how and where the dedicated KPIs are defined.

As the KPIs may be different, going up the different responsibility levels shown in Figure B.1, the extended product approach is a concept to sharing the responsibilities of collaborating TCs, while respecting the KPI of the next upper level. This is done as the relevant output data from the boxes of one responsibility level are the same as the input data to the boxes of the next upper level reuniting the first ones.

Doing this together collaboratively between the relevant TCs will give an idea of how the different publications should interact and how the requirements are complementing.

B.1.3 Example of how different TCs may determine their role in a common collaboration

Each box in Figure B.1 stands for a component or an extended product (e.g. system) and would be represented also by a responsible TC.

The red arrows show the direction of the evidential evolution from a component to a plant incorporating more elements.

Each TC may also have its own driving values (KPIs) but a limited understanding/influence of the driving values from the next upper responsibility levels.

In case no collaborating exists, the red arrows may just indicate an arbitrary KPI like an efficiency classification from the lower level component, without reflecting if this KPI would give appropriate system efficiency relevant information for use of the upper level.

Nevertheless they could improve both while collaborating in EE-standardization, because the lower level TC in Figure B.1 fulfils the upper level TC specifications, otherwise the system will not work properly.

In the example illustrated in Figure B.2, the technical committee TC a would be the customer of TC b; TC e and TC f would be the suppliers for TC c.

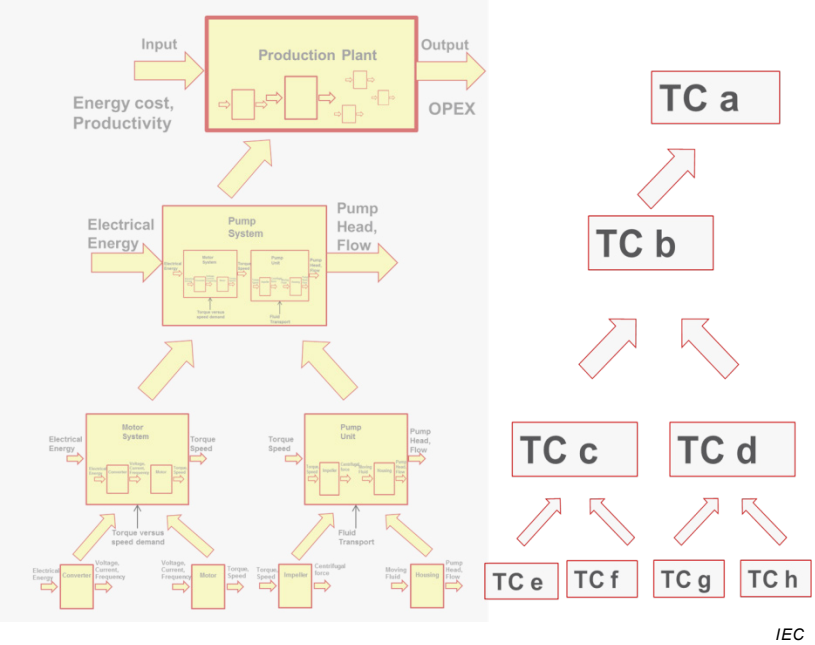
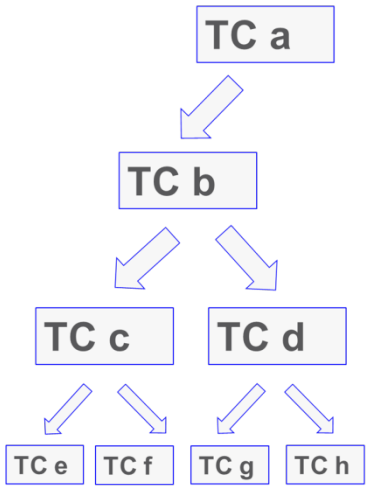


Figure B.2 – Link between every box's corresponding TCs

B.1.4 Example of how different TCs should share their responsibilities

According to the different viewpoints in every responsibility level and sharing specifications with others, it will be clear that some collaboration in the EE-standardization work would be advantageous. See Figure B.3.



Responsibility	EE specifications of interest
a) Plant	Energy Cost OPEX Productivity Operating parameters
b) Pump System	Operating parameters duty cycle Efficiency index Electrical losses of the motor system
c) Motor system	Electrical system losses at dedicated operating points…
d) Pump unit	Control curve hydraulic losses at best operating point...
e), f) other	g), h) other

IEC

Figure B.3 – TC's responsibilities with EE key parameters at the different levels, starting from the plant level and going down to individual components

If the common understanding has been agreed for the EE-standardization work, the product standard of the lowest level component may give a requirement that will indirectly be contributing to lower the operating expenses (OPEX) of the plant.

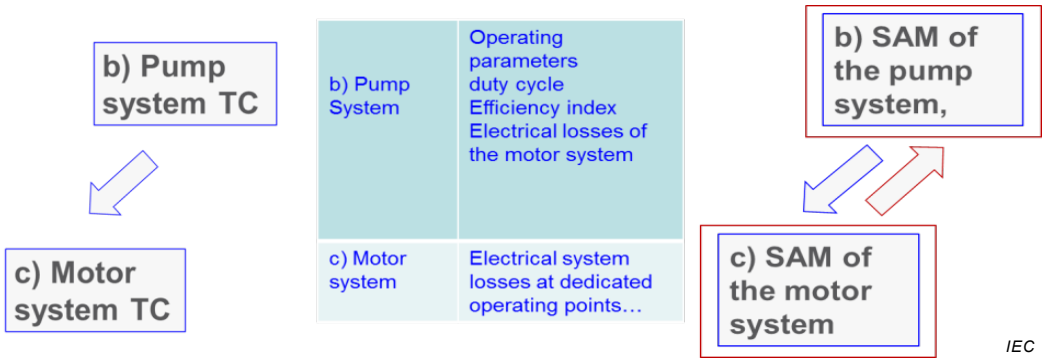
Vice versa, the implementation team would correctly select the products or the system in order to achieve the satisfaction of the plant responsible.

In practice, this will work if the TCs are working together at different responsibility levels.

B.2 Practical example – a motor system and pump system collaboration

This example shows two TCs at different levels. Their functional interaction and collaboration is required in the extended product approach.

The collaboration is shown in Figure B.4 where on the left side the two collaborating committees (pump system and motor system committees) are illustrated. The requirements in the middle are commonly linked together in a standard. The right side is the outcome as being two semi-analytical models (SAM of the pump system and SAM of the motor system) which need to interact in order to realize their optimal contributions.



IEC

Figure B.4 – Interaction between the two SAMs

The interaction of both semi-analytical models is called the extended product approach (EPA), because in this terminology the pump unit was originally defined as being the product together with the extension of the pump unit by a motor system ("extended product"). See Figure B.5.

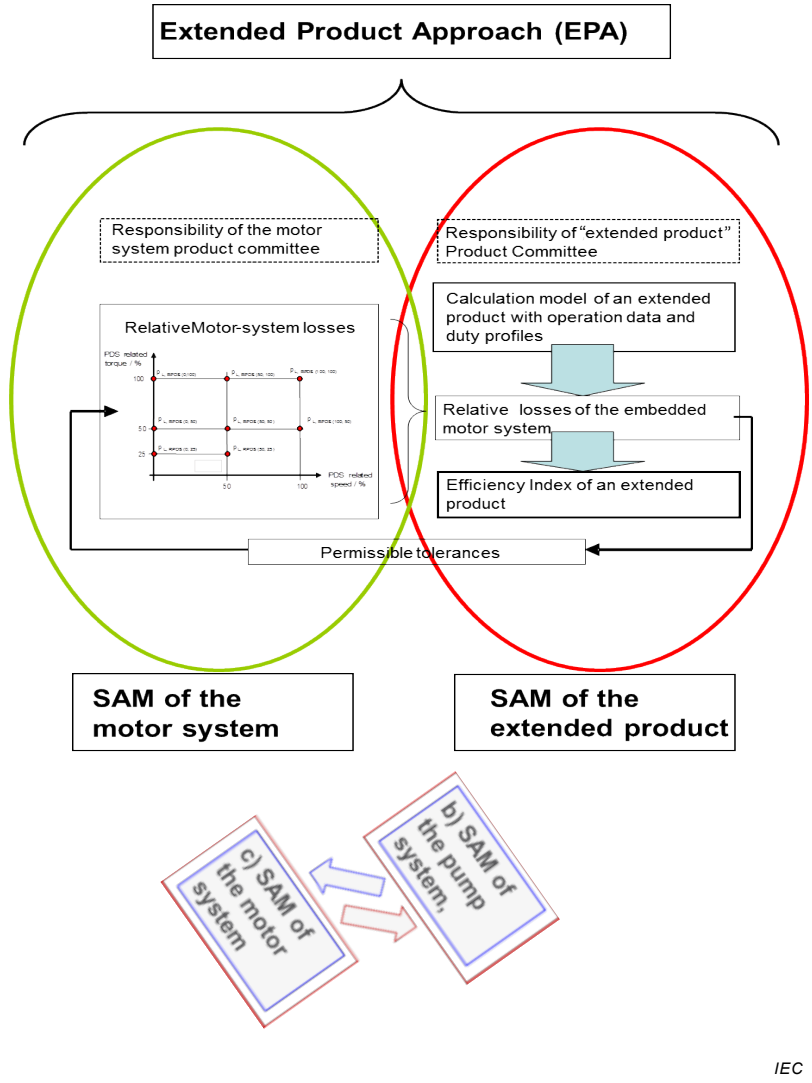


Figure B.5 – The SAMs of the pump system (the extended product) and the motor system

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