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Energieaudits - Teil 3: Prozesse

Audits énergétiques - Partie 3 : Procédés

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European foreword

This document (EN 16247-3:2022) has been prepared by the Joint 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of an identical text or by endorsement, at the latest by February 2023, and conflicting national standards shall be withdrawn at the latest by February 2023.

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.

This document supersedes EN 16247-3:2014.

Significant changes compared to the previous edition are:

- a) terms and definition updated;
- b) structure aligned with EN 16247-1;
- c) sampling method allowed as energy audit process;
- d) new Annex D with an example of methodology for multi-sites audit sampling in industrial companies.

This document is part of series EN 16247 “*Energy audits*”, which comprises the following:

- *Part 1: General requirements;*
- *Part 2: Buildings;*
- *Part 3: Processes;*
- *Part 4: Transport;*
- *Part 5: Competence of energy auditors.*

This Part provides additional material to Part 1 for the Process sector and is intended to be used in conjunction with Part 1.

This document has been prepared under a mandate given to CEN and CENELEC by the European Commission and the European Free Trade Association.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN and CENELEC websites.

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

Introduction

An energy audit can help an organization to identify opportunities to improve energy performance. It can be part of a site wide energy management system.

There are various sectors with important differences in processes and utilities. It should be emphasized that there are many types of processes in industry and commerce, with important differences in energy use and energy consumption. In general, energy is used:

- directly by a process, e.g. furnaces, direct fired dryers, etc.;
- indirectly by a process (e.g. heat exchange, distillation, extrusion, etc.) including the specific conditions of production (e.g. start-up, shut-down, product change over, cleaning, maintenance, laboratory and product transfer);
- utility processes (e.g. motor driven systems such as fans, pumps, motors, compressors, etc., steam, hot water), including on site power plants;
- other processes (e.g. sterilization in hospitals, fume cupboards, laboratories, etc.).

This document defines the attributes of an appropriate quality energy audit for processes in addition to EN 16247-1, which gives the general requirements for energy audits.

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1 Scope

This document specifies the requirements, methodology and deliverables of an energy audit within a process. These consist of:

- a) organizing and conducting an energy audit;
- b) analysing the data from the energy audit;
- c) reporting and documenting the energy audit findings.

This part of the standard applies to sites or parts of sites where a significant part of the energy use is due to processes. It is used in conjunction with and is supplementary to EN 16247-1, *Energy audits — Part 1: General requirements*. It provides additional requirements to EN 16247-1 and is applied simultaneously.

A process can include one or more production lines or services, offices, laboratories, research centres, packaging and warehouse sections with specific operational conditions and site transportation. An energy audit can include the whole site or part of a site.

If buildings are included in the scope of the energy audit, the energy auditor can choose to apply EN 16247-2, *Energy Audits — Part 2: Buildings*. If on-site transport on a site is included in the scope of the energy audit, the energy auditor can choose to apply EN 16247-4, *Energy audits — Part 4: Transport*.

NOTE The decision to apply Parts 2 and/or 4 is expected to be made during the preliminary contact, see 5.1.

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.

EN 16247-1:2022, *Energy audits — Part 1: General requirements*

EN 16247-2:2022, *Energy audits — Part 2: Buildings*

EN 16247-4:2022, *Energy audits — Part 4: Transport*

EN 16247-5, *Energy audits — Part 5: Competence of energy auditors*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16247-1 and the following apply.

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

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

3.1

production process

all the steps necessary to manufacture a product or to deliver a service

Note 1 to entry: Production process could include specific facilities for health, safety and environment pollution control.

EN 16247-3:2022 (E)**3.2****utility**

energy carrier necessary for the process and auxiliary

Note 1 to entry: A utility could be generated on-site, off-site, or purchased from a third party.

EXAMPLE Steam, hot water, compressed air, etc.

3.3**utility process**

set of utility equipment and distribution

Note 1 to entry: If the utility is purchased from a third party, utility process is only the utility distribution.

Note 2 to entry: All processes, not linked to one specific process or service, and whose purpose is limited to the transformation, distribution or storage of energy.

3.4**site**

processes within the boundary of the organization

Note 1 to entry: This may include pollution treatment processes and energy recovery, and waste product.

3.5**building**

construction as a whole, including its envelope and all technical building systems, for which energy may be used to condition the indoor climate, to provide domestic hot water and illumination and other services related to the use of the building and the activities performed within the building

Note 1 to entry: The term can refer to the building as a whole or to parts thereof that have been designed or altered to be used separately.

Note 2 to entry: The building could include its site location and related external environment.

[SOURCE: EN 16247-2:2022, 3.1]

3.6**energy**

electricity, fuels, steam, heat, compressed air, and other similar media

Note 1 to entry: For the purposes of this document, energy refers to the various type of energy, including renewable, which can be purchased, stored, treated, used in equipment or in a process, or recovered.

[SOURCE: EN ISO 50001:2018, 3.5]

3.7**energy performance improvement action****EPIA**

action or measure or group of action or measures implemented or planned within an organization intended to achieve energy performance improvement through technological, managerial or operational, behavioural, economical, or other changes

[SOURCE: EN 16247-1:2022, 3.9]

4 Quality requirements

4.1 Energy auditor

The qualification of an energy auditor is defined in EN 16247-5.

4.2 Energy audit process

The quality of the energy audit depends on the knowledge of the processes, the site and available data and information. Close collaboration between the energy auditor and the organization is essential. When a sampling method is used, the selected samples shall be representative of the whole audited objects.

NOTE An example energy audit process is shown in Annex A.

5 Elements of the energy audit process

5.1 Preliminary contact

The energy auditor shall obtain a preliminary description of the site and the relevant processes from the organization or from a site visit.

NOTE 1 The preliminary contact can be a physical meeting, by telephone, webinar or other remote interactive discussions.

The energy auditor shall agree with the organization on the scope and boundary of the energy audit in terms of:

- a) processes included in the energy audit;

NOTE 2 A process can be defined as the whole process, part of a process, part of a system or a component.

- b) whether or not outsourced utilities are included in the energy audit;
- c) depending of the thoroughness of the energy audit, required by the organization, the energy auditor shall design and carry out the energy audit taking into consideration the requirements of the relevant standard (see bibliography).

For energy use not directly related to process (e.g. storing, packaging, logistics, offices, research centre, laboratory and transport), the energy auditor shall agree with the organization the applicability of EN 16247-2 and EN 16247-4. This choice and the agreed scope shall be clearly stated in the final energy audit report (see 5.8).

For each audited process, the energy auditor and organization shall agree which members of staff, and their roles, have a significant impact on energy consumption and energy performance, and propose a preliminary list of data to be collected.

5.2 Start-up meeting

The energy auditor and organization shall agree energy performance indicators which can be used in the energy audit.

EN 16247-3:2022 (E)**5.3 Collecting data****5.3.1 General**

The data collection could be carried out over several stages during an energy audit.

During data collection, the energy auditor shall:

- a) verify the data and information provided by the organization (e.g. the indicated power rating or the number of pieces of equipment);
- b) obtain any missing data;
- c) check the quality and plausibility of the data and ask for correction if significant mistakes or inaccuracies are identified.

5.3.2 Information request

In addition to the information requested in EN 16247-1, the energy auditor shall request from the organization the following:

- a) site information including building, boundary and other relevant information;
- b) utility processes information;
- c) production processes information;
 - 1) product specification;
 - 2) main processes equipment involved in the process (drawings, other relevant technical data and datasheets);
 - 3) current operational conditions (set points) of utilities and production process;
 - 4) specific condition and constraint for process and environment (security, pollution, health, etc.).
- d) energy sources information.

NOTE 1 The collected data can be based on invoices, contracts, measurements, calculations from given operating hours and installed capacity (technical characteristics), operation and maintenance documents, meeting with operations and maintenance personnel, etc.

NOTE 2 See Annex B for examples of data to be collected.

5.3.3 Review of the available data

The energy auditor shall review the information collected for consistency and suitability.

The energy auditor shall assess whether the information provided is sufficient to achieve the agreed objective.

If data requested is not available, or the provided data evaluated as unreliable, the energy auditor shall define the method to obtain the necessary information (e.g. measurements, estimates, modelling, etc.).

5.3.4 Preliminary data analysis

The energy auditor shall carry out an analysis of the data collected in order to:

- a) undertake a preliminary analysis of the site's energy balance on the basis of energy bills and output;
- b) identify the relevant variables and static factors;
- c) make a first identification of the significant energy uses;
- d) establish the relevant energy performance indicator(s);
- e) evaluate the distribution of energy consumption on the basis of sub-meter reading, installed capacity and operating time;
- f) evaluate the energy efficiency of the equipment and processes;
- g) if there is sufficient information, to cover at least one complete operation cycle, establish an energy baseline;
- h) plan further data collection and measurements to be carried out during field works (5.4).

The energy auditor should develop preliminary EPIA.

The energy auditor shall agree with the organization about any measurement plan on:

- 1) objectives and parameters;
- 2) content;
- 3) required measurement conditions.

NOTE See Annex C for quality measurement plans.

5.4 Measurement plan

The general requirements for the measurement plan are defined in EN 16247-1:2022, 5.4.

5.5 Sampling methods

The general requirements for the sampling methods are defined in EN 16247-1:2022, 5.5.

5.6 Field work

5.6.1 Aim of field work

If necessary, the energy auditor shall carry out additional measurement to:

- a) collect any missing data needed for analysis;
- b) confirm the suitability of the baseline;
- c) confirm the energy consumption, energy balance, relevant variables and static factors;
- d) confirm the current operational conditions (set points) of utilities and production processes and the impact with energy use and consumption;