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Audits énergétiques - Partie 4: Transport

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European foreword

This document (EN 16247-4:2022) 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of an identical text or by endorsement, at the latest by February 2023, and conflicting national standards shall be withdrawn at the latest by February 2023.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 16247-4:2014.

Significant changes compared to the previous edition are:

a) terms and definition updated;

b) structure aligned with EN 16247-1.

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 Transport 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.

This document is intended for the energy auditing of mobile assets e.g. vehicles, railways, marine vessels, aircraft, as well as mobile plant.

Due to the mobility of the assets in transport, energy auditing in this area is especially challenging. For example, the meetings are harder to organize, the activities involved are harder to inspect.

The first part of this document harmonizes the procedures for energy auditing in transport systems. On the other hand, there are certain aspects which are particular to every transport mode. For example, whereas the mobile assets in road transport are numerous, similar and replaced frequently, the assets for marine and air transport are large and long-lived.

In order to state the energy auditing features of every transport mode, there is a specific section for each of them at the end of this document.

Finally, the possibility of planning and selecting the mode of transport (and, sometimes, using different modes for a unique transport service) is also a specific aspect of the transport activity. Therefore, this standard will place special attention to this topic.

NOTE An energy audit is not a fiscal method, the term and the nature of an energy audit are defined in EN 16247-1 Energy Audits.

1 Scope

This document 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.

The procedures described here apply to the different modes of transport (road, rail, marine and aviation), as well as the different ranges (local- to long-distance) and what is transported (i.e. goods and people).

This document specifies the requirements, methodology and deliverables specific to energy audits in the transport sector, every situation in which a displacement is made, no matter who the operator is (a public or private company or whether the operator is exclusively dedicated to transport or not), is also addressed in this document.

This document advises on both the optimization of energy within each mode of transport, as well as selecting the best mode of transport in each situation; the conclusions drawn by the energy audit can influence decisions on infrastructure and investment e.g. in teleconferencing or web meetings.

Energy audits of buildings and processes associated with transport can be conducted respectively with the EN 16247-2 *Buildings* and EN 16247-3 *Processes*, e.g. pipelines, depots and escalators/travelators. This part of the standard does not include the infrastructure which supplies energy e.g. the electricity generation of energy for railways.

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 50591:2019, *Railway Applications — Rolling Stock — Specification and verification of energy consumption*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16247-1:2022 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
transport
activity that implies the movement of people, livestock or goods from one place to another

3.2
vehicle
object used to perform the transport, may include the container, trailer or carriage where energy is consumed

Note 1 to entry: This document will use this term, instead of the more general one (audited object), from part 1 of this standard.

3.3
energy
includes fuels, inclusive of biofuels, electricity inclusive of regenerated/recovered energy from braking, etc.

Note 1 to entry: Excludes feedstock energy sources such as Aqueous Urea Solution (for example AdBlue®[1] ISO 22241-1).

3.4
fleet
group of vehicles

3.5
train set
consist
railway terminology used to describe a "train" which varies between countries, very often a single scheduled service

Note 1 to entry: In the UK, the interchangeable terms "set" and "unit" are used to refer to a group of permanently or semi-permanently coupled vehicles, such as those of a diesel multiple unit. The United Kingdom Section 83(1) of the Railways Act 1993 defines "train" as follows:

a) two or more items of rolling stock coupled together, at least one of which is a locomotive;

b) a locomotive not coupled to any other rolling stock.

Note 2 to entry: In the United States, the term "consist" is used to describe the group of rail vehicles which make up a train.

3.6
operator
person that governs the vehicle operation with his/her own hands, e.g. driver, pilot, helmsman, etc. (not the organization being audited)

3.7
organization
owner or operator of the fleet of vehicles subject to the audit

3.8
transport service
service provided to a beneficiary for the transport of goods, livestock or of a person from a departure point to a destination point

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1 AdBlue® is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by CEN or CENELEC of this product.

3.9
segment
group of vehicles performing the same type of transport; i.e. subset of a fleet having a certain common feature

Note 1 to entry: The criteria for segment definition depend on the kind of transport the audited organization performs and the kind of vehicles used. An example might be differentiating the vehicles performing local distribution as opposed to long distance shipment in two different segments.

3.10
load factor
ratio of the average load or passenger number to total vehicle capacity in tonnes, volume or seats/standing

4 Quality requirements

4.1 Qualifications

With reference to EN 16247-5 the energy auditor shall have relevant knowledge of the different modes of transport and energy sources used in transport by the organization subject to the audit.

4.2 Energy audit process

4.2.1 General

Due to the complexity, mobility and time critical nature of transport operations, the site visit needs to be done within restrictions for both auditor and operator to allow both parties to complete their duties, thus this clause states distinct requirements to those specified in EN 16247-1:2022, 4.2.

4.2.2 Operations department cooperation

Transport operations are a complex, time-critical process and being able to audit it without affecting its final result is imperative.

The organization shall provide the auditor with appropriate access to relevant personnel, records, documentation or equipment.

The auditor shall agree with the operations department on the needs of both parties to complete their duties in a proper manner. Failing to do so upfront will put extra difficulties into the auditing process.

When a sampling method is used, the selected sample of vehicle(s) shall be representative of the fleet or that part of the fleet.

4.2.3 Personnel

In order to perform the audit in a proper manner, the auditor shall have direct access to people within the organization in charge of the following areas:

a) planning. Personnel responsible for logistics and route management;

b) operations. This department is in charge of organizing the transport operations and specifically of assigning them to operators and vehicles;

c) maintenance. These are the people responsible for assuring the availability and good performance of the vehicles, or granting access to service records if maintenance is outsourced;

d) technical and procurement. Those people responsible for vehicle specifications and acquisition, including sub-contractors and suppliers;

e) human resources. It is important for the auditor to understand the views of the staff and operators as they are critical to the energy consumption reduction process. Moreover, direct contact with operators is advisable;

f) operator training department and/or training personnel;

g) operators. They are one of the keys to eliminating energy wastage and encouraging ecodriving;

h) finance. They usually process financial data associated with energy purchases, particularly important where energy prices vary week by week.

5 Elements of the energy audit process

5.1 Preliminary contact

Due to the dispersed nature of transport, a focus on communication is of paramount importance. The auditor shall issue a summary of the purpose and main needs of the audit and communicate this to the people with responsibility for the organization's transportation. Where possible, these personnel shall be present at the start-up meeting.

As the audit progresses, the organization shall be informed of the results, deviations and any outstanding issues. Likewise, the auditor shall communicate with the organization on issues affecting the conduct of the audit.

The auditor shall require the organization to inform them of any significant changes that would impact on the energy audit.

5.2 Start-up meeting

Within the restrictions of normal transport operations and where practicable, the organization shall enable the relevant personnel (see 4.2.3) to attend the start-up meeting.

The objective is to define the following points:

— scope of work: number of sites included, typology of transport;

— the roles of each, the methodology, the preparation for the field work;

— designation of the person responsible of the energy audit within the organization;

— the mode of travel planning if it is organized;

— fleet renewal procedures and subscribed maintenance contracts;

— training offered to staff;

— the expectations of the audited body.

The auditor selects the types of vehicles to be checked on the site, according to the objective, the scope of the audit and the level of thoroughness of the energy audit.

5.3 Collecting data

The auditor shall gather the following information: the energy consumption for every vehicle during the last year, with intervals that allow for a useful trend analysis (for seasonal analysis or any other significant factor):

a) criteria used for planning transport operations assignments;

b) description of the routes taken and planning policy;

c) fleet composition: list of all available vehicles along with their age and main technical features (e.g. vehicle category, fuel type, engine size, emissions rating, ancillaries);

d) operator training conducted for energy consumption reduction (e.g. ecodriving), including documented records of any resultant reductions;

e) methods of refuelling, where appropriate;

f) evidence of the fuel or electricity consumption metering and relevant training given to operators;

g) energy source pricing documents including historical data over an appropriate period;

h) distance travelled for each vehicle or number of hours of operation during the last year;

i) data regarding goods and passengers to enable the calculation of load factor for the last year;

j) data to enable the calculation of percentage of productive distance and time from operators and vehicles;

k) if part of transport is outsourced, the auditor shall make sure the activities are identified and raise questions about whether details on energy figures were requested and made available from the sub-contractor;

l) where applicable, criteria for supplier and sub-contractor procurement; e.g. energy policy or performance criteria;

m) maintenance programmes, service and inspection checklists, maintenance records will be asked for when necessary;

n) policies for vehicle specification, operation, purchase, maintenance, refurbishment and replacement;

o) actions for development and testing of new techniques and methods of reducing greenhouse gas emissions by reductions in energy usage or alternative energy sources;

p) if a telemetric or tracking fleet management system is available, the auditor should consider the opportunity to use more sophisticated data analysis, such as vehicle's driving condition, operator's behaviour, etc.

See Annex B Sources of information for data collection.