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Railway applications - System energy efficiency

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Railway applications - System energy efficiency

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The text of this Technical Specification is based on the following documents:

Draft	Report on voting
9/3352/DTS	9/3384/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

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INTRODUCTION

Energy efficiency is a key for preserving the environment and to save natural resources. Energy policies of railway stakeholders are supported.

This document on electric railway energy efficiency (EE) specifies key performance indicators and boundaries to assess the EE. This document establishes comparability between different (overall) railway systems based on the key performance indicators and the boundaries, which are defined in this document.

The purpose of this document is (in the following applications for energy efficiency in electric railways) to

– consider energy efficiency in standardization work;
– identify which aspects of energy efficiency are relevant for standardization;
– use a structured and harmonized approach when addressing energy efficiency;
– use a systematic approach when addressing energy efficiency.

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1 Scope

This document harmonizes the requirements and criteria for Key Performance Indicators (KPIs) and specifies KPIs of energy efficiency for entire electric railway system and its subsystems such as trains, contact lines, substations, both single and combined, clarifying the boundaries to be considered. This document applies to entire electric railway systems including non-traction loads.

The purposes are:

a) to determine and to trace the energy efficiency for a specific railway system;

b) to enable comparability between the different electric railway systems (on overall system level) by means of harmonized KPIs and system boundaries concerning energy efficiency;

c) to overview the characteristics of the electric railway system on an overall level with the structure of the electric railway system (including type, hierarchy and number of substations) and the KPIs (including the ranking) for transportation quality;

d) identification of the key impacts for energy efficiency as there are system flexibility, system functions and system features as basic characteristics for the entire electric railway system;

e) definition of harmonized processes and procedures for the simulation or calculation and validation of the system specific energy consumption (including energy feedback);

f) presenting the related and referenced standards and regulations for the electric railway system and its subsystems and their possible contribution to the overall target of the energy efficiency.

2 Normative references

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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.

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IEC 60850:2014, *Railway applications - Supply voltages of traction systems*

IEC 62313:2009, *Railway applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock*

IEC 63593:20—, *Railway applications - Rolling stock - Specification and verification of energy consumption*[1]

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

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

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

[1] Under preparation. Stage at the time of publication: IEC FDIS 63593:2026.

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3.1 Terms and definitions

3.1.1
apparatus
device or assembly of devices which can be used as an independent unit for specific functions

Note 1 to entry: In English, the term "apparatus" sometimes implies use by skilled persons for professional purposes.

[SOURCE: IEC 60050-151:2001, 151-11-22]

3.1.2
boundary
set of criteria that specify the limit of the system or apparatus under consideration as well as the interface or interaction between other adjacent systems

3.1.3
capital expenditure
CAPEX
expenditure on acquisitions of, or improvements to, assets

Note 1 to entry: Based upon accounting standards and organizational policy, CapEx usually relates to relatively large (material) expenditure, which has benefits that are expected to last for more than 12 months.

[SOURCE: ISO/TS 55010:2024, 3.8]

3.1.4
comfort system
all equipment consuming energy for passenger and crew comfort belonging neither to the traction equipment nor to traction auxiliaries, mainly for the provision of a comfortable environment (for example lighting, heating, air conditioning, toilets, information and entertainment systems, laptop supplies)

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Note 1 to entry: Comfort systems are split into two groups for use in this document: heating, ventilation and air conditioning (HVAC) and other comfort functions.

3.1.5
contact line
conductor system for supplying electric energy to vehicles through current-collecting equipment

[SOURCE: IEC 60050-811:2017, 811-33-01, modified – the Note 1 to entry has been omitted.]

3.1.6
electric railway system
electric railway trains, power network used to provide energy for trains, and related systems

3.1.7
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 are clearly specified in quantity and quality and are measurable.

[SOURCE: IEC Guide 118:2024, 3.1, modified – Rewording of Note 1 to entry.]

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