SLOVENSKI STANDARD
SIST EN 50600-4-6:2020

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Informacijska tehnologija - Naprave in infrastruktura podatkovnih centrov - 4-6. del: Faktor ponovne uporabe energije

Information technology - Data centre facilities and infrastructures - Part 4-6: Energy Reuse Factor

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ICS:

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35.110	Omreževanje	Networking

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European foreword

This document (EN 50600-4-6:2020) has been prepared by CLC/TC 215 “Electrotechnical aspects of telecommunication equipment”.

The following dates are fixed:

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This document is based on the text of ISO/IEC DIS 30134-6:2019.

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Introduction

The unrestricted access to internet-based information demanded by the information society has led to an exponential growth of both internet traffic and the volume of stored/retrieved data. Data centres are housing and supporting the information technology and network telecommunications equipment for data processing, data storage and data transport. They are required both by network operators (delivering those services to customer premises) and by enterprises within those customer premises.

Data centres need to provide modular, scalable and flexible facilities and infrastructures to easily accommodate the rapidly changing requirements of the market. In addition, energy consumption of data centres has become critical both from an environmental point of view (reduction of carbon footprint) and with respect to economic considerations (cost of energy) for the data centre operator.

The implementation of data centres varies in terms of:

a) purpose (enterprise, co-location, co-hosting, or network operator facilities);

b) security level;

c) physical size;

d) accommodation (mobile, temporary and permanent constructions).

The needs of data centres also vary in terms of availability of service, the provision of security and the objectives for energy efficiency. These needs and objectives influence the design of data centres in terms of building construction, power distribution, environmental control and physical security. Effective management and operational information is required to monitor achievement of the defined needs and objectives.

The EN 50600 series specifies requirements and recommendations to support the various parties involved in the design, planning, procurement, integration, installation, operation and maintenance of facilities and infrastructures within data centres. These parties include:

1) owners, facility managers, ICT managers, project managers, main contractors;

2) architects, consultants, building designers and builders, system and installation designers;

3) facility and infrastructure integrators, suppliers of equipment;

4) installers, maintainers.

At the time of publication of this document, the EN 50600 series comprises the following standards and documents:

— EN 50600-1, *Information technology — Data centre facilities and infrastructures — Part 1: General concepts*;

— EN 50600-2-1, *Information technology — Data centre facilities and infrastructures — Part 2-1: Building construction*;

— EN 50600-2-2, *Information technology — Data centre facilities and infrastructures — Part 2-2: Power distribution*;

— EN 50600-2-3, *Information technology — Data centre facilities and infrastructures — Part 2-3: Environmental control*;

— EN 50600-2-4, *Information technology — Data centre facilities and infrastructures — Part 2-4: Telecommunications cabling infrastructure*;

— EN 50600-2-5, *Information technology — Data centre facilities and infrastructures — Part 2-5: Security systems*;

— EN 50600-3-1, *Information technology — Data centre facilities and infrastructures — Part 3-1: Management and operational information*;

— EN 50600-4-1, *Information technology — Data centre facilities and infrastructures — Part 4-1: Overview of and general requirements for key performance indicators*;

— EN 50600-4-2, *Information technology — Data centre facilities and infrastructures — Part 4-2: Power Usage Effectiveness*;

— EN 50600-4-3, *Information technology — Data centre facilities and infrastructures — Part 4-3: Renewable Energy Factor*;

— EN 50600-4-6, *Information technology — Data centre facilities and infrastructures — Part 4-6: Energy Reuse Factor*;

— EN 50600-4-7, *Information technology — Data centre facilities and infrastructures — Part 4-7: Cooling Efficiency Ratio*;

— CLC/TR 50600-99-1, *Information technology — Data centre facilities and infrastructures — Part 99-1: Recommended practices for energy management*;

— CLC/TR 50600-99-2, *Information technology — Data centre facilities and infrastructures — Part 99-2: Recommended practices for environmental sustainability;*

— CLC/TR 50600-99-3, *Information technology — Data centre facilities and infrastructures — Part 99-3: Guidance to the application of EN 50600 series.*

The inter-relationship of the standards within the EN 50600 series is shown in Figure 1.

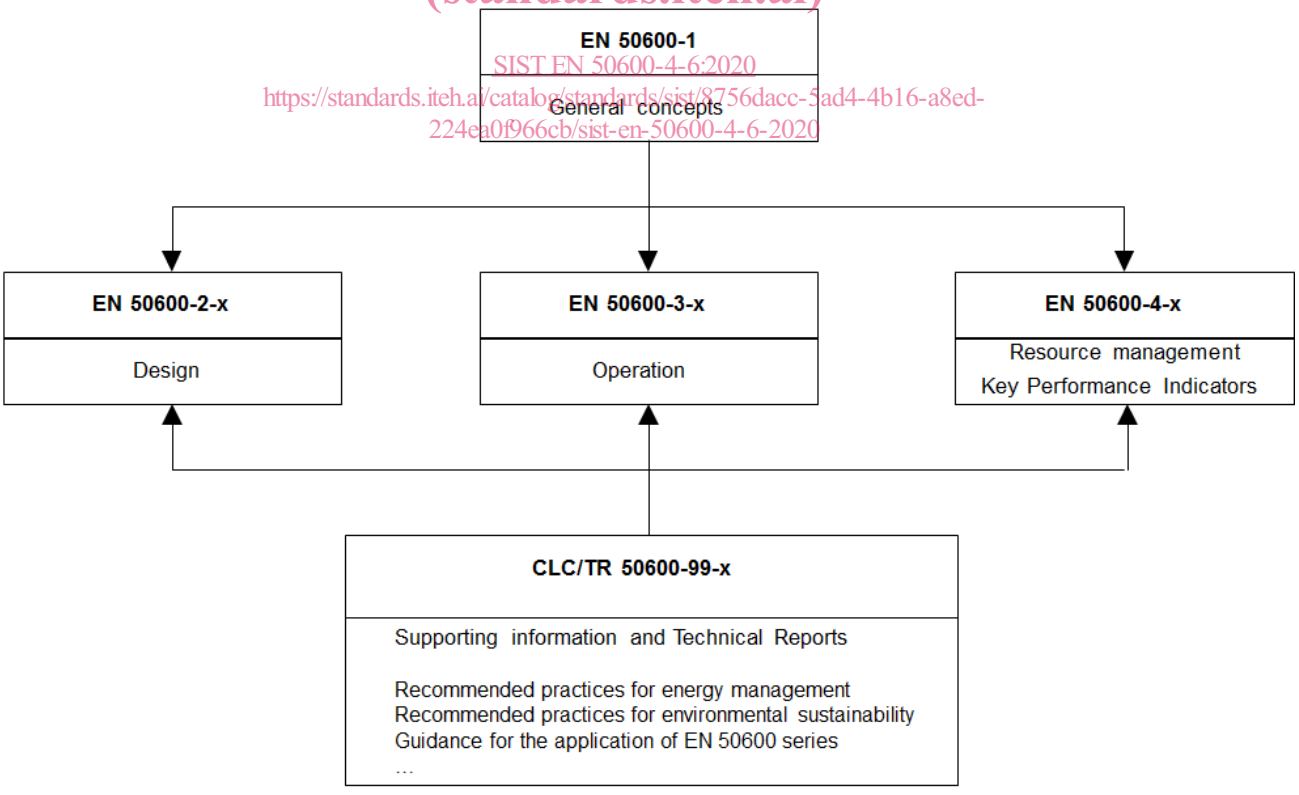

Figure 1 — Schematic relationship between the EN 50600 series of documents

EN 50600-2-X standards specify requirements and recommendations for particular facilities and infrastructures to support the relevant classification for “availability”, “physical security” and “energy efficiency enablement” selected from EN 50600-1.

EN 50600-3-X documents specify requirements and recommendations for data centre operations, processes and management.

EN 50600-4-X documents specify requirements and recommendations for key performance indicators (KPIs) used to assess and improve the resource usage efficiency and effectiveness, respectively, of a data centre.

In today’s digital society data centre growth, and power consumption in particular, is an inevitable consequence and that growth will demand increasing power consumption despite the most stringent energy efficiency strategies. This makes the need for key performance indicators that cover the effective use of resources (including but not limited to energy) and the reduction of CO_2 emissions essential.

NOTE Within the EN 50600-4-X series, the term “resource usage effectiveness” is more generally used for KPIs in preference to “resource usage efficiency”, which is restricted to situations where the input and output parameters used to define the KPI have the same units.

In order to enable the optimum resource effectiveness of data centres a suite of effective KPIs is needed to measure and report on resources consumed in order to develop an improvement roadmap.

These standards are intended to accelerate the provision of operational infrastructures with improved resource usage effectiveness.

This document specifies the Energy Reuse Factor (ERF), i.e. the reuse of the energy consumed in a data centre.

This document is intended for use by data centre managers. The use of the Energy Reuse Factor as a key performance indicator provides data centre managers with greater visibility into energy efficiency in data centres that make beneficial use of any reused energy from the data centre.

Additional standards in the EN 50600-4-X series will be developed, each describing a specific KPI for resource usage effectiveness or efficiency.

The EN 50600-4-X series does not specify limits or targets for any KPI and does not describe or imply, unless specifically stated, any form of aggregation of individual KPIs into a combined nor an overall KPI for data centre resource usage effectiveness or efficiency.

This document is intended for use by and collaboration between data centre managers, facility managers, ICT managers, and main contractors.

This series of European Standards does not address the selection of information technology and network telecommunications equipment, software and associated configuration issues.

1 Scope

This document:

a) specifies the Energy Reuse Factor (ERF) as a KPI to quantify the reuse of the energy consumed in the data centre;

b) defines the measurement, the calculation and the reporting of ERF;

c) describes the application of ERF and its discrimination from Power Usage Effectiveness (PUE).

The ERF does reflect the efficiency of the reuse process, which is not part of the data centre.

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 50600-4-1:2016, *Information technology - Data centre facilities and infrastructures - Part 4-1: Overview of and general requirements for key performance indicators*

ISO 8601 series, *Date and time - Representations for information interchange*

3 Terms, definitions, abbreviations and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50600-4-1 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

3.1.1
reuse of energy
utilization of energy used in the data centre to an alternate purpose outside the data centre boundary

Note 1 to entry: Energy ejected to the environment does not constitute reused energy.

3.1.2
handoff point
point at the boundary of the data centre where energy is measured and is handed off to another party which utilizes the energy outside data centre boundary

Note 1 to entry: An example of another party is an energy company.

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

ERF	Energy Reuse Factor
GPU	Graphics Processing Unit
HPC	High Performance Computing

KVM	keyboard, video and mouse
IT	Information Technology
PUE	Power Usage Effectiveness
PDU	Power Distribution Unit
r.m.s	root mean square
UPS	Uninterruptible Power System

3.3 Symbols

For the purposes of this document, the following symbols apply.

$E_{COOLING}$	energy used by the entire cooling system attributable to the data centre including support spaces (annual)
E_{DC}	total data centre energy consumption (annual)
E_{EXCESS}	data centre excess energy (annual)
E_{IT}	IT equipment energy consumption (annual)
E_{IN}	electricity delivered to the data centre at its boundary
$E_{LIGHTING}$	energy used to light the data centre and support spaces (annual)
E_{POWER}	energy lost in the power distribution system through line-loss and other infrastructure (e.g. UPS or PDU) inefficiencies (annual)
E_{ren}	renewable energy in kWh owned and controlled by a data centre
E_{Reuse}	energy from the data centre (annual) that is used outside of the data centre and which substitutes partly or totally energy needed outside the data centre boundary (annual)

4 Applicable area of the data centre

For the determination of ERF, the data centre under consideration shall be viewed at as a system bounded by interfaces through which energy flows (see Figure 2). The calculation of ERF accounts for energy crossing this boundary. The bounded areas are the same as that used in calculations for PUE and other KPIs in the EN 50600-4 series.

As shown in Figure 2, the data centre boundary is “drawn” around the data centre at the point of handoff from the utility provider. This is a critical distinction when alternate energy types and mixed-use buildings are analysed. It is equally important to ensure all energy types are included in ERF. All energy carriers (such as fuel oil, natural gas, etc.) and energy generated elsewhere (such as electricity, chilled water, etc.) that feed the data centre shall be included in the calculation.

Assuming there is no energy storage, conservation of energy requires that the energy into the data centre shall equal the energy out. In the simple schematic of Figure 2, that means A + B = F. This is oversimplified, as there are losses and heat generated at the cooling (A minus E), uninterruptible power system (UPS), and power distribution unit (PDU) (B minus D) points as well, but this waste heat also shall leave the boundary. Once a boundary is defined for a data centre, it can be used to properly understand the ERF concept.

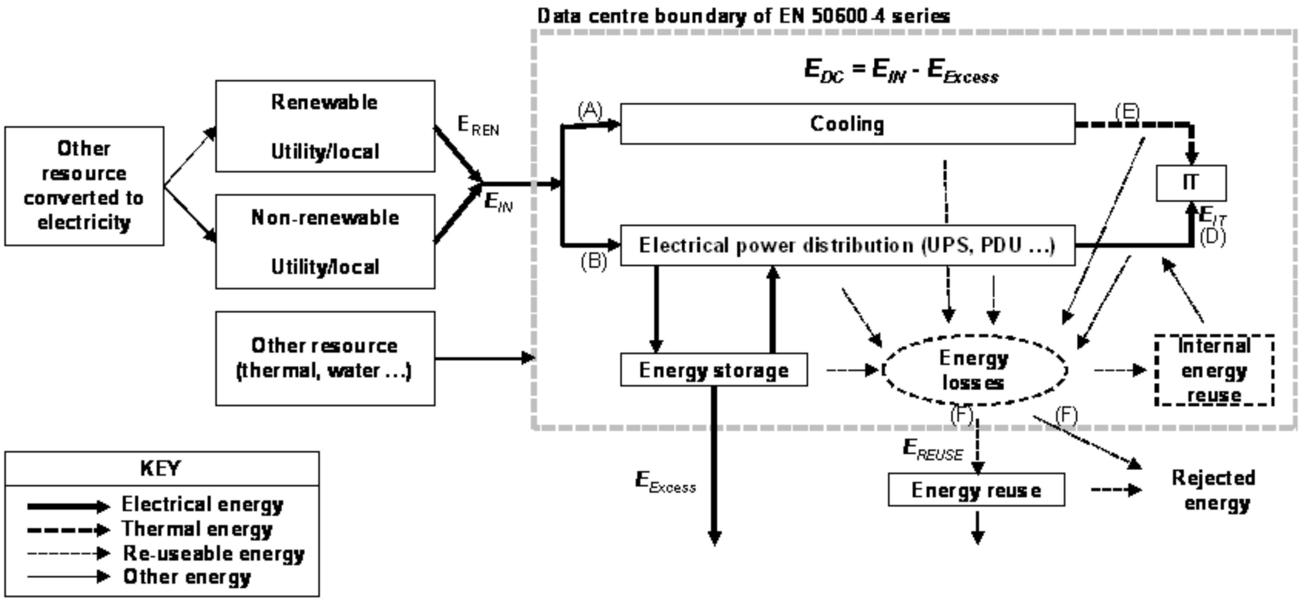

Figure 2 — Simplistic data centre components and boundary

NOTE 1 It is critical to include all energy carriers at the point of utility handoff. It is also critical to include all of the data centre's energy consumption in the calculations, which includes but is not limited to generators, inside and outside lighting, fire detection and suppression, associated office/cubicle space for data centre personnel, receiving areas, storage areas, and the same. For clarity, the diagrams only show the large components to demonstrate the ERF concept.

ERF only considers energy being reused outside the boundary of a data centre.

NOTE 2 Energy reused inside the data centre boundary is not counted towards ERF as it already is accounted for in a lower PUE and including it in ERF is double counting. Examples of this are shown in Annex A.

NOTE 3 The PUE in this subclause is as specified in EN 50600-4-2.

In Figure 2, any portion of (F) that is reused outside the data centre boundary (such as in a mixed-use building or a different building and not directly rejected to the atmosphere) is considered reused energy for determining ERF.

To determine ERF, the practitioner will need to identify and account for all energy streams crossing the data centre boundary coming in and any energy streams that will have beneficial use going out of the data centre boundary.

The energy coming in would typically be electricity but can also be natural gas, diesel fuel, chilled water, or conditioned air from another space.

The energy leaving the data centre boundary will most often take the form of heated water or heated airflow; these are what this document considers to be potentially reused energy. However, any form of energy that is reused outside of the data centre boundary shall be accounted for.

Processes that take advantage of the reused energy for other uses are outside the data centre boundary and the benefits of that reused energy and the efficiency of the reuse process are not considered in the ERF.

Examples of ERF usage are described in Annex A.

5 Determination of Energy Reuse Factor (ERF)

ERF provides a way to determine the factor of energy reuse. Heat is the most common example, where some of the heat produced by the data centre is utilized for beneficial purposes outside the data centre boundary and is not regarded as waste heat.

ERF will range from 0,0 to 1,0. An ERF of 0,0 means that no energy is reused, while a value of 1,0 means, theoretically, all the energy brought into the data centre is reused.