



**Access, Terminals, Transmission and Multiplexing (ATTM);
Energy management;
Global KPIs;
Operational infrastructures;
Part 3: Global KPIs for ICT sites**

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Foreword

This final draft ETSI Standard (ES) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM), and is now submitted for the ETSI standards Membership Approval Procedure.

In all parts of the multi-part deliverable ETSI ES 205 200, energy management deals with energy use management, not energy production management.

The present document is part 3 of a multi-part deliverable covering operational energy management and sustainability of broadband deployment, as identified below:

Part 1: "General requirements";

Part 2: "Specific requirements";

Part 3: "Global KPIs for ICT Sites";

NOTE 1: Additional documents are in development by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM) which include:

Part 4: "Monitoring of sustainability".

NOTE 2: A further document is under consideration ETSI Technical Committee CABLE to address "cable access networks".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

Information and communication technology (ICT) sites constitute one of the most important areas of the worldwide growing energy consumption. They are responsible for at least 2 % of the worldwide greenhouse gas emissions, still growing.

Energy management performance of ICT sites is an important matter. It is now essential if not vital to implement commitments in order to reduce the energy consumption by ICT sites.

Further to the 1997 Kyoto protocol [i.7], the European Commission has issued, and will issue, Directives in order to improve energy management of networks, sites included, of whole industry sectors.

Therefore suppliers and users of ICT equipment are required to implement "Green" tools (indicators, recognized Green levels) to monitor the efficiency of their greener ICT sites.

Consequently, the first target of ETSI ATTM has been the development of this ETSI standard (ES) with support of ISG OEU members (ICT world Users) in order to define those tools.

The KPI presented in the present document is an answer to requirements by end users and European Community to justify a global sustainability level for ICT sites. On the side of the ICT site owner, it assesses an energy management performance level; on the EC side, it allows a follow-up for the global adjustment of policy for sustainability of ICT industry.

The present document presents the Objective KPIs defined in standard ETSI ES 205 200-2-1 [2] for data centres, ETSI ES 205 200-2-2 [i.10] for fixed networks, and ETSI ES 205 200-2-3 [i.11] for mobile networks and uses them to define a Global Key Performance Indicators (KPI) allowing the evaluation of performance of energy use management in ICT sites.

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1 Scope

The present document defines field implementation of a so-called Global Key Performance Indicators (Global KPI) enabling the monitoring of performance of energy use management in all ICT sites including, but not limited to, data centres and operator sites.

Performance of energy management is dealt as independent layers. The present document addresses performance of hosting infrastructure that allows normal functioning of hosted ICT equipment, including climatic conditions, security and safety. The present document does not deal with other layers such as performance of ICT equipment itself, performance of usage of available processing power, and layers related to final service delivered (e.g. processing power required per built car) or overlay layers (e.g. final energy required per built car).

The present document deals with final energy consumption by ICT sites or group of sites, use of energy from renewable source and energy reuse. It does not deal with GHG gas emissions that will be taken care of in other parts. Neither does the present document deal with efficiency of power generators or adequacy of performance to given climatic conditions or availability requirements.

Energy consumption should not to be confused with power generation. Only energy actually consumed by the ICT site should be counted. Use of excess locally generated power is out of the scope of the present document.

The present document does not address the whole sustainability aspects related to ICT sites. Other aspects such as power management, global environmental footprint of the ICT site construction, operation and decommissioning are not dealt with in the present document and should be considered.

The Global KPI alone is not designed for comparison of ICT sites or group of sites. It does not define an ICT site as good or bad unless combined with other parameters considered relevant for a comparison, such as local climatic conditions, availability requirements or purpose of ICT site.

Several standards and technical documents have been taken into account during the development of the present document including EC Mandate M/462 [i.1], ETSI ES 205 200-1 [1], ETSI TS 105 174-1 [i.6], ETSI TS 105 174-2-2 [i.2], CENELEC EN 50600 Series [3], Recommendation ITU-T L.1300 [i.4], and EC DG JRC Code of Conduct for Data Centres [i.3] and [i.5]. It was initially built based on the position paper [i.13] by ETSI ISG OEU.

The present document addresses in a simple way the following objectives defined in standard ETSI ES 205 200-2-1 [2] for data centres, ETSI ES 205 200-2-2 [i.10] for fixed networks and ETSI ES 205 200-2-3 [i.11] for mobile networks:

- energy consumption;
- task efficiency;
- energy reuse;
- renewable energy.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference/>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI ES 205 200-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 1: General requirements".
- [2] ETSI ES 205 200-2-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 2: Specific requirements; Sub-part 1: Data centres".
- [3] CENELEC EN 50600 Series: "Information technology - Data centre facilities and infrastructures".
- [4] CENELEC EN 1434 Series: "Heat meters".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] EC Mandate M/462: "Standardisation mandate addressed to CEN, CENELEC and ETSI in the field of ICT to enable efficient energy use in fixed and mobile information and communication networks".
- [i.2] ETSI TS 105 174-2-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 2: Network sites; Sub-part 2: Data centres".
- [i.3] European Commission DG JRC: "Code of Conduct for Data Centre Energy Efficiency".
- [i.4] Recommendation ITU-T L.1300: "Series L: Construction, installation and protection of cables and other elements of outside plant. Best practices for green data centres".
- [i.5] European Commission DG JRC: "Code of Conduct on Energy Consumption of Broadband Equipment".
- [i.6] ETSI TS 105 174-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 1: Overview, common and generic aspects".
- [i.7] Kyoto Protocol to the United Nations Framework Convention on Climate Change.
- [i.8] ETSI ES 205 200 Series: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures".
- [i.9] Directive 2010/31/EU of the European parliament and of the council of 19 May 2010 on the energy performance of buildings.
- [i.10] ETSI ES 205 200-2-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 2: Specific requirements; Sub-part 2: Fixed broadband access networks".
- [i.11] ETSI ES 205 200-2-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 2: Specific requirements; Sub-part 3: Mobile access networks".
- [i.12] ETSI ES 203 228: "Environmental Engineering (EE); Assessment of mobile network energy efficiency".
- [i.13] ETSI GS OEU 001: "Operational energy Efficiency for Users (OEU); Technical Global KPIs for Data Centres".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

energy consumption: total consumption of energy by an operational infrastructure

final energy consumption: energy consumption as seen by the consumer of a power source

NOTE: This consumption does not include losses resulting from transformation of primary energy, if any.

fossil energy: any energy not classified as renewable energy

global KPI: compound KPI obtained by combination of objective KPIs in order to assess overall performance of energy management

ICT equipment: equipment providing data storage, processing and transport services

ICT site: site containing structures or group of structures dedicated to the accommodation, interconnection and operation of ICT equipment together with all the facilities and infrastructures for power distribution and environmental control together with the necessary levels of resilience and security required to provide the desired service availability

objective KPI: KPI assessing one of the objectives of operational energy performance which is subsequently used to define a Global KPI for energy management (DC_{EM})

operational infrastructure: combination of information technology equipment and/or network telecommunications equipment together with the power supply and environmental control systems necessary to ensure provision of service

renewable energy: energy produced from dedicated generation systems using resources that are naturally replenished when energy required for production is no higher than 10 % of the produced energy

3.2 Symbols

For the purposes of the present document, the following symbols apply:

DC_{CLASS}	DC_{EM} class of energy management performance
DC_{EC}	DC_{EM} yearly energy consumption
DC_G	DataProcessing & Communication energy consumption gauge for a single ICT site
DC_P	DataProcessing & Communication Performance for a single ICT site
DC_{EM}	Global KPI for DataProcessing & Communication energy management
EC_{FEN}	Portion of KPI_{EC} not considered renewable for the purpose of the present document
EC_{HE}	Energy consumption by equipment that manage data for calculation, storage or transport purposes in an ICT site
EC_{REN}	Portion of KPI_{EC} considered renewable for the purpose of the present document.
EC_{REUSE}	Total of energy consumption from reused energy
EC_{TH}	Energy consumption from externally-provided thermal energy (either hot or cold)
EER	Energy Efficiency Ratio expressed as thermal kWh extracted by one electrical kWh
KPI_{EC}	Objective KPI for "Energy Consumption"
KPI_{ECI}	KPI for "Energy consumption per square metre"
KPI_{REN}	Objective KPI for "Renewable Energy"
KPI_{REUSE}	Objective KPI for "Energy Reuse"
KPI_{TE}	Objective KPI for "Task Efficiency"
K_{TH}	Conversion ratio from thermal energy to electricity
W_{CRs}	CRs mitigation ratio; ranges from 0 to 1
W_{REN}	Mitigation factor for KPI_{REN}
W_{REUSE}	Mitigation factor for KPI_{REUSE}

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

DC	Dataprocessing & Communication
EC DG JRC	European Commission Directorate General Joint Research Centre
GWh	Giga Watt Hour
ICT	Information and Communication(s) Technology
IT	Information Technology
ITE	IT Equipment
KPI	Key Performance Indicator
MWh	Mega Watt Hour
NTE	Network Telecommunications Equipment
PSU	Power Supply Unit
PUE	Power Usage Effectiveness

4 Definition of Key Performance Indicators

4.1 Objective KPIs for ICT sites operation

4.1.1 Energy Consumption (KPI_{EC})

4.1.1.1 General

The present document applies in a simple format the requirements of KPI_{EC} of ETSI ES 205 200-2-1 [2] for data centres, ETSI ES 205 200-2-2 [i.10] for fixed networks, and ETSI ES 205 200-2-3 [i.11] for mobile networks.

All energy required to maintain an ICT site at its design level of service availability, including energy required by hosted ICT equipment and by technical equipment such as cooling, power distribution, surveillance systems, access control, flood and fire detection, fire extinguishing system and lighting shall be allocated to KPI_{EC} .

All other energy consumptions within the boundaries of an ICT site but not necessary to deliver the design level of service availability (such as office facilities) are out of the scope and shall not be included in any measurements of KPI_{EC} .

All energy consumptions shall be recorded by electricity counters when possible. In other cases, final energy consumption by systems for producing and distributing other kinds of energy (e.g. cold loop network) shall be recorded.

Energy from local renewable hot or cold sources (e.g. air, river water) and waste heat, used for maintaining an ICT site to its design availability level shall not be counted. Anyhow, energy for devices required to distribute it to the ICT site (e.g. fans, pumps) shall be counted.

4.1.1.2 Scale

KPI_{EC} applies to all ICT sites of all sizes and includes IT rooms located in buildings.

4.1.1.3 Evolution

KPI_{EC} applies to all states of ICT sites, from initial operation to end of life.

4.1.1.4 Formula

$$KPI_{EC} = EC_{REN} + EC_{FEN}$$