

# ETSI EN 303 472 V1.1.1 (2018-10)



## Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for RAN equipment

**PREVIEW**  
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## Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE).

National transposition dates	
Date of adoption of this EN:	25 September 2018
Date of latest announcement of this EN (doa):	31 December 2018
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2019
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## Modal verbs terminology

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## Introduction

Energy efficiency has been seen to be a critical issue for telecommunication systems in relation to environmental impact and operational cost.

Within a radio access network (RAN), energy consumption is dominated by the base stations (BSs), the support infrastructure at the BS sites and repeaters (where used).

The key Performance Indicators (KPIs) and the associated measurement processes defined in the present document are used to reflect the operational energy efficiency of a radio access network and supporting infrastructures as specified in the scope.

The present document is related to the following documents:

- ETSI ES 203 228 [1] - addressing energy consumption and efficiency measurement of operational radio access networks using small samples (RAN);
- ETSI ES 202 336-12 [2] - addressing energy consumption monitoring of ICT equipment in telecommunications networks;
- ETSI ES 202 706-1 [i.1], and ETSI TS 102 706-2 [i.2] - addressing energy consumption and efficiency measurements of base stations in the laboratory.

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# 1 Scope

The present document specifies Key Performance Indicators (KPIs), and associated measurement processes, which reflect the operational energy efficiency of the following digital cellular RAN equipment and supporting infrastructures:

- integrated BS;
- distributed BS;
- BS site.

Repeaters are not considered in the present document but are considered for further study (ffs).

Energy consumption of user equipment (UE) is outside the scope of the present document, however, how a user equipment (UE) affects a base station energy performance is considered for further study.

The KPIs specified:

- combine the energy consumption (in the form of electricity) with the volume of data processed;
- combine the energy consumption (in the form of electricity) with the coverage area served;
- are applicable to the above equipment and also, in certain cases, to the sites accommodating the equipment;
- are primarily intended for trend analysis - not to enable comparison between individual BSs unless the conditions of operation are "similar".

The present document specifies KPIs that are only applicable to BS sites supporting a single operator network. KPIs for shared BS and BS site between two operators or more is considered for further study.

The RAN equipment addressed by the present document supports the following RANs, amongst others, both individually and in combination:

- UTRA, WCDMA (IMT-2000 Direct Spread, W-CDMA, UMTS);
- E-UTRA, LTE (IMT-2000 and IMT advanced);
- GSM (IMT-2000 SC, Technology GSM/EDGE).

KPIs for future RAN technologies such as 5G will be considered for future version of the present document once appropriate specifications are completed.

The present document does not define target values for the energy consumption nor the energy efficiency of the equipment for which KPIs are specified.

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## 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.

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

- [1] ETSI ES 203 228: "Environmental Engineering (EE); Assessment of mobile network energy efficiency".

- [2] ETSI ES 202 336-12: "Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (power, cooling and building environment systems used in telecommunication networks); Part 12: ICT equipment power, energy and environmental parameters monitoring information model".
- [3] ETSI TS 123 203: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Policy and charging control architecture (3GPP TS 23.203)".
- [4] ETSI TS 132 412: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Performance Management (PM) Integration Reference Point (IRP): Information Service (IS) (3GPP TS 32.412)".
- [5] ETSI TS 132 425: "LTE; Telecommunication management; Performance Management (PM); Performance measurements Evolved Universal Terrestrial Radio Access Network (E-UTRAN) (3GPP TS 32.425)".
- [6] ETSI TS 125 306: "Universal Mobile Telecommunications System (UMTS); UE Radio Access capabilities (3GPP TS 25.306)".
- [7] ETSI TS 136 306: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities (3GPP TS 36.306)".
- [8] ETSI TS 136 214: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements (3GPP TS 36.214)".

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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] ETSI ES 202 706-1: "Environmental Engineering (EE); Metrics and measurement method for energy efficiency of wireless access network equipment; Part 1: Power Consumption - Static Measurement Method".
- [i.2] ETSI TS 102 706-2: "Environmental Engineering (EE); Metrics and Measurement Method for Energy Efficiency of Wireless Access Network Equipment; Part 2: Energy Efficiency - dynamic measurement method".
- [i.3] ETSI TS 132 405: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Performance Management (PM); Performance measurements; Universal Terrestrial Radio Access Network (UTRAN) (3GPP TS 32.405)".
- [i.4] ETSI TS 152 402: "Digital cellular telecommunications system (Phase 2+); Telecommunication management; Performance Management (PM); Performance measurements - GSM (3GPP TS 52.402)".
- [i.5] ISO/IEC 17025: "General requirements for the competence of testing and calibration laboratories".
- [i.6] Recommendation ITU-T L.1350: "Energy efficiency metrics of a base station site".