**3GPP TSG-SA5 Meeting #135e *S5-211035rev2***

**e-meeting 25th January – 3rd February 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **28.310** | **CR** | **0008** | **rev** | **-** | **Current version:** | **16.3.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | Add introductory text to EE KPIs for network slices | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Orange, AT&T, Deutsche Telekom | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | EE5GPLUS | | | | |  | ***Date:*** | | | 14/01/2021 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | Energy Efficiency (EE) KPIs have been introduced in TS 28.554 for network slices. An introduction to these KPIs is missing in TS 28.310. | | | | | | | | |
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| ***Summary of change:*** | | Add introductory text to EE KPI definitions for network slices. | | | | | | | | |
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| ***Consequences if not approved:*** | | TS 28.310 would contain introductory text for EE KPIs for NG-RAN only and not for 5G network slices. | | | | | | | | |
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| ***Clauses affected:*** | | 2, 6.1, 6.1.2 (New) | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st change** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

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

[3] ETSI ES 202 336-1 V1.2.1: "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 1: Generic Interface".

[4] ETSI ES 202 336-12 V1.1.1: "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".

[5] 3GPP TS 28.550: "Management and orchestration; Performance assurance".

[6] 3GPP TS 28.531: "Management and orchestration; Provisioning".

[7] 3GPP TS 28.545: "Management and orchestration; Fault Supervision (FS)".

[8] 3GPP TS 32.432: "Telecommunication management; Performance measurement: File format definition".

[9] 3GPP TS 32.435: "Telecommunication management; Performance measurement; eXtensible Markup Language (XML) file format definition".

[10] 3GPP TS 32.436: "Telecommunication management; Performance measurement: Abstract Syntax Notation 1 (ASN.1) file format definition".

[11] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[12] 3GPP TS 38.401: "NG-RAN; Architecture description".

[13] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[14] 3GPP TR 37.816: "Study on RAN-centric data collection and utilization for LTE and NR".

[15] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[16] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[X] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

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| **Next change** |

## 6.1 Solutions for assessment of mobile network data energy efficiency

### 6.1.1 Energy efficiency of NG-RAN

Assessment of NG-RAN data EE is based on the high-level mobile network data EE KPI defined in clause 3.1 and clause 5.3 of ETSI ES 203 228 [2]:



For different gNB scenarios, the two following performance measurements may be used as the DVMN:

**- For split-gNBs scenario:**

1) DL PDCP SDU Data Volume per interface (cf. clause 5.1.3.6.2.3 of TS 28.552 [15]): This measurement provides the Data Volume (amount of PDCP SDU bits) in the downlink delivered from GNB-CU-UP to GNB-DU (F1-U interface), to external gNB-CU-UP (Xn-U interface) and to external eNB (X2-U interface). The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI, and reported per Interface (F1-U, Xn-U, X2-U);

2) UL PDCP SDU Data Volume per interface (cf. clause 5.1.3.6.2.4 of TS 28.552 [15]): This measurement provides the Data Volume (amount of PDCP SDU bits) in the uplink delivered to GNB-CU-UP from GNB-DU (F1-U interface), from external gNB-CU-UP (Xn-U interface) and from external eNB (X2-U interface). The measurement is calculated per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI, and reported per Interface (F1-U, Xn-U, X2-U);

**- For non-split gNBs scenario:**

1) DL Cell PDCP SDU Data Volume (cf. clause 5.1.2.1.1.1 of TS 28.552 [15]): This measurement provides the Data Volume (amount of PDCP SDU bits) in the downlink delivered to PDCP layer. The measurement is calculated per PLMN ID and per QoS level (mapped 5QI) and per S-NSSAI;

2) UL Cell PDCP SDU Data Volume (cf. clause 5.1.2.1.2.1 of TS 28.552 [15]): This measurement provides the Data Volume (amount of PDCP SDU bits) in the uplink delivered from PDCP layer to higher layers. The measurement is calculated per PLMN ID and per QoS level (mapped 5QI) and per S-NSSAI;

The following PEE (Power, Energy and Environmental) measurement may be used as the ECMN:

- PNF Energy consumption (cf. clause 5.1.1.19.3 of TS 28.552 [15]): This measurement provides the energy consumed (in kilowatt-hours) by the subject gNB.

### 6.1.2 Energy efficiency of network slices

#### 6.1.2.1 Introduction

Assessment of the energy efficiency of 5G network slices is based on KPIs defined in TS 28.554 [X] clause 6.7.2.

#### 6.1.2.2 Generic Network Slice Energy Efficiency (EE) KPI

The Generic network slice EE KPI is defined as:



, where ‘Performance of network slice’ (Pns) is defined per type of network slice.

#### 6.1.2.3 Energy efficiency of eMBB network slice

This KPI is obtained by the sum of UL and DL data volumes at N3 interface(s) of the network slice, divided by the energy consumption of the network slice. The unit of this KPI is bit/J.



The following measurements are used:

- GTP.InDataOctN3UPF.SNSSAI: Number of octets of incoming GTP data packets on the N3 interface, from (R)AN to UPF, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [15] clause 5.4.1.3;

- GTP.OutDataOctN3UPF.SNSSAI: Number of octets of outgoing GTP data packets on the N3 interface, from (R)AN to UPF, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [15] clause 5.4.1.4.

#### 6.1.2.4 Energy efficiency of URLLC network slice

This KPI is obtained by the inverse of the average end-to-end User Plane (UP) latency of the network slice divided by the energy consumption of the network slice. The unit of this KPI is (0.1ms \* J)-1.



Where Network slice mean latency is defined as:



The following KPIs are used to calculate Network slice mean latency:

- DelayE2EUlNs: Average e2e uplink delay for a network slice, defined in TS 28.554 [X] clause 6.3.1.8.1 as the average e2e UL packet delay between the PSA UPF and the UE for a network slice;

- DelayE2EDlNs: Average e2e downlink delay for a network slice, defined in TS 28.554 [X] clause 6.3.1.8.2 as the average e2e DL packet delay between the PSA UPF and the UE for a network slice.

#### 6.1.2.5 Energy efficiency of MIoT network slice

##### 6.1.2.5.1 Introduction

This KPI is defined with two variants.

##### 6.1.2.5.1 Based on the number of registered subscribers of the network slice

This KPI is obtained by the mean number of active UEs of the network slice divided by the energy consumption of the network slice. The unit of this KPI is UE/J.



The following measurement is used:

- RM.RegisteredSubNbrMax.SNSSAI: maximum number of registered state subscribers per AMF, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [15] clause 5.2.1.2.

##### 6.1.2.5.2 Based on the number of active UEs in the network slice

This KPI is obtained by the mean number of active UEs of the network slice divided by the energy consumption of the network slice. The unit of this KPI is UE/J.



The following measurements are used:

- DRB.MeanActiveUeDl.SNSSAI, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [15] clause 5.1.1.23.1.

- DRB.MeanActiveUeUl.SNSSAI, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [15] clause 5.1.1.23.3.

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| **End of changes** |