**3GPP TSG- Meeting #S5-244973**

**Maastricht, The Netherlands, 19 - 23 August 2024 Revision of S5-244127**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | **0052** | **rev** | **1** | **Current version:** |  |  |
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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:*** | Rel-18 CR TS 28.310 Correction of references | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson-LG Co., LTD | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI16 | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***Release:*** | | |  |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | There are both missing references and wrong reference numbers in the document specially for ETSI NFV references both reference and also the referred clause numbers are wrong. The TS refers to a TR instead of a valid TS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Remove non-valid references and update and correct the references in the document with relevant TS number and add missing references. Replaced the TR reference to relevant TS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Error will remain in the document for ex. when same reference number in clause 2 is used for two different source documents. Without having TS number in the text, keeping track of the source documents is difficult. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.1, 4.2, 5.1.1.2, 5.1.1.3, 5.1.1.4, 5.1.2.2, 5.1.2.3, 5.1.2.4, 5.1.2.6, 5.1.3.1, 5.1.3.2.3, 6.3.2.2.1, B.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | |  | | --- | | Candidate for block approval | | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

***First 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] Void

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

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

[17] 3GPP TS 32.551: "Energy Saving Management (ESM); Concepts and requirements".

[18] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[19] ETSI GR NFV-IFA 015 V3.4.1 (2020-06): "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Report on NFV Information Model".

[20] ETSI GR NFV 003 V1.6.1 (2021-03): "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[21] 3GPP TS 28.530: " Management and orchestration; Concepts, use cases and requirements".

[22] 3GPP TS 28.312: "Management and orchestration; Intent driven management services for mobile networks".

[23] ETSI ES 202 706-1 V1.7.1 (2022-08): "Environmental Engineering (EE); Metrics and measurement method for energy efficiency of wireless access network equipment; Part 1: Power consumption - static measurement method".

[24] Void

[25] ETSI GS NFV-IFA 027 (V4.3.1) (2022-06): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Performance Measurements Specification".

[26] ETSI ES 202 336-12 (V1.2.1) (2019-02): "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".

[A] ETSI GS NFV-IFA 008 V3.5.1 (2021-11): "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".

[B] ETSI GS NFV-TST 008 V3.3.1 (2020-12): "Network Functions Virtualisation (NFV) Release 3; Testing; NFVI Compute and Network Metrics Specification".

[C] ETSI GS NFV-IFA 006 (V3.7.1) (2022-11): " Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Vi-Vnfm reference point – Interface and Information Model Specification".

***First change***

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**Candidate cell:** cell which can provide coverage when the original cell goes into energySaving state.

**energySaving state:** state in which some functions of a cell or network function are powered-down.

Note 1: In energySaving state, the cell or network function is still controllable.

Note 2: This is the state when the traffic goes below a certain threshold.

**notEnergySaving state:** state when no energy saving in progress.

Note 3: This is the state when the traffic goes above a certain threshold.

**ES activation:** procedure to power down a cell or network function for energy saving purposes.

Note 4: As a result, the subject cell or network function goes into energySaving state.

**ES deactivation:** procedure to power up a cell or network function.

Note 5: As a result, the subject cell or network function goes into notEnergySaving state.

**ES Probing procedure:** procedure executed by an ES probing capable cell triggered by Cell Activation procedure or ES deactivation procedure.

NOTE 6: The ES probing procedure TS 32.551 [17] assists the decision whether the cell will transfer to notEnergySaving state or remain in energySaving state.

Note 7: During the ES probing procedure the ES probing capable cell is not carrying traffic, while it can perform measurements and be visible to the UEs in its coverage.

**compensatingForEnergySaving state:** in an off-peak traffic situation, a cell is remaining powered on, e.g. taking over the coverage areas of neighbor cell in energySaving state.

**ES compensation:** theprocedure to change a cell’s configuration to remain powered on for compensating energy saving activation on other cells, e.g. by increasing a cell’s coverage area. As a result, the cell is in compensatingForEnergySaving state.

**Energy Efficiency (EE)**: ratio between performance and energy consumption.

NOTE 8: the performance may be measured based on e.g. data volume, latency, number of active users, etc..

**Energy Consumption (EC)**: integral of power consumption over time.

NOTE 9: see ETSI ES 202 706-1 [23].

***Next change***

## 4.2 Management services

The management services required for the assessment of the energy efficiency of 5G networks are listed below:

- Performance management services (see TS 28.550 [5] – clause 4.3):

- Measurement job control service for NF.

- Performance data file reporting service for NF.

- Performance data streaming service for NF.

- Management services for network function provisioning (cf. TS 28.531 [6] – clause 6.3):

- Provisioning for NF.

- Provisioning data report for NF.

- Management services for Fault Supervision (cf. [7] – clause 4.1.1):

- Fault supervision data report service for NF.

- Fault supervision data control service for NF.

***Next change***

#### 5.1.1.2 DV measurement control

Use cases specified in TS 28.550 [5] – clause 5.1.1.1 ("NF measurement job control service") – apply for measurement job control of Data Volume.

Depending on scenarios, NF measurement job control services may not exist. In such a case, the NF measurement control of DV may be achieved as specified in TS 28.531 [6] – clause 5.1.18 ("Configuration of a 3GPP NF instance").

Traceability: REQ-DVMCS-FUN-001, REQ-DVMCS-FUN-002, REQ-DVMCS-FUN-003, REQ-DVMCS-FUN-004, REQ-DVMCS-FUN-005, REQ-PEEMCS-FUN-006.

#### 5.1.1.3 DV measurement data file reporting

Use cases specified in TS 28.550 [5] – clause 5.1.1.2 – apply for Data Volume measurement data file reporting, in compliance with TS 32.432 [8], TS 32.435 [9], TS 32.436 [10].

Traceability: REQ-DVFRS-FUN-010, REQ-DVFRS-FUN-011.

#### 5.1.1.4 DV measurement data streaming

Use cases specified in TS 28.550 [5] – clause 5.1.1.3 – apply for Data Volume measurement data streaming.

Traceability: REQ-DVDS-FUN-020.

***Next change***

#### 5.1.2.2 PEE measurement control

Use cases specified in TS 28.550 [5] – clause 5.1.1.1 ("NF measurement job control service") – apply for measurement job control of PEE parameters.

Depending on scenarios, NF measurement job control services may not exist. In such a case, the NF measurement control of PEE parameters may be achieved as specified in TS 28.531 [6] – clause 5.1.18 ("Configuration of a 3GPP NF instance").

Traceability: REQ-PEEMCS-FUN-001, REQ-PEEMCS-FUN-002, REQ-PEEMCS-FUN-003, REQ-PEEMCS-FUN-004, REQ-PEEMCS-FUN-005.

#### 5.1.2.3 PEE measurement data file reporting

Use cases specified in TS 28.550 [5] – clause 5.1.1.2 – apply for PEE measurement data file reporting, in compliance with TS 32.432 [8], TS 32.435 [9], TS 32.436 [10].

Traceability: REQ-PEEFRS-FUN-010, REQ-PEEFRS-FUN-011.

#### 5.1.2.4 PEE measurement data streaming

Use cases specified in TS 28.550 [5] – clause 5.1.1.3 – apply for PEE measurement data streaming.

Traceability: REQ-PEEDS-FUN-020.

***Next change***

#### 5.1.2.6 PEE configuration management

Use cases specified in TS 28.531 [6] – clause 5.1.18 - apply for PEE configuration management.

Traceability: REQ-PEECMS-FUN-030, REQ-PEECMS-FUN-031.

***Next change***

#### 5.1.3.1 General

The objective of energy saving is to lower OPEX for mobile operators, through the reduction of power consumption in the mobile networks that is becoming more urgent and challenging, as there are much more network elements in NR (e.g., small cells with massive MIMO in higher frequency bands) than those used in LTE (TS 38.300 [13]). One typical scenario of energy saving is to switch off capacity boosters when the traffic demand is low, and re-activated them on a need basis (see clause 15.4.2 in TS 38.300 [13]).

For NG-RAN, the energy saving consists of two scenarios where the capacity booster cell - gNB is fully or partially overlaid by the candidate cell(s). For 5GC, the energy saving consists of scenario where some UPFs deployed at the edge of 5GC network may be switched off during off-peak traffic time.

***Next change***

##### 5.1.3.2.3 Inter-RAT energy saving

Inter-RAT energy saving focuses on a scenario where the LTE eNB provides basic coverage, with the gNB providing the capacity booster that can be switched off, based on its own cell load information or by MnS producer(s). The LTE eNB is allowed to activate the dormant capacity booster NR cell (see clause 15.4.2 in TS 38.300 [13]).

Inter-RAT energy saving consists of centralized energy saving where the energy saving decision is made in MnS producer. The inter-RAT energy saving is almost the same as the intra-RAT energy with the exception that the candidate cells are eNB.

***Next change***

##### 6.3.2.2.1 Solution based on vCPU usage of virtual compute resources

The procedure for estimating the energy consumption of VNF/VNFCs based on the vCPU usage of underlying virtual compute resources is as follows:

1. The MF in charge of estimating the energy consumption of VNFs collects Power, Energy and Environmental (PEE) measurements from NFVI nodes (see clause 6.3.1), during a given period of time. The procedure described here is independent from whether the NFVI nodes are equipped with embedded sensors or external sensors;

2. The MF subscribes to PM notifications towards the VNFM, so as to receive notifications about the vCPU mean usage of selected VNF/VNFC instances (see ETSI GS NFV-IFA 008 [A] clause 7.4.4) for a given period of time (same observation period as in 1);

3. The MF requests the VNFM to create a PM job to collect the vCPU usage of selected VNF/VNFC instances (see ETSI GS NFV-IFA 008 [A] clause 7.4.2);

4. The VNFM subscribes to PM notifications towards the VIM, so as to receive notifications about the vCPU usage of the virtual compute instances on which each VNF/VNFC instance runs (see ETSI GS NFV IFA 006 [C] clause 7.7.5);

5. The VNFM requests the VIM to create a PM job to collect the vCPU usage of the virtual compute instances on which each VNF/VNFC instance runs and whose IDs are provided as input parameters of the CreatePMJob request (see ETSI GS NFV IFA 006 [C] clause 7.7.2);

6. The VIM gets, at pre-defined intervals, the process utilization compute metric values from all CPU Cores of the NFVI (see ETSI NFV-TST 008 [B] – clause 6.6). Whether the VIM gets this data in pull mode or in push mode is out of scope of the present document;

7. The VIM aggregates them per virtual compute resource and calculates their arithmetic mean per virtual compute resource; this per virtual compute resource arithmetic mean of process utilization compute metric values is called VCpuUsageMean (see ETSI GS NFV-IFA 027 [25] clause 7.1.2);

8. The VIM notifies the VNFM about VCpuUsageMean measurement(s) for the virtual compute instance(s) (see ETSI GS NFV IFA 006 [C] clause 7.7.6);

9. The VNFM maps the received VCpuUsageMean measurement(s) from virtual compute instances to the VNF/VNFC instance(s);

10. The VNFM generates the measurement for the subject VNF/VNFC instances by assigning the value of the multiple VCpuUsageMean measurements received (see ETSI GS NFV-IFA 027 [25] clause 7.2.2);

11. The VNFM notifies the Management Function in charge of estimating the 5GC NF EC, about the average VCpuUsageMean of each virtual compute instance used by the VNF/VNFC instance(s) which constitute the NF (see ETSI GS NFV-IFA 008 [A] clause 7.4.5);

12. NF energy consumption can be now estimated as follows:

- The energy consumed by the NF is the sum of the energy consumed by all its constituent VNF/VNFC instances.

- For each VNF/VNFC instance, its estimated energy consumption is a proportion of the NFVI node energy consumption on which it runs.

- This proportion is equal to the vCPU mean usage of the VNF/VNFC instance relatively to the sum of the vCPU mean usage of all VNF/VNFC instances running on the same NFVI node.

***Next change***

# B.2 Example scenario #2 – Virtualized 5GC on telco cloud

In this scenario:

- Company-B operates their 5G core network (playing thus the role of NOP);

- 5G core network functions are all virtualized and deployed on a telco cloud infrastructure owned and managed by Company-B (playing thus the role of VISP);

- the telco cloud infrastructure is deployed on Company-B’s own data center (Company-B playing thus the role of DCSP).

In this scenario, Company-B:

1) as NOP: collects required performance measurements from 5GC NFs via OA&M. These performance measurements include those used as numerator of EE KPIs defined in TS 28.554 [18] clause 6.7, e.g. performance measurements related to traffic data volumes, number of registered subscribers, etc.

2) as VISP: collects performance measurements related to VNF/VNFCs which compose the 5GC NFs, e.g. vCPU usage, vDisk usage, etc. defined in ETSI GS NFV-IFA 027 [25] clause 7;

3) as DCSP: collects PEE (Power, Energy and Environmental) parameters related to NFVI nodes on which the VNF/VNFCs supporting the 5GC NFs run. These PEE parameters are defined in TS 28.552 [15] clause 5.1.1.19 and collected according to the method defined in ETSI ES 202 336-12 [26];

4) builds EE KPIs using:

a) performance measurements (cf. item 1 above) as numerator of the KPIs; and

b) performance measurements related to VNF/VNFCs which compose the 5GC NFs (cf. item 2 above) and PEE parameters (cf. item 3 above) as denominator of the KPIs;

NOTE: NOP, VISP and DCSP are role names defined in TS 28.530 [21] clause 4.8.

***End of changes***