**3GPP TSG-SA5 Meeting #162 *S5-253928***

Goteborg, Sweden, 25 - 29 August 2025

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *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-19 CR TS 28.554 Updates to NF energy consumption based on VNF | | | | | | | | | |
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| ***Source to WG:*** | NTT DOCOMO, Rakuten Mobile, Huawei | | | | | | | | | |
| ***Source to TSG:*** | SA5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | Energy\_OAM\_Ph3 | | | | |  | ***Date:*** | | | 2025-08-28 |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TR 28.880 has studied on energy efficiency and energy savings aspects of 5G networks and services. As part of the use case #2 documented in clause 5.2 of TR 28.880, solutions for alternative options to obtain energy consumption of VNF/VNFC have been documented and recommended (see clause 6.2 of TR 28.880), whereby it is recommended to document relevant new estimated KPIs in the TS 28.554. | | | | | | | | |
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| ***Summary of change:*** | | Change #1: update existing references to refer to new measurements available in ETSI NFV.  Change #2: add additional case of collecting estimated energy consumption already associated to the VNF and clarify case of based on “constituent VNFCs”.  Changes #3 and #4: clarify in the title and description that this KPI is based on “constituent VNFCs” and add cases of either computed based on resource usage metrics or by collecting EC associated to VNFC.  Change #5: add option to getting estimated EC of VNFC based on collected energy consumption.  Change #6: add option of VNF estimated energy consumption based on collecting such energy consumption already associated to VNF. | | | | | | | | |
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| ***Consequences if not approved:*** | | Support for energy consumption in other common forms of deployment of 3GPP NF like based on OS containers will not be possible, as well as less accurate forms of estimating the energy consumption would remain in 3GPP management system related specifications. | | | | | | | | |
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| ***Clauses affected:*** | | 2, 6.7.3.1.1, 6.7.3.1.2, 6.7.3.1.3, 6.7.3.1.A (new), 6.7.3.1.B (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | | **X** |  | O&M Specifications | | | | TS 28.310 CR 0092 | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Rev1 in S5-253928 (revision of S5-253620) | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

***Start of 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] Void.

[3] ITU-T Recommendation E.800: "Definitions of terms related to quality of service".

[4] 3GPP TS 24.501: " Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[5] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[6] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[7] 3GPP TS 23.501: " System Architecture for the 5G System; Stage 2".

[8] ETSI ES 203 228 V1.2.1 (2017-04): "Environmental Engineering (EE); Assessment of mobile network energy efficiency".

[9] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[10] ETSI 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".

[11] ETSI GS NFV-IFA 027 V5.2.1 (2024-09): "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Performance Measurements Specification".

[12] 3GPP TS 38.314: "NR; layer 2 measurements".

[13] 3GPP TS 22.261: "Service requirements for the 5G system".

[14] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[15] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[16] 3GPP TS 38.473: "NG-RAN; F1 Application Protocol (F1AP)".

[17] 3GPP TS 28.318: "Management and Orchestration; Network and Service Operations for Energy Utilities (NSOEU)".

[18] 3GPP TS 28.313: "Management and orchestration; Self-Organizing Networks (SON) for 5G networks".

[19] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity; Overall Description; Stage 2"

***Start of second change***

#### 6.7.3.1 NF Energy Consumption (EC)

##### 6.7.3.1.1 Definition

a) ECNF

b) This KPI describes the Energy Consumption (EC) of a 5G Network Function (NF). This KPI is obtained by summing up the energy consumption of PNF(s) and/or VNF(s) which compose the NF. The unit of this KPI is J.

c)



- How a 5GC NF is composed of VNFs and PNFs is implementation specific. In particular, whether a VNF instance (respectively PNF) is shared or not between more than one NF is implementation specific. Hence, the case where a VNF instance (resp. PNF) is shared between multiple NFs is out of scope of the present document;

- ECPNF represents the Energy Consumption (EC) of a PNF;

- ECVNF represents the Energy Consumption (EC) of a VNF. It is obtained by summing up the Energy Consumption (EC) of all its constituent VNFCs or collecting the energy consumption already associated to the VNF from NFV-MANO;

- In the present document:

# ECPNF is measured according to ETSI ES 202 336-12 [10],

# it is considered that ECVNF cannot be measured hence is estimated by different means, based on the VNF’s constituent VNFCs (see clause 6.7.3.1.2) or by collecting energy consumption already associated to the VNF from NFV-MANO (see clause 6.7.3.1.B). Therefore the resulting ECNF KPI is defined as:



***Start of third change***

##### 6.7.3.1.2 Estimated Virtualized Network Function (VNF) energy consumption based on its constituent VNFCs

a) ECVNF,estimated

b) A KPI that gives an estimation of the energy consumption of a VNF. This KPI is obtained by summing up the estimated energy consumption of its constituent Virtualized Network Function Components (VNFC). The unit of this KPI is J.

c) 

d) ManagedFunction

e) In the present document, the energy consumption of the VNFC is estimated by different means, based on the form of deployment of the VNFC and the availability of energy consumption measurements provided by other management and orchestration systems.

When the VNFC is realized with a virtual machine, ECVNFC,estimated is obtained by the following two options:

- estimated based on its resource usage metrics as per clause 6.7.3.1.3, or

- by collecting the total energy consumption of the VNFC, as per clause 6.7.3.1.A.

When the VNFC is realized with OS containers, ECVNFC,estimated is obtained by the following form:

- by collecting the total energy consumption of the VNFC, as per clause 6.7.3.1.A.

***Start of fourth change***

##### 6.7.3.1.3 Estimated Virtualized Network Function Component (VNFC) energy consumption based on resource usage metrics

a) ECVNFC,estimated

b) A KPI that gives an estimation of the energy consumption of a VNFC. In the present document, this KPI is obtained by taking the estimated energy consumption of the virtual compute resource instance on which the VNFC runs. The unit of this KPI is J.

c) 

d) ManagedFunction

e) In the present document, the energy consumption of the virtual compute resource instance is estimated based on either:

- its mean vCPU usage, as per clause 6.7.3.1.4. The method for calculating ECVNFC,estimated is described in TS 28.310 [9] clause 6.3.2.2.1, or

- its mean vMemory usage, as per clause 6.7.3.1.5, or

- its mean vDisk usage, as per clause 6.7.3.1.6, or

- its I/O traffic volume, as per clause 6.7.3.1.7.

***Start of fifth change***

##### 6.7.3.1.A Estimated Virtualized Network Function Component (VNFC) energy consumption based on collected energy consumption

a) ECVNFC,estimated

b) A KPI that gives an estimation of the energy consumption of a VNFC. This KPI is obtained by collecting the total energy consumption of the VNFC instance over the collection period provided by NFV-MANO (named as EnergyConsumptionVnfc.vComputeId, see measurement "Energy consumption of VNFC instance" in clause 7.2.16 of ETSI GS NFV-IFA 027 [11]), which equals to the energy consumption of the VNFC. The unit of this KPI is J.

c)

d) ManagedFunction

e) The method for collecting "Energy consumption of VNFC instance" is described in clause 6.3.2.A of TS 28.310 [9].

***Start of sixth change***

##### 6.7.3.1.B Estimated Virtualized Network Function (VNF) energy consumption based on collected energy consumption

a) ECVNF,estimated

b) A KPI that gives an estimation of the energy consumption of a VNF. This KPI is obtained by collecting the total energy consumption of the VNF instance over the collection period already associated and provided by NFV-MANO (named as EnergyConsumptionVnf, see measurement "Energy consumption of VNF instance" in clause 7.2.18 of ETSI GS NFV-IFA 027 [11]), which equals to the energy consumption of the VNF. The unit of this KPI is J.

c)

d) ManagedFunction

e) The method for collecting "Energy consumption of VNF instance" is described in clause 6.3.2.A of TS 28.310 [9].

***End of changes***