**3GPP TSG-SA5 Meeting #158 *S5-246906***

Orlando, USA, 18 - 22 November 2024

**Source: Samsung**

**Title: Rel-19 pCR TR 28.880 Editorial corrections\_Edit-help**

**Document for: Approval**

**Agenda Item: 6.19.20**

# 1 Decision/action requested

***The group is requested to discuss and approve the pCR below.***

# 2 References

[1] 3GPP TR 28.880: " Study on energy efficiency and energy saving aspects of 5G networks and services"

# 3 Rationale

This contribution proposes to fix some editorial issues as per Edit Help comments

# 4 Detailed proposal

The following changes are proposed for TR 28.880[1].

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

[3] ETSI GR NFV-IFA 029 (V3.3.1): "Network Functions Virtualisation (NFV) Release 3; Architecture; Report on the Enhancements of the NFV architecture towards "Cloud-native" and "PaaS"".

[4] ETSI GS NFV-IFA 040 (V4.3.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Requirements for service interfaces and object model for OS container management and orchestration specification".

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

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

[7] 3GPP TS 22.261: "Service requirements for the 5G system".

[8] ETSI GS OEU 020: "Operational energy Efficiency for Users (OEU); Carbon equivalent Intensity measurement; Operational infrastructures; Global KPIs; Global KPIs for ICT Sites".

[9] Void.

[10] ISO/IEC 30134-3:2016: "Information technology -- Data centres -- Key performance indicators -- Part 3: Renewable energy factor (REF)".

[11] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[12] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[13] 3GPP TS 28.313: "Management and orchestration; Self-Organizing Networks (SON) for 5G networks".

[14] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[15] [Energy Benchmark 2023: Telco Insights and Industry Health Check](https://www.gsmaintelligence.com/wp-content/uploads/2024/03/EnergyBenchmarkDeck_forWeb-1.pdf).

[16] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[17] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[18] 3GPP TS 22.104: "Service requirements for cyber-physical control applications in vertical domains".

[19] ETSI EN 303 471 V1.1.1 (2019-01): "Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for Network Function Virtualisation (NFV)".

[20] ITU-T Recommendation L.1333: "Carbon data intensity for network energy performance monitoring".

[21] 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"

[22] ETSI ES 202 336-2 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 2: DC power system control and monitoring information model"

[23] ETSI ES 202 336-3 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 3: AC UPS power system control and monitoring information model"

[24] ETSI ES 202 336-4 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 4: AC distribution power system control and monitoring information model"

[25] ETSI ES 202 336-5 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 5: AC diesel back-up generator system control and monitoring information model"

[26] ETSI ES 202 336-6 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 6: Air Conditioning System control and monitoring information model"

[27] ETSI ES 202 336-7 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 7: Other utilities system control and monitoring information model"

[28] ETSI ES 202 336-8 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 8: Remote Power Feeding System control and monitoring information model"

[29] ETSI ES 202 336-9 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 9: Alternative Power Systems"

[30] ETSI ES 202 336-10 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 10: AC inverter power system control and monitoring information model"

[31] ETSI ES 202 336-11 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 11: Battery system with integrated control and monitoring information model"

[32] ETSI ES 202 336-12 V1.2.1 "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"

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| **Next Change** |

4 Concepts and background

## 4.1 Overall view of network energy efficiency

In addition to traditional policy-based energy-saving solutions, operators and vendors are developing many solutions aimed at enhancing overall energy efficiency throughout 3GPP networks, such as deployment of intent driven RAN energy saving solutions and AI-driven energy saving solutions focused on improving energy efficiency and preventing unnecessary energy consumption in networks.

According to network energy distribution published by GSMA Intelligence [15], which illustrates the area of energy consumption, RAN is still the most power consuming part in mobile networks. See reference [15] for further info of the data based on GSMA Intelligence Telco Energy Benchmark study in 2024 with 65 mobile networks. There are many initiatives on energy efficiency and energy saving in 3GPP and other SDOs/fora. During the past 3GPP releases, SA5 has been working jointly with external SDOs/groups on EE and will continue to synchronize with e.g. ETSI TC EE, ITU-T SG5, NGMN GFN (Green Future Networks), ETSI NFV ISG, and more recently with ITU‑T SG11.

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#### 5.4.3.2 Potential solution #2: Based on ManagementDataCollection

##### 5.4.3.2.1 Introduction

In this potential solution, authorized consumers collect, from the 3GPP management system, energy related information by means of management data services. In this case, the authorized consumer requests the 3GPP management system to create a ManagementDataCollection instance in order to collect per 5GC NF and per gNB energy information.

##### 5.4.3.2.2 Description

The authorized Management Service consumer requests the 3GPP management system (as Management Service producer) to create a ManagementDataCollection instance defined in clause 4.3.47 of 3GPP TS 28.622 [14], with the following input parameters:

1. managementData: to indicate the management data which should be reported. This may either include a list of data categories (e.g. "ENERGY\_EFFICIENCY"), or a list of management data identified with their name (e.g. PEE.Energy or ECNF);
2. targetNodeFilter: to indicate the target object instance(s) producing the required management data. As it is likely that the 5GC NF (as consumer) may not have detailed knowledge of the network, it may not be able to identify the exact object instance producing the required management data. In this case, the consumer can request management data produced by certain object instance(s) based on:

- a particular location (e.g. list of TAI, a list of cells (identified either by NG-RAN CGI, E-UTRAN CGI or UTRAN CGI) or by a geographical area); and/or

- the domain of the object instances (e.g. CN or RAN); and/or

- the type of traffic handled by the object instances (CP or UP);

1. collectionTimeWindow: to indicate the time window for which the management data should be reported;
2. reportingCtrl: to indicate the method and associated control parameters for reporting the produced management data to the consumer (i.e. the 5GC NF). Three methods are available:

- file-based reporting with selection of the file location by the MnS producer (i.e. 3GPP management system);

- file-based reporting with selection of the file location by the MnS consumer;

- stream-based reporting;

1. dataScope: to indicate whether the management data should be reported per S-NSSAI or per 5QI or per PLMN, if applicable.

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Annex A:  
Rel-19 SA1 requirements on energy consumption / energy efficiency

Table A-1 provides the list of SA1 requirements with respect to. 5G Energy Consumption/Energy Efficiency (see 3GPP TS 22.261 [7]) and identifies which of those may find a solution to be provided in Rel-19 by SA5 OAM.

Table A-1: Analysis of Rel-19 SA1 requirements on energy consumption / energy efficiency

| Id. | Requirement | 3GPP TS 22.261 [7], clause | In scope of SA5 OAM in Rel-19 | Observation |
| --- | --- | --- | --- | --- |
| **Energy efficiency** | | | | |
| 1 | The 5G access network shall support an energy saving mode with the following characteristics:  - the energy saving mode can be activated/deactivated either manually or automatically;  - service can be restricted to a group of users (e.g. public safety user, emergency callers).  NOTE: When in energy saving mode the UE's and Access transmit power may be reduced or turned off (deep sleep mode), end-to-end latency and jitter may be increased with no impact on set of users or applications still allowed. | 6.15.2 | Yes | Already partially supported.  - Energy saving mode already supported at cell level.  - Restriction of service to a group of users for energy saving purposes is not supported. |
| 2 | The 5G system shall support mechanisms to improve battery life for a UE over what is possible in EPS. | 6.15.2 | FFS |  |
| 3 | The 5G system shall optimize the battery consumption of a relay UE via which a UE is in indirect network connection mode. | 6.15.2 | FFS |  |
| 4 | The 5G system shall support UEs using small rechargeable and single coin cell batteries (e.g. considering impact on maximum pulse and continuous current). | 6.15.2 | FFS |  |
| **Energy related information as a service criteria** | | | | |
| 5 | Subject to operator's policy, the 5G system shall support subscription policies that define a maximum energy credit limit for services without QoS criteria. | 6.15a.2.2 | No |  |
| 6 | Subject to operator's policy, the 5G system shall support a means to associate energy consumption information with charging information based on subscription policies for services without QoS criteria. | 6.15a.2.2 | No |  |
| 7 | Subject to operator's policy, the 5G system shall support a mechanism to perform energy consumption credit limit control for services without QoS criteria.  NOTE 1: The result of the credit control is not specified by this requirement.  NOTE 2: Credit control compares against a credit control limit. It is assumed charging events are assigned a corresponding energy consumption and this is compared against a policy of energy credit limit. It is assumed there can be a new policy to limit energy consumption allowed. | 6.15a.2.2 | No |  |
| 8 | Subject to operator's policy, the 5G system shall support a means to define subscription policies and means to enforce the policy that define a maximum energy consumption (i.e. quantity of energy for a specified period of time) for services without QoS criteria.  NOTE 3: The granularity of the subscription policies can either apply to the subscriber (all services), or to particular services. | 6.15a.2.2 | No |  |
| 9 | The 5G system shall provide a mechanism to include Energy related information as part of charging information. | 6.15a.2.2 | No |  |
| 10 | Subject to operator policy and agreement with 3rd party, the 5G system shall provide a mechanism to support the selection of an application server based on energy related information associated with a set of application servers. | 6.15a.2.2 | FFS |  |
| 11 | Subject to user consent and operator policy, 5G system shall be able to provide means to modify a communication service based on energy related information criteria based on subscription policies. | 6.15a.2.2 | FFS |  |
| 12 | Subject to user consent, operator policy and regulatory requirements, the 5G system shall be able to provide means to operate part or the whole network according to energy consumption requirements, which may be based on subscription policies or requested by an authorized 3rd party. | 6.15a.2.2 | FFS |  |
| **Support of different energy states** | | | | |
| 13 | The 5G system shall support different energy states of network elements and network functions. | 6.15a.3.2 | Yes | Cell and UPF already support two energy saving state values. |
| 14 | 5G system shall support dynamic changes of energy states of network elements and network functions.  NOTE: This requirement also includes the condition when providing network elements or functions to an authorized 3rd party, the dynamic changes can be based on pre‑configured policy (the time of changing energy states, which energy state map to which level of load, etc.) | 6.15a.3.2 | Yes |  |
| 15 | The 5G system shall support different charging mechanisms based on the different energy states of network elements and network functions. | 6.15a.3.2 | No |  |
| **Monitoring and measurement** | | | | |
| 16 | Subject to operator's policy, the 5G network shall support energy consumption monitoring at per network slice and per subscriber granularity.  NOTE 1: Energy consumption monitoring as described in the preceding requirement is done by means of averaging or applying a statistical model. The requirement does not imply that some form of 'real time' monitoring is required. The granularity of the subscription policies can either apply to the subscriber (all services), or to particular services. | 6.15a.4.2 | Partially | Per network slice EE KPI already defined.  Per-subscriber EC/EE KPI is not in scope of SA5 OAM. |
| 17 | Subject to operator's policy and agreement with 3rd party, the 5G system shall be able to monitor energy consumption for serving this 3rd party.  NOTE 2: The granularity of energy consumption measurement could vary according to different situations, for example, when several services share a same network slice, etc.  NOTE 3: The energy consumption information can be related to the network resources of network slice, NPNs, etc. | 6.15a.4.2 | FFS |  |
| 18 | Subject to operator policy and regulatory requirements, the 5G system shall be able to monitor the energy consumption for serving the 3rd party, together with the network performance statistic information for the services provided by that network, related to same time interval e.g. hourly or daily.  NOTE 4: The network performance statistic information could be the data rate, packet delay and packet loss, etc. | 6.15a.4.2 | FFS |  |
| **Information exposure** | | | | |
| 19 | Subject to operator's policy and agreement with 3rd party, the 5G system shall be able to expose information on energy consumption for serving this 3rd party.  NOTE 1: Energy consumption information can include ratio of renewable energy and carbon emission information when available. The reporting period could be set, e.g. on monthly or yearly basis and can vary based on location.  NOTE 2: The energy consumption information can be related to the network resources of network slice, NPNs, etc. | 6.15a.5.2 | FFS |  |
| 20 | Subject to operator's policy, agreement with 3rd party and consent by the customer, the 5G system shall be able to expose the network performance statistic information (e.g. the data rate, packet delay and packet loss) together with energy consumption information resulting from service provided to the customer, to the authorized third party, related to the same time interval e.g. hourly or daily. | 6.15a.5.2 | FFS |  |
| 21 | Subject to operator's policy, the 5G system shall support a means to expose energy consumption to authorized third parties for services, including energy consumption information related to the condition of energy credit limit (e.g. when the energy consumption is reaching the energy credit limit). | 6.15a.5.2 | FFS |  |
| 22 | Subject to operator policy, the 5G system shall provide means for the trusted 3rd party, to configure which network performance statistic information (e.g. the data rate, packet delay and packet loss) for the communication service provided to the 3rd party, needs to be exposed along with the information on energy consumption for serving this 3rd party. | 6.15a.5.2 | FFS |  |
| 23 | Based on operator's policy and agreement with 3rd party, the 5G system shall be able to expose energy consumption information and prediction on energy consumption of the 5G network per application service to the 3rd party. | 6.15a.5.2 | FFS |  |
| 24 | Subject to operator's policy and agreement with 3rd party, the 5G system shall support a mechanism for the 3rd party to provide current or predicted energy consumption information over a specific period of time. | 6.15a.5.2 | FFS |  |
| **Network actions leveraging energy efficiency as a service criteria** | | | | |
| 25 | Subject to regulatory requirements and operators' policies, the 5G system shall enable an operator to temporarily serve UEs of other operators within a geographical area for the purpose of saving energy of the other operators.  NOTE 1: The other operators are assumed to stop providing access to their own network infrastructure within the same geographical area to save energy during that time.  NOTE 2: Policies may include predefined times/locations, energy consumption/efficiency thresholds, etc.  NOTE 3: It is assumed that the 5G system can collect charging information associated with serving UEs of other operators. | 6.15a.6.2 | FFS |  |

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| **End of change** |