**3GPP TSG SA WG 1 Meeting #99e S1-222215**

**Electronic Meeting, 22 August – 1 September 2022** *(revision of S1-22xxxx)*

Title: pCR on existing Energy Efficiency standardisation

Agenda Item: 7.12

Source: Huawei

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*Abstract: This contribution proposes an annex to TR 22.882 to document the standards related to energy efficiency.*

**1. Proposal**

It is proposed to agree the following changes to 3GPP TR 22.882.

\* \* \* 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: "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: "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 TR 21.866: "Study on Energy Efficiency Aspects of 3GPP Standards".

[6] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[7] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[8] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[9] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

\* \* \* Second Change \* \* \* \*

Annex A (informative): Existing Energy Efficiency Standardisation

## A.1 Overview of existing energy efficiency standardisation

In ETSI, GSMA and 3GPP, there were many reports, studies, specifications related to energy efficiency. And now there are also ongoing R18 studies on energy efficiency in both SA5 and RAN.

In ETSI, existing specifications cover several aspects of energy efficiency, which includes energy efficiency metrics and measurement methods for mobile core equipment, metrics and methods to measure energy performance of Mobile Radio Access Networks, measurement and monitoring of power, energy and environmental parameters for ICT equipment in telecommunications. [a] [b]

GSMA has done lots work in assessing energy consumption in different field within communication system. In "Going green: benchmarking the energy efficiency of mobile", GSMA states that 73% of the energy of the participating operators is consumed in the radio access network (RAN). The network core (13%), owned data centres (9%) and other operations (5%) account for the rest. [c] The statistics shows that energy efficiency is an end-to-end issue.

In 3GPP, energy efficiency has been studied in SA, SA5 and RAN. SA have studied system requirement and principle, provided Energy Efficiency Control Framework. [d] SA5 have specified concepts, use cases, requirements and solutions for the energy efficiency assessment and optimization for energy saving, as well as Energy Efficiency (EE) KPIs. [e] [f] RAN EE study will concentrate on definition of network energy consumption model, evaluation methodology and KPIs, also study and identify techniques on the gNB and UE side to improve network energy savings in terms of both BS transmission and reception. [g]

The existing studies concentrate more on how to satisfy user experience and try to achieve energy efficiency at the same time and achieve energy efficiency within the network, so the requirements, use cases and solutions are basically within the network itself. Verticals and customers have no approach for energy efficiency related information from network.

In 5G and 5G advanced network, beside finding energy efficient solutions as in past, introducing energy efficiency as a service could also be taken into account. Users can have the choice to select proper energy efficiency criteria as well as other network performance when they need, which may include:

1. Define and support energy efficiency criteria as part of communication service to user and application services.
2. Provide information exposure on systematic energy consumption or level of energy efficiency to vertical customers.

Such as in satellite and terrestrial convenience scenario, for some regions where both satellite and terrestrial coverage exist, energy saving could be taken as a dimension while providing the communication service, users or operators could have the choice to find out a best way in satisfying both user experience and the energy efficiency. From another perspective, network could also react to different energy consumption modes of application or adjust network resource.

Both the two aspects above need more interaction between application and network on energy consumption status. It is worth considering how to deliver services with energy efficiency as service criteria, associated with verticals’ preferences, and how to support the policy of handling energy as part of a subscription.

## A.2 Energy efficiency KPIs

3GPP Energy Efficiency KPI definitions are under SA5 (Telecom Management) responsibility. They are based on measurements collected on RAN or CN network elements / network functions via OA&M. The KPI calculation is a generalisation of the work in ETSI TC EE. Figure A.1-1 below shows the KPI derivation with notes to the source specifications.

Performance Measurements

(TS28.552, 3GPP SA5)

Energy Consumption Measurements a.k.a. PEE parameters (Power, Energy and Environmental)

(TS28.552 28.554, 3GPP SA5, based on input from ETSI ES 203 336-12)

3GPP generic EE KPI = $\frac{Performance }{Energy Consumption}$

is a generalisation of

OA&M Collection Method

(TS28.550, TS 28.532, 3GPP SA5)



Defined in ETSI TC EE 203 228

Figure A.2-1: KPI derivation and sources

## A.3 Summary of existing energy efficiency standards

Table A.2-1 below shows the standards relevant to the FS\_EnergyServ study with a synopsis taken from the Scope clause of the standard.

|  |  |  |  |
| --- | --- | --- | --- |
| **SDO** | **Group** | **Standard** | **Summary** |
| **3GPP** |  |  |  |
|  | **SA** | TR 21.866: Study on Energy Efficiency Aspects of 3GPP Standards [5] | Identifies and studies the key issues and the potential solutions in defining Energy Efficiency Key Performance Indicators and the Energy Efficiency optimization operations in existing and future 3GPP networks. |
|  | **SA5** | TS28.310: Management and orchestration; Energy efficiency of 5G [6] | Specifies concepts, use cases, requirements and solutions for the energy efficiency assessment and optimization for energy saving of 5G networks. |
|  |  | TS28.552: Management and orchestration; 5G performance measurements [7] | Specifies the performance measurements for 5G networks including network slicing. Performance measurements for NG-RAN are defined in this document, and some L2 measurement definitions are inherited from TS 38.314. The performance measurements for 5GC are all defined in this document. Related KPIs are defined to those measurements are defined in TS 28.554. |
|  |  | TS28.554: Management and orchestration; 5G end to end Key Performance Indicators (KPI) [8] | Specifies end-to-end Key Performance Indicators (KPIs) for the 5G network and network slicing |
|  |  | TS28.622: Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS) [9] | Specifies the Generic network resource information that can be communicated for telecommunication network management purposes, including management data about energy efficiency |
| **ETSI** |  |  |  |
|  | **TC EE** | ETSI ES 203 228: "Environmental Engineering (EE); Assessment of mobile network energy efficiency" [2] | Defines the topology and level of analysis to assess the energy efficiency of mobile networks (excluding terminal) |
|  |  | ETSI ES 202 336-1: "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 1: Generic Interface" [3] | Defines monitoring and control of Infrastructure Environment i.e. power, cooling and building environment systems for telecommunication centres and access network locations. |
|  |  | 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" [4] | Defines measurement and monitoring of power, energy and environmental parameters for ICT equipment in telecommunications or datacenter or customer premises |

Table A.3-2: List of EE specifications