**3GPP TSG-SA4 Meeting # 128 S4-240877**

**Jeju, KR, 20th - 24th May 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
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|  | **26.942** | **CR** |  | **rev** |  | **Current version:** | **0.1.1** |  |
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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 | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:*** | FS\_MediaEnergyGREEN KI#1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Orange | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_MediaEnergyGREEN | | | | |  | ***Date:*** | | | 2024-05-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***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)* | |
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| ***Reason for change:*** | | Describe Key Issue #1: Information exposure and list the associated requirements. | | | | | | | | |
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| ***Summary of change:*** | | Description of the Key Issue #1: Information exposure and add associated requirements. | | | | | | | | |
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| ***Consequences if not approved:*** | | SID objectives will not be met. | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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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** |

# 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".

[28554] 3GPP TS 28.554: "5G end to end Key Performance Indicators (KPI)".

[28552] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[28533] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

[28622] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[28532] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[L.1210] International Telecommunication Union, Recommendation ITU-T L.1210, "Sustainable power-feeding solutions for 5G networks", 12/2019

[L.1220] International Telecommunication Union, Recommendation ITU-T L.1220, "Innovative energy storage technology for stationary use – Part 1: Overview of energy storage", 8/2017

[L.1221] International Telecommunication Union, Recommendation ITU-T L.1221, "Innovative energy storage technology for stationary use – Part 2: Battery", 11/2018

[L.1222] International Telecommunication Union, Recommendation ITU-T L.1222, "Innovative energy storage technology for stationary use – Part 3: Supercapacitor technology", 5/2018

[L.1331] International Telecommunication Union, Recommendation ITU-T L.1331, "Assessment of mobile network energy efficiency", 1/2022

[L.1350] International Telecommunication Union, Recommendation ITU-T L.1350, "Energy efficiency metrics of a base station site", 10 /2016

[L.1351] International Telecommunication Union, Recommendation ITU-T L.1351, "Energy efficiency measurement methodology for base station sites", 8/2018

[L.1380] International Telecommunication Union, Recommendation ITU-T L.1380, "Smart energy solution for telecom sites", 11/2019

[L.1381] International Telecommunication Union, Recommendation ITU-T L.1381, "Smart energy solutions for data centres", 6/2020

[L.1382] International Telecommunication Union, Recommendation ITU-T L.1382, "Smart energy solution for telecommunication rooms", 6/2020

[L.1383] International Telecommunication Union, Recommendation ITU-T L.1383, "Smart energy solutions for city and home applications", 10/2021

[L.1310] International Telecommunication Union, Series L Supplement 36, "ITU-T L.1310 – Study on methods and metrics to evaluate energy efficiency for future 5G systems", 11/2017

[L.sup43] International Telecommunication Union, Series L Supplement 43, "Smart energy saving of 5G base stations: Traffic forecasting and strategy optimization of 5G wireless network energy consumption based on artificial intelligence and other emerging technologies", 5/2021

[L.1450] International Telecommunication Union, Recommendation ITU-T L.1450, "Methodologies for the assessment of the environmental impact of the information and communication technology sector", 9/2018

[ICT] Jens Malmodin, Nina Lövehagen, Pernilla Bergmark, and Dag Lundén. "[ICT sector electricity consumption and greenhouse gas emissions–2020 outcome.](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4424264)" Telecommunications Policy (2024): 102701

[BT2385] International Telecommunication Union, Report ITU-R BT.2385-1, "Reducing the environmental impact of terrestrial broadcasting systems", 03/2022

[OP104] International Telecommunication Union, Opinion ITU-R OP.104, "Advice for sustainability strategies incorporating carbon offsetting policies", 2022

[BT2521] International Telecommunication Union, Report ITU-R BT.2521-0, "Practical examples of actions to realize energy aware broadcasting", 3/2023

[23001-11] ISO/IEC 23001-11:2023 Information technology, MPEG systems technologies, Part 11: Energy-efficient media consumption (green metadata)

[S100] DVB, "Study Mission report on Energy Aware service Delivery and Consumption", DVB Document S100, 11/2023

[PT9] ATSC Planning Team 9, https://www.atsc.org/subcommittees/planning-team-9-sustainability/

[GoS] Greening of Streaming, <https://www.greeningofstreaming.org/>

[DIMPACT] DIMPACT, <https://dimpact.org/>

[DTMeth] DIMPACT, "Methodology: Estimating the carbon impacts of serving digital media and entertainment products", version 1.0, October 2022

[DTPaper] DIMPACT, Draft paper "Literature review and policy principles for streaming and digital media carbon footprinting", March 2023

[UHDF] Ultra HD Forum, <https://ultrahdforum.org/ibc2023-press-release-ultra-hd-forum-to-showcase-efficient-hdr-sdr-sustainability-demos/>

[22282] 3GPP TR 22.882: “Study on Energy Efficiency as a service criteria”

…

[x] <doctype> <#>[ ([up to and including]{yyyy[-mm]|V<a[.b[.c]]>}[onwards])]: "<Title>".

It is preferred that the reference to TR 21.905 be the first in the list.

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| **2nd Change** |

# 5 Key issues

[Editor’s note: Description of key issues and their potential requirements]

## 5.1 Introduction

In TR 22.882 [22282], use cases regarding enhancements to Energy Efficiency of 5G network and application service enabler aspects have been listed. Five of them have been identified as media-related in the scope of this study:

* Use case 5.5 on service energy monitoring by an application server: The service provider cares about energy consumption in the 5G system as a result of the service to UEs. This could be for 3 reasons:
  + The service provider needs to show they are saving energy;
  + The service has an associated energy cost, and the service provider wants to reduce it;
  + The service provider recognizes that there are policies that limit energy use and controls the overall use of the service to operate within those constraints.
* Use case 5.8 on Application energy efficiency monitoring: The application service energy efficiency can be monitored and predicted at the 5GS and can be exposed as a monitoring event to the Service Provider to allow an application layer action. In media context, this action could be for example trigerring multicast/broadcast delivery for a given service area and time of the day.
* Use case 5.9 on renewable energy consumption information exposure: The operators need to understand and track the proportion of energy consumed in their networks that is sourced from renewable sources, which can be made available to customers and authorized third parties.
* Use case 5.10 on supporting carbon-aware communication service: The operator provides the estimation of carbon emissions for the services.
* Use case 5.14 on reducing GHG footprint of Application Services: by considering the temporal and spatial information of sustainable energy source and availability, the possibility of reduction of the GHG footprint for application services is explored. Compute tasks having flexibility in both when and where they are executed (e.g., some AI/ML training or video processing) can be routed to a computing node using the (most) sustainable energy sources at that moment.

Media-related requirements associated to these use cases are addressed in the following “key issues”, completed by requirements associated to findings identified in the clause 4.

## 5.2 Key Issue #1: Information exposure

### 5.2.1 Description

As described in the use cases, energy related information needs to be exposed. This information is not only necessary for network internal optimization, but also will benefit the service adjustment for third parties. With the consent of operators, it is relevant to expose energy related information (e.g., energy consumption related information, energy efficiency related information, renewable energy and carbon emission related information) to the authorized consumers.

Network energy related information exposure has already been studied in TR 23.700-66 [23700-66]. The purpose of this key issue is to extend this work taking into consideration media context (e.g., 5GMS) and UE energy related information exposure. As explained in Clause 4.2.2, Data collection and reporting architecture already exist in the 5G system. But energy related information is missing. Several questions have been raised:

* How should UE energy consumption data be reported by a UE to the 5G System?
* Which reference points should be used to report UE energy consumption data to the Data Collection AF?
* Would it be useful to expose energy-related information of the network to the Media Session Handler to help it optimize its media session in an energy-efficient way?

[Editor’s note: Additional questions will probably to be added when other 4.2 clauses will be completed]

These questions will need answers, taking into consideration existing work done in 3GPP but also other market trends. Application Service Provider are often reluctant to deploy solutions specific to mobile networks. Proposing technologies already supported in their services or technologies agnostic to the network will be more likely adopted.

### 5.2.2 Potential requirements

PR-1-1 Subject to operator’s policy and agreement with third party, the 5G system shall be able to expose information on energy consumption associated to the consumption of the service of this third party.

PR-1-2 Subject to operator’s policy, agreement with third party and consent by the customer, the 5G system shall be able to expose consumption information (e.g., the data rate, video resolution and screen size) 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.

PR-1-3 Subject to operator policy, the 5G system shall provide means for the trusted third party, to configure which consumption information (e.g., the data rate, video resolution and screen size) for the media service provided to the 3rd party, needs to be exposed along with the information on energy consumption for serving this 3rd party.

PR-1-4 Based on operator’s policy and agreement with third 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 third party.

PR-1-5 Subject to operator’s policy and agreement with third party, the 5G system shall support a mechanism for the third party to provide current or predicted energy consumption information over a specific period of time.

NOTE: Requirements PR-1-1 to PR-1-5 are consolidated requirements extracted from clause 6.4 of TR 22.882 [22882].

PR-1-6 Existing mechanism and information (e.g., data collection and reporting architecture as in TS 26.531 [26531]) shall be reused for energy-related information exposure when possible.

PR-1-7 Commonly supported client data reporting format shall be reused for energy-related information exposure when possible.

PR-1-8 Media Session Handler shall be able to obtain energy-related information allowing to optimize its media session in an energy-efficient way.

[Editor’s note: Additional Potential Requirements will probably to be added when other 4.2 clauses will be completed]

## 5.3 Key Issue #2: Monitoring and measurement

### 5.3.1 Description

### 5.3.2 Potential requirements

## 5.4 Key Issue #3: Evaluation framework

### 5.4.1 Description

### 5.4.2 Potential requirements

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| **End of Changes** |