**3GPP TSG- Meeting # *1007***

**Jeju, 20 – 24 May, 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **26.942** | ***p*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:***  | UE energy consumption information reporting |
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| ***Source to WG:*** | Nokia  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | FS\_ MediaEnergyGREEN |  | ***Date:*** | 2024-05-14 |
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| ***Category:*** | B |  | ***Release:*** | 9 |
|  | *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 canbe 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:*** | Based on the discussion of S4al240056 during MBS SWG telco on 2024-05-07, the motivation of this pCR is to provide a candidate solution on what energy-related information will be provided by UE, and how this information would be reported by UE to the 5G system. Also cccording to the objective of FS\_ MediaEnergyGREEN, this pCR is proposed to add UE energy consumption information related metrics as part of the solution, in order to evaluate the energy usage/savings of media handling. |
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| ***Summary of change:*** | Addition of new subclause in clause 6 for UE energy consumption information reporting.  |
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| ***Consequences if not approved:*** | Information needed for UE energy consumption collection and reporting will be unclear.  |
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| ***Clauses affected:*** | 6.x (new) |
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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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |   |

FIRST CHANGE

## 6.X Solution #<X>: QoE metrics reporting on UE energy consumption information reporting

### 6.X.1 Key issue mapping

KI#1/KI#2

### 6.X.2 Functional description

This solution focuses on the energy consumption of the UE, and not of the network. However, as a result of collecting and evaluating energy-related measurements on the UE, network utilisation by the UE, and therefore energy consumption in the network, may be reduced, thus resulting in network energy savings.

A typical use case is for the network (potentially acting on behalf of an Application Server) to initiate a campaign of UE energy measurements in order to evaluate the impacts of a specific action taken (e.g., updating some parameters of a media session). In particular, when contextual to QoE measurements, the network, or an application, may appreciate the relationship between QoE and energy consumption on the UE, that is to look for an optimum configuration that would save most energy on the UE whilst preserving the target QoE (trade-off).

A new set of QoE metrics related UE energy consumption information is proposed in following table, relating to three major causes of energy consumption by the UE: device, application and processing:

Table 6.x.2.1: UE energy consumption metrics

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| Metric name | Description |
| UE energy consumption metrics |
| Screen on duration | The time duration of the display screen on during the session (e.g. in ms). |
| Screen energy consumption | The energy consumed by the display screen during the session (e.g. in mAh). |
| Camera on duration | The time duration of the camera on during the session (e.g. in ms) |
| Camera energy consumption | The energy consumed by the camera during the session (e.g. in mAh). |
| Loudspeaker on duration | The time duration of the loudspeaker on during the session (e.g. in ms). |
| Loudspeaker energy consumption | The energy consumed by the loudspeaker during the session (e.g. in mAh). |
| Sensor on duration | The time duration of a sensor on during the session, the sensor can be e.g. GPS sensor. |
| Sensor energy consumption | The energy consumed by the sensor during the session (e.g. in mAh). |
| … |  |
| Application-specific energy consumption metrics |
| Application identifier | Single entry in the list. |
| Application energy consumption | The energy consumed by the application during the session (e.g. in mAh). |
| … |  |
| UE processing energy consumption metrics |
| Modem energy consumption | The energy consumed by the UE modem as a result of uplink radio transmission and downlink radio reception during the session. |
| Media codec energy consumption | Energy consumed by the UE as a result of media encoding or decoding associated with a media delivery session. |
| Media rendering energy consumption | Energy consumed by the UE as a result of the split rendering process and split-rendered media processing associated with media session. |
| … |  |

### 6.X.3 Procedures

QoE configuration and reporting can optionally be specified by the QoE Measurement Collection (QMC) functionality [TS 26.247].

 A signalling diagram example is shown in figure 6.x.3.1.



Figure 6.x.3.1: Example signalling diagram for QoE reporting

The steps are as follows:

0: When UE starts/registers, the QMC handler of the UE indicates the qoe-Streaming-MeasReport capability via the UE Access Stratum when supported.

1a: OAM sends QoE configuration requests **with EC flag (energy consumption)** inside the QoE reporting request which is associated with a media delivery session identifier, time stamp, etc.

 QoE reporting request may indicate that UE energy reporting has to be inside a RAN-visible container (RVQoE).

1b: The QMC Handler within the UE triggers the DASH Client to collect DASH QoE metrics.

2: UE (DASH Client) **collects energy consumption QoE** metrics related to the media delivery session**.** This may be done, for example, based on new AT commands between the UE Application Layer and the UE Access Stratum, or gathered from the Operating System**.**

3a, 3b: The new QoE report is created and sent to OAM via the QMC Handler, **including the requested energy consumption information**, in the MTSI QoE container (including RVQoE if requested by gNB).

3c. After OAM receives the **UE energy consumption status report** as part of the QoE report for the same session), OAM may forward this information to an Application Function. The application Function may accordingly propose an optimised network configuration (e.g. different QoS or slice) to the UE via the 5G Core to fit the UE energy consumption status whilst monitoring an acceptable level of QoE metrics.

 If applicable, the gNodeB may also trigger actions in the RAN especially based on the energy consumption of radio transmission during the session (e.g. use of dual connectivity etc).

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| *End of changes* |

Second CHANGE

#### 4.2.2.x Collection and exposure of energy consumption information by QMC

Furthermore, TS 38.300 also indicates that the QMC function enables collection of application layer measurements from the UE. QMC is supported for the following service types in NR cells:

- QoE Measurement Collection for DASH streaming services;

- QoE Measurement Collection for MTSI services;

- QoE Measurement Collection for VR services.

The QMC function also supports collection of QoE measurements for any of the supported service types carried by the MBS communication service. The QMC is supported for the following two communication service types:

- MBS broadcast;

- MBS multicast.

More details of QMC control and configuration can be found in TS 28.405. A potential solution would be to reuse and expand the QMC functionality to support the collection of energy consumption information at UE.

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| *End of changes* |