**3GPP TSG-SA WG4 Meeting #127e S4-240715**

**eMeeting, 4**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **26.439** | **pCR** |  | **rev** |  | **Current version:** | **1.0.0** |  |
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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:***  | Use case on Application energy efficiency monitoring |
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| ***Source to WG:*** | Nokia  |
| ***Source to TSG:*** | S4 |
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| ***Work item code:*** | FS\_MediaGREEN |  | ***Date:*** | 29-03-2024 |
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| ***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 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | One of the objectives of [S4-240](https://www.3gpp.org/ftp/TSG_SA/WG4_CODEC/TSGS4_127_Sophia-Antipolis/Docs/S4-240515.zip)468 states the following: “Refine relevant SA1 use cases (5.5, 5.8, 5.9, 5.10 and 5.14) in TR 22.882 in the SA4 context.” In this context, it is proposed to add the proposed content to the latest draft of TR 26.439 v 1.0.0 so that it is not left incomplete.  |
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| ***Summary of change:*** | This CR proposes new text to be added in TR 26.439 on “Use case on Application energy efficiency monitoring” use case section |
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| ***Consequences if not approved:*** | Proposed 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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| 1st Change |

## X.X Use case on Application energy efficiency monitoring from SA1 [1]

### X.x.x Description

Next generation mobile communication systems are expected to accommodate more demanding services, e.g., XR, AI/ML which will require much energy consumption at the device side as well as the network side. The impact on devices and the network to support these services will be huge and sometimes unpredictable.

When Operator A is deploying a communication service to meet the application service requirements (e.g. gaming app requirements), the customer (e.g. service provider or vertical) needs to make sure that the application service doesn’t consume significant energy for the end users as well as for the data network side.

Possible high energy consumption or low energy efficiency of the application service can lead to an application layer adaptation at the service provider’s domain to deal with this. An example of application layer adaptation would be to trigger the adaptation of the service level due to high expected energy consumption for the given application in a certain service area (e.g. edge service area) or during a certain hour of the day (e.g. peak hours).

The Application service Energy Efficiency (AEE) predicted based on the Application service Energy Consumption (AEC) monitored at the 5GS and can be exposed as a monitoring event to the Service Provider to allow an application layer action. Such monitoring may relate to whether the AEE is sustainable for a given service area and time of the day or can be provided when the energy consumption for the application service is reaching the upper bound (upper bound can be set based on the SLA). The monitoring result can be exposed either periodically or event-based (e.g. when upper threshold is reached as defined in Energy-related KPIs) subject to the application service provider’s requirement (based on the SLA).

### X.x.x Pre-conditions

The service provider X wants to deploy an application service (e.g., gaming service) in a given service area and for a target number of users, where the service is expected to be provided via 5G network “N” of the 5GS of operator A. The application service may have different service levels, which may be different KPIs associated with the service, and can correspond e.g., to different levels of automation or video quality targets.

The service provider X subscribes to the operator A for the “App EnergyEff Moni” feature with the requested service level(s) to monitor whether the application service is energy-efficient when using 5G system of operator A for the given service level(s).

The operator A and service provider X have agreed on certain energy efficiency target for the application service and optionally for given service levels.

### X.x.x Service flows

1. Service provider X asks the “App EnergyEff Moni” of Operator A to provide the predicted application service energy efficiency information for App Service #1 and one or more service modes for a given service area and time of the day.

2. The 5G system of operator A acquires the energy consumption information of related 5G system functions serving the App Service #1 of service provider X. Such information can be derived per application service and can include statistical data related to the application service energy consumption within a given service area.

Then, the 5G system of operator A calculates or predicts the AEE for the application service #1 and optionally the service mode X, based on the acquired energy consumption information.

3. Operator A exposes the calculated or predicted AEE for the application service #1 (and optionally the service mode X) to the Service Provider X.

4. Service Provider X configures or adapts the application service parameters based on the Operator A feedback. Such adaptation of the application service parameters can be for instance the application server re-location to an edge data network to enhance the energy efficiency for the application.

### X.x.x Post-conditions

Service provider X can get the energy related statistics or predictions for the application service #1, independently from NG-RAN deployment scenarios, and this can help either adapting the application service parameters (e.g. service levels, application relocation) or configuring the application service in an energy-efficient manner.

### X.x.x Existing features partly or fully covering the use case functionality from SA5 perspective [2].

EE TS 28.310 [x] specifies the work in 3GPP related to energy efficiency. It specifies use cases relating to energy efficiency such as switching off edges UPFs for low-latency communication in certain geographical areas when no user is actively using them. Based on the scenarios the document presents requirements to be considered to support energy efficiency. The main requirements among them are requirements related to Power, Energy and Environmental measurements as well as requirements concerning energy saving.

This use case uses the existing 3GPP features as input for the application-level energy efficiency prediction, without providing an overlapping capability. In particular, the energy monitoring and optimization tasks in OAM cannot consider per application / session energy monitoring/predictions, and are limited to the energy calculation and monitoring per managed element (e.g. NG-RAN, UPF, slice...).

Based on operator policy and service agreement between the operator and application service provider, the 5G system shall be able to derive energy efficiency information for one or more application services, and expose energy efficiency information notifications to the application service provider.

NOTE: The granularity of energy efficiency information notifications could vary according to different situations, for example, application service energy consumption can be acquired based on means of averaging or applying a statistical model for the energy consumed by the application sessions within the application service in the service area, etc.

Based on operator policy and service agreement between the operator and application service provider, the 5G system shall be able to provide means to predict the energy efficiency per application service, and expose the predicted energy efficiency information to the application service provider.

Based on operator policy and service agreement between the operator and application service provider, the 5G system shall enable the application service provider to subscribe, update, and unsubscribe for energy efficiency information notifications.

### X.x.x Potential new requirements needed to support the use case from SA4 perspective.

Based on the predicted energy efficiency information exposed from the 5G system, the application service provider shall be able to adapt the application service parameters based on the 5GS feedback. Such adaptation of the application service parameters can be for instance the application server re-location to an edge data network to enhance the energy efficiency for the application. In order to perform such operations, the application service provider shall use the relevant APIs exposed by the 5G system operator.

Based on the derived energy efficiency information notification for one or more application services exposed from the 5G system, the application service provider shall be able to decide to dynamically switch to a different service level, which may have different KPIs associated with the service. The switching of service level applies across all users/UEs subscribed to the application service. In order to perform such operations, the application service provider shall use the relevant APIs exposed by the 5G system operator.

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| End of change |

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| 2nd Change |

X. References

[x] 3GPP TS 22.882: " Study on Energy Efficiency as a service criteria".

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

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| End of change |