**3GPP SA4 131** **S4-250043**

**Geneva, February 17th 2025 – February 21th 2025**

**Source: Orange**

**Title: Pseudo-CR on Proposed Conclusions**

**Spec: 3GPP TR 26.942 v1.0.1**

**Agenda item: 8.8 – FS\_MediaEnergyGREEN (Study on Media enerGy consumption exposuRE and EvaluatioN framework)**

**Document for:** **Agreement**

**1. Introduction**

The goal of this pCR is to progress on clause 8 Conclusions and proposed next steps. More solutions will be probably added during SA4#131. The goal of this document is to propose a basis which will be modified/complemented during the meeting to complete the Technical Report at the end of the meeting as expected.

**2. Reason for Change**

Conclusions and proposed next steps are missing.

**3. Conclusions**

Without this pCR, no instructions will be provided for next steps.

**4. Proposal**

It is proposed to agree the following changes to 3GPP TR 26.942 v1.0.1.

\* \* \* First Change \* \* \* \*
(all new text)

# 8 Conclusions and proposed next steps

## 8.1 General

The present document highlights ongoing challenges in accurately estimating energy consumption of media delivery and consumption in the 5G System, including mobile network as well as end-user devices. The main difficulties are:

**-** *Data accuracy:* Difficulty in obtaining precise power data at the hardware level.

**-** *Energy attribution:* Challenges in assigning energy usage to specific data throughput across multiple stakeholders, complicated by non-linear relationships between energy and data.

**-** *Regulatory pressures:* Legal requirements for net zero emissions necessitate clear energy allocation strategies, which can lead to disputes among network operators, service providers and consumers.

**-** *Measurement boundaries:* Defining system boundaries for energy measurements affects responsibility and accountability.

Current assessments of energy use are often too coarse for effective policymaking or system design, and do not meet reporting standards set by the Greenhouse Gas Protocol (see clause 4.2.5) and regulatory bodies (see, for example, clause 4.2.8). The present document suggests that collecting fine-grained energy consumption data in real time could address these challenges and proposes a framework for future measurements.

## 8.2 Conclusion for Key Issue #1 (Energy-related information exposure)

Two alternative Candidate Solutions addressing this Key Issue are documented:

- Solution #4 in clause 7.5 proposes to extend the UE data collection, reporting and event exposure architecture defined in TS 26.531 [21] such that the Direct Data Collection Client additionally collects and reports per-application UE energy-related information to the Data Collection AF.

- Solution #5 in clause 7.6 proposes a new architecture and related procedures allowing energy-related information from the device and the network to be provided to a UE application during media consumption for exposure to the user with the definition of two new components, the *Energy Information AF* and the *Energy Information Collector*.

The following aspects are concluded:

- For exposure of end-to-end energy-related information to the network, the Direct Data Collection Client and Data Collection AF specified in TS 26.532 [22] would need to be extended to take into consideration UE energy-related information in addition of their existing data.

- For exposure of end-to-end energy-related information to UE applications, two new entities and their associated interfaces would be required to provide energy-related information from the device, the network and other components of the Media Delivery system to a UE application: The Energy Information AF and the Energy Information Collector.

In conclusion, it is recommended to address the above principles by the following normative work:

1. Provide relevant extensions to TS 26.532[22] to extend the role of Direct Data Collection Client and Data Collection AF to take into consideration UE energy-related information.

2. Create a new stage-2 TS defining an enerfy architecture allowing end-to-end energy-related information to be exposed to UE applications and extend TS 26.501 [23] and TS 26.506 [59] to instantiate this architecture in the media context.

3. Address the relevant stage-3 aspects based on stage-2 work.

## 8.3 Conclusion for Key Issue #2 (Energy-related monitoring and measurement)

Two solutions addressing this Key Issue are documented:

- Solution #3 in clause 7.4 describes how UE Operating Systems provide tools to assess the energy footprint of applications using system-wide metrics but lists some major limitations (information not publicly available on all UE OS, not limited to media consumption and with uncertain accuracy).

- Solution #6 in clause 7.7 proposes a method leveraging energy consumption information to monitor and measure the way the media content is handled and delivered to the users, and to provide better Quality of Experience (QoE) for users.

The following aspects are concluded:

- On the device side, there is no consensus on defining a UE entity in the 5G System to manage the measurement of UE energy-related information. UE energy-related information can still be used on some UE Operating Systems providing these kinds of metrics, but because the metrics differ from one UE OS to another, there will not be normative work on UE energy-related information collection and metrics.

- On the network side, the Energy Information Function (EIF) is defined in TS 23.501 [72] to collect UE-related Energy Consumption information from Network Functions in the 5G Core, to calculate the Energy Consumption information at the granularity of UE, PDU Session and/or QoS Flow, and to expose the Energy Consumption information to the authorized consumer NF(s) (AF/NEF or another 5GC NF). No additional information has been identified at this time in the context of media delivery or consumption.

In conclusion, no normative work is planned at this time to address this Key Issue.

## 8.4 Conclusion for Key Issue #3 (Evaluation framework)

Two different solutions addressing this Key Issue are documented:

- Solution #1 in clause 7.2, based on work done by the French regulator, indicates how APIs available on some UE Operating Systems can be used to evaluate the impact of the use of some technologies on energy efficiency on devices in a lab.

- Solution #2 proposes a method to evaluate the energy efficiency of the entire UE as a whole device, which is UE implementation-specific.

The following aspects are concluded:

* No methodology has yet been identified allowing evaluation of the energy usage/savings of multimedia standards features and proposals, following best practices from these earlier characterization frameworks. The main difficulties are the lack of common UE metrics related to media consumption available on all mobile Operating Systems, and the lack of implementation of 5G network entities allowing to provide energy-related information from the network with sufficiently fine granularity.
* It seems that Energy Information Function implementations are needed before being able to evaluate the energy usage/savings of a multimedia standards feature on a specific device in a lab.

In conclusion, no normative work is planned at this time to address this Key Issue.