**3GPP SA WG2 Meeting #S2-161 S2-2403449**

**26 Feb. – 01 March, 2024 Athens, Greece rev of S2-2403163**

Title: draft LS on per UE energy consumption in RAN

Response to:

Release: Rel-19

Work Item: FS\_EnergySys

Source: Vodafone [SA2]

To: RAN, RAN1, RAN2, , RAN4

Cc: SA, SA1, SA5, RAN3

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Attachments:

1. **Overall Description:**

Based on Rel-19 stage 1 requirements in TS 22.261 clause 6.15a, SA2 are studying Energy Efficiency and Energy Saving (TR 23.700-66) including how to expose information about the amount of network energy consumed by UEs.

In general, operators can already (pre-Rel-19) generate an approximate “energy consumption per UE” by taking the complete energy consumption for the network over a period of time; the complete data traffic for the network over that period of time; and the amount of data used by the UE over that period of time.

However, it is clear this is only a very rough piece of information that may not be suitable for

the identification of the UEs using a disproportionately large or small amount of network energy for the data they receive. At the moment, no one (operator, subscriber, chipset maker, base station vendor, CN vendor) knows this information. Hence, e.g., network optimisation cannot be done to reduce energy consumption, nor enterprises encouraged to mount IoT devices in less energy-consuming locations, nor consumers nudged to modify their habits, etc.

SA2 are interested whether the RAN can estimate and report the network energy consumption for connected mode mobiles. While some of this energy consumption (e.g., in the base-band unit) is probably relatively easy to compute based on the UE’s data volume, the majority is consumed by the remote radio heads and is likely to vary with the radio conditions and require more complex estimation. . SA2 invites RAN working groups (e.g., RAN1, 2, 4) to identify an appropriate estimation mechanism for this.

With regard to the granularity of reporting, SA2 invites RAN working groups (e.g., RAN2) to indicate whether per-UE-per-network slice, and per-UE-per-QoS flow reporting is possible for the network energy consumption including the energy consumption that varies with radio conditions.

With regard to how the information about the UE’s RAN energy consumption is reported to the CN, SA2 are studying various mechanisms (e.g., similar to DC’s “secondary RAT data volume reporting”, or GTP-U header extensions, etc).

**2. Actions:**

**To RAN**

SA2 invites TSG-RAN to take these requests into account e.g., with regard to work organisation and planning, and co-ordinate with TSG-SA if necessary.

**To RAN1, RAN2, RAN4**

SA2 invites RAN1, RAN2 and RAN4 to investigate whether and how the gNB can estimate the base station energy consumption described above and whether a standardized solution can be identified.

**To RAN2**

SA2 invites RAN2 to indicate whether the base station energy consumption (that varies with radio conditions) can be reported on a per-UE-per-PDU session and per-UE-per-QoS flow basis.

**3. Date of Next SA2 Meetings:**

SA2#162 April 15 – 19, 2024 Changsha, CN

SA2#163 May 27 – 31, 2024 Jeju Island, KR