

Qualcomm

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# Views on Network Energy Savings for Rel-18

Qualcomm

A woman with dark hair, wearing a light green jacket over a blue shirt, is looking down at her smartphone. She is outdoors in a garden-like setting with green foliage and a blue butterfly perched on a branch to her left. The background is softly blurred.

# Moderator's Summary of Email Discussions

## **Potential scope of a study on network energy savings**

### **1. Definition of a network energy consumption model**

- a) **Note 1: it is suggested to adapt the framework of the power consumption methodology of TR38.840 to the network side, utilizing information from known models / external references and other relevant information, including relative energy consumption for DL and UL (considering factors like PA efficiency, number of TxRU, etc), sleep states and the associated transition times, and one or more reference parameters/configurations**
- b) **Note 2: an absolute power consumption model could also be studied in addition to the relative power consumption model, or a method could be studied for allowing to derive absolute power consumption metric from the relative power consumption metric and additional information available outside 3GPP**

### **2. Definition of an evaluation methodology, including studying potential KPIs**

- a) **Note: evaluation methodology should not focus on a single KPI, but allow evaluating how to enable system-level network energy savings while balancing impact to network/user performance (e.g. spectral efficiency, capacity, UPT, latency) and UE power consumption/complexity**

### **3. Study techniques and features to enable network energy saving**

- a) **Note 1: the focus areas include how to achieve more efficient dynamic and/or semi-static and finer granularity adaptation of transmissions and/or receptions in one or more of time, frequency, spatial, and power domains, with potential support/feedback from UE. Additional areas of the study may include UE assistance information and intra-network information exchange/coordination.**
- b) **Note 2: legacy UEs should be able to continue accessing a network implementing Rel-18 network energy savings techniques, with the possible exception of techniques developed specifically for greenfield deployments.**

**RAN1 would be the leading WG of such study, with at least RAN3 and RAN4 as secondary WGs and possibly also RAN2. Some companies mentioned a potential need for alignment with SA5 activities on enhancement on energy efficiency for 5G network. Several companies propose to plan the study in order to ensure normative work in Rel-18.**

**As a starting point, the following scenarios can be considered as targets for system-level studies on network energy savings:**

- **Urban micro in FR1, including TDD massive MIMO**
- **FR2 beam-based scenarios with massive MIMO**
- **Urban/Rural macro in FR1 with/without DSS (no impact to LTE expected in case of DSS)**
- **EN-DC/NR-DC macro with FDD anchor band and TDD/Massive MIMO on higher FR1 frequency**
- **Other scenarios, e.g., small cell deployment, can be considered**

**General note: new features studied or specified in other WI/SI should consider network energy consumption as a criterion in the study and design of new features when relevant.**

# Comments on the Moderator's Summary

We generally agree with the moderator's summary but would like to emphasize the following aspects.

- **Network energy consumption model and methodology:**
  - To analyze the techniques of improving PA efficiency, support [a model for the PA efficiency](#) related to PAPR, back-off and linearity requirements.
  - The power efficiency model needs to take into account [at least the energy per bit](#) so we can capture the value of proposals that improve the bitrate/SNR for the same energy consumption.
    - For example, UE assisted DPD functionality can improve the PA efficiency by improving its linearity. The benefit of the method might be reflected when considering the power consumed per bit.
  - Support [different types of network nodes](#) (such as different base station classes, and IAB-nodes).
- **Focus area:**
  - The focus area summary covers well only part of the potential proposals. As we've proposed in RWS-210025, we think that [techniques to improve PA power efficiency](#) can play a central role in power optimizations. Those include:
    - [Solutions on the Tx and/or the Rx side to compensate](#) for possible PA non-linearities and increase in the in-band and/or out-of-band distortions
    - [PAPR reduction solutions](#) to facilitate higher efficiency transmission
    - [Fixed or dynamic out-of-band emissions control method](#), e.g., allowing usage of the reduced back-off transmission and signal shaping while controlling out-of-band emissions
  - The current summary wording emphasizing proposals that “achieve more efficient dynamic and/or semi-static adaptation” or “achieve finer granularity adaptation” might seem to not directly address those kind of proposals, so we would like to emphasize the importance of the above methods to be central part of the proposed SI
  - In addition, we re-iterate our support for the proposals that are covered in the moderator's summary:
    - **Support more efficient dynamic and/or semi-static and finer granularity network energy saving techniques in time, frequency, spatial, and/or power domains,**
      - Those include [optimizations and proper configuration of periodic/broadcast signals \(SSBs/SI/paging\)](#).
    - Support UE assistance information and network-side coordination.