3GPP TSG-RAN WG3 Meeting #123 R3-240998

Athens, Greece, 26 February – 01 March, 2024

**Title: Reply LS on the NG-RAN Energy Saving Energy Cost index**

**Response to:** S5-241076 – R3-240056

**Release:** Release 18

**Work Item:** NR\_AIML\_NGRAN-Core

**Source:** RAN3

**To:** SA5

**Cc:**

**Contact Person:**

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**Attachments: None**

**1. Overall Description:**

RAN3 thanks SA5 for their LS. RAN3 would like to provide answers to the questions provided by SA5 as follows:

**Q1: Why should the operator configure the Energy Consumption values corresponding to minimum and maximum Energy Cost index values, when the NG-RAN node already knows its own minimum and maximum Energy consumption values? What is the use case or requirement that motivates this need?**

**Answer 1**: It is true that gNBs know their minimum and maximum energy consumption values, but the value 0 of the Energy Cost index is associated to a single energy consumption value, configured based on the minimum energy consumption of the gNBs in the defined area, and the value 10,000 of the Energy Cost index is associated to a single energy consumption value, configured based on the maximum energy consumption of the gNBs in the same area. The requirement motivating this is that the mapping rule used to convert the gNBs energy consumption into an Energy Cost index value is unified within the defined area, namely an energy consumption value is unequivocally mapped to an Energy Cost index value.

**Q2: Do ‘the Energy Consumption values corresponding to the minimum and maximum Energy Cost index values’ for a given gNB, correspond to its own minimum and maximum energy consumption values? If not, then what do these correspond to?**

**Answer 2**: The energy consumption values corresponding to the minimum and maximum Energy Cost index values do not necessarily correspond to the given gNB’s own minimum and maximum energy consumption values. Instead, they depend on the minimum and maximum energy consumption values among all gNBs within a certain area.

**Q3:** **What is the use case for configuring a unified mapping rule among multiple gNBs, i.e., all gNBs in the defined area?**

**Answer 3**: One of the use cases considered by RAN3 is switching-off a cell and offloading the traffic to one or more neighbouring cells. To explain the use case, we provide the example in Figure 1. In this figure, the operator has configured a unified mapping rule around an area of gNB0. gNB0 serves cells deployed to provide capacity, and gNB0 tries to determine whether it is optimal to offload its traffic to one or more of its neighbouring gNBs (gNB1, gNB2 and gNB3) and switch off its cells. To make an optimal AI/ML Energy Saving decision the gNB0 needs to request and obtain Energy Cost information from its neighbours. However, for gNB0 to be able to make the right AI/ML Energy Saving decision the Energy Cost provided by its neighbouring gNBs need to be derived from their energy consumptions in the same way as its own Energy Cost is derived from its own energy consumption, so that it can compare whether the overall Energy Cost, and hence overall energy consumption, in the defined area (comprising gNB0, gNB1, gNB2 and gNB3) after the offloading will be no more than the one in the same area before the offloading.

In this example, the unified mapping rule must be common among the gNBs that are involved in an AI/ML offloading action (gNBs serving source cells and gNBs serving target cells for the offloading). A different unified mapping rule could be defined across other gNBs participating to a different AI/ML offloading.



Figure 1 Example of Energy Cost exchange between gNBs.

**Q4: What are the aspects related to the mapping rule that should be made configurable? What should the mapping rule consider in mapping energy consumption values to the Energy Cost index?**

**Answer 4**: The mapping rule between energy consumption values and Energy Cost index values should be defined by the operator and left to implementation. OAM configuration may enable selection of such operator defined rules.

**Q5:** **What are the requirements and/or use cases for the usage of Energy Cost Index (e.g., usage of Energy Cost Index in the recipient gNB)?**

**Answer 5**: The use case motivating the introduction of an Energy Cost index is described in previous answers. The requirement is that the gNB receiving Energy Cost information from different neighbouring gNBs is able to directly compare the information without additional mapping or conversion.

**Q6: What are the requirements for the mapping rule? Should the mapping rule be same for all the gNBs in a given area?**

**Answer 6**: Yes, the mapping rule should be the same across all gNBs in a given area where an AI/ML Energy Saving action is initiated as described in answer 3. Requirements of the mapping rule have been described in previous answers.

**Q7: Should the ‘time interval’ have the same value for all gNBs in a defined area or can the gNBs in the defined area have different values for the ‘time interval’?**

**Answer 7**: The time interval selection is up to operator to define, but RAN3 would assume that the same time interval is configured by OAM for all gNBs within the defined area. The time interval is configured to limit, within specific time boundaries, the choice of an implementation-specific averaging window size for energy consumption measurements.

**2. Actions:**

**To SA5 : RAN3 would like to ask SA5 to take the above answers to their questions into account in their work on OAM support for Energy Cost mapping rules and apply the required changes in their specifications.**

**3. Dates of Next TSG-RAN WG3 Meetings:**

3GPP TSG RAN WG3#123-bis 15 April – 19 April, 2024 Changsha, China

3GPP TSG RAN WG3#124 20 May – 24 May, 2024 Fukuoka, Japan