3GPP TSG-RAN WG3 Meeting #123 R3-24xxxx

Athens, Greece, 26 February – 01 March, 2024

**Title: [Draft] 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:** Nokia [to be RAN3]

**To:** SA5

**Cc:**

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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**: Energy Cost discussion is not in scope of ng-eNBs, so we limit the scope of this answer to gNBs. It is true that gNBs know their minimum and maximum energy consumption values, but the value 0 of the Energy Cost index should depend on the minimum energy consumption of the gNB(s) with the lowest consumption in the defined area, and the value 10,000 of the Energy Cost index should depend on the maximum energy consumption of the gNBs with the highest consumption in the same area. The requirement is that energy cost values received by gNBs within the defined area are comparable, and in that way the received Energy Cost values will enable a receiving node to make AI/ML Energy Saving decisions.

**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 correspond to the given gNB’s own minimum and maximum energy consumption values, but the minimum and maximum energy consumption values among all gNBs within a certain area. The mapping rule between energy consumption values and Energy Cost index values is up to operator by implementation.

**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**: RAN3 has considered the use case of 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, operator has configured a unified mapping rule around an area of gNB0. gNB0 serves cells deployed to provide capacity, and this 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 to be able to monitor the variations of their reported Energy Cost index in different scenarios. However, for gNB0 to be able to make the right AI/ML Energy Saving decision the energy cost measurements provided by its neighbouring gNBs need to be normalized in the same way as its own Energy Cost is normalized so that it can compare whether the overall energy cost after the offloading (comprising gNB0, gNB1, gNB2 and gNB3) will be no more than the Energy Cost 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 a different AI/ML offloading. In one extreme, the unified mapping rule could be common across the PLMN.



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 details of mapping rule between energy consumption values and Energy Cost index values should be defined by operator by implementation.

**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 switching-off a cell and offloading of its traffic to its neighbouring nodes (e.g., switch off a capacity cell and offloading of all the traffic to the neighbouring coverage cells) as described in answer 3. 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 needed, so that it can take UE offloading decisions for energy saving and evaluate performance of its AI/ML Energy Saving action according to the normalization given by the mapping rule provided by the operator.

**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. The requirement on the mapping rule is that Energy Cost information resulting from the mapping rule is comparable by gNBs located throughout the considered area.

**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 for all gNBs within the defined area.

**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 provide further feedback if required.**

**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