**3GPP TSG SA WG 1 Meeting #106 S1-24xxxx**

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**Source: Nokia**

**pCR Title: pCR on New Use case on proposing incentives to users for network energy saving**

**Draft Spec: 3GPP TR 22.883**

**Agenda item: 7.2 (FS\_EnergyServ\_Ph2)**

**Document for: Approval**

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*Abstract:* *This pCR proposes requirements allowing to incentivize users in order to accept service adjustment offerings allowing network energy saving.*

**1. Introduction**

This pCR proposes a new use case to propose incentives UEs/users in order to accept service adjustment offerings allowing network energy savings.

**2. Reason for Change**

The main problem with known energy saving techniques is that it is unclear what tradeoff among power saving and QoS degradation is acceptable. Depending on load and network deployment, some changes to configuration due to energy saving cannot be adhered to without service/QoS degradation.

Users and/or UEs may have different requirements with respect to QoS degradation when it comes to save network energy. Tolerance to QoS degradation can also vary case by case depending on the current UE/user activity.

Yet UE/users may be more tolerant if stimulated by some incentive, being it charging-related to service-related, thus favoring the network to perform network saving actions.

The present use case introduces different situations for which the network incentivize UE/users in order to save energy, including managed movements of UEs desirable from the operator.

Rev\_1317:

- clarified the possible use of subscription policies to alleviate the dialog with UEs, together with an Editor’s Note

- removed details on UE negotiation

- clarified QoS adjustments examples

Rev1322:

- clarified the motivation and scenario

- clarified that answers can be automatically handled by the UE

**3. Conclusions**

None.

**4. Proposal**

It is proposed to agree the following use case and add it to TR 22.883.

FIRST CHANGE

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**ES offer**: a charging-based mechanism to incentivize users to accept network side energy saving (ES).

SECOND CHANGE (NEW TEXT)

## 5.x Use case on proposing incentives to users for network energy saving

### 5.x.1 Description

The main problem with known energy saving techniques is that it is unclear what tradeoff is acceptable (e.g. tolerated by the service / end user) among power saving and service adjustments, such as QoS degradation. Depending on load and network deployment, some changes to configuration due to energy saving cannot be adhered to without service/QoS degradation. Actions from the network in order to save energy may target one or more UEs: in some cases, if a UE is generating very high energy consumption on a base station due to its location/radio conditions and heavy traffic, it may alone be identified by the network as potential candidate to propose an incentive in turn of measures could lower such energy consumption from a network perspective.

Users and/or UEs may have different requirements with respect to QoS degradation when it comes to save network energy, possibly based on some incentive they can get to assist their network operator. Different kinds of behaviors are envisioned:

* not tolerant to any QoS degradation
* tolerant to some QoS degradation upon explicit/informed consent
* tolerant to some QoS degradation, although upon explicit/informed notification
* tolerant to any QoS degradation

Hence, tolerance to QoS degradation can vary case by case depending on the current UE/user activity, in particular based on the specific application/service. QoS degradation could take the form of a change in 5QI to accommodate more relaxed KPIs for example for conversational or streaming video services in particular when using GBR.

Yet UE/users may be more tolerant if stimulated by some incentive, being it charging-related to service-related, thus favoring the network to perform network saving actions.

The present use case introduces different situations for which the network incentivize UE/users in order to save energy.

In particular, some situation would require the UE to move to a (nearby) location served by a more energy efficient cell. Such cell could be a micro-cell powered by green energy and thus mainly available during the office hours, whilst the coverage macro-cell is less carbon efficient. In other scenarios the origin cell may want to switch off and have the user move under another cell coverage. In order to induce the user to move (e.g. within 100m, around the corner etc), the network could either offer a charging incentive, or a “performance boost” to overcome to potential worse/poor service level when moving to the edge of the macro cell, further advocating to the user an advantageous level of service at the new location. Proof of move would need to be verified by the network in order to validate the incentive.

### 5.x.2 Pre-conditions

Tom is a site manager at a construction company. His company has subscribed a QoS-based 5G service for their mobile rugged devices, which are used for various professional tasks.

The company wants to save some money so its subscription allows some QoS degradation in turn of some discount, knowing that its mobile network operator will try to save energy when possible. However, the subscription allows users like Tom to prevent this whenever needed and justified.

### 5.x.3 Service Flows

1. Tom goes for a site inspection with his rugged tablet. As the inspection goes on, he notices some cracks in the concrete of foundations and decides to call one of the few remote experts of his company on video to understand the potential risks.
2. At some point during this video session, the 5G network wants to save energy locally (e.g. based on energy price or supply mix change during some time period) and tries to degrade the QoS of UEs it is serving in that area. Based on internal logic and the expected amount of energy saving in the network, Tom’s UE subscription data and context, the network derives some ES offer to send to Tom, require his explicit user consent before QoS optimization is applied.
3. As Tom is in a critical call he needs to show high-quality video to his remote expert to properly evaluate the risks and cannot tolerate degradation so he refuses to degrade the QoS. This setting is saved in its UE to be applicable to this and future similar calls. The network also stores this preference, in this case as long as Tom’s UE is registered with the network.
4. On the next day Tom is looking at video simulations and training with some colleagues on site to prepare a future phase of the site construction. When the 5g network asks again to degrade the QoS he accepts it as he knows it is best for his company savings and can tolerate a lower bitrate during this streaming session, as long as it fits acceptable limits.
5. Tom is now having his weekly video conference call on his rugged tablet with his boss Alice. Part of it includes a tour of the construction site to let her see the progress, but then they debrief about the project planning. As the site building rises up, coverage quality is varying but still its QoS contract allows him to have good quality call. However from a network operator perspective, such QoS is costly to maintain using the coverage cell around the site. The network operator is planning to deploy a small cell within the site once completed. For now, a capacity cell does cover a side of the construction site.
6. After 10mn of high quality video call, the network determines that Tom’s UE traffic is quite resource-consuming and sends an ES offer to Tom to propose him to walk to that area within the next 5mn: he will get a better coverage there that will ensure good service continuity, and also lower energy consumption of his tablet. Some “green virtual credit” will also be applied to his subscription if he accepts.
7. As Tom knows that his call is important and would last for still 30mn, he decides to move there. The network acknowledges he reached the new area once served by the new cell buy sending him some notification.
8. Some days later, as the building work has completed Tom is asked to use one of the company drones to do a live footage retransmission to his boss and the future building owners and users during inauguration. Usually drones are used for internal purposes also for inspection and as such the 5QI of the uplink video streaming can be relaxed. However for this specific live event, no 5QI tolerance will be accepted in case the network would send an ES offer to save energy.

### 5.x.4 Post-conditions

Tom continues to have a high-quality service despite some seldom notifications of his mobile network operator to save energy. In turn, his network operator manages to keep its energy consumption quite low over its serving area and attractive subscription plans despite providing good QoS.

### 5.x.5 Existing features partly or fully covering the use case functionality

UE can already provide updated parameter list within the QoS flow descriptor, or even new 5QI for energy saving with relaxed QoS parameters values that most influence the energy consumption at the UE side. However, such mechanisms imply the UE to know and request specific QoS profiles, rather than enabling the network to maximize the tradeoff between QoS and energy saving and adjust its service accordingly, whilst still meeting the UE requirements.

### 5.x.6 Potential new requirements needed to support the use case

[PR.5.x.6-1] Subject to operator’s policy, regulatory requirements, subscription policies and user consent, the 5G network shall be able to support ES (energy saving) offers with associated service performance adjustment criteria, charging and/or incentives characteristics and applicability criteria.

NOTE 1: Charging/incentives characteristics and applicability criteria can be (semi-) permanent or limited in terms of e.g., applicable network slice, time or area, application/service.

NOTE 2: Incentives can correspond to future dynamic adjustments of the provided communication service (e.g. temporary improved QoS or service performance)

NOTE 3: ES offers can request explicit actions from UEs and/or users (e.g. move to another location, stay at a given location for a minimal duration).

NOTE 4: Service performance adjustment criteria can include the newly proposed service performance characteristics (e.g. reduced bitrate, latency, 5QI)

[PR.5.x.6-2] Subject to operator’s policy, regulatory requirements and user consent, the 5G system shall be able to negotiate ES offers with UEs.

NOTE 5: Negotiation includes sending offers, receiving answers (accept/deny). ES offer information can include human-readable information. Answers can be automatically handled by the UE or request explicit user involvment.

NOTE 6: ES offers can be implicitly negotiated without UE involvment, based on subscription policies. Subscription policies can for example indicate whether the subscriber prefers to be notified before an ES offer is applied, or to verify the ES offer before it is applied, or to reject by default, or to accept by default without being notified.

Editor’s Note: The granularity and frequency of negotiation with UE is FFS.

[PR.5.x.6-3] Subject to operator’s policy, the 5G system shall provide a mechanism to include the ES offer and answer (e.g. accepted/rejected) information as part of charging information, based on the negotiated ES offers.

END OF CHANGES