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**pCR Title: New use case on energy related characteristics information used for network connection path selection**

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*Abstract: This contribution proposes a new use case for FS\_EnergyServ\_ph2 in which energy related characteristics information is used for network connection path selection.*

**1. Introduction**

Please read the use case below.

**2. Reason for Change**

This is a new use case related to energy related characteristics information for the FS\_EnergyServ\_ph2 study.

**3. Conclusions**

None.

**4. Proposal**

It is proposed that the following changes to 3GPP TR 22.883 be agreed upon.

\* \* \*Start of Change (All new text)\* \* \* \*

## 5.y Use case on energy related characteristics information used for network connection path selection

### 5.y.1 Description

In order to cut down carbon emissions and enhance network efficiency, more and more operators seek to green energy sources (e.g. solar energy, wind power, geothermal energy, biomass and hydroelectric power) for their network. Due to the highly variable and unpredictable nature of green energy sources, different network nodes(e.g. RAN node or network functions) may be powered with different types of energy. For example, some network nodes may be powered by non-green energy while other network nodes may be powered by green energy. Some network nodes may also be powered by a mixture of non-green energy and green energy. In this case, the ratio of green energy of network node is determined as the ratio of the power that is used from green energy sources as a percentage of total power usage in a given time unit. Calculation of ratio of green energy is done by means of averaging or applying a statistical model.

Moreover, for the green energy used by network node, it can be generated at the site or delivered from the grid. For example, on-site wind power generation equipment is installed together with a network node, so the network node can use the green energy conveniently. For the network node which uses the green energy delivered from the grid, the energy transmission loss should be taken into account. From the perspective of carbon emission reduction, the network node powered by on-site green energy should be prioritized over the network node powered by green energy far away.

In the following use case, subscribers may specify its preference on the usage of green energy and telecom operator provides communication service to subscribers considering the energy related characteristics of network node. Here the energy related characteristics denote energy type (e.g. green energy, non-green energy, or the ratio of green energy) and energy location (e.g. energy at the site or delivered from grid). By taking the energy related characteristics of the network nodes into account, the UE can access the 5G network nodes with more green energy. Besides, during the data delivery, the 5G network can select the network connection path with more green energy for the UE in a best effort manner.

### 5.y.2 Pre-conditions

Maggie receives 5G service from the mobile network operator A.

The 5G network operated by operator A is powered by both green energy and non-green energy. Different network nodes may be powered with different energy sources and locations, e.g. non-green energy, green energy, or a mixture of non-green energy and green energy, energy locally generated or delivered from grid.

The operator A offers a “Green Comm.” service. That means user’s UE can access the network nodes with more green energy when possible. During the data delivery, the 5G network can select the connection path with more local green energy for the UE in a best effort manner, once the “Green Comm.” service is subscribed by a user.

Maggie loves our planet, so she subscribes the “Green Comm.” service which utilize as much local green energy as possible.

### 5.y.3 Service Flows

1. The 5G network monitors the energy related characteristics(e.g. ratio of green energy, location of the green energy) of its network nodes.
2. Maggie wants to upload a video through the “Green Comm.”. By taking into account the energy related characteristics, Maggie’s UE can access the 5G network node with high ratio of local green energy.
3. Then, the network connection path is set up considering the energy related characteristics of the network nodes in the path.
4. Maggie’s video is uploaded through the green connection path.
5. By selecting the network connection path which is powered by local green energy as much as possible, Maggie can be nearly carbon-free and still obtains the desired communication service.

### 5.y.4 Post-conditions

Maggie can enjoy the communication service with the satisfied quality of service while reducing her carbon footprint.

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

In TS 22.261, clause 6.15a.1 on description, clause 6.15a.2 on energy related information as a service criteria and clause 6.15a.5 on information exposure include the following requirements:

Energy related information can include ratio of renewable energy and carbon emission information when available. Calculation of energy related information as described in the following requirements is done by means of averaging or applying a statistical model. The requirements do not imply that some form of 'real time' monitoring is required.

Subject to operator policy and agreement with 3rd party, the 5G system shall provide a mechanism to support the selection of an application server based on energy related information associated with a set of application servers.

Subject to operator’s policy and agreement with 3rd party, the 5G system shall be able to expose information on energy consumption for serving this 3rd party.

NOTE 1: Energy consumption information can include ratio of renewable energy and carbon emission information when available. The reporting period could be set, e.g., on monthly or yearly basis and can vary based on location.

NOTE 2: The energy consumption information can be related to the network resources of network slice, NPNs, etc.

### 5.y.6 Potential New Requirements needed to support the use case

[PR.5.y.6-1] Subject to operator’s policy and user’s subscription policies, the 5G network shall be able to support the selection of network connection path within the 5G network boundaries, taking into account the energy related characteristics (e.g. ratio of green energy, on-site or grid location for the green energy) of the network nodes in the network connection path and the subscriber’s energy-related policies.

NOTE 1: It is assumed that 5G network can monitor the energy related characteristics of its network nodes within 5G network.

NOTE 2: It is assumed that the network may not implement the subscriber’s energy-related policies in emergency scenarios.

NOTE 3: Existing network connection path selection criteria (e.g. capacity, load balancing) are still applicable when taking into account the energy related characteristics.

Editor’s Note: FFS on the network behavior if the 5G network cannot provide network connection path according to the subscriber’s energy-related policies.

Editor’s Note: It is FFS that the network connection path needs a definition.

\* \* \*End of Change \* \* \* \*