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Title: New use case on supporting information exposure and service adjustment based on energy supply mix

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*Abstract: This document proposes a use case on supporting information exposure and service adjustment based on energy supply mix.*

## x.1 Use case on supporting information exposure and service adjustment based on energy supply mix

### x.1.1 Description

Based on the condition of environment (e.g. wind condition, solar power condition, etc.), energy company may change the energy supply mix to specific areas. Such change will result in energy supply mix to network equipment such as base station, edge computing center, etc. If this information can be shared to operators, operators can adjust or optimize the network or service provisioning based on this information for lower carbon emission. For example, operator may tend to provide the same level of service experience with higher ratio of renewable energy usage with the agreement with 3rd party.

### x.1.2 Pre-conditions

Operator A deploys network and provides services in the southern region of country C. Energy company E provides thermal power as energy supply to operator A all over country C. Recently, energy company E has deployed solar power to replace 30% of the thermal power generation in some regions of southern country C.

As a result, the energy supply mix that energy company E provide to operator A has changed. By network exposure, operator A gets aware of where the solar power has been deployed, and which network equipment has been powered by solar energy. Taking low carbon emission into consideration, operator A may perform adjustment or optimization, e.g. changing network paths or Service Hosting Environment for the services.

### x.1.3 Service Flows

1. A new solar panel field is deployed in one area, the rise and fall of the solar power will bring impact to the main power grid. Energy company E would like to comsume the resource locally instead of transport with main grid. With the agreement with Operator A, Energy company E changes the energy supply mix to the network facilities in this specific area.

2. The change information of energy supply mix is exposed to operator A. The RAN node, UPFs and edge nodes in this particular area are now supported by more ratio of renewable energy.

3. Based on awareness of the update of energy supply mix information of these network elements, operator A makes analysis and see it’s possible to adjust the communicaiton service for less carbon emission while still satisfy the requirements of 3rd party and the users.

4. Based on the agreement between operator and 3rd party , Operator A may perform adjustment to traffic of this 3rd party, e.g. relocating to the UPF or edge node with less energy consumption or higher renewable energy ratio.

### x.1.4 Post-conditions

Network exposure of energy supply mix information is enforced for operator A. This enables network adjustment or optimization, targeting reduction of energy consumption or improvement of renewable energy ratio.

### x.1.5 Existing features partly or fully covering the use case functionality

3GPP TS 22.261, clause 6.15a.5.2 on information exposure requirement of Energy Efficiency as a Service Criteria includes the following requirements:

*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.*

*Subject to operator’s policy,agreement with 3rd party and consent by the customer, the 5G system shall be able to expose the network performance statistic information (e.g. the data rate, packet delay and packet loss) together with energy consumption information resulting from service provided to the customer, to the authorized third party, related to the same time interval e.g. hourly or daily.*

*Subject to operator’s policy, the 5G system shall support a means to expose energy consumption to authorized third parties for services, including energy consumption information related to the condition of energy credit limit (e.g. when the energy consumption is reaching the energy credit limit).*

*Subject to operator policy, the 5G system shall provide means for the trusted 3rd party, to configure which network performance statistic information (e.g. the data rate, packet delay and packet loss) for the communication service provided to the 3rd party, needs to be exposed along with the information on energy consumption for serving this 3rd party.*

*Based on operator’s policy and agreement with 3rd party, the 5G system shall be able to expose energy consumption information and prediction on energy consumption of the 5G network per application service to the 3rd party.*

*Subject to operator’s policy and agreement with 3rd party, the 5G system shall support a mechanism for the 3rd party to provide current or predicted energy consumption information over a specific period of time.*

### x.1.6 Potential New Requirements needed to support the use case

[PR.x.1.6-1] Based on operators’ policy and agreement with 3rd party, 5G network shall provide mechanisms to adjust communication service (e.g. reselection of UPF, EAS of the service) considering the change of energy supply mix of the network functions as one of the factors.

NOTE 1: It is assumed that 5G system can obtain energy supply mix inforamtion, how to obtain this information is out of scope.

[PR.x.1.6-2] Based on regulatory, operators’ policy and agreement with 3rd party, 5G network shall include the usage of different energy resource of a 3rd party service in charging record.

NOTE 2: Charging here is referring to the charging related to 3rd party (e.g. network slice of a 3rd party).