**3GPP TSG-SA5 Meeting #157 *S5-246271***

Hyderabad, India, 14 - 18 October 2024 (revision of S5-245619)

**Source: Nokia**

**Title: Rel-19 pCR TR 28.880 Potential solution for use case Enabling renewable energy consumption and carbon emission information reporting**

**Document for: Approval**

**Agenda Item: 6.19.20**

# 1 Decision/action requested

***The group is requested to discuss and approve the pCR below.***

# 2 References

[1] 3GPP TR 28.880: "Study on energy efficiency and energy saving aspects of 5G networks and services".

# 3 Rationale

This pCR proposes a potential solution for Use case #3: Enabling renewable energy consumption and carbon emission information reporting, of TR 28.880 [1].

This use case describes the following

“In this use case, the 3GPP management system is capable, based on energy related information obtained from various sources, to measure per 5GC NF and per gNB energy related information, i.e.:

1. carbon emission information, i.e.:

- carbon emission;

- carbon emission efficiency.

1. ratio of renewable energy;

and to provide this information to authorized consumers.”

One of the sources for this information is also the information provided by the operator or an MnS Consumer. Hence there should be a provision for the operator to configure such information into the 3GPP system.

# 4 Detailed proposal

The following changes are proposed for TR 28.880[1].

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| **1st Change** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[3] ETSI GR NFV-IFA 029 (V3.3.1): "Network Functions Virtualisation (NFV) Release 3; Architecture; Report on the Enhancements of the NFV architecture towards "Cloud-native" and "PaaS"".

[4] ETSI GS NFV-IFA 040 (V4.3.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Requirements for service interfaces and object model for OS container management and orchestration specification".

[5] ETSI GS NFV-IFA 027 (V4.3.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Performance Measurements Specification".

[6] ETSI GS NFV-IFA 027 (V5.1.1): "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Performance Measurements Specification".

[7] 3GPP TS 22.261: "Service requirements for the 5G system".

[8] ETSI GS OEU 020: "Operational energy Efficiency for Users (OEU); Carbon equivalent Intensity measurement; Operational infrastructures; Global KPIs; Global KPIs for ICT Sites".

[9] ETSI EN 303 472: "Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for RAN equipment".

[10] ISO/IEC 30134-3:2016: "Information technology -- Data centres -- Key performance indicators -- Part 3: Renewable energy factor (REF)".

[11] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[12] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[13] 3GPP TS 28.313: "Management and orchestration; Self-Organizing Networks (SON) for 5G networks".

[14] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[15] [Energy Benchmark 2023: Telco Insights and Industry Health Check](https://www.gsmaintelligence.com/wp-content/uploads/2024/03/EnergyBenchmarkDeck_forWeb-1.pdf).

[16] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

Editor's Note: reference [6] is not published yet, will be published soon, the latest draft of DGS/NFV-IFA027 is available in the following location: <https://docbox.etsi.org/ISG/NFV/Open/Drafts/IFA027ed451>

[17] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[18] 3GPP TS 22.104: "Service requirements for cyber-physical control applications in vertical domains".

[X] ITU-T Recommendation L.1333: "Carbon data intensity for network energy performance monitoring".

[A] ETSI ES 202 336-1 V1.2.1: "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 1: Generic Interface"

[B] ETSI ES 202 336-2 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 2: DC power system control and monitoring information model"

[C] ETSI ES 202 336-3 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 3: AC UPS power system control and monitoring information model"

[D] ETSI ES 202 336-4 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 4: AC distribution power system control and monitoring information model"

[E] ETSI ES 202 336-5 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 5: AC diesel back-up generator system control and monitoring information model"

[F] ETSI ES 202 336-6 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 6: Air Conditioning System control and monitoring information model"

[G] ETSI ES 202 336-7 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 7: Other utilities system control and monitoring information model"

[H] ETSI ES 202 336-8 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 8: Remote Power Feeding System control and monitoring information model"

[I] ETSI ES 202 336-9 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 9: Alternative Power Systems"

[J] ETSI ES 202 336-10 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 10: AC inverter power system control and monitoring information model"

[K] ETSI ES 202 336-11 V1.1.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 11: Battery system with integrated control and monitoring information model"

[L] ETSI ES 202 336-12 V1.2.1 "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 12: ICT equipment power, energy and environmental parameters monitoring information model"

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| **Next Change** |

## 5.3 Use case #3: Enabling renewable energy consumption and carbon emission information reporting

### 5.3.1 Description

In Rel-18, the 3GPP management system is capable to manage the following types of energy related information:

- energy consumption measurements and/or KPIs;

- energy saving state.

In Rel-19, new aspects of energy related information are expected to be provided by the 5G system. 3GPP TS 22.261 [7] clause 6.15a states:

"*Energy consumption and efficiency information and network energy states can be exposed to third parties and energy consumption can be constrained.*

*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.*".

There are different energy sources existing, producing different energy types, e.g. non-renewable, renewable etc. Thus, the equipment and infrastructure of the network could be powered by different types of energy sources and the energy consumption measurements could correspond to such different energy types.

Due to the highly variable and unpredictable nature of renewable energy sources, the supply of renewable energy varies substantially by time and location. There is a need for the 3GPP management system to report the energy consumption metrics along with the type of consumed energy and carbon emission information, for example:

- Network slice customers may request some minimal amount/ratio for renewable energy to be used for the slice realization, and hence the network slice provider needs to have a means to monitor and report on the energy consumption for different energy types.

- Awareness of energy consumption of different energy types is useful for energy type aware network management, e.g. defining energy saving policies such that the consumption of renewable energy can be favoured.

In this use case, the 3GPP management system is capable, based on energy related information obtained from various sources, to measure per 5GC NF and per gNB energy related information, i.e.:

1. carbon emission information, i.e.:

- carbon emission;

- carbon emission efficiency.

1. ratio of renewable energy;

and to provide this information to authorized consumers.

How this energy related information is exposed to authorized consumers is addressed by the use case #4: Exposure of carbon and renewable energy related information, see clause 5.4.

### 5.3.2 Potential requirements

**REQ-ENERGY\_INFO-CON-1:** The 3GPP management system should be able to measure per 5GC NF and gNB carbon emission related information and report it to authorized consumers.

**REQ-ENERGY\_INFO-CON-2:** The 3GPP management system should be able to measure per 5GC NF and gNB energy related information, i.e. renewable energy and/or non-renewable energy related information and report it to authorized consumers.

**REQ-ENERGY\_INFO-CON-2:** The 3GPP management system should allow its authorized consumers to associate power supply information and energy related information, i.e.carbon emission, renewable energy factor, related to the managed functions, to be utilized within the 3GPP system.

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| **Next Change** |

#### 5.3.3.X Potential solution #X: Enable association of power supply and energy related information with network elements and network functions

##### 5.3.3.X.1 Introduction

The power supply of network elements and network functions can change over different time periods. These power supply information includes grid electricity, Backup energy and locally generated energy (see clause 6 of ITU-T Recommendation L.1333[X]). This information is not managed by 3GPP system but are defined by ETSI. (ETSI ES 202 336-1 [A] to ETSI ES 202 336-12 [L]). Nevertheless, the 3GPP system requires this information which can be distributed and utilized within the 3GPP system (including 5GC and external 3rd parties).

This potential solution proposes a list of information elements to be associated with the network functions, for which the operator collects information and inputs into the 3GPP management system.

##### 5.3.3.X.2 Description

This potential solution proposes that new information element(s) be defined to enable the operator to associate this information with the managed functions that are managed by 3GPP management system. This information can be further used for the carbon emission and renewable energy related KPIs and for any network optimizations.

Associated to the 5G NFs (represented by ManagedFunction), the power supply information :

- can consist of power supply, which can be power grids, batteries, UPS (Uninterrupted Power Supplies), generators (e.g., diesel back-up generator), on-site generated power (e.g., solar power, wind power).

- allows to indicate if different power supply types are used at certain planned schedules. (E.g., if the locally generated energy is used during the day, and energy from the grid is used during the night times to power the network functions).

This information may be associated with energy related information described in other potential solutions (see clauses X, Y, Z), such as e.g.:

- carbon emission of the 5G NF,

- renewable energy factor of the 5G NF,

- carbon intensity of the 5G NF.

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### 5.3.4 Evaluation of potential solutions

The potential solution #X proposes to introduce information element(s) to enable the operator to associate the power supply information to 5G network functions (represented by ManagedFunction).

This solution is feasible by providing configuration options for the operator to provide the power supply types used by network functions, and corresponding planned usage periods to the 3GPP management system.

NOTE: The definition of the information elements (e.g., an IOC or attribute(s) representing this information) and how this is associated with the network functions (represented by ManagedFunction) will be part of the normative phase.

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| **End of change** |