|  |  |
| --- | --- |
| 3GPP TR 33.766 V0.3.0 (2024-08) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Services and System Aspects;  Study on security aspects of energy savings in 5G  (Release 19) | |
|  | |
|  |  |
| The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP. The present document has not been subject to any approval process by the 3GPPOrganizational Partners and shall not be implemented. This Specification is provided for future development work within 3GPPonly. The Organizational Partners accept no liability for any use of this Specification. Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices. | |

|  |
| --- |
|  |
| ***3GPP***  Postal address  3GPP support office address  650 Route des Lucioles - Sophia Antipolis  Valbonne - FRANCE  Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16  Internet  http://www.3gpp.org |
| ***Copyright Notification***  No part may be reproduced except as authorized by written permission. The copyright and the foregoing restriction extend to reproduction in all media.  © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).  All rights reserved.  UMTS™ is a Trade Mark of ETSI registered for the benefit of its members  3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners LTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners  GSM® and the GSM logo are registered and owned by the GSM Association |

Contents

Foreword 5

1 Scope 7

2 References 7

3 Definitions of terms, symbols and abbreviations 7

3.1 Terms 7

3.2 Symbols 7

3.3 Abbreviations 8

4 Overview 8

5 Architecture and security assumptions 8

6 Key issues 8

6.1 Key Issue #1: Security aspects of collecting energy related information. 8

6.1.1 Key issue details 8

6.1.2 Security threats 8

6.1.3 Potential security requirements 8

6.2 Key Issue #2: Security aspects of exposure of energy related information. 9

6.2.1 Key issue details 9

6.2.2 Security threats 9

6.2.3 Potential security requirements 9

6.X Key Issue #X: <Key Issue Name> 10

6.X.1 Key issue details 10

6.X.2 Threats 10

6.X.3 Potential security requirements 10

7 Solutions 10

7.0 Mapping of Solutions to Key Issues 10

7.1 Solution #1: Solution reusing existing interfaces and security mechanisms for energy related information collection 10

7.1.1 Introduction 10

7.1.2 Solution details 10

7.1.3 Evaluation 10

7.2 Solution #2: Mutual authentication and NEF-AF interface protection for exposing energy related information 11

7.2.1 Introduction 11

7.2.2 Solution details 11

7.2.2.1 Mutual authentication 11

7.2.2.2 Protection of NEF-AF interface 11

7.2.3 Evaluation 11

7.3 Solution #3: AF level Authorization for energy level information notification/retrieval 11

7.3.1 Introduction 11

7.3.2 Solution details 11

7.3.2.1 General 11

7.3.2.2 Subscribe/Unsubscribe procedure of energy related information 12

7.3.3 Evaluation 13

7.Y Solution #Y: <Solution Name> 13

7.Y.1 Introduction 13

7.Y.2 Solution details 13

7.Y.3 System impact 13

7.Y.4 Evaluation 13

8 Conclusions 13

Annex <X> (informative): Change history 14

# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document studies the security and privacy aspects of energy savings. More especially the document will:

* Identify key issues concerning the privacy and security aspects of collecting energy related information.
* Identify key issues concerning the privacy and security impacts of exposure of energy related information.
* If required, develop solutions addressing the identified key issues.

# 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 TR 23.700-66: "Study on Energy Efficiency and Energy Saving".

[3] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[4] 3GPP TS 33.210: "Network Domain Security (NDS); IP network layer security".

[5] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[6] 3GPP TS 23.502: "Procedures for the 5G System (5GS)".

# 3 Definitions of terms, symbols and abbreviations

## 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].

**example:** text used to clarify abstract rules by applying them literally.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

## 3.3 Abbreviations

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

<ABBREVIATION> <Expansion>

# 4 Overview

Editor’s Note: This clause includes the overview applicable for the study.

# 5 Architecture and security assumptions

The following architecture and security assumptions are applied to the study:

- Security mechanisms applied for energy saving in this study are based on the architecture assumptions and requirements as described in TR 23.700-66 [2].

# 6 Key issues

Editor’s Note: This clause contains all the key issues identified during the study.

## 6.1 Key Issue #1: Security aspects of collecting energy related information.

### 6.1.1 Key issue details

TR 23.700-66 [2] studies the collection of energy related information for potential exposure.

The integrity and confidentiality of the data collected is of importance to produce correct analytics metrics.

Another aspect of collecting energy related information is the granularity at which it’s collected. Further information on the granularities can be found in TR 23.700-66 [2].

The key issue aims to address the security issues, ensuring integrity and confidentiality of the energy related information collected.

Editor’s Note: Further details are FFS.

### 6.1.2 Security threats

Lack of confidentiality, integrity, and replay protection in collecting energy related information can lead to disclosure of the information and tampering of the information.

Editor’s Note: Further security threats are FFS.

### 6.1.3 Potential security requirements

The data in transit shall support confidentiality, integrity, and replay protection.

Editor’s Note: Further requirements are FFS.

## 6.2 Key Issue #2: Security aspects of exposure of energy related information.

### 6.2.1 Key issue details

The key issue aims to address the security issues related to exposure of energy related information studied in TR 23.700-66 [2].

Authentication and authorization are key aspect of securing exposure of network energy-related data, including consumption, efficiency to external consumers as per KI#1 in TR 23.700-66 [1]. This key issue focus on investigating authorization methods for exposure.

The key issues assumes that the data will be exposed on a monthly or yearly basis, as exemplified in TS 22.261 [1] clause 6.15a.5.2, such linkability attacks using the consumption information as a side channel can be neglected.

Editor’s note: Further details are FFS.

### 6.2.2 Security threats

Potential security threat:

If energy related information is leaked in transit, sensitive information may be disclosed.

Having no authorization or enough level access control can lead to information leakage to authenticated AF’s.

Editor’s note: Further security threats are FFS.

### 6.2.3 Potential security requirements

The exposed energy related information shall be integrity and confidentiality protected.

The producer and consumer of energy related information shall mutually authenticate.

The 5GS should support authorization mechanism for the exposed energy related information.

The 5GS should enable granular level access control to be able to restrict and control the flow of energy related information.

Editor’s note: Further requirements are FFS.

## 6.X Key Issue #X: <Key Issue Name>

### 6.X.1 Key issue details

### 6.X.2 Threats

### 6.X.3 Potential security requirements

# 7 Solutions

## 7.0 Mapping of Solutions to Key Issues

Table 7.0-1: Mapping of Solutions to Key Issues

| Solutions | Key Issues | |
| --- | --- | --- |
| KI#1 | KI#2 |
| **Sol#1** | x |  |
| **Sol#2** |  | x |

## 7.1 Solution #1: Solution reusing existing interfaces and security mechanisms for energy related information collection

### 7.1.1 Introduction

The proposed solution addresses the security requirement (confidentiality, integrity, and replay protection for data-in-transit) in key issue #1: "Security aspects of collecting energy related information.".

### 7.1.2 Solution details

According to clause 13.1 of TS 33.501 [1], all network functions shall support TLS and HTTPS with mutual authentication. Network functions can guarantee that data-in-transit is protected by an encrypted connection and is only sent to other authenticated network functions by implementing the protection principles outlined in clause 13.1 of TS 33.501 (thereby protecting data-in-transit hop-by-hop).

The solution can inherit the protection principles from clause 13.1 of TS 33.501 to address the security requirement in KI#1.

### 7.1.3 Evaluation

This solution fulfills the requirement of key issue 1.

The solution implements the protection principles in clause 13.1 of TS 33.501 [1], thereby introducing no new impacts to the 5GS.

Editor’s note: Further evaluation is FFS.

## 7.2 Solution #2: Mutual authentication and NEF-AF interface protection for exposing energy related information

### 7.2.1 Introduction

This pCR introduces a new solution for KI#2 for mutual authentication and NEF-AF interface protection for EE information exposure for the study TR 33.766 [2].

### 7.2.2 Solution details

#### 7.2.2.1 Mutual authentication

Clause 12.2 of TS 33.501 [3] highlights the needs for authentication between NEF and an AF that resides outside the 3GPP operator domain, mutual authentication based on client and server certificates is performed between the NEF and AF using TLS.

Certificate based authentication follows the profiles given in 3GPP TS 33.310 [4], clause 6.1.3a. The identities in the end entity certificates is used for authentication and policy checks.

#### 7.2.2.2 Protection of NEF-AF interface

Clause 12.3 of TS 33.501 [3] TLS is used to provide integrity protection, replay protection and confidentiality protection for the interface between the NEF and the AF. The support of TLS is mandatory.

Security profiles for TLS implementation and usage follows the provisions given in clause 6.2 of TS 33.210 [4].

### 7.2.3 Evaluation

The solution resuses Clause 12.2 and Clause 12.3 of TS 33.501 [3] without any change or enhancement.

Editor’s note: Further evaluation are FFS

## 7.3 Solution #3: AF level Authorization for energy level information notification/retrieval

### 7.3.1 Introduction

This pCR introduces a new solution for KI#2 on authorization of AF when AF subscribes/unsubcribes and retrieve energy related information.

### 7.3.2 Solution details

#### 7.3.2.1 General

Based on conclusion for KI#1 clause 8.1 in TR 23.700-66 [1] If an AF is deployed outside the 3GPP operator domain, and is an authorized consumer, the granularities include: per application corresponding to the AF, per Network Slice level, per UE, and per UE per AF. The procedure for notifying and retrieval of energy related information by the AF is described in section 5.2.2.

#### 7.3.2.2 Subscribe/Unsubscribe procedure of energy related information

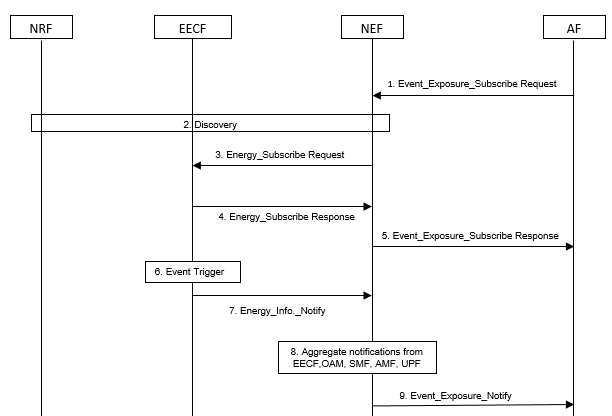


Figure 5.2.2-1: AF level Authorization for energy level information notification/retrieval

The AF authorization is based on clause 13 of TS 33.501 [5]

The token-based authorization mechanism is used. The token is generated for the AF after authorization that includes the level of service access. The token claim may contain the external application ID, S-NSSAI, UE ID, or AF-Service-Identifier.

1. To subscribe energy related information per application corresponding to the AF, per Network Slice level, per UE, and per UE per AF with the EECF, the AF sends Event\_Exposure\_Subscribe Request.The message contains the token with token claims as described above.
2. The NEF checks whether the AF is authorised for the requested subscription based on the AF token. It needs to check whether the token claims match the AF’s identity and service level access i.e external application ID, S-NSSAI, UE ID, or AF-Service-Identifier. If authorised, the NEF may query the NRF to find the EECF responsible to provide the requested energy related information.
3. The NEF forwards the request to the EECF with susbcription based on service level as described in step 2.
4. The EECF acknowledges the execution of request message to the NEF.
5. The NEF based on the confirmation from EECF in step 4, sends a response back to the AF for subscription success.
6. – 7 The EECF triggers a notification towards the AF and sends the message to the NEF as described in TS 23.502 [6].
7. -9 The NEF forwards the message to the AF for single EECF or aggregates reporting information for multiple EECF message as described in TS 23.502 [6].

Editor’s Note: The solution requires alignment with TR 23.700-66 [1].

Editor’s Note: Clarification of which steps are in the scope of the present document is FFS.

### 7.3.3 Evaluation

The solution relies on the Event exposure services offered by the NEF while reusing the existing authorization mechanism based on clause 13 of TS 33.501 [5]. The token-based authorization introduces additional token claims necessary to limit the service level access based on AF subscription policies.

Editor’s Note: Applicability and evaluation of the solution depends on final conclusion drawn in TS 23.700-66.

## 7.Y Solution #Y: <Solution Name>

### 7.Y.1 Introduction

Editor’s Note: Each solution should list the key issues being addressed.

### 7.Y.2 Solution details

### 7.Y.3 System impact

### 7.Y.4 Evaluation

Editor’s Note: Each solution should motivate how the potential security requirements of the key issues being addressed are fulfilled.

# 8 Conclusions

Editor’s Note: This clause contains the agreed conclusions that will form the basis for any normative work.

Annex <X> (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2024-04 | SA3#115 Adhoc-e | S3-241541 |  |  |  | TR Skeleton | 0.0.0 |
| 2024-04 | SA3#115 Adhoc-e | S3-241654 |  |  |  | Included changes from S3-241542, S3-241546, S3-241544, S3-241547 | 0.1.0 |
| 2024-05 | SA3#116 | S3-242606 |  |  |  | Included changes from S3-242576, S3-242577, S3-242578, S3-242579 | 0.2.0 |
| 2024-08 | SA3#117 | S3-243606 |  |  |  | Included changes from S3-243607, S3-243608, S3-243609, S3-243610 | 0.3.0 |