**3GPP TSG-SA WG1 Meeting #92e S1-204105**

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Title: UC of Isolation for Smart Grid Applications

Agenda Item: 7.9.1

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*Abstract: This contribution proposes to add the new use case about isolation for smart grid applications.*

*Discussion:*

According to the regulation of China Grid industry [4], the power grid business is mainly divided into two working categories: production control and information management. The production control can be further divided into safety zone I and safety zone II. All the real-time monitoring, detection, and controlling energy production applications belong to safety zone I. And other non-controlling energy production applications belong to the safety zone II. The information management also can be further divided into safety zone III and safety zone IV. The applications belong to the safety zone III are information systems for power production, while the internal information services for the energy enterprises belong to safety zone IV.

According to [4], different kinds of safety isolation requirements are applied to different safety zones:

1. The energy applications belong to production control category i.e. safety zone I and II need to be physically isolated from other applications which don’t belong to production control working category.
2. The energy applications belong to information management working category i.e. safety zone III and IV can be logically isolation from other applications including non-energy applications.
3. The energy applications belong to a same working category can be logically isolated each other.
4. The energy applications belong to a same safety zone can be logically isolated each other

Typically, the physical isolation requires the traditional wired communication link utilizing different time slots, wavelengths, and physical media to guarantee the safety level. And the logical isolation may be supported by shared communication resource.

When 5G system is utilized to support smart grid applications, the different isolation modes will also be supported by 5G system. Not only core network, but also radio network will be involved. For 5G system, the physical isolation means dedicated core network element and dedicated radio resource e.g. PRB pool, spectrum etc. The logical isolation on the other hand may be supported by shared network element or shared network resource.

Considering the different isolation modes require different network resource utilization, it is proposed to add description of the safety isolation definition and related requirements for the energy use cases.

*Proposed Text:*

----------------------------------------------------- Start of the 1st change -------------------------------------------------

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions 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.

Physical Isolation communication service: the physical isolation communication service for energy application means the communication network supporting the energy application utilizes dedicated network element and dedicated radio resource e.g. PRB pool, spectrum etc.

Logical Isolation communication service: the logical isolation for energy application means the communication network supporting the energy application may utilize shared network element or shared network resource e.g. VLAN etc.

----------------------------------------------------- End of 1st change ------------------------------------------------------

----------------------------------------------------- Start of the 2nd change ------------------------------------------------

### 5.x Use case of isolation demand for energy applications

#### 5.x.1 Description

According to the regulation of China Grid industry [4], the power grid business is mainly divided into two working categories: production control and information management. The production control can be further divided into safety zone I and safety zone II. All the real-time monitoring, detection, and controlling energy production applications belong to safety zone I. And other non-controlling energy production applications belong to the safety zone II. The information management also can be further divided into safety zone III and safety zone IV. The applications belong to the safety zone III are information systems for power production, while the internal information services for the energy enterprises belong to safety zone IV. Following Table 5.x.1-1 lists the typical applications belong to different safety zones.

Table 5.x.1-1 typical safety zone and related energy application

|  |  |
| --- | --- |
| Safety Zone type | Typical energy applications |
| I | distribution automation system, substation automation system, relay protection, distributed energy storage, etc. |
| II | Reservoir dispatch automation system, electric energy metering system, relay protection and fault recording information management system, etc. |
| III | Dispatch production management system (DMIS), lightning monitoring system, power line inspection, statistical report system, etc. |
| IV | Management Information System (MIS), Office Automation System (OA), Customer Service System, etc. |

According to [4], different kinds of safety isolation requirements are applied to different safety zones:

1. The energy applications belong to production control category i.e. safety zone I and II need to be physically isolated from other applications which don’t belong to production control working category.
2. The energy applications belong to information management working category i.e. safety zone III and IV can be logically isolation from other applications including non-energy applications.
3. The energy applications belong to a same working category can be logically isolated each other.
4. The energy applications belong to a same safety zone can be logically isolated each other



Typically, the physical isolation requires the traditional wired communication link utilizing different time slots, wavelengths, and physical media to guarantee the safety demand. And the logical isolation may be supported by shared communication resource.

With 5G system is utilized to support smart grid applications, the different isolation modes will also be supported by 5G system. Not only core network, but also radio network and UE are involved. For 5G system, the physical isolation communication service means dedicated core network element and dedicated radio resource e.g. PRB pool, spectrum etc. The logical isolation communication service on the other hand may be supported by shared network element or shared network resource.

#### 5.x.2 Pre-Conditions

The energy company EE utilizes 5G system to support multiple energy applications with different isolation communication services. Among them, the PMU belongs to safety isolation I, the electricity information collection belongs to safety isolation II, power line on-site patrol belongs to safety isolation III, Office Automation System (OA) belongs to safety isolation IV.

#### 5.x.3 Service Flows

The 5G system deployes several communication links to support multiple energy applications.

One link is used to support PMU application and the dedicated core network element and dedicated radio resource have been configured in this link to guarantee the physical isolation demand.

One link is used to support electricity information collection application. It also belongs to safety isolation II which can be logical isolation with applications belong to safety isolation I and physical isolation with applications belong to safety isolation III and IV. So, it also can share network resource e.g. core network element and dedicated resource with PMU application.

One link is used to support power line on-site patrol application. It belongs to safety isolation III which require logical isolation. Considering applications belong to safety isolation I & II require physical isolation with applications belong to safety isolation III and IV, it cann’t share the network resource e.g. core network element and dedicated resource with PMU, diffential protection and eletricity information collection applications. But it can share network resource with other applications belong to safety isolation III and IV, even other internet applications.

One link is used to support Office Automation System (OA). It also requires logical isolation. So, it can share network resource with power line on-site patrol application.

The energy company EE also can monitor the above communication resource usage and communication link quality.

#### 5.x.4 Post-Conditions

The energy applications can be work well and fulfill the isolation requirements with the assistance of 5G system.

The communication resource usage status and communication link quality also can be monitored by energy company EE.

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

When required by regulations, the 5G system shall be able to provide suitable [mechanism](https://cn.bing.com/dict/search?q=simple%20mechanism&FORM=BDVSP2" \t "_blank) for the energy application to monitor the communication link quality and network resource usage.

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

[PR 5.x.6 - 1] Subject to regional or national regulation, the 5G system shall be able to provide dedicated communication resources per energy application to allow energy applications to remain unaffected in their communication e.g. in case of overload caused by another energy application.

Editor’s Note:  It is FFS whether the requirements [PR 5.x.6 - 1] , [PR 5.x.6 - 2] , [PR 5.x.6 - 3] are already supported, e.g. using redundant transmissions.

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