Business Use Cases for the OneNet

D2.3

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About OneNet

OneNet will provide seamless integration of all the actors in the electricity network across Europe to create the conditions for a synergistic operation that optimizes the overall energy system while creating an open and fair market structure.

The project OneNet (One Network for Europe) is funded through the EU's eighth Framework Programme Horizon 2020. It is titled "TSO – DSO Consumer: Large-scale demonstrations of innovative grid services through demand response, storage and small-scale (RES) generation" and responds to the call "Building a low-carbon, climate resilient future (LC)".

While the electrical grid is moving from being fully centralized to a highly decentralized system, grid operators have to adapt to this changing environment and adjust their current business model to accommodate faster reactions and adaptive flexibility. This is an unprecedented challenge requiring an unprecedented solution. For this reason, the two major associations of grid operators in Europe, ENTSO-E and E.DSO, have activated their members to put together a unique consortium.

OneNet will see the participation of a consortium of over 70 partners. Key partners in the consortium include: already mentioned ENTSO-E and E.DSO, Elering, E-REDES, RWTH Aachen University, University of Comillas, VITO, European Dynamics, UBITECH Energy, Engineering, and the EUI's Florence School of Regulation (Energy).

The key elements of the project are:

1. Definition of a common market design for Europe: this means standardised products and key parameters for grid services which aim at the coordination of all actors, from grid operators to customers;
2. Definition of a Common IT Architecture and Common IT Interfaces: this means not trying to create a single IT platform for all the products but enabling an open architecture of interactions among several platforms so that anybody can join any market across Europe; and
3. Large-scale demonstrators to implement and showcase the scalable solutions developed throughout the project. These demonstrators are organized in four clusters coming to include countries in every region of Europe and testing innovative use cases never validated before.

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List of Abbreviations and Acronyms

Acronym	Meaning
aFRR	automatic Frequency Restoration Reserve
AMI	Advanced Metering Infrastructure
ASM	Active System Management
ATC	Available Transfer Capacity
BRP	Balance Responsible Party
BSP	Balancing Service Provider
BUC	Business Use Case
CACM	Capacity Allocation & Congestion Management
CIM	Common Information Model
CGM	Common Grid Model
CM	Congestion Management
DACF	Day Ahead Congestion Forecast
DAM	Day Ahead Market
DER	Distributed Energy Resources
DSO	Distribution System Operator
EHV	Extra High Voltage
EMS	Energy Management System
ESCO	Energy Service Company
FCR	Frequency Containment Reserves
FMO	Flexibility Market Operator
FP	Flexibility Platform
FR	Flexibility Register
FSP	Flexibility Service Provider
FSPA	Flexibility Service Provider Aggregator
GCT	Gate Closure Time
HEMRM	Harmonised Electricity Market Role Model
HV	High Voltage
IGM	Individual Grid Model
IMO	Independent Market Operator
KPI	Key Performance Indicator

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LV	Low Voltage
mFRR	manual Frequency Restoration Reserve
MO	Market Operator
NEMO	Nominated Electricity Market Operator
MV	Medium Voltage
NWP	Numerical Weather Prediction
OO	Optimization Operator
OTC	Over The Counter
OHL	Over Head Line
PMU	Phasor Measurement Unit
PoC	Point of Connection
PoI	Points of Interest
RES	Renewable Energy Sources
RR	Replacement Reserves
RSC	Regional Security Coordinators
SCADA	Supervisory Control And Data Acquisition
SGAM	Smart Grid Architecture Model
SO	System Operator
SPP	Solar Power Producer
SUC	System Use Case
TSO	Transmission System Operator
UML	Unified Modelling Language
VC	Voltage Control
WP	Work Package
WPP	Wind Power Producer

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Executive Summary

One of OneNet's innovation pillars is to create an integrated marketplace for system services by contributing to the construction of the European Internal Market for electricity. The main objective of Task 2.3 is to produce a set of Business Use Cases (BUCs) for all demonstrators in the four clusters (Northern, Southern, Western, Eastern) and to evaluate them to ensure that are well-positioned and linked with the priorities set by the Green Deal and respectively with the project's strategic objectives.

To reach the objectives of Task 2.3 this deliverable presents a set of BUCs, that will materialize the OneNet products and services. For this, the standardized IEC Use Case methodology was applied, which is based on the IEC 62559 template, in order to enable a common understanding of functionalities, actors and processes across the different demo BUCs.

In total 23 BUCs were developed from OneNet demonstrators. As a first step, these BUCs were evaluated in terms of (i) addressed system services, (ii) system operator's approach for acquiring these services, and (iii) defined business roles.

To answer the question "What services were addressed in each BUC?", the services addressed in each BUC were mapped against the OneNet system services framework developed in Task 2.2. This analysis concluded that when considering the services included in the BUCs, there is a clear focus on the provision of non-frequency ancillary services. Even in those cases where frequency control services are being considered, the BUC is considering options that evaluate joint solutions for both frequency control and non-frequency control. In addition, there would appear to be a slight focus on predictive services, i.e. services addressing need that arise as the result of forecast circumstances, even if several of the demonstrator partners are also considering BUCs aimed at addressing corrective needs, i.e. services addressing needs that arise as the result of unexpected circumstances.

To answer the question "What was the approach of the SO to acquire this service?", the market framework described in each BUC was analysed against the OneNet market framework developed in Task 3.1. The project demos were grouped into three main sets to ease the analysis between comparable market frameworks. Considering coordination addressed in demonstration BUCs, three types of coordination are addressed: market-based TSO-DSO coordination, market-based DSO coordination, and technical based TSO-DSO coordination. The demonstrators that belong to the market-based TSO-DSO coordination adopt a coordination scheme in which the TSO and the DSO are coordinated through a market,while the demonstrators that belong to the DSO market-based coordination category focus on the mechanism to procure system services from FSPs to solve local needs. The demonstrators that belong to the technical-based TSO-DSO coordination adopt a coordination scheme in

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which the TSO and DSO directly interact by exchanging information and requests for operating actions. The cross analysis of the BUCs regarding the type of coordination points out that the number of BUCs considering market-based TSO-DSO coordination, market-based DSO coordination and technical-based TSO-DSO coordination respectively is equally distributed.

To answer the question “Which were the business roles defined within each BUC?”, the business roles defined in each BUC were recorded and mapped against the Harmonised Electricity Market Role Model (HEMRM) to identify which of these roles are included in it and which could potentially introduce new ones. This mapping indicated a small number of business roles proposed by OneNet that are not explicitly defined in HEMRM but are rather connected with some of the existing HEMRM roles.

In addition to the individual demo BUCs, the concept of the regional business use cases was introduced and developed to further promote cooperation between countries at a cluster level. These regional BUCs comprise multi-country cross-border scenarios in which the different demo countries within a cluster foresee the exchange of information between themselves through the use of the technical solutions developed throughout the course of the project.

After evaluating the demonstration business use cases, the OneNet General Business Use case was developed by mapping the demo BUCs against the process described in the Active System Management Report (ASM). The ASM report describes and analyses active power management from the perspective of TSOs and DSOs for congestion management in both distribution and transmission grids and system balancing when such services are provided in a market-based approach by flexibilities owned and operated by third parties. The described process includes the preparatory phase, the forecasting phase, the market phase, the monitoring and activation phase, as well as the measurement and settlement phase. By identifying these phases in the processes described within the demo BUCs, the high-level description of OneNet general BUC was created, which is illustrated in the picture below:

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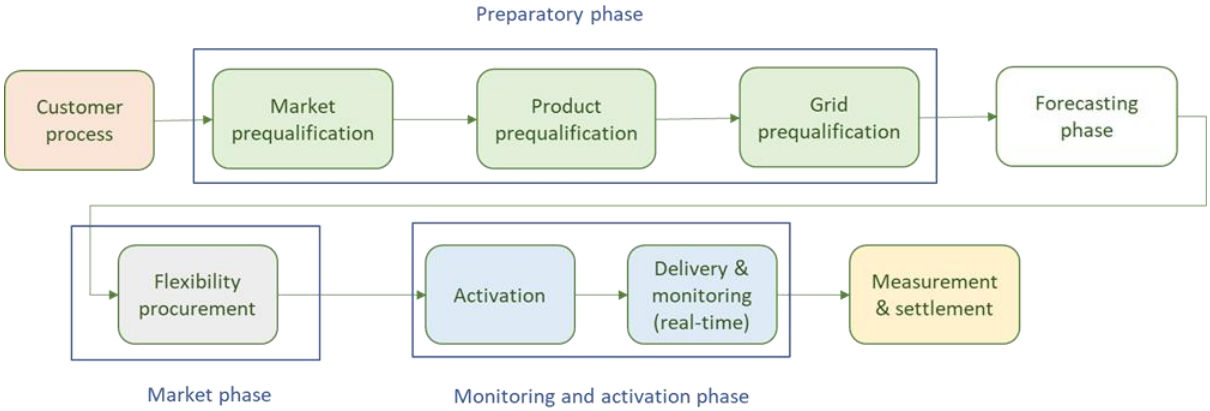

Figure 1: OneNet General BUC high-level description

It should be highlighted that the customer process scenario deals with onboarding customer for providing flexibility. This scenario is considered in OneNet general BUC in order to explore how the customers are part of the interactions between TSO-DSO-market parties-customers.

The presented work is a clear starting point for the demonstration Work Packages (WPs) of the OneNet project and it will be also used as an input for the work carried out in the rest of the horizontal WPs.

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1 Introduction

1.1 Work Package 2 objectives

The overall objective of WP2 is to set the basis of the work that will be carried out within OneNet. To this aim, market solutions and digital platforms presented so far in the EU pilot projects in addition to European policy frameworks have been reviewed and their contributions and benefits have been analysed. Based on that knowledge the new products and business use cases proposed in the OneNet approach have been defined. Moreover, the differences among EU markets have been reviewed and specific priorities for KPIs, Scalability and Replicability of OneNet solutions are being devised to enable the pan-EU integration of these new services and products digitally procured for the system operation.

1.2 Objectives of Task 2.3 and relationship with other tasks

The main objective of Task 2.3 is to produce a set of Business Use Cases (BUCs) for all demonstrators in the four clusters according to the standardised methodology IEC – 62559. Within the scope of Task 2.3, the BUCs were defined for all demonstrator clusters. In addition, regional level BUCs, as well as a general BUC for the OneNet project were developed to facilitate the interaction between the different demo clusters.

A review of the BUCs developed in previous H2020 projects set the starting point of the BUCs analysis. In addition, while reviewing the OneNet demonstration BUCs, special focus was given to analysing the system services, the type of coordination and the business roles addressed.

As shown in Figure 1.1, Task 2.3 holds a central role within the OneNet project development since its input is required not only from the rest of WP2 tasks, but also from most of the other horizontal and all the demonstrators' work packages. More specifically, the results of Task 2.3 will be an input for:

- WP3: WP3 will integrate the market design concepts developed within this particular WP with the findings of Task 2.3 and the results coming from the demo clusters.
- WP4: WP4 will use the demonstrators' BUCs to identify the technical requirements to facilitate the integration of flexibility both from TSO, DSO and customer perspective. In addition, T2.3 output will be used to map the actors, roles and data exchanges as part of the flexibility exchange process.
- WP5: Based on the Task 2.3 output, WP5 will define the functional and non-functional requirements of the OneNet platform.

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- WP7-WP10: Demonstration WPs will align even more their demonstration activities with OneNet overall objectives using the feedback from the horizontal WPs provided through the T2.3 output.

Moreover, the task's results will be presented through GRIFOn Forum in order to achieve a higher level of engagement of the stakeholders with T2.3 work.

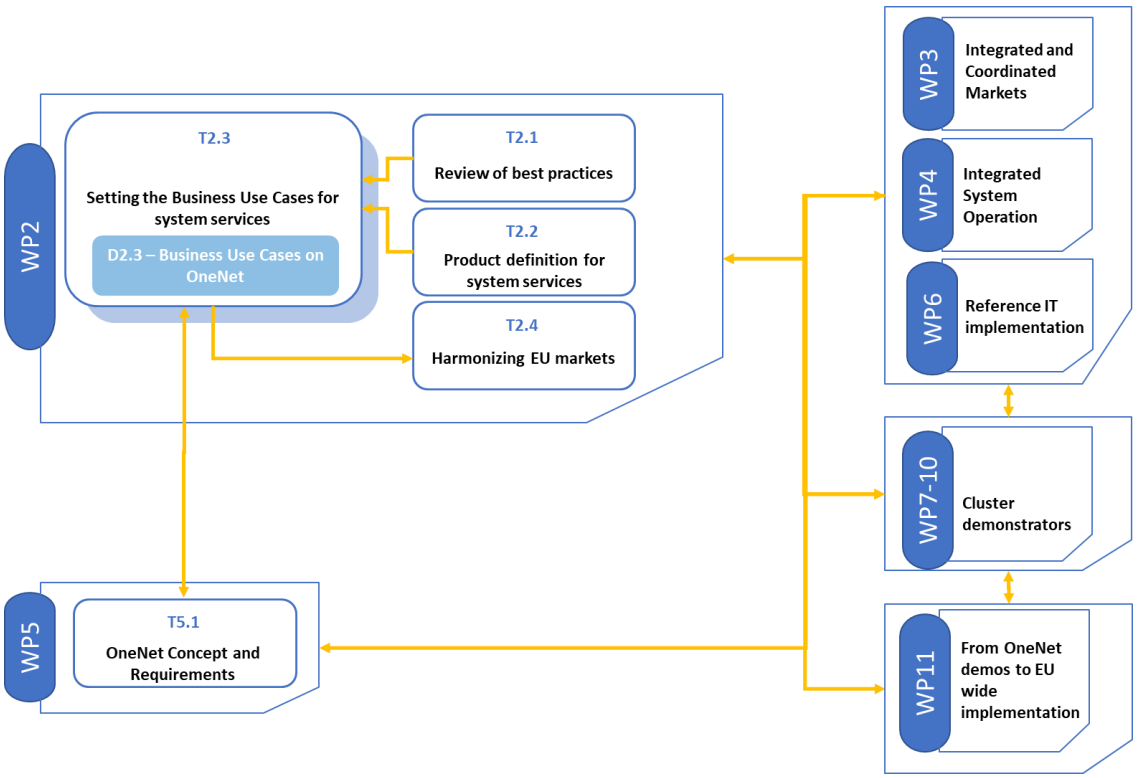

Figure 1.1: Interactions between Task 2.3 and other work packages in OneNet

1.3 Structure of the deliverable

This deliverable aims to present the respective work carried out in Task 2.3, including a set of business use cases for all OneNet demonstrators in the four clusters, that will materialize the OneNet products and services. First, Chapter 2 describes the workflow of Task 2.3 and the methodology that was adopted to develop the OneNet demonstration business use cases. Chapter 3 revisits the lessons learnt from previous H2020 projects' BUCs and draws conclusions on that.

Then, Chapter 4 presents the BUCs developed by the demonstration clusters, as well as their evaluation framework, which was developed based on the information provided by Deliverable 2.2 and Deliverable 3.1. Chapter 5 presents the regional BUCs and Chapter 6 presents the general OneNet business use case and elaborates on the methodology followed to develop it. Finally, the work of Task 2.3 is concluded in Chapter 7.

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2 BUC development methodology

2.1 Horizontal and demonstration WPs coordination

To achieve this task's objectives, a high level of coordination between WP2, horizontal work packages (WP2-WP6) and demonstration clusters was necessary. To ensure the smooth development of the BUCs a 3-level coordination approach was adopted:

- Coordination within WP2 level – We set up recurrent T2.3 core team meetings to ensure alignment with the other WP2 tasks and the seamless flow of information and analysis results between them.
- Horizontal WPs coordination level – We planned meetings with the T5.1 partners to coordinate the collection of BUCs and SUCs, which were part of the two different tasks, respectively. In addition, we had meetings with WP4 partners to align our work regarding the OneNet General BUC. The output of the analysis conducted within tasks 2.2, 3.1, 4.1 and 4.2 was considered while forming the evaluation framework for the demonstration BUCs.
- WP2-demos coordination level – We appointed T2.3 core team partners as contact points to coordinate the communication with the demonstration leaders. Moreover, we organised workshops with the demonstration clusters to provide feedback for the initial BUCs they had provided.

This 3-level coordination approach is illustrated in Figure 2.1.

Figure 2.1: Levels of coordination within T2.3 workflow.

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2.2 T2.3 workflow

As stated above, defining the OneNet BUCs is the core objective of this deliverable. To this aim, a structured approach was followed, which is depicted in Figure 2.2. The workflow of T2.3 included:

1. Evaluation of BUCs of other HORIZON 2020 projects from the material collected in T2.1 and BUCs collection work conducted in WP4. This evaluation was complemented with the review of these projects conducted in T2.2 and T3.1.
2. Demos provided the first drafts of their BUCs using the IEC-625592 template. This first input focused on describing the BUCs general information (i.e., scope, objectives, short description).
3. This information was circulated among the horizontal WPs to identify the business objectives reported within the developed BUCs and to ensure their alignment with the OneNet project's overall objectives.
4. Feedback was provided to the demonstration clusters through workshops.
5. Demos provided the updated drafts of their BUCs. This round of information collection included a more detailed description of the BUCs and focused on collecting more technical details.
6. An iterative process of reviewing BUCs between demo clusters and horizontal WPs took place.
7. The initial list of demo BUCs was completed. Based on the analysis of the demonstration BUCs and the Active System Management (ASM) report, the general OneNet BUC was defined.
8. The demonstration clusters provided the regional BUCs.
9. The final demonstration BUCs were formed and then the necessary files needed for uploading them to the BRIDGE repository were prepared.

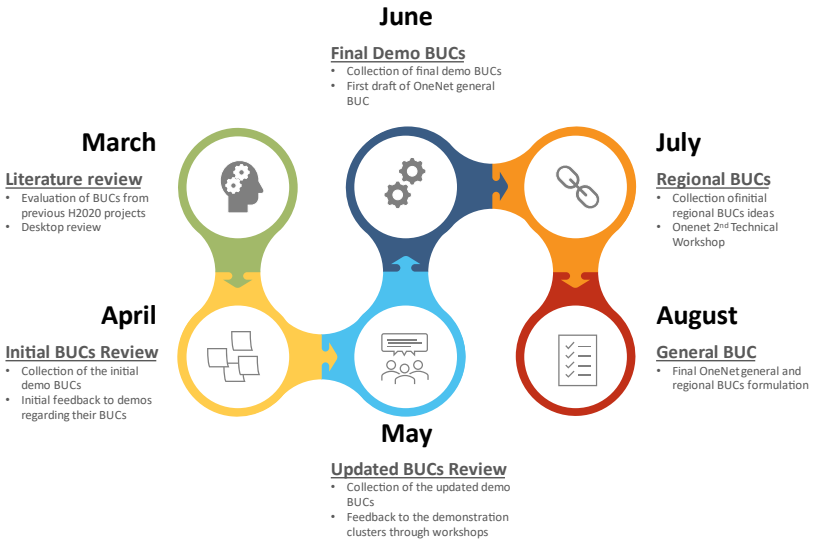

Figure 2.2: Workflow towards the definition of the OneNet BUCs.

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2.3 Methodology for defining OneNet demonstration BUCs

2.3.1 Description of the Use Case Methodology

Use cases are the first building blocks for projects in software engineering and describe the developed system and its functionalities in static as well as dynamic aspects. The static view is given through the presentation of actors that are related to the system, the dynamic view is described through the relation between actors and the system by use cases. [1]

The objective of T2.3 is to describe generic functional specifications for the business layer to be tested in the demonstration clusters in the form of Business Use Cases (BUCs), following the approach described in the IEC 62559 standard. This process is specified by a template in the standard IEC 62559-2. The full standard template has eight sections, each of which provides information about the use case from different viewpoints:

1. Description of the Use Case,
2. Diagrams of the Use Case,
3. Technical details,
4. Step by step analysis of the Use Case,
5. Information exchanged,
6. Requirements,
7. Common terms and definitions,
8. Custom information.

The building of use cases is usually based on an abstract business case with no technical details. A use case realises the description of the business goals in different layers of granularity and can be differentiated into the high-level use case, generic use case, specialised use case, and individual use case. The distinction between those terms is determined by the purpose of the use case and its authors and follows a top-down approach or a bottom-up approach.

The difference between these two approaches is described below [1]:

- **Top-down approach**: A high-level use case describes an innovative, abstract function but the actual technical implementation is not essential from this point of view. On its basis, specialised use cases can be developed and explain a tangible elaboration of the technical or functional details. Since the more general use case is created first in this course of action and the details are filled in later, this procedure is called the top-down approach.

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- **Bottom-up approach**: The bottom-up approach proceeds conversely and starts with explicit individual use cases which are created by organisations or diverse stakeholders of the project. They contain precise particulars for the realisation of the business case and quite possibly several of those individual use cases describe the same functions but with different means. From that compilation, a general use case can be derived which entails a functional description without technical details for implementation. This perception characterises the bottom-up approach. Usually, such a general use case unifies many viewpoints and thus has a high acceptance rate among the stakeholders. Hence, it is often well-suited for a standardisation process.

In T2.3, after analysing the individual BUCs of the demo clusters, the general OneNet BUC was derived following a combination of the bottom-up and top-down approaches. The methodology of developing the general BUC is mentioned in detail in Chapter 6.1.

The Use Case Methodology is displayed in Figure 2.3, where the way this process is linked to the above-mentioned sections of the use case template is also described.

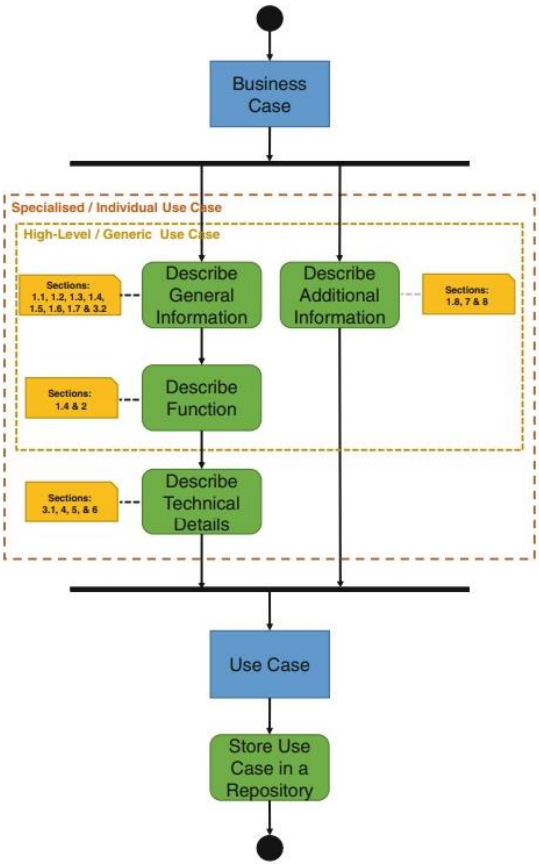

Figure 2.3: Process of the use case methodology. [1]

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At this point, we should distinguish the Business Use Cases and the System Use Cases, which are two different types of use cases. This distinction is based on the type of goals and the level of detail they are focused on, as it is described in Table 2.1.

Table 2.1: Differences between Business and System Use Cases. [2]

Type of Use Case	Description	Actors involved
Business Use Case (BUC)	Depicts a business process. It is expected to be system agnostic.	Business Roles (organisations, organisational entities or physical persons)
System Use Case (SUC)	Depicts a function or sub-function supporting one or several business processes.	Business Roles and System Roles (Devices, Information System)

These two types of use cases help to define the functional and non-functional requirements of Generic Smart Grids as it is illustrated in Figure 2.4.

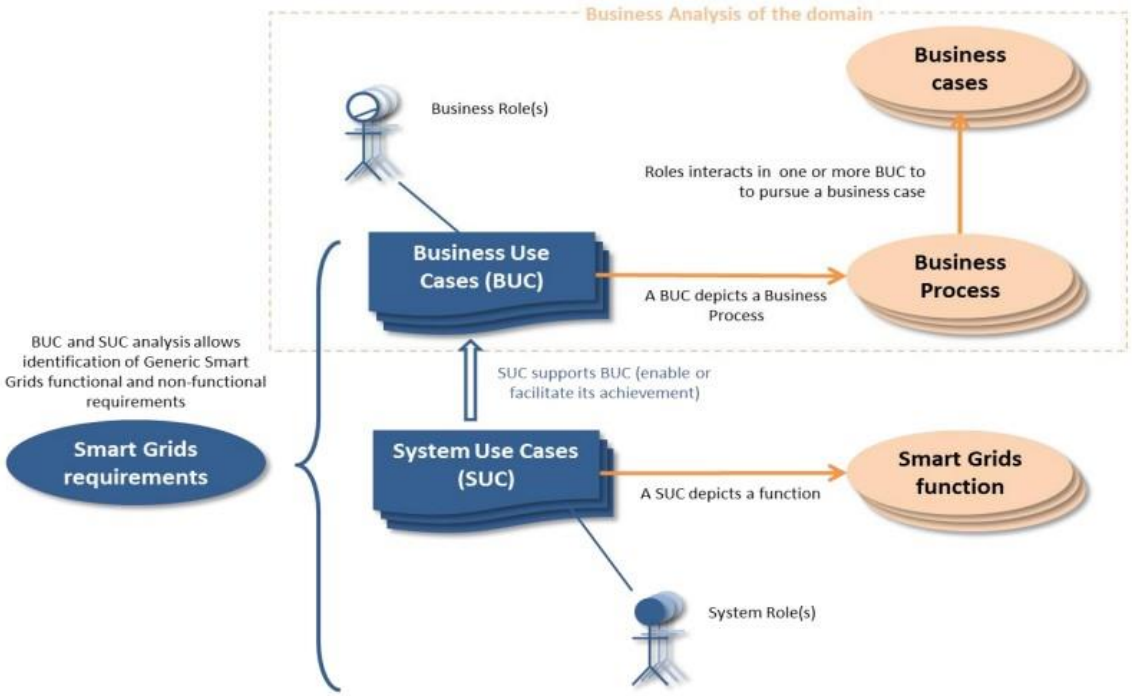

Figure 2.4: Relationship between BUCs and SUCs [3]

As mentioned in the introduction OneNet Deliverable 2.3 collects and analyses only the business use cases, while the system use cases analysis is part of the Deliverable 5.1. The distinction between these two types of use cases becomes more apparent if one considers where they are located in the SGAM layers, which will be discussed thoroughly in the next section.

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2.3.2 The SGAM Architecture

For better visualising the use cases, an architectural overview is needed which represents the various viewpoints described in the use cases. To this end, the Smart Grid Architecture Model (SGAM) has been developed by the Smart Grid Coordination Group/Reference Architecture Working Group (SG-CG/RA) in the context of the European Commission's Standardisation Mandate M/490 as a holistic viewpoint of an overall architecture in the Smart Grid domain [1].

The SGAM model enables the provision of a global and clear view of smart grid projects by mapping the different actors and devices considering 3 dimensions. The first dimension describes the domains which range from generation through transmission and distribution to end-consumers. The second dimension corresponds to the zones of operation from the processes through field, station and operation to enterprise and market zones. Finally, the third dimension describes the interoperability layers that range from the component layer to the business layer.

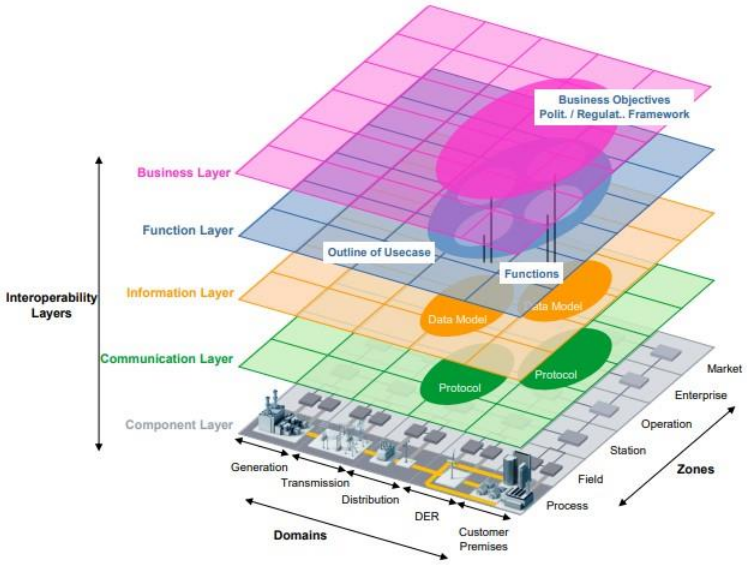

Figure 2.5: The Smart Grid Architecture model. [4]

As it is shown in Figure 2.5, according to the SGAM, there are 5 interoperability layers [4]:

- The **Business Layer** represents the business view on the information exchange related to smart grids. The business layer can be used to map different stakeholders within the zones and domains, as well as to map their roles and responsibilities.

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- The **Function Layer** describes functions and services independent from actors and physical implementations in applications, systems and components. These functions are derived by extracting the use case functionality which is independent from actors.
- The **Information Layer** contains the information exchanged between functions, services and components. This layer comprises information objects and the underlying canonical data models.
- The **Communication Layer** describes protocols and mechanisms for the interoperable exchange of information between components.
- The **Component Layer** represents the physical distribution of all the components (e.g., system actors, applications, power system equipment, smart meters, etc).

The SGAM zones represent the hierarchical levels of power system management:

- **Process zone**: includes all the physical, chemical or spatial transformations of energy and the equipment directly involved such as generators, transformers, cables, sensors, etc.
- **Field zone**: includes all the equipment to protect, control and monitor the power system such as protection relays, intelligent electronic devices, etc.
- **Station zone**: represents the aggregation of field zones such as local SCADA systems, data concentration, etc.
- **Operation zone**: hosts power system control operation in the respective domain such as distribution management system, energy management system, etc
- **Enterprise zone**: includes commercial and organizational processes, services and infrastructures for enterprises such as asset management, logistics, work force management, customer relation management, etc.
- **Market zone**: reflects the market operations possible along the energy conversion path such as energy trading or retail market.

Finally, domains cover the complete electrical energy conversion chain:

- **Generation domain**: includes generation of electrical energy in bulk quantities (fossil, nuclear, hydropower plants, offshore wind farms, large-scale solar power plants), normally connected to the transmission system.
- **Transmission domain**: includes all the infrastructure responsible for transporting electricity over long distances.
- **Distribution domain**: represents the infrastructure responsible for distributing electricity to the customers.

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- **Distributed Energy Resources (DER) domain:** includes any distributed technologies of small-scale power generation (from 3 kW to 10.000 kW) directly connected to the distribution grid.
- **Customer Premises domain**: hosts both end-users and producers of electricity. The premises can be industrial, commercial and home facilities such as airports, shopping centres and homes.

As mentioned above, BUC depicts a business process and hence it describes the business layer activities within the SGAM architecture, while SUC depicts a function and thus, it describes the function layer of the SGAM architecture. Figure 2.6 illustrates where BUCs and SUCs stand on the SGAM layers.

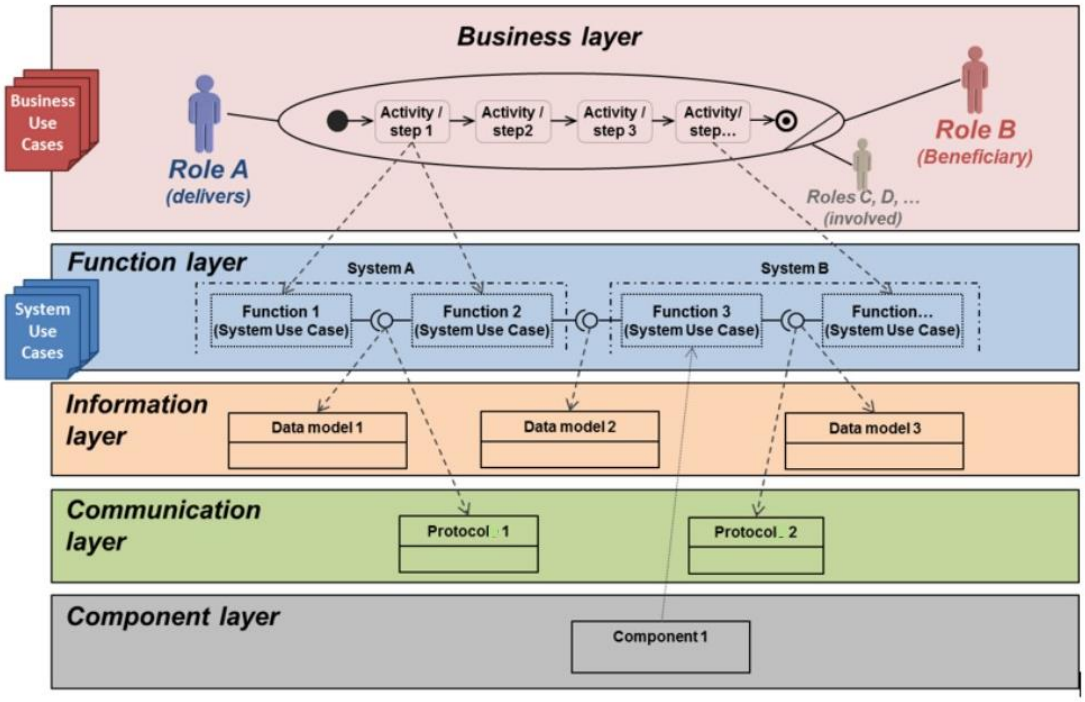

Figure 2.6: Interactions between BUCs, SUCs and the SGAM. [2]

2.3.3 The IEC-62559 template

In this section the information required in the eight sections of the IEC-62559 template is described:

1. **Description of the Use Case**: this section deals with the description of the use case where all general information about the designated goals of the use case is collected, including the name of the use case, the scope, the use case narrative, as well as the key performance indicators (KPIs) and the use case conditions.

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2. **Diagrams of the Use Case**: in this section the diagrams of the use case are displayed. Usually, unified modelling language (UML) and sequence diagrams enable a good understanding of the procedures of the use case.
3. **Technical details**: this section includes the description of the actors possibly sorted into groups according to their properties, as well as a list of the used references for background information.
4. **Step by step analysis of the Use Case**: this section describes the possible scenarios of the use case with a distinct association to the use case narrative in Sect. 1.4 of the template. The scenarios should comply with the sequence diagrams in Sect. 2 of the template so that every step describes one part of a communication or action.
5. **Information exchanged**: this section presents the exchanged information reported in the scenario steps.
6. **Requirements**: this section identifies the requirements needed in the range of the project.
7. **Common terms and definitions**: this section contains common terms and definitions in a glossary. Each important term used in course of the project has to be followed by its definition.
8. **Custom information**: this section is optional, and it contains custom information in case it is needed.

The full standard template is available in Annex 9.1.

2.3.4 Other tools

In this section, some additional tools used for the use case development are reported. These tools are namely the Enterprise Architect, the MODSARUS plugin and the BRIDGE repository.

Enterprise Architect is a commercial tool widely used for systems and business processes modelling using UML. It can be used combined with MODSARUS plugin, which is an open licence tool produced by EDF for Sparx Enterprise Architect. MODSARUS automates the transformation from paper documents to UML models to data exchange interfaces (XSD). These tools were used from some of the demos to develop their BUCs.

The BRIDGE use cases repository was developed in the frame of the Data Management Working Group with the purpose of creating an easily accessible Use Case repository for users with different backgrounds, based on Use-Case Methodology defined in IEC 62559-2. The output of the repository is a website where everyone can see the use cases uploaded. As an input three formats to describe use cases are supported: Excel sheets, XML files, MarkDown. This procedure is depicted in Figure 2.7.

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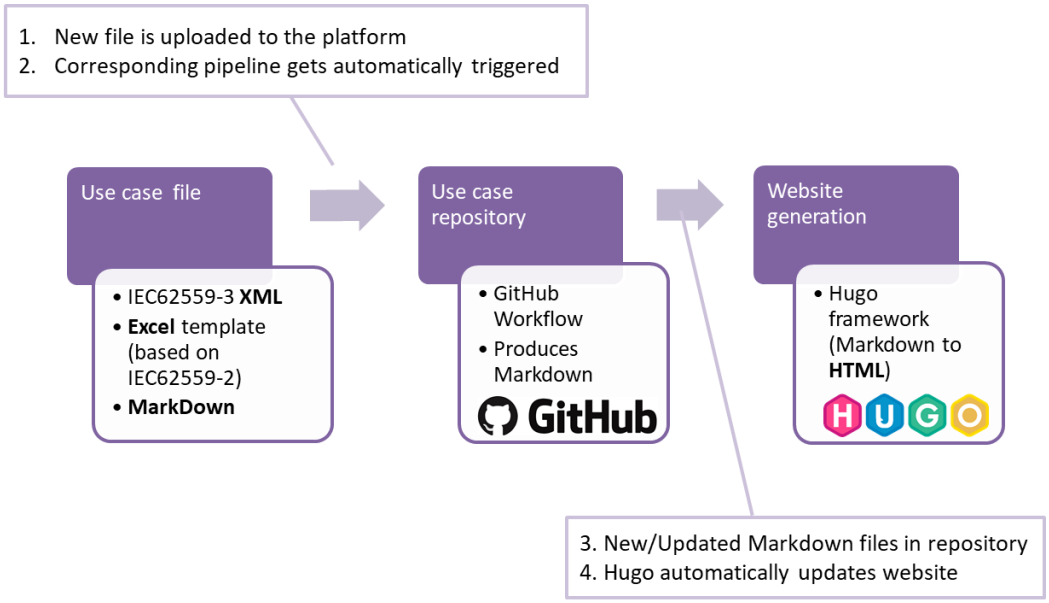

Figure 2.7: BRIDGE use case repository operation process [5]

OneNet project is an active participant in the BRIDGE initiative and thus the BRIDGE repository will be used to store the use cases.

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3 Review of H2020 projects BUCs

This section presents the conclusions derived from the review of the business use cases defined in some of the other H2020 projects, listed in Deliverable 2.1 [6]. These conclusions were used as a starting point to form the OneNet BUCs evaluation framework, which is presented in Chapter 4. The review of BUCs of other H2020 projects aims to analyse what type of system services and markets frameworks were considered in them and what was the rationale behind their development. This review was based on the analysis presented both in projects' deliverables, as well as in OneNet Deliverables 2.1, 2.2 and 3.1.

As discussed in Deliverable 2.1 [6], the review process of the use cases of H2020 projects revealed that IEC-62559-2 is the most used methodology and that defining the use cases is a unique process that should take into consideration each project's objectives and individual characteristics. Nevertheless, some projects present common characteristics among the defined BUCs. INTERRFACE, CoordiNet [7], EUniversal [8] and EU-SysFlex [9] defined BUCs focusing on testing different system services and system products. InteGrid [10] focused on testing different functionalities of the developed tools. TDX-Assist [2] focused on testing the TSO-DSO coordination process in various market designs. In addition, this H2020 projects' review showed that congestion management, frequency control and voltage control are the services that receive more attention.

In Deliverable D3.1 [11], the second phase of the project review included an assessment of the corresponding market model frameworks of the reviewed projects according to the market model proposed in the CoordiNet project. For each of the surveyed projects, the use cases were analysed and assigned to the corresponding CoordiNet market model (common market model, local market model, central market model, multi-level market model, fragmented market model, distributed market model). [12]

An overview of the system services and market model framework considered in the use cases of the reviewed projects, as well as the BUCs development main pillars considered in these research projects is presented in Table 3.1.

Table 3.1: System services, market model framework and BUCs development main pillars on the reviewed H2020 projects.

Project	Number of BUCs	System services	Market model framework	BUCs development main pillars
INTERRFACE	14	– Congestion Management – Frequency control – Voltage control	– Common – Central – Distributed – Other local with multiple buyers	– Service type
CoordiNet	13	– Congestion Management	– Common – Local	– Service type – Market model framework

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		– Frequency control – Voltage control – Others	– Central – Multi-level – Fragmented – Distributed	– Demonstration country
EUniversal	7	– Congestion Management – Voltage control – Others		– Service type – Product type[1] – If the service procurement process was market-based or through contracting
EU-SysFlex	11	– Frequency control – Voltage control – Congestion Management	– Local – Central – Multi-level – Other local with multiple buyers – Other local – Other central	– Service type – Product type – Demonstration country
Platone	2	– Congestion Management – Frequency control – Voltage control – Others	– Not applicable	– Service type
InteGrid	12	– Congestion Management – Frequency control – Voltage control	– Local – Multi-level	– Grid operations – Grid and market hub – Grid users – Energy services
TDX-Assist	23	– Congestion Management – Frequency control – Voltage control – Others	– Central – Multi-level – Other central and local	– Service type – Service procurement timeframe – TSO-DSO coordination schemes

OneNet project includes a wide variety of demonstrations in terms of geographical diversity, system needs and demonstration objectives for using the OneNet platform. Thus, a combination of criteria was applied for OneNet demonstration BUCs development based on each demonstration cluster needs.

[1] A product is defined as a tradable unit that the network operator acquires from flexibility providers and that entails the option to deliver a service in case of activation. [13]

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4 OneNet Demonstration Business Use Cases

As mentioned in the introduction, the main objective of T2.3 is to produce a set of BUCs for all demonstrators in the four clusters according to the standardised methodology IEC – 62559 and to evaluate them to ensure that are well-positioned and linked with the priorities set by the Green Deal and respectively with OneNet strategic objectives. This chapter presents an overview of OneNet demonstrator BUCs, which were collected from the demonstrators using the IEC-62559 template, as well as the results of their evaluation, which was undertaken after their collection.

One of OneNet's innovation pillars is to create an integrated marketplace for system services by contributing to the construction of the European Internal Market for electricity. To that end, OneNet proposed standardized products for system services (involving active and reactive power activation through capacity and energy-based services), as well as coordination schemes alternatives and market design options. In addition, the possible role of all stakeholders, in particular of system operators, will be analysed for different market concepts, taking into account elements such as observability and shared responsibility, with the aim of proposing new or evolving roles for system operators to enable these new concepts.

Given how important system services, market design and role models concepts are for OneNet and based on the findings of Chapters 3 and 4, the demo BUCs were evaluated considering the following questions:

1. What services are addressed in each BUC?
2. What is the SO's approach to acquire this service? Is it a market-based approach or a technical-based approach?
3. Which are the business roles defined within each BUC?

4.1 BUCs overview

In total 23 BUCs were gathered from the four different OneNet demonstration clusters. In this section, the key characteristics of each one of them are presented. This information includes the BUC's scope, objectives, services considered and type of coordination. The full description of each BUC using the IEC-62559-2 template is available in Annex 9.2. The services addressed in each BUC were identified based on the OneNet services framework developed in T2.2 and the type of coordination was based on the extensive comparative analysis on the market designs of demonstration clusters conducted in T3.1.

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4.1.1 Northern cluster

Table 4.1: NOCL-01 BUC overview

BUC ID	NOCL-01
BUC Name	Northern flexibility market
Scope	Regional, enabling multiple operators, coordination of the system operators
Objectives	– Develop seamless end-to-end process for market-based flexibility utilization for grid services; – Lower the entry barrier for flexibility by simplifying the process for flexibility service providers; and – Ensure availability of short-term flexibility from multiple sources.
Services	Service agnostic[2]
Type of coordination	Market-based TSO-DSO coordination

4.1.2 Southern cluster

Table 4.2: SOCL-GR-01 BUC overview

BUC ID	SOCL-GR-01
BUC Name	Enhanced Active/Reactive Power Management for TSO-DSO coordination
Scope	Achieve enhanced identification of the available flexibility resources, focused on a DSO voltage level, as well as enhanced identification of the power system flexibility needs, focused on a TSO voltage level grid. This identification will be on a longer time span and wider geographical scope than the one being utilised today, through a sequence of DSO and TSO grid simulations backed up by AI based calculation engines.
Objectives	– Maintain frequency stability; – Demonstrate improved load flow and contingency monitoring and predictions; – Facilitate predictive congestion management for maintaining secure and stable power system operation; – Achieve cost-effective operation of the system; – Implement early warning on hazardous power system regimes; – Demonstrate better FSPs planning and managing flexibility resources; – Demonstrate better energy predictions and power system state predictions; – Achieve improved identification of the available flexibility resources on all power system levels; and – Achieve improved prediction of the system flexibility needs.

[2] Products identified in Deliverable 2.2 [13] would allow to address most of the services listed for frequency control, congestion management and voltage control.

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Services	mFRR, RR, predictive active power products for CM and predictive reactive power products for VC
Type of coordination	Technical based TSO-DSO coordination

Table 4.3: SOCL-GR-02 BUC overview

BUC ID	SOCL-GR-02
BUC Name	Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator
Scope	Ensure that the SO can operate the power system more efficiently and preserve it from running into dangerous topological or operational states by enhanced severe weather condition management using predictive maintenance algorithms and enhanced storm and icing predictions .
Objectives	– Facilitate predictive maintenance and outage management; – Achieve enhanced severe weather condition management; – Demonstrate outage management optimisation for increased system adequacy; – Implement early warning on a potentially hazardous power system topology and regimes; and – Avoid damages caused by the severe weather conditions.
Services	Service agnostic[3]
Type of coordination	Technical based TSO-DSO coordination

Table 4.4: SOCL-CY-01 BUC overview

BUC ID	SOCL-CY-01
BUC Name	Active power flexibility
Scope	Enhance of active power flexibility (i.e., ramping, droop control and power regulation) through the use of distributed flexible resources (energy storage and PV systems)
Objectives	– Maintain frequency stability; and – Demonstrate congestion management for maintaining capacity limits of the grid.
Services	Inertia, aFRR, mFRR and corrective active power management for CM
Type of coordination	Market-based TSO-DSO coordination

Table 4.5: SOCL-CY-02 BUC overview

BUC ID	SOCL-CY-02

[3]This BUC addresses the grid resilience focusing on the performance of the system during extreme operating conditions and on enhancing it through improved data exchange between SOs.

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BUC Name	Reactive power flexibility and power quality
Scope	Enhance of reactive power flexibility and power quality (i.e., voltage support, congestion management, phase balancing) through the use of distributed flexible resources (energy storage and PV systems)
Objectives	– Maintain voltage stability; – Demonstrate congestion management for maintaining capacity limits of the grid; and – Achieve power quality enhancement.
Services	Corrective reactive power management for VC and CM
Type of coordination	Market-based TSO-DSO coordination

4.1.3 Western cluster

Table 4.6: WECL-ES-01 BUC overview

BUC ID	WECL-ES-01
BUC Name	Long-term congestion management
Scope	Ensure that the DSO can procure flexibility in advance to solve specific local system loading issues on the distribution system thus deferring/eliminating the need for traditional system upgrades.
Objectives	– Apply market procedures to obtain flexibility services attending DSO requirements; – Demonstrate that long term agreements are suitable amongst different available DERs; – Implement flexibility provision/usage through a market platform; and – Use consumer's demand-response in efficient flexibility services.
Services	Predictive active power management for CM
Type of coordination	Market-based DSO coordination

Table 4.7: WECL-ES-02 BUC overview

BUC ID	WECL-ES-02
BUC Name	Short-term congestion management
Scope	Demonstration of the short-term local congestion management procurement of local flexibility by the DSO. Flexibility providers at both LV and MV will be able to participate. Two-time frame markets will be considered: Day ahead and intraday.
Objectives	– Apply market procedures to obtain flexibility services attending short term DSO requirements; – Implement flexibility provision/usage through a market platform; and – Use consumer's demand-response in efficient flexibility services.

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Services	Corrective and predictive active power management for CM
Type of coordination	Market-based DSO coordination

Table 4.8: WECL-FR-01 BUC overview

BUC ID	WECL-FR-01
BUC Name	Improved monitoring of flexibility for congestion management
Scope	Simplify and optimize the management of renewable production curtailments
Objectives	– Simplify and optimize the management of renewable production curtailments, by covering the entire life cycle of a flexibility offer, from the formulation of offers to the control of their activations for invoicing using blockchain technology; and – Build a platform enabling such objectives and test it for each participating entity on a chosen area of the French network.
Services	Corrective active power management for CM
Type of coordination	Technical based TSO-DSO coordination

Table 4.9: WECL-FR-02 BUC overview

BUC ID	WECL-FR-02
BUC Name	Improved TSO-DSO information exchange for DER activation
Scope	Enhanced information exchange between TSO and DSO: When a TSO or DSO activates flexibilities on its networks (such as renewable curtailments), it can generate contingencies on the other system operator's network (i.e., congestion or voltage constraints). With the foreseen extensive use of flexibilities close to real-time, system operators will not have the possibility to perform ad hoc security analysis for every flexibility activation demand. One of the solutions that could be considered is having the TSO and DSO to agree in advance on a constraint envelope within which the controls sent to the flexibilities must be kept in check so that it can be guaranteed that activations are safe for each other and that can be used without further prior approval, the so-called " shared DSO/TSO congestion management in case of activation of distributed flexibility"
Objectives	– Improve the information exchange between TSO and DSO in the context of local DER flexibility activation; – Carry out studies on the management of the constraints between DSO and TSO in case of activation of a flexibility; and – Develop a method that would guarantee that the activation of curtailment by one TSO or DSO will not trigger other constraints on one or another network.
Services	Service agnostic
Type of coordination	Technical based TSO-DSO coordination

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Table 4.10: WECL-PT-01 BUC overview

BUC ID	WECL-PT-01
BUC Name	Exchange of Information for Congestion Management – Short Term
Scope	Description in detail of each process phase of the ASM report, stating what information should be exchanged and what rules should be established between DSO and TSO in order to procure congestion management products for short-term (intraday, day-ahead)
Objectives	– Design and detail each process phase of ASM report so that it can serve as a basis for future developments; – Coordination of the use of flexibility for different voltage levels; – Identify what information should be shared between DSO and TSO for each of the flexibility procurement process phases for short term congestion management, namely for the technical selection and validation of the bids by the relevant system operator; and – Develop information exchange mechanisms to enable market-based procurement of flexibility products.
Services	Predictive active power management for CM
Type of coordination	Technical based TSO-DSO coordination

Table 4.11: WECL-PT-02 BUC overview

BUC ID	WECL-PT-02
BUC Name	Exchange of Information for Congestion Management – Long Term
Scope	Description of each process phase of the ASM report, stating what information should be exchanged and what rules should be established between DSO and TSO in order to procure congestion management products for long-term (more than annually)
Objectives	– Design and detail each process phase of ASM report so that it can serve as a basis for future developments; – Coordination of the use of flexibility for different voltage levels; – Identify what information should be shared between DSO and TSO for each of the flexibility procurement process phases for long terms congestion management, namely for the technical selection and validation of the bids by the relevant system operator; and – Develop information exchange mechanisms to enable market-based procurement of flexibility products.
Services	Predictive active power management for CM
Type of coordination	Technical based TSO-DSO coordination

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Table 4.12: WECL-PT-03 BUC overview

BUC ID	WECL-PT-03
BUC Name	Exchange of information for operational planning
Scope	Definition and description of the TSO and DSO information exchange, aiming to improve and facilitate long-term to short-term operational planning for both networks.
Objectives	– Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of DSO operation; – Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of TSO operation; – Anticipate and solve distribution grid constraints; – Anticipate and solve transmission grid constraints; and – Develop information exchange mechanisms to share the identified information.
Services	Service agnostic
Type of coordination	Technical based TSO-DSO coordination

4.1.4 Eastern cluster

Table 4.13: EACL-CZ-01 BUC overview

BUC ID	EACL-CZ-01
BUC Name	Nodal area congestion management
Scope	Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Nodal area congestion management)
Objectives	Identify relevant way of service procurement to address local congestion management in the distribution networks. The test is expected to deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment, activation of flexibility).
Services	Predictive active power management for CM
Type of coordination	Market-based DSO coordination

Table 4.14: EACL-CZ-02 BUC overview

BUC ID	EACL-CZ-02
BUC Name	Reactive power overflow management
Scope	Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Reactive power overflow management)
Objectives	Identify relevant way of service procurement to control flow of reactive power between TSO and DSO in order to keep reactive power flows in given limits. The test is expected to

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	deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment)
Services	Predictive reactive power management for VC
Type of coordination	Market-based DSO coordination

Table 4.15: EACL-CZ-03 BUC overview

BUC ID	EACL-CZ-03
BUC Name	Voltage Control
Scope	Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Voltage control)
Objectives	Identify relevant way of service procurement to address voltage issues in the distribution networks through reactive power. The test is expected to deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment).
Services	Predictive reactive power management for VC
Type of coordination	Market-based DSO coordination

Table 4.16: EACL-HU-01 BUC overview

BUC ID	EACL-HU-01
BUC Name	MV feeder voltage control
Scope	Increasing renewable penetration causes violation of standard voltage bands on MV lines. The main scope of EACL-HU-01 is to mitigate voltage variations of MV feeders by activating flexibility services.
Objectives	– Keep actual voltage values of MV feeders within the standard bands.
Services	Predictive active and reactive power management for VC
Type of coordination	Market-based DSO coordination

Table 4.17: EACL-HU-02 BUC overview

BUC ID	EACL-HU-02
BUC Name	HV/MV transformer overload
Scope	Increasing renewable penetration causes overloading of HV/MV transformers. The main scope of EACL-HU-02 is to mitigate overloading of HV/MV transformers by activating flexibility services.

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Objectives	– Avoid overloading of HV/MV transformers in all operational states of the power system.
Services	Predictive active and reactive power management for VC
Type of coordination	Market-based DSO coordination

Table 4.18: EACL-PL-01 BUC overview

BUC ID	EACL-PL-01
BUC Name	Prequalification of resources provided by FSPs to support flexibility services in the Polish demonstration
Scope	The description of prequalification of resources (DER) to participate in the flexibility market represented by Flexibility Platform (FP)
Objectives	– Register DER in the Flexibility Register (FR), which will enable the submission of bids on FP and participation in the flexibility market.
Services	Service agnostic
Type of coordination	Market-based TSO-DSO coordination

Table 4.19: EACL-PL-02 BUC overview

BUC ID	EACL-PL-02
BUC Name	Managing flexibility delivered by DER to provide balancing services to TSO.
Scope	Bring the flexibility provided by resources connected to the distribution network (Low and Medium voltage, LV/MV) in the form of active power and/or active energy to the polish TSO balancing market.
Objectives	– Ensure that the energy system is balanced and frequency is kept within the permitted range; – Open a balancing market for resources connected to the distribution network (LV/MV); – Develop rules for coordination between TSO and DSO when using flexibility services; and – Create revenue opportunities for market participants for providing balancing services in the form of balancing capacity products and balancing energy.
Services	aFRR, mFRR, RR
Type of coordination	Market-based TSO-DSO coordination

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Table 4.20: EACL-PL-03 BUC overview

BUC ID	EACL-PL-03
BUC Name	Event-driven Active Power Management for Congestion Management and voltage control by the DSO
Scope	The scope of BUC covers the use by the distribution system operator (DSO) of the service providers' active power capabilities to eliminate congestion and voltage violations in the distribution network. The services would be purchased using an IT Flexibility platform on market condition.
Objectives	– Elimination of congestion in the distribution network using active power; – Elimination of voltage violations in the distribution MV and LV network, using active power; and – Coordination of TSO and DSO activities in the field of congestion management and voltage control.
Services	Predictive active power management for CM and VC
Type of coordination	Market-based TSO-DSO coordination

Table 4.21: EACL-PL-04 BUC overview

BUC ID	EACL-PL-04
BUC Name	Balancing Service Provider on the Flexibility Platform
Scope	Introduction of BSP, linking it with FSP or FSPA, creation of a scheduling unit and its prequalification for the Balancing Market
Objectives	– Enable pre-qualified FSP and FSPA resources to provide balancing services in the balancing market via BSP.
Services	aFRR, mFRR, RR
Type of coordination	Market-based TSO-DSO coordination

Table 4.22: EACL-SL-01 BUC overview

BUC ID	EACL-SL-01
BUC Name	Congestion management in distribution grids under market conditions
Scope	Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process in which managing flexibility in the distribution grid (e.g., switching of heat pumps) can prevent that distribution grid overreaches its physical limits (e.g., transformer overheating, line congestion). It will also verify information exchange between all

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	stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions.
Objectives	– Deferral of grid reinforcement investments (defer or avoid secondary substation replacement); – Improve security of supply; – Validate demand response mechanism to prevent congestion in the distribution grid; and – Test flexibility products to prevent congestion in the distribution grid under market conditions.
Services	Corrective active power management for CM
Type of coordination	Market-based DSO coordination

Table 4.23: EACL-SL-02 BUC overview

BUC ID	EACL-SL-02
BUC Name	Voltage control in distribution grids under market conditions
Scope	An increased number of household solar power plants causes voltage increase on LV voltage substations. Integrated smart inverters have advanced power controlling functions and with adjusting the output of active power, they may be used as voltage reduction devices. Using Volt-Watt method we would properly design the control parameters in the PV inverters. With this control method voltage violation would be mitigated and the power curtailment would be evenly distributed among the PV power plants. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process in which managing flexibility in the distribution grid (e.g., mitigating active power of the PV plants and charging household battery systems with excess energy) can prevent that distribution grid overreaches its physical limits (e.g., voltage increase, transformer overheating, line congestion). It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions.
Objectives	– Deferral of grid reinforcement investments (defer or avoid secondary substation replacement); – Improve security of supply; – Validate demand response mechanism to prevent voltage increase in the distribution grid; and – Test flexibility products to prevent voltage increase in the distribution grid under market conditions.
Services	Corrective active power management for VC
Type of coordination	Market-based DSO coordination

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4.2 Services overview

To answer the question "What services were addressed in each BUC?", the services addressed in each BUC were mapped against the OneNet system services framework, which is described in detail in Deliverable 2.2 [13]. The theoretical framework for system services, that was developed in Task 2.2, aimed to identify what are the services required to ensure the stability of the grid. To create this framework the main classification drivers were:

- Division by system needs
- Division in function of the timing when the system need is addressed – this timing is grouped into three categories:
    - **Long term planning** (over one month);
    - **Short term** (between one day and one month); and
    - **Operational** (intraday or near real-time).
- Division in function of the reason causing this need – the reason cusing this need is grouped into two categories:
    - **Corrective** – these are needs that arise as the result of unexpected circumstances; and
    - **Predictive** – these needs arise as the result of forecast circumstances.

For some of the services of this framework some additional drivers were considered:

- Frequency control services are divided in the function of time that the SO has to address the system need which can range from real-time to hours ahead of the actual consumption of energy.
- Voltage control system services are divided depending on whether the SO uses active or reactive power.

The diagram below shows the services framework developed:

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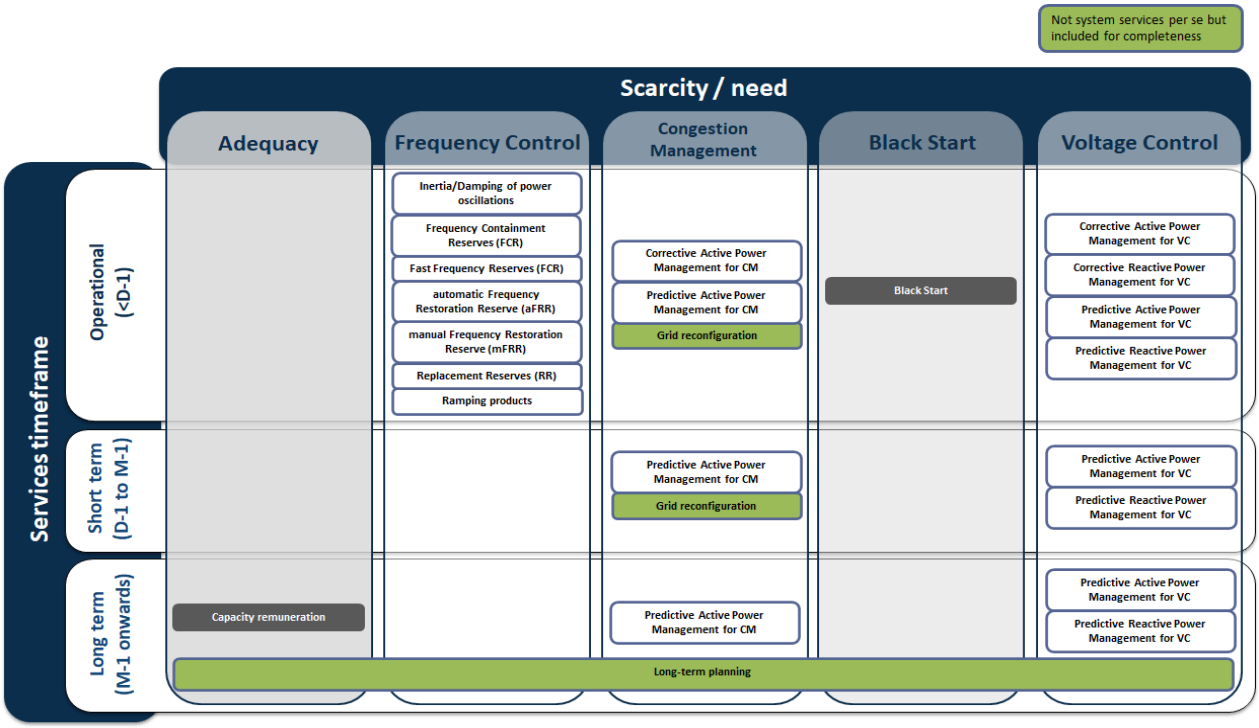

Figure 4.1: System services identified in OneNet. [13]

The services that the demonstrators have reported within each BUC were mapped against this framework. The results of this mapping can be seen in the table below.

Table 4.24: Services addressed in OneNet demonstration BUCs.

Demo Cluster	BUC ID	BUC Title	Services addressed within BUC
Northern	NOCL-01	Northern flexibility market	Service agnostic[4]
Southern	SOCL-GR-01	Enhanced Active/Reactive Power Management for TSO-DSO coordination	mFRR, RR, predictive active power products for CM, predictive reactive power products for VC
	SOCL-GR-02	Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator	Service agnostic[5]
	SOCL-CY-01	Active power flexibility	Inertia, aFRR, mFRR and corrective active power management for CM

[4] Products identified in Deliverable 2.2 [13] would allow to address most of the services listed for frequency control, congestion management and voltage control.

[5]This BUC addresses the grid resilience focusing on the performance of the system during extreme operating conditions and on enhancing it through improved data exchange between SOs.

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	SOCL-CY-02	Reactive power flexibility and power quality	Corrective reactive power management for VC and CM
Western	WECL-ES-01	Long-term congestion management	Predictive active power management for CM
	WECL-ES-02	Short-term congestion management	Corrective and predictive active power management for CM
	WECL-FR-01	Improved monitoring of flexibility for congestion management	Corrective active power management for CM
	WECL-FR-02	Improved TSO-DSO information exchange for DER activation	Service agnostic
	WECL-PT-01	Exchange of Information for Congestion Management – Short Term	Predictive active power management for CM
	WECL-PT-02	Exchange of Information for Congestion Management – Long Term	Predictive active power management for CM
	WECL-PT-03	Exchange of information for operational planning	Service agnostic
Eastern	EACL-CZ-01	Nodal area congestion management	Predictive active power management for CM
	EACL-CZ-02	Reactive power overflow management	Predictive reactive power management for VC
	EACL-CZ-03	Voltage Control	Predictive reactive power management for VC
	EACL-HU-01	MV feeder voltage control	Predictive active and reactive power management for VC
	EACL-HU-02	HV/MV transformer overload	Predictive active and reactive power management for VC
	EACL-PL-01	Prequalification of resources provided by FSPs to support flexibility services in the Polish demonstration	Service agnostic
	EACL-PL-02	Managing flexibility delivered by DER to provide balancing services to TSO.	aFRR, mFRR, RR
	EACL-PL-03	Event-driven Active Power Management for Congestion Management and voltage control by the DSO	Predictive active power management for CM and VC
	EACL-PL-04	Balancing Service Provider on the Flexibility Platform	aFRR, mFRR, RR
	EACL-SL-01	Congestion management in distribution grids under market conditions	Corrective active power management for CM
	EACL-SL-02	Voltage control in distribution grids under market conditions	Corrective active power management for VC

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When considering the services included in the BUCs, there is a clear focus on the provision of non-frequency ancillary services as, even in those cases where frequency control services are being considered, the BUC is considering options that evaluate joint solutions for both frequency control and non-frequency control. In addition, there would appear to be a slight focus on predictive services even if several of the demonstrator partners are also considering BUCs aimed at addressing corrective needs.

4.3 Market operations overview

To answer the question "What was the approach of the SO to acquire this service?", the market framework described in each BUC was analysed against the OneNet market framework. In Deliverable D3.1 [11], a theoretical market framework was proposed and applied to the different clusters of OneNet. The OneNet project demos were grouped into three main sets to ease the analysis between comparable market frameworks considering the type of coordination in which the activity focused:

1. **Market-based TSO-DSO coordination**. The demonstrators that belong to the market-based TSO-DSO coordination adopt a coordination scheme in which the TSO and the DSO are coordinated through a market. The flexibility is allocated between the system operators through market-based processes (e.g., bid forwarding, priority in bid selection). Thus, in the market-based TSO-DSO coordination, the market architecture for procuring flexibility is in-between the two system operators.
2. **Market-based DSO coordination**. The demonstrators that belong to the DSO market-based coordination category focus on the mechanism to procure system services from FSPs to solve local needs. The market-based DSO coordination concerns the adoption of market practices to allow the DSO to procure the system services from the FSPs. To test the DSO coordination, the demonstrators adopt a local market where the DSO has exclusive access to DERs. Even if the interaction with the TSO is not tested by the demonstrators belonging to this cluster, this interaction is considered in the theoretical design of the technical or market-based coordination.
3. **Technical based TSO-DSO coordination.** The demonstrators that belong to the technical-based TSO-DSO coordination adopt a coordination scheme in which the TSO and DSO directly interact by exchanging information and requests for operating actions. The flexibility is allocated between the system operators employing technical procedures (e.g., interaction between control centres and platforms). In the technical-based TSO-DSO coordination for procuring flexibility, a direct link between the two system operators exists. It is worth highlighting the technical-based coordination do not prevent the definition of a market architecture and the adoption of market-based

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coordination. The demonstrators adopting the technical-based coordination focus their activities on improving the technical aspects regarding the TSO-DSO coordination to allocate flexibility.

The type of coordination considered in each OneNet demonstration cluster is illustrated in Figure 4.2, while in Table 4.25: Type of coordination addressed in OneNet demonstration BUCs.Table 4.25 the type of coordination addressed in each demo BUC is presented.

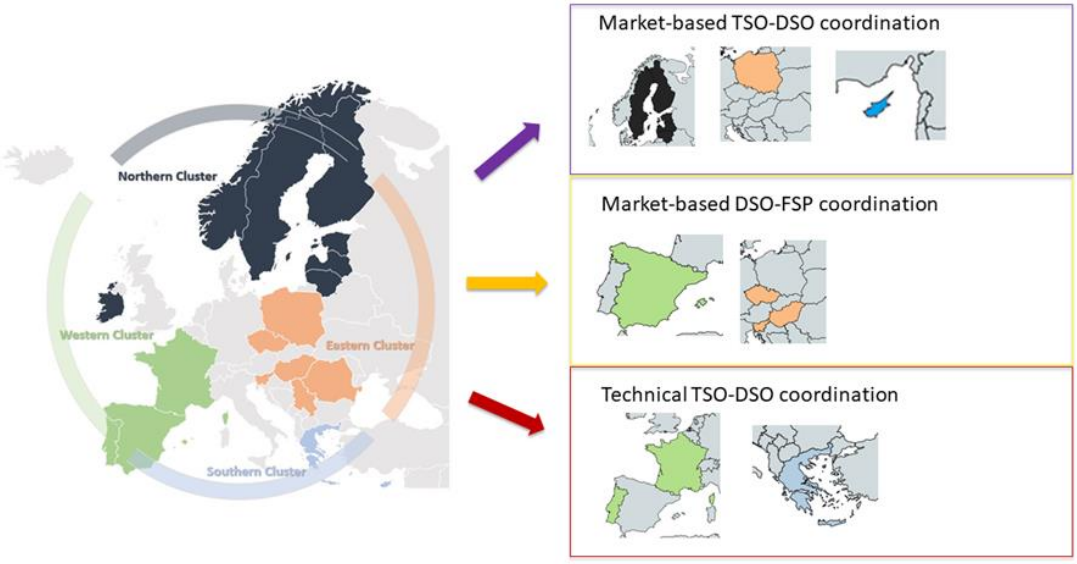

Figure 4.2: Types of coordination considered in OneNet demo clusters. [11]

The same three types of coordination used to group the project's demos were also used to group the demo BUCs. Table 4.25 presents the type of coordination addressed in OneNet demonstration BUCs.

Table 4.25: Type of coordination addressed in OneNet demonstration BUCs.

Demo Cluster	BUC ID	BUC Title	Type of coordination
Northern	NOCL-01	Northern flexibility market	Market-based TSO-DSO coordination
Southern	SOCL-GR-01	Enhanced Active/Reactive Power Management for TSO-DSO coordination	Technical based TSO-DSO coordination
	SOCL-GR-02	Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator	Technical based TSO-DSO coordination
	SOCL-CY-01	Active power flexibility	Market-based TSO-DSO coordination
	SOCL-CY-02	Reactive power flexibility and power quality	Market-based TSO-DSO coordination

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Western	WECL-ES-01	Long-term congestion management	Market-based DSO coordination
	WECL-ES-02	Short-term congestion management	Market-based DSO coordination
	WECL-FR-01	Improved monitoring of flexibility for congestion management	Technical based TSO-DSO coordination
	WECL-FR-02	Improved TSO-DSO information exchange for DER activation	Technical based TSO-DSO coordination
	WECL-PT-01	Exchange of Information for Congestion Management – Short Term	Technical based TSO-DSO coordination
	WECL-PT-02	Exchange of Information for Congestion Management – Long Term	Technical based TSO-DSO coordination
	WECL-PT-03	Exchange of information for operational planning	Technical based TSO-DSO coordination
Eastern	EACL-CZ-01	Nodal area congestion management	Market-based DSO coordination
	EACL-CZ-02	Reactive power overflow management	Market-based DSO coordination
	EACL-CZ-03	Voltage Control	Market-based DSO coordination
	EACL-HU-01	MV feeder voltage control	Market-based DSO coordination
	EACL-HU-02	HV/MV transformer overload	Market-based DSO coordination
	EACL-PL-01	Prequalification of resources provided by FSPs to support flexibility services in the Polish demonstration	Market-based TSO-DSO coordination
	EACL-PL-02	Managing flexibility delivered by DER to provide balancing services to TSO.	Market-based TSO-DSO coordination
	EACL-PL-03	Event-driven Active Power Management for Congestion Management and voltage control by the DSO	Market-based TSO-DSO coordination
	EACL-PL-04	Balancing Service Provider on the Flexibility Platform	Market-based TSO-DSO coordination
	EACL-SL-01	Congestion management in distribution grids under market conditions	Market-based DSO coordination
	EACL-SL-02	Voltage control in distribution grids under market conditions	Market-based DSO coordination

The BUCs concerning market-based coordination define procedures to enable the system service procurement from third-party resources through a market framework. The BUCs focused on the technical based

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coordination design procedures regarding the information exchange necessary for the system service procurement and provision irrespective of the adoption of a market mechanism for the procurement. The proposed BUCs concern the coordination of the actors involved to mainly address congestion management and voltage control both at the transmission and distribution levels.

The cross analysis of the BUCs regarding the type of coordination points out that the number of BUCs considering market-based TSO-DSO coordination, market-based DSO coordination and technical-based TSO-DSO coordination respectively is equally distributed.

4.4 Business role list

To answer the question "Which were the business roles defined within each BUC?", the business roles defined in each BUC were recorded and mapped against HEMRM to identify which of these roles are included in the HERM and which could potentially introduce new ones. The procedure followed was:

1. Create a list of roles defined within the demonstration BUCs.
2. Compare the roles of this list with the roles defined in HEMRM.
3. Identify the OneNet roles that were not defined in HEMRM based on the analysis from experts from ENTSO-E.

In this sub-chapter, the list of roles is presented, together with a comparison with the HEMRM [14]. Then, a review from ENTSO-E experts is presented so the roles can be better adjusted according to the HEMRM. The specific roles' description presented here is important for the BUCs. In this case, all the correct roles will correctly fulfil their objectives when the BUCs are finished. It is also important to note that the roles presented here are included in the Business layer of the SGAM, which was presented in Section 2.3.2.

The objective of the HEMRM is to facilitate the dialogue between the market participants from different countries through the designation of a common name for each role and related object that are prevalent within the European electricity market information exchange. It focuses essentially on enabling a common terminology for IT supported information exchange. It covers both retail and wholesale electricity market, there is a current work to align HEMRM and Gas Role Model, but it should be noted that this is not a model of electricity market, but a model of roles related to information exchange. To build a role model diagram the UML class diagramming technique has been used.

Table 4.26: Roles proposed by OneNet and its correspondent definition and connection with the HEMRM presents a deep analysis for each of the roles in OneNet. This table presents the roles presented into some Use Cases. It is important to note that until the conclusion of this deliverable, not all Use Cases were finished their

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role's definitions. Thus, a detailed and final review of all the roles is provided at Deliverable 2.5 of OneNet, named "Recommendations for the Harmonised Electricity Role Model".

Table 4.26: Roles proposed by OneNet and its correspondent definition and connection with the HEMRM

Proposed Role for OneNet	Definition in demo BUCs	Connection with HEMRM
Day Ahead Congestion Forecast (DACF) Operator	*Greek demo definition:* An expert from TSO/Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures. If the day ahead congestion forecast analysis is performed by a national TSO, the analysed system is usually a national power system.	May be performed by System Operator
2DACF operator	*Greek demo definition:* The same as for the DACF, only for a 2 day-ahead timeframe.	As there is only the difference of a time frame from the "DACF Operator", it is suggested to apply the same suggestion as "DACF Operator", thus, the System Operator
Available Transfer Capacity (ATC) Calculator	*Greek demo definition:* TSO/Short term planning department Expert in charge of short to long term available capacity calculations, flow-based or ATC based (bilateral or composite values).	It can be a Coordinated Capacity Calculator
Distributed Energy Resources (DER)	*Spanish demo definition:* Resources connected at the distribution grid capable of providing active power flexibility, either upward/downward or both. It can comprise several different roles and devices such as demand response (actor/role), distributed generation, electric vehicles, and storage systems.	No connection with the HEMRM. The OneNet project can analyse the "Resource Aggregator" as a candidate for this role. If it does not fit, it may be considered the "Resource" or "Reserve Resource". If none of the above proposals fits, it can be an option to add the DER as a specialisation of the Resource (similar to the Reserve Resource)
Distribution System Operator (DSO)	*Slovenian, Polish, Cypriot & Spanish demo definition*: A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and	A "DSO" can be played by the role of a System Operator. The DSO in this case will be an actor.

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	for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity. Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast). *Portuguese demo definition*: According to the EDSO, the DSOs are "the operating managers (and sometimes owners) of energy distribution networks, operating at low, medium and, in some member states, high voltage levels (LV, MV)". *Hungarian demo definition*: Active actor, responsible for maintaining service quality (e.g., EN 50160) and quantifying flexibility service needs, participates in energy auctions and energy activations.	
Flexibility Register Operator (FRO)	*Northern demo definition:* A party that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access.	It may be a Market Information aggregator
Flexibility Service Provider (FSP)	*Northern demo definition:* A party which offers flexibility services to the Consumer and thus connects these to the flexibility market. *Slovenian demo definition:* Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties. *Spanish demo definition*: Generic role which links the role customer and its possibility to provide flexibilities to the roles market and grid; generic role that could be taken by many stakeholders, such as an aggregator or individual distributed energy resources. *Cypriot demo definition*: A party providing flexibility services to energy stakeholders via bilateral agreements or flexibility markets. *Polish demo definition*: Natural or legal person who is a market participant providing flexibility services to any electricity market who owns at least one distributed energy resource. *Portuguese demo definition*: Flexibility service provider controls sufficient volume of flexibility resources and provides flexibility services to avoid grid congestion problems.	There is no actor on HEMRM that is dedicated to flexibility provision. But ENTSO-E advises to be more specific on this role, given that a flexibility provider can be many things.

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	Hungarian demo definition: Provides services for the DSO, provides information to the TSO in case of activations through schedules.	
Flexibility Service Provider being Aggregator (FSPA)	*Polish demo definition:* A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resource (DER).	It may be a Resource Aggregator
Individual Grid Models (IGM) Manager	*Greek demo definition:* TSO/Short term planning department Expert/s responsible for development, maintenance and regular updates of Individual Grid Models containing consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems. IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis.	Apply the role Modelling Authority. Although it is not presented in the current version of the HEMRM, it was approved by the HG to be included in the next version, which will be published at beginning of 2022.
Maintenance and asset management operator	*Greek demo definition:* TSO/Transmission department Expert in charge of grid maintenance planning which uses grid condition forecasts to foresee potential risks and prepare a proper mitigation or preventive measures for it.	This can be a System Operator
Optimization Operator (OO)	*Northern demo definition:* A party which is responsible to avoid activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process), through grid impact assessment. OO will find the best value-stack of available flexibilities to be activated by performing optimization process.	It may be a Nominated Electricity Market Operator (NEMO) or a Market Operator
Outage Scheduler	*Greek demo definition:* Expert in charge of outage planning. Outage schedules are later on used for IGM and CGM development and regular updates of a grid topology inside models. This person is an interface between TSO transmission department and TSO short-term planning department, making sure that all maintenance activities are well covered and foreseen by IGM topology updates and simulations as well.	Replace by “Outage Planning Agent: means an entity with the task of planning the availability status of a relevant power generating module, a relevant demand facility or a relevant grid element;” according to System Operation Guidelines.
Resource Owner	*Northern demo definition:* A party who owns the resource.	It can be a Resource Provider
Transmission System Operator (TSO)	*Slovenian, Polish, Cypriot & Spanish demo definition*: According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of	A "TSO" can be played by the role of a System Operator. The TSO in this case will be an actor.

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	and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area. Source: EU Commission Task Force for Smart Grids, EG3 *Portuguese demo definition*: According to the European Commission, the TSO is "an organisation committed to transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure". The certification procedure for TSOs is listed in Article 10 of the 2009 Electricity and Gas Directives. *Hungarian demo definition*: Passive actor, receives information on capacity auctions and energy activations.	
Independent Market Operator (IMO)	*Spanish demo definition*: Responsible for calling, clearing, communicating results and possibly settling the provision of distributed flexibility. This role can be taken by an independent market operator, an existing one (e.g. a NEMO), or a system operator.	Market operator

The analysis presented in this section indicates a small number of business roles proposed by OneNet that are not explicitly defined in HEMRM but are rather connected with some of the existing HEMRM roles. This section forms the starting point for the Deliverable D2.5, where recommendations for the Harmonised Electricity Role Model will be devised.

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5 OneNet Regional Business Use Cases

A central objective of the OneNet project is the development of an interoperable network of platforms with near to real time multi-country operation. As such, and to further promote cooperation between countries at a demonstration cluster level, it was decided to introduce the **regional business use case** concept (regional BUC). A regional BUC comprises multi-country cross-border scenarios in which the different clustered countries foresee the exchange of information between themselves through the use of the technical solutions developed throughout the course of the project. These newly developed use cases were refined by discussing the different country needs and how they could use a pan-European system to connect and allow for different systems to exchange valuable information to improve, amongst others, network operation.

This action will allow to demonstrate the scalability and interoperability of the OneNet projects by taking advantage of the unprecedented number of European level demonstrations that compose the project.

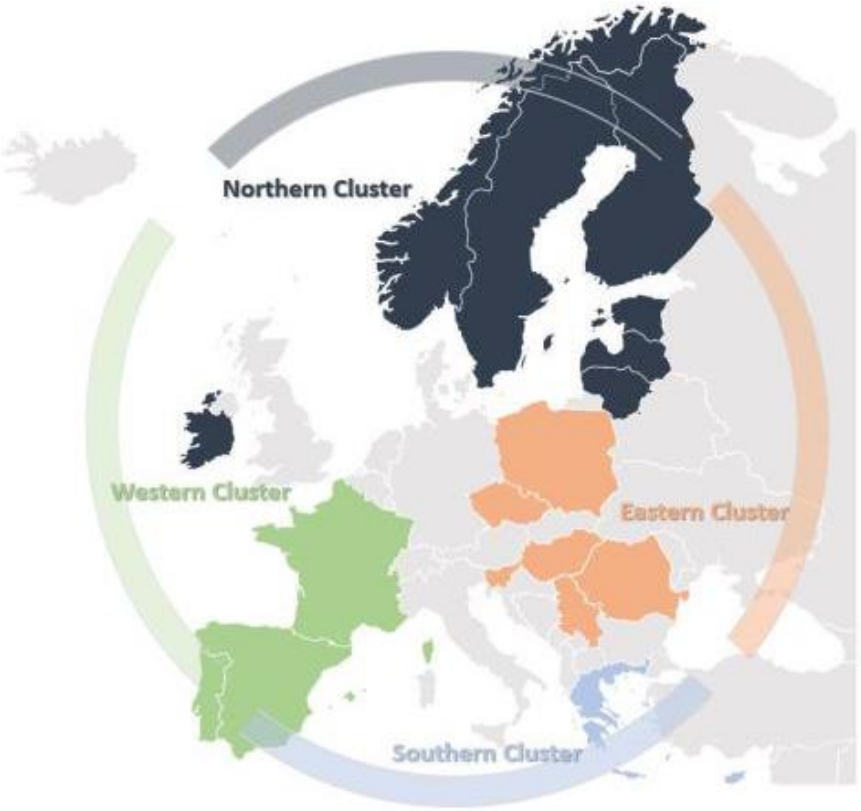

Figure 5.1: OneNet project demonstration clusters

The 4 clusters that compose the OneNet demonstrations - Northern, Southern, Western, and Eastern - developed the regional BUCs, however, as the Northern cluster is undertaking a regional, or cross-border,

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approach since the beginning of the demonstration efforts, the cooperation between countries within this cluster is already explicit in the previously presented BUC. For the remainder 3 clusters, 3 regional BUCs were initially developed by establishing their descriptions, following the IEC 62559-2 template, for the specific foreseen interactions. At the time of the writing of this deliverable, the regional BUCs are in an initial stage and will be further developed as the demonstrations progress and the technical pillar of the project starts developing results that can be easily implemented for the exchange of information that support the ambitions of the project.

5.1 Southern Regional BUC

The Southern Regional BUC aims to enhance the regional cooperation through the provision of early warnings regarding potentially hazardous weather conditions and cyber threats. This will be achieved by exchanging information about cyber security and severe weather condition forecasts between the Greek and Cypriot demo. Predictive maintenance algorithms together with enhanced storm predictions will be developed under Greek BUC to preserve system running into dangerous topological or operational state. In addition, information exchange and an early warning system for potentially hazardous weather conditions and cyber threats with TSO and DSO from Cyprus will be introduced to avoid dangerous power system regimes which could lead to damages to the critical infrastructure.

The main foreseen functionalities related to this particular business case are as follows:

- Regional storm predictive operations and maintenance process in TSO and DSO grid.
- Cyber security and protection of the vital infrastructure.

Table 5.1: Southern Cluster Regional BUC overview

BUC ID	Southern Cluster Regional Business Use Case
BUC Name	Regional critical infrastructure security awareness information exchange
Scope	Regional cooperation and information exchange about cyber security and severe weather condition forecasts.
Objectives	– Cyber Security; – Critical infrastructure protection and avoidance of damages caused by severe weather conditions and cyber attacks; – Predictive maintenance and outage management; – Enhanced severe weather condition management; and – Early warning on a potentially hazardous power system topology and regimes.
Countries	Cyprus, Greece

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5.2 Western Regional BUC

The ASM report [15] describes the Preparatory phase as a crucial stage to enable effective functioning of any flexibility markets because it is a process which ensures that the flexibility offered by a particular FSP can actually be delivered without causing an undesirable situation in either of the involved grids. Moreover, once the services and the providers are pre-qualified, they are registered in a flexibility register. The report splits the prequalification evaluation into product and grid pre-qualification processes.

On the one hand, the product pre-qualification is done to determine whether the unit can actually perform according to the general requirements set by the system operator to deliver the product it wants to sell/deliver. On the other hand, the grid pre-qualification, is defined as checking whether the grid can manage the delivery of the product. It can be repeated on a set regular basis and whenever the technical characteristics of the FSP, or the grid where it is connected, notably change. However, these pre-qualifications, do not avoid the need for the unit to be examined again, in case of possible activation, already in the market phase, known as qualification.

Finally, if the FSP passes product and grid pre-qualification, its information is stored in a flexibility register (the Flex register), a database in which information on all FSPs interested in participating in the flexibility market is stored and it could be shared. The phases described in the ASM report are also presented in Section 6.3

The challenge of the Western Regional BUC is, taking into account the particular constraints of each country, to be able to harmonize the main elements of the prequalification processes (product and grid prequalification) and to define the main requirements that FSPs have for their Flex register for all countries in the Western Cluster. Therefore, a “minimum” set of information is agreed among the SOs involved in the Western Cluster for the purpose of grid and product pre-qualification. Beyond this set of information, SOs can request additional information, if necessary, to complete the pre-qualification processes. Coordination between system and market operators from the cluster is needed to carry out this preparatory phase.

The development of this BUC is important since it addresses some principles agreed between system operators and which are described in the ASM Report, such as the need to define clearly their needs from an operational perspective to allow the FSPs to develop sound products, facilitate the participation of all market parties and lower entry barriers and enable any service provider to sell its service in all markets. For instance, an Aggregator or an FSP who wants to participate in two Flexibility Markets from different countries could enter using the same rules.

In this regional BUC, the OneNet system is essential to foster the interaction among system operators, market operators and the Flexibility Service Providers.

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Table 5.2: Western Cluster Regional BUC overview

BUC ID	Western Cluster Regional Business Use Case
BUC Name	Cluster Preparatory Phase: Cross-SO grid pre-qualification
Scope	Regional Use Case, enabling coordination among market and system operators of the Western Cluster through OneNet System for the harmonization of the preparatory phase based on the experience of the system and market operators from the three countries in the cluster.
Objectives	– Design the Pre-qualification process phase of ASM report among the Cluster so that it can serve as a basis for future developments; – Design the Flexibility Resource Register requirements among the Western Cluster; – Exchange information for the Grid Pre-qualification through OneNet System; and – Facilitate the entry of FSPs into the various flexibility markets within the Western Cluster.
Countries	Portugal, Spain, France

5.3 Eastern Regional BUC

The Eastern Regional BUC defines how an external entity can retrieve market data from national market platforms through OneNet system, in a standardised way and in a standardised data format. It provides preliminary information to be exchanged through the OneNet system and it includes the following processes:

- **Definition of the category of information to be shared by national platforms**

  Creation of information indicators characterizing the national flexibility markets, that are available through national market platforms. The preliminary information and indicators may include:

  a) Market participants (number of prequalified flexibility service providers, range of volumes & sources, etc.)
  b) Auction results (range of prices, volumes, number of offers, etc.)
  c) Identified and avoided constraints in the DSO network (volumes, number of transactions, etc.)

  In each information category, the results will present the information and indicators that will characterize the parameters of the flexibility market. Each national data and/or particular indicators (KPI) should be prepared in unified way and should be available to the OneNet system users. The meaning of individual indicators should be identical for individual national platforms.

  All data and indicators should be made available according to the following rules:

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a) Individual data should be anonymized to avoid the breach the GDPR rules or to reveal trade secrets.
b) Data representing the specific information should be aggregated (in terms of range and requested time frame). In this case, uniform results within East Cluster are expected.
c) KPI data should be calculated by flexibility market platform based on already defined algorithms.

- **OneNet system user registration**

  Each eligible entity interested in obtaining data about national flexibility markets should be authenticated and authorised for this access (undergo the registration process) through the OneNet system, with a request to provide information on the nature of the activity and the objective of data use. Only users registered on the OneNet system can obtain data.

  The above will allow to define the range of stakeholders and monitor the interest in the development of flexibility services.

- **Data retrieval request sent by a registered OneNet System user**

  In order to obtain data, the user must create a data request. A data request has to define:

  a) Addressee (Flexibility Platform of national demonstration)
  b) Information category (already determined and described in process 1)
  c) Time frame (from date – to date) of required information (for already available data).

  The request for data submitted on the OneNet system is sent to a given national platform on which the data is collected in accordance with the request and returned. National platforms apply data access restrictions:

  a) Individual data relating to the FSP or other entity subject to the GDPR or being a trade secret can be anonymized, or
  b) Data can be aggregated.

- **Collecting and processing data**

  The collected data are sent in an appropriate (agreed) standardised format (CIM) to the user registered on the OneNet system.

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- **Data statistics**

  Statistics of data downloaded from national platforms via OneNet system is published on the OneNet system (e.g., log file). This information may concern: the number of serviced queries (including those concerning individual countries), types of users, time of data acquisition, etc.

Table 5.3: Eastern Cluster Regional BUC overview

BUC ID	Eastern Cluster Regional Business Use Case
BUC Name	Flexibility market data aggregation
Scope	Sharing data on individual national platforms via the OneNet system.
Objectives	– Defining and preparing key data on the results of national demonstrations (national platforms); and – Rules for sharing data through the OneNet system, by registered users of the OneNet system.
Countries	Slovenia, Poland, Hungary, Czech Republic

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6 OneNet General Business Use Case

The OneNet General Business Use case was developed with the aim to provide the necessary input to WP4. The main objective of WP4 is to link the market activities with grid operation with the target to maximize the integration of FSP. To this end, the demo BUCs were mapped against the ASM report and against each other to identify their common elements, as well as their individual characteristics. In this chapter, the process and the results of this analysis are presented.

6.1 Methodology of developing the General OneNet BUC

For the development of the general BUC a combination of the top-down and bottom-up approach was adopted. After the collection and evaluation of the demonstration BUCs, we mapped the described processes of these BUCs against each other. From the total number of the demo BUCs the ones concerning market-based coordination were selected and analysed further. We identified their common elements and based on them we formed a generic market-based process (bottom-up approach). Then, we mapped this generic market-based process against the process described within the ASM report (top-down approach), thus creating a combination of the two, which formed OneNet general business use case. To finalise the general BUC, we obtained feedback from OneNet partners through the T2.3 core team meetings. In addition, a meeting with WP4 partners was organised in which the extent of the details, the general BUC should have, was specified.

6.2 Demonstration BUCs processes

In this section, the phases of the demo BUCs, which addressed TSO-DSO market-based coordination, are presented. These phases are describing the procedures to enable the system service procurement from third-party resources through a market framework. The colour coding used indicates how the different phases described in the demo BUCs can be mapped against the phases described in the ASM report. The ASM report phases are described in detail in the next section of the deliverable and the colour coding indicates the following:

- Green colour indicates activities that take place in the preparatory phase.
- Gray colour indicates activities that take place in the market phase.
- White colour indicates activities that take place in the forecasting phase.
- Blue colour indicates activities that take place in the monitoring and activation phase.
- Yellow colour indicates activities that take place in the settlement phase.
- Red colour indicates activities that were not explicitly defined within one of the ASM phases.

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Table 6.1: NOCL-01 overview of scenarios.

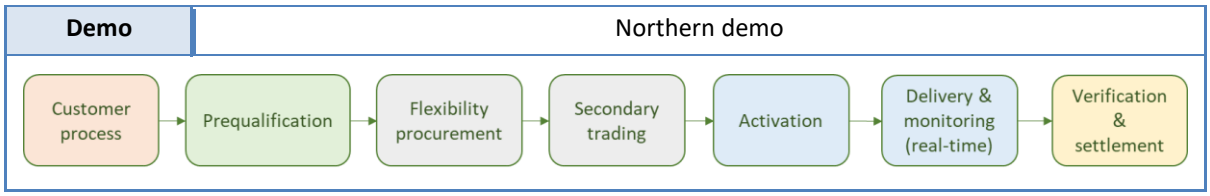


Table 6.2: WECL-ES-01 & WECL-ES-02 overview of scenarios

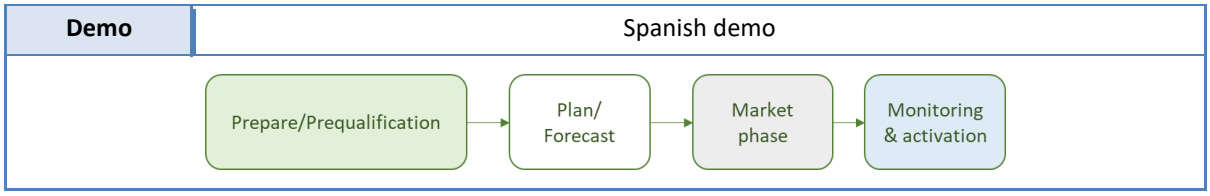
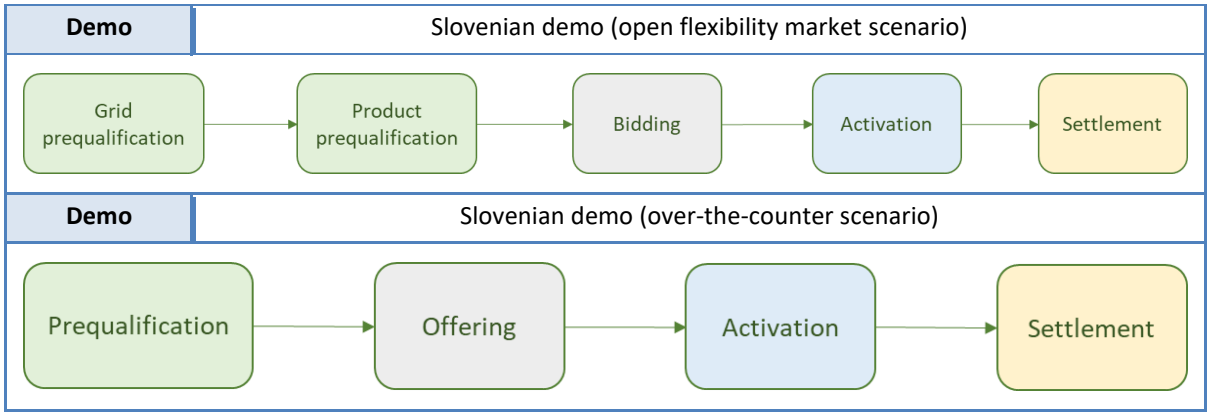


Table 6.3: EACL-SL-01 & EACL-SL-02 overview of scenarios



In the Slovenian BUCs, depending on how the local flexibility market is organised two scenarios are considered: over the counter market (OTC) and organised flexibility market. In the OTC market scenario, the FSP makes a long-term (e.g., 6 months) bilateral contract with DSO, while in the second scenario the DSO procures the flexibility on the organised local flexibility market.

Table 6.4: EACL-HU-01 & EACL-HU-02 overview of scenarios

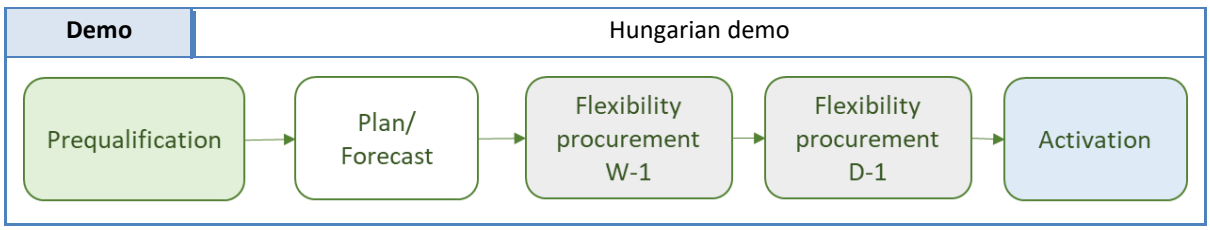


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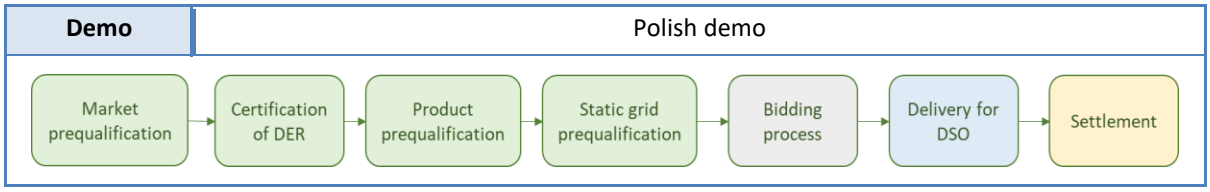
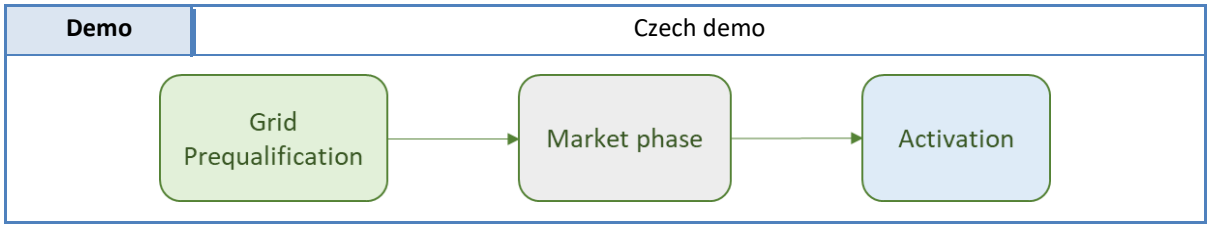
Table 6.5: EACL-PL-01 & EACL-PL-03 overview of scenarios



In Polish demo, product prequalification and static grid prequalification steps might be performed in reversed order that the one presented in Table 6.5.

Table 6.6: EACL-CZ-01, EACL-CZ-02 & EACL-CZ-03 overview of scenarios



It should be noted that the forecasting phase is described in detail within the Hungarian and Spanish demo BUCs as part of their demo activities. In the rest of the demo BUCs, the demand forecasts are used as an input for the prequalification activities without though focusing on the process which generates these forecasts.

6.3 Active System Management report process

The ASM report describes and analyses active power management from the perspective of TSOs and DSOs for congestion management in both distribution and transmission grids and system balancing when such services are provided in a market-based approach by flexibilities owned and operated by third parties. [15] As it was concluded from Chapter 4.2 when considering the services included in the BUCs, there is a clear focus on the provision of non-frequency ancillary services. Upon this base the processes described within the demonstration BUCs were mapped against the ASM process.

The main phases of the congestion management process with respect to market-based solutions described in ASM are the following:

1. **Preparatory phase**: Product definitions and initial pre-qualification.
2. **Forecasting phase**: Planning of grid utilisation and identifying potential congestions.

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3. **Market phase**: Bids' collection and evaluation, both in long-term and short-term contracts (availability or capacity products) and short-term products/services (activation of energy products), up until real time.
4. **Monitoring & activation phase**: Activation of bids for congestion management and system operator co-operation up to real time.
5. **Measurement & settlement phase**: Validation of delivery.

The above-mentioned phases are illustrated in Figure 6.1.

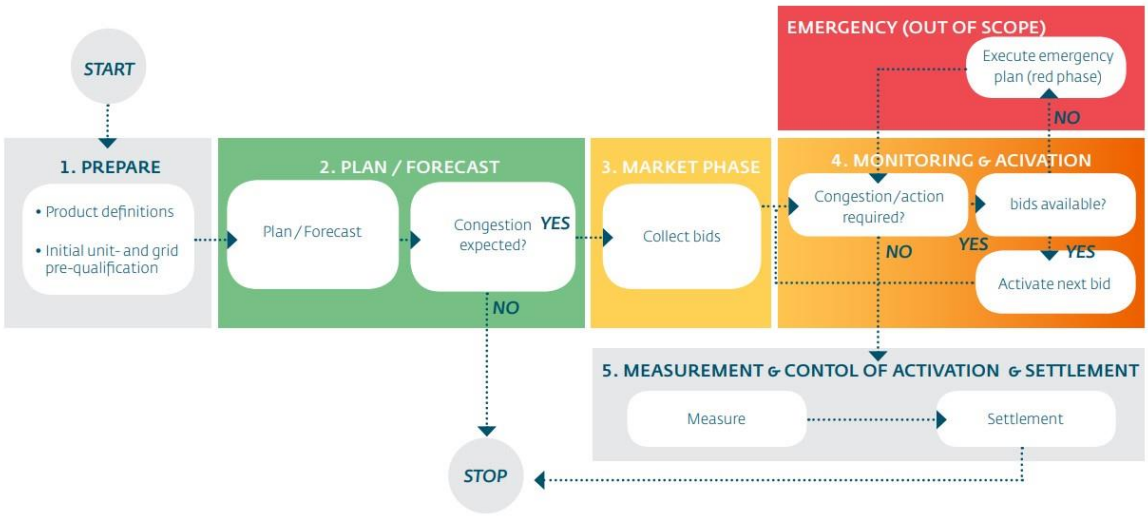

Figure 6.1: ASM process overview [15]

6.4 OneNet General BUC process

Following the analysis presented in the previous sections, a high-level description of the OneNet General Business Use Case was developed. It should be noted that this description includes only the scenarios' description of the BUC without going into the technical details of defining specific data exchanges between actors or systems. This is part of the work that will be carried out within WP4. The description of the general BUC using the IEC-62559 template can be found in Annex 9.2. In Table 6.7, an overview of the general BUC is presented.

Table 6.7: OneNet General BUC overview

BUC ID	OneNet_GBUC
BUC Name	Unlocking market-based flexibility provision to procure services to operators
Scope	The scope of this BUC is to facilitate the unlocking of flexibility markets both on transmission and distribution system level and to address the network operators' needs,

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	by providing flexibility for 'frequency' and 'non-frequency' ancillary services. In addition, the aim of this BUC is to strengthen the role of customer in the flexibility value chain and ensure the seamless coordination of the different actors. This BUC is the result of mapping the demo BUCs against the process described within the ASM report.
Objectives	– Definition of common market processes in different EU regions; – Moving from system-centric to customer-centric approach; and – Creating an integrated marketplace for system services

This abstract description of OneNet general BUC process is illustrated in Figure 6.2.

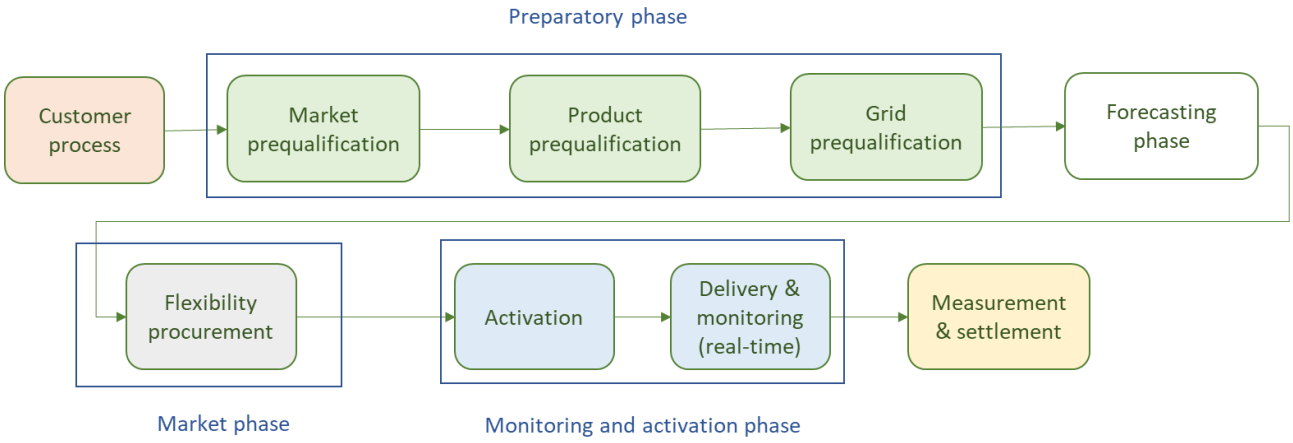

Figure 6.2: OneNet General BUC high-level description

A brief description of the general BUC scenarios follows:

- **Customer process**: This process deals with onboarding customer for providing flexibility. It starts from definition of some products, contract format, and information consents for customers, who want to provide flexibility.
- **Preparatory phase**: This scenario focuses on prequalification of a) Flexibility Service Providers, b) product prequalification (the technical specification of product), and c) the grid assessment of the flexibility product ('grid prequalification'), for example if the flexibilities can cause congestions in the grid.
- **Forecasting phase**: This phase focuses on the planning of grid utilization and on identifying potential congestions.
- **Market phase**: This scenario deals with the market opening, qualification, bids collection, market clearing and communication of results procedures.

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- **Activation phase**: This scenario describes the process of activation of the flexibility procured in the flexibility market, taking into account any grid limitations, and the needed data exchange.
- **Delivery and monitoring phase**: This scenario focuses on monitoring the flexibility delivery.
- **Measurement and settlement phase**: This scenario deals with the validation of service delivery and the financial settlement of the delivered flexibility product.

As stated above, the customer process scenario deals with onboarding customer for providing flexibility. This scenario is considered in OneNet General BUC in order to explore how the consumers are part of the interactions between TSO-DSO-market parties-consumers.

The rest of the scenarios described in OneNet General BUC are also mentioned in the ASM report. It should be highlighted that in OneNet general BUC in addition to product and grid prequalification in the preparatory phase, market prequalification is also considered. While product prequalification focuses on the technical specification of product and grid prequalification focuses on checking whether the grid can manage the delivery of the product, market prequalification focuses on checking if the flexibility resource is capable of participating in the market.

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7 Conclusions

The Deliverable 2.3 describes the specifications of 23 BUCs for the 4 demonstration clusters of the OneNet project. Each BUC describes the process of acquiring system services, the roles of the stakeholders, the market design and the necessary information exchanges. The description of the BUCs follows the standardized IEC 62559 template and the complete 23 BUCs description can be found in Annex 9.2.

The deliverable's main part presents a review of previous H2020 projects' BUCs and evaluates each demo BUC in terms of (i) addressed system services, (ii) system operator's approach for acquiring these services, and (iii) defined business roles. This work was aligned with the work carried out in other tasks and was carried out in collaboration with all the other horizontal and demonstration WPs. In addition, it presents the regional BUCs and the OneNet General BUC.

The cross analysis of the BUCs showed that there is a clear focus on the provision of non-frequency ancillary services, while regarding the type of coordination the number of BUCs considering market-based TSO-DSO coordination, market-based DSO coordination and technical-based TSO-DSO coordination respectively is equally distributed.

The presented work is a clear starting point for the demonstration WPs of the OneNet project and essential for developing the corresponding SUCs in WP5. In addition, the OneNet General BUC high-level description will be used as input for the work carried out in WP4, in which more technical details regarding specific data exchanges between actors or systems will be defined.

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8 References

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 957739

9 Appendixes

9.1 IEC-62559-2 Use Case template

[Name of use case]

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
	Country market layer	

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	
Objective(s)	
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
Need: Short description, a few sentences Service (short description of how the service meets the objectives): Short description, a few sentences
Complete description
The complete description is focused on the narrative descriptions of each phase of the service. Each phase is linked to a scenario in the use case template. Definition of services phases (= scenarios)

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions		
Assumptions		
Prerequisites		

1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
Level of depth
Prioritisation
Generic, regional or national relation
Nature of the use case
Further keywords for classification

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

3. Technical details

3.1. Actors

Actors			
Grouping (e.g., domains, zones)		*Group description*	
Actor name	*Actor type*	*Actor description*	*Further information specific to this use case*

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1						
2						
3						

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name		Activation						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1								
1.2								

- Step No 1.x / Name of process

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***

- Step No 1.x / Name of process

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***

Scenario name #2

Scenario #2 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name		Offering						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1								
2.2								
2.3								

- Step No 2.x / Name of process

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*

- Step No 2.x / Name of process

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

9.2 Detailed description of BUCs

The BUCs available at the time of the writing of this deliverable, which are presented in this section, can be subject to minor changes, upgrades and refinements at a later stage to support the demonstrations progress.

9.2.1 Northern Cluster demo BUC

Northern Flexibility market

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
NOCL-01	Flexibility market, TSO-DSO coordination. Nothern Demonstration Cluster: Finland, Estonia, Latvia, Lithuania	Northern Flexibility market

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	10.5.2021	Sirpa Repo	Ch. 1.1-1.4	
0.2	11.6.2021	Sirpa Repo and all WP7 partners	All chapters modified and complemented	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Regional, enabling multiple market operators, coordination of the system operators
Objective(s)	- Develop seamless end-to-end process for market-based flexibility utilization for grid services - Lower the entry barrier for flexibility by simplifying the process for flexibility service provider - Ensure availability of short-term flexibility from multiple sources
Related business case(s)	So far this is only BUC in the demonstration cluster, so no related business cases

1.4. Narrative of Use Case

Narrative of use case
Short description
Business Use Case describes the flexibility process starting from FSP contracting the end-customers to prequalification, procurement, activation, delivery and monitoring, verification and settlement. BUC introduces flexibility register for sharing flexibility resource information and TSO&DSO coordination platform for the grid impact assessment and for optimisation.
Complete description
The business use case describes seven scenarios. Scenarios are 1) customer onboarding process, 2) prequalification process of flexibility service providers, resources and network needs, 3) flexibility (energy and capacity) procurement process, 4) conditional secondary trading process. 5) activation

process (in case separate activation after the procurement is needed), 6) delivery and monitoring process, 7) verification and settlement process.

The business use case can be applied in provision and procurement of balancing, network congestion management and voltage control services. BUC includes new platforms, flexibility register and TSO&DSO coordination platform. These platforms will have a role in management of flexibility resources and procurement related data and joint TSO/DSO coordination and network impact assessment.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions	
Assumptions	
1	BUC is service or product agnostic
2	Solutions for consent management for sharing private data are in place in all countries of the region.
3	Flexibility Register Operator and Optimisation Operator are well integrated with each other and with other relevant stakeholders and countries.
4	It is evident that congestions occur in a concerned grid area.
5	Value-stacking is allowed in legislation, i.e. same resources and bids can be used simultaneously for more than on flexibility service and/or for more than one System Operator.
6	Timing allows value-stacking while sharing the concerned bids also with EU platform.
7	Balancing bids can be withdrawn from EU platform at any time before activation.
8	Location of the issue in the grid and location of the flexibility resource matters from the total cost perspective.
9	System Operator is informed about actual activations in real time through its SCADA solution. (not meaning having real-time data of all, individual small resources)
10	Sharing of network topology with Optimisation Operator is permitted.
11	Compensations in the secondary market are handled by the FSP. SO is not affected financially
Prerequisites	
1	Cross-border acknowledgement of consents is enabled.
2	The concerned System Operators for grid impact assessment need to be identified.
3	The preferred option for counter balancing is defined.
4	Participating FSPs in the secondary market are also registered in the flexibility register

1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
Level of depth
Prioritisation
Generic, regional or national relation

Nature of use case
Business Use Case
Further keywords for classification

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

3. Technical details

3.1. Actors

Actors			
Grouping		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Consumer/Producer	Business	Consumer is a party that consumes electricity and Producer is a party that generates electricity.	According to HEMRM definition.
Balancing responsible party (BRP)	Business	A Balance Responsible Party is responsible for its imbalances, meaning the difference between the energy volume physically injected to or withdrawn from the system and the final nominated energy volume, including any imbalance adjustment within a given imbalance settlement period.	According to HEMRM definition.
Balancing service provider (BSP)	Business	A party with reserve-providing units or reserve-providing groups able to provide balancing services to one or more LFC (Load frequency conrol) Operators.	According to HEMRM definition.
Resource aggregator	Business	A party that aggregates resources for usage by a service provider for energy market services.	According to HEMRM definition.
Market operator (MO)	Business	A market operator is a party that provides a service whereby the offers to sell electricity are matched with the bids to buy electricity.	According to HEMRM definition.
System operator (SO)	Business	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity.	According to HEMRM definition.

Imbalance settlement responsible (ISR)	Business	A party that is responsible for settlement of the difference between the contracted quantities with physical delivery and the established quantities of energy products for the Balance Responsible Parties in a Scheduling Area.	According to HEMRM definition.
Flexibility Register Operator (FRO)	Business	A party that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access.	Based on BRIDGE proposal for Flexibility Register Operator definition.
Flexibility Service Provider (FSP)	Business	A party which offers flexibility services to the Consumer and thus connects these to the flexibility market.	NEW
Optimisation operator (OO)	Business	A party which is responsible to avoid activating of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process), through grid impact assessment. OO will find the best value-stack of available flexibilities to be activated by performing optimization process.	Based on BRIDGE proposal for Flexibility Register Operator definition.
Resource Owner (RO) = resource provider	Business	A party who owns the resource.	

3.2. References

References						
No.	***Reference Type***	***Reference***	***Status***	***Impact on use case***	***Originator / organisation***	***Link***
		ASM report		Definitions		
		INTERRFACE -project				
		EUSysflex - project				

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Customer process	This scenario deals with onboarding customer for providing flexibility. It starts from definition of some products, contract format, and information consents for customers, who want to provide flexibility. Also aggregating the customer	Flexibility Service Provider	---		

		flexibility, registration in FR, and providing the information of resources for prequalification is part of this scenario.				
2	Prequalification process	This scenario focuses on prequalification of 1) Flexibility Service Providers, 2) product prequalification (the technical specification of product), and 3) the grid assessment of the flexibility product (‘grid prequalification’), for example if the flexibilities can cause congestions in the grid (‘grid prequalification’).	Flexibility Register Operator	Trading process from MO		
3	Flexibility (capacity and energy) procurement	This scenario deals with trading of flexibility products, which are previously defined with Market operators (System Operators might have a role of MO) and possibly standardized. Flexibility Service Providers offer flexibilities for these defined flexibility products in parallel markets while System Operators looking for the optimum solutions. In this mechanism, OO takes into account the maximum global benefit and bid qualification (network limits). This means that it may happen that more than one System Operator will be willing to buy same flexibility.Therefore, it is not necessarily the cheapest flexibility which would bring highest socio-economic value. bids. The MO are responsible to clear the bids, therefore, timing and clearing of markets need to be coordinated between the markets, when there are markets running in parallel.	MO	Sending a request from OO (,which originated in one SO) to MO to ask start procurement		
4	Secondary trading	For longer term flexibility products, FSPs may wish to trade their flexibility contracts to another qualified participant if they cannot fullfill the obligations. The scenario is similar but simpler that the original trading, scenario 3. The	MO	Sending a request from FSP, who is not capable to fulfil the contract		

		SO needs to be notified of this trade to continue with scenarios 4-6				
5	Activation	This Scenario describes the process of activation of the flexibility, taking into account any grid limitations, and the needed data exchange. Notifying the activation requests to the Flexibility Service Providers (FSPs) must happen in a reliable and timely manner according to the relevant terms and conditions applicable to FSPs.	SO	SO		
6	Delivery and monitoring (real-time)	This scenario focuses on monitoring the flexibility delivery. Actual flexibility delivered is calculated as the difference between baseline and metered consumption/generation of that resource. In this regard, FSP need to provide the real-time metering data and FRO calculates the amount of flexibility delivered and the possible difference between it and the requested amount. If needed OO can start a new procurement. requested flexibility.	FRO	FSP (submit the activation confirmation)		
7	Verification and settlement	This scenario focuses on verification and balance and financial settlement The verification takes place by comparing the actually delivered flexibility and flexibility traded on the markets. FSP is asked for a penalty if actually delivered flexibility is less than requested flexibility. Measured data is sent to Datahub and trades in the markets to ISR for the balance settlement. Market operator financially settles the trades for the market participants.	FRO	After Scenario 6, Delivery and monitoring		

4.2. Steps – Scenarios

Scenario								
Scenario name		1. Customer process/Customer onboarding (Customer contracts, provision of information to customers, customer benefits. Aggregation of resources)						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1		Create end-customer flexibility products	Create products relevant for customer. Define customer benefit, communication and rewarding mechanism.		Flexibility Service Provider (FSP)	FSP	Marketing information	
1.2		Marketing/ customer dialogue	Attract relevant customers through marketing efforts. Includes feedback from the RP		FSP	Resource Provider (RP)	Marketing, price/ customer incentive, technical information etc.	
1.3		Evaluate resource provider	Ensure RP meets set criteria for flexibility potential		FSP	RP	Flexibility related information	
1.4		Create customer contract	Create a legally compliant contract for customer flexibility		FSP	FSP	Contract information	
1.4.1		Send customer contract			FSP	RP		
1.4.2		Send signed contract			RP	FSP		
1.5.1		Register contract in internal systems	Register relevant customer and contract information in internal CRM and invoicing systems		FSP	FSP	Customer information	

1.5.2		Register resource information in internal systems	Register resource flexibility potential in internal systems (technical details)		FSP	FSP	Flexibility related information	
1.5.3		Manage flexibility contracts in flexibility register	(new contracts, modification, termination)		FSP	FRO	FlexCont	
1.6.1		Register consent			RP	Consent administrator	Consent	
1.6.2		Forward consent information			CA	FRO, OO, MO, SO?	Consent	

Scenario								
Scenario name		2. Prequalification of flexibility service providers, resources and network needs						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		Publish flexibility product and qualification specifications	Market operators publishes the product definitions and other possible specifications or requirement that are relevant for FSP or RP		MO	FRO	ProdSpec	
2.2		Register as Flexibility service provider			FSP	FRO	FSPInfo	
2.3		Qualification check of the FSP	Qualification check for the FSP concerning financial and legal liability per product		FRO	FRO	FSPInfo	
2.4		Publish flexibility need	SO communicates its (short-term) flexibility needs so that FSPs can more accurately		System Operator (SO)	Flexibility Register Operator (FRO)	FlexNeed	

			answer to the location-specific demand					
2.5		Publish flexibility resource	Each Flexibility Service Provider registers its flexibility potential. The resource can be existing or one that is planned		Flexibility Service Provider (FSP)	FRO	ResInfo	
2.6		Send information for grid impact assessment	Information about flexibility potential/resource		FRO	Optimisation Operator (OO)	ResInfo	
2.7		Assess grid impact (grid pre-qualification)	Impact assessment of flexibility potential in order to avoid congestions if these would be activated. Impact assessment can be completed by each SO separately and/or by OO centrally. I The impact assessment is a continuous process. Only structural congestions should be considered in this phase.		SO / OO	OO	GridRest	
2.8		Send network restrictions as grid prequalification result	Restrictions on the activation of flexibilities which would cause congestion in grids.		OO	FRO	GridRest	
2.9		Prequalify the product	The ability of FPS's flexible resources to deliver flexibility with respect to product specifications is checked		FRO	FRO		

2.10		Publish the results of prequalification with additional restrictions information	Information available for FSP		FRO	FSP	GridRest	
2.11		Publish the results of prequalification with additional restrictions information	Information available for SO as well FSP		FRO	SO	GridRest	
2.12		Publish qualified resources per market party to the market operator	In order to enable the FSP to offer a specific resource on the MO platform, the list of resources is needed by the MO.		FRO	MO	ResInfo	

Scenario								
Scenario name		3. Flexibility (capacity and energy) procurement						
Step No	**Event**	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
3.1		Request to open the flexibility call for tenders or flexibility market opens	The call for tenders is opened by the System Operator who needs the flexibility service.		SO	OO	ProdSpec	
3.2		Facilitate information about the flexibility calls	A call for tenders of flexibility services relies on specific products and covers specific periods (week ahead, day ahead, intraday, etc.). Include possibly		OO	MO, SO	FCT	

			information about the flexibility need(s). Includes also continuous bidding					
3.3		Opening of the flexibility call			MO	MO	FCT	
3.4		Inform about flexibility call for tenders opening	FSPs should receive information about call for tenders opening.		MO	FSP	FCT	
3.5		Submit flexibility bids			FSP	MO	FlexBid	
3.6		Forward flexibility bids			MO	OO	FlexBid	
3.7		Forward relevant bids to European platform	Bids for balancing need to be sent to relevant EU platform at right time.		OO	(EU) MO	FlexBid	
3.8		Submit information for grid impact assessment	Information about network topology, sensitivity, …		SO	OO	GridInfo	
3.9		Assess grid impact	Impact assessment of flexibility bids in order to avoid congestions if these would be activated. Impact assessment can be completed by each SO separately and/or by OO centrally. ISetting restrictions on the activation of		SO / OO	OO	GridRest	

			flexibilities which would cause congestion in grids. The impact assessment is a continuous process.					
3.10		SO flexibility purchase offers			SO	OO	FlexPur	
3.11		Closing of the flexibility call for tenders (virtual closing of continuous markets)			SO	MO	FCT	
3.12		Rank bids based on merit order, optimise flexibility bids and flexibility purchase offers	Optimising bid by matching flexibility bids and purchase offers in most economic way taking into account synergies (value-stacking).		OO	OO	MOLOptRes	
3.12.1		Notify MOs	Sending relevant optimisation information to MOs		OO	MO	OptRes	
3.12.2		Notify SOs	Sending relevant optimisation information to SOs		OO	SO	OptRes	
3.13		MOs finalises the trades according to market rules	Confirmation of the trades. If the matching has been done at OO, commercial transactions. In exchange type of market, commercial matching		MO	MO	Matching results	

3.14		Notify FSP	Notify the market outcome of FSP bids		MO	FSP	MarOut	
3.15		Notify FRO, OO	Notify the market outcome		MO	FRO, OO	MarOut	
3.16		Close the flexibility call for tenders			SO	MO	FCT	
3.17		Identify counter action need	Counter Action is needed if activation of would cause imbalance in system		OO	OO, SO		

Scenario								
Scenario name		4. CONDITIONAL Secondary Trading (to be decided by the MO)						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
4.1		Determine trade needs	FSP that holds a flexibility contract discovers they cannot deliver flexibility for all or a period of the contract	Long-term flex products	FSP	N/A		
4.2		Publish trade	FSP publishes trade needs to MO to find other pre-qualified FSP to take contract		FSP	MO	Flexibility Contractual obligations	
4.3		MO publishes the need for a take-over of the contract	The need (contract) of the FSP, which is not capable to fulfil the contract, is published in MO platform and other registered FSP get the information.		MO	FSP		
4.4		Bid for contract	Other registered FSP can view contract up for		FSP	MO	Bid price for contract	

			trade and bid through the MO to take over that contract, regardless whether it had initially submitted the bid or not.					
4.5		Send contract bids for grid impact assessment	All the attributes associated to FlexBid should be forwarded		MO	OO		
4.6		Receive grid impact assessment results	OO analyses the bids and find the optimum solution		OO	MO		
4.7		Notification of the market results	MO inform the new FSP		MO	FSP		
4.8		Notification of new contract holder	Once FSP's have agreed to trade the MO must notify the OO, FRO, SO so the correct asset can be activated and dispatched and the right FSP is verified and paid.		MO	OO, SO, FRO	Details on new FSP and asset	

Scenario								
Scenario name		5. Activation (in case a separate activation after "3. Flexibility procurement" is needed)						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
5.1		Identify a flexibility activation need			SO	SO		
5.2		Request flexibility activation	SO requests an activation of flexibility		SO	OO	FlexActReq	
5.3		Submit information for grid impact assessment	Information about network topology, sensitivity, …		SO	OO	GridInfo	

5.4		Assess grid impact	Impact assessment of flexibility activations in order to see if activations would cause further congestions. Impact assessment can be completed by each SO separately and/or by OO centrally.		SO / OO	OO	GridRest	
5.5		Publish qualification results			OO	FRO	GridRest	
5.6		Select bids for activation	Selection of bid which would not cause congestion. If needed, going back to scenario 3 procurement 3.12 bid optimisation		OO	OO	FlexBid	
5.7		Forward request for activation			OO	FSP	FlexActOrd	
5.8		Submit activation request confirmation	If no answer or denial received from FSP, feedback loop back to bid selection (step 5.6)		FSP	OO	FlexActOrd	
5.9		Notify activation requests and confirmations from FSP			OO	SO MO FRO	FlexActReq	

Scenario	
Scenario name	6. Delivery and monitoring (real-time)

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
6.1		Conditional: Submit production/consumption plans	Submit production/consumption plans in cases where plans are used for verification		FSP	FRO	ProdPlan ConsPlan	
6.2		Activate resources	Resource is activated		FSP	RP	ActFlex	
6.3.1		Submit activation confirmation	Submit activation confirmation		FSP	OO	ActFlex	
6.3.2		Inform about activation confirmation	Inform about activation confirmation		OO	FRO	ActFlex	
6.4		Provide metering data	Real-time data delivery, if required in the product definition		FSP	FRO	MetData	
6.5		Conditional: Determine a reference level for real-time monitoring	In cases where ex-ante schedule is known, it can be used as a reference against which the performance of the resource is evaluated		FRO	FRO	Baseline	
6.7		Conditional: Calculate the actually delivered flexibilities	Calculation of difference between the metered data and the reference value, and compare with FSP's activation confirmation (from step 6.3.2)		FRO	FRO		
		Conditional: Calculate under- or overdelivered flexibilities	Calculation of difference between requested activation volumes and actually delivered flexibilities		FRO	FRO		
6.8		Conditional: Inform about under or overdelivered flexibilities			FRO	FSP, SO		

6.9		Conditional: Procurement of additional flexibility during delivery period	Initiate additional procurement in case more flexibility is needed (feedback loop to bid selection (step 5.6 select bids for activation)		OO	OO		

Scenario								
Scenario name		7. Verification and settlement						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
7.1		Provide metering data	Deliver generation and consumption data measured by certified meters data and sub-meters		Metered Data Administrator (MDA)	FRO	MetData	
7.2		Determine verification method	Determination of verification method. If schedule based: step 6.1 submit production/consumption plans, otherwise 7.3. Product definition determines the used baseline method		FRO	FRO	Baseline	
7.3		Conditional: Compile baseline	Compile baseline.		FRO	FRO	Baseline	
7.4		Determine the actually delivered flexibilities	Calculation of the difference between the metered data and the baseline or the schedule		FRO	FRO	DelivFlex	
7.5		Calculate under- or overdelivered flexibilities	Calculation of difference between requested activation volumes and actually delivered flexibilities		FRO	FRO	Deviation	
7.6		Conditional: Determine remuneration and penalties	Calculation of penalties for the over/under delivered flexibilities or delegating this to MO		FRO	FRO	Remunera-tion, Penalties	
7.7		Send invoicing data			FRO	SO, MO		

7.8		Send invoice	Invoicing of delivered flexibility		SO	FSP	Invoicing data	
7.9		Forward adjusted volumes to imbalance settlement	Report adjusted volumes to imbalance settlement		FRO	Imbalance Settlement Responsible (ISR), BRP	Adjusted imbalance volumes	
7.10		inform the customer	Provide information about the flexibility trades and prices (insights, informing)		FSP	RP	Measurement data, market price information	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
ProdSpec	Product Specification	The technical specification of the flexibility product (technical parameters, validation, requirements)	
Consent	Customer Consent	Permission of data owner to use its private data.	
FlexNeed	Flexibility Need	System operator's future need for flexibilities.	
ResInfo	Resource Information		
GridInfo	Grid Information	The depth of Grid Information may be different case-by-case ranging from full grid model to some information about grid topology to simple grid constraints as reported by SOs.	
GridRest	Grid Restrictions	Constraints assigned to flexibilities which cannot be (fully or partially) activated without causing congestions in the grid.	
FCT	Flexibility Call for Tenders	Flexibility call specification for a specific product	
FlexBid	Flexibility Bid	Offer made by Flexibility Service Provider for selling flexibility.	

MOL	Merit Order List	Rank of Flexibility Bids based on predefined criteria.	
FlexPur	Flexibility Purchase Offer	Offer made by System Operator for buying flexibility.	
OptRes	Optimisation results	Optimisation of Merit Order List taking into account the possible synergies of using the same bid for more than one service and/or buyer.	
MarOut	Market Outcome	the results of matching the offers/bid by MO	
FlexActReq	Flexibility Activation Request	Request made by SO to activate required flexibility.	
FlexActOrd	Flexibility Activation Order	Flexibility Activation Request forwarded to specific FSP.	
ActFlex	Activated Flexibility	Amount of flexibility activated according to Flexibility Activation Order.	
ProdPlan	Production Plan		
ConsPlan	Consumption Plan		
Baseline	Baseline		
DelivFlex	Delivered Flexibility		
Deviation	Deviation		
Remuneration	Remuneration		
Penalties	Penalties		
Invoicing data	Invoicing data		
	Adjusted imbalance volumes		
	Measurement data, market price information		
	Marketing information		
	Marketing, price/ customer incentive, technical information etc.		
	Flexibility related information		
	Contract information		
	Customer information		
	Flexibility Contractual obligations		
	Bid price for contract		
	Details on new FSP and asset		

6. Requirements (optional)

Requirements (optional)		
Categories ID	***Category name for requirements***	***Category description***
Requirement R-ID	***Requirement name***	***Requirement description***

7. Common terms and definitions

Common terms and definitions	
Term	***Definition***
Resource	***Single. Existing and future***
Resource pool	

9.2.2 Southern Cluster demo BUCs

9.2.2.1 Cypriot demo

Active power flexibility

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
SOCL-CY-02	Country market layer	Active power flexibility

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	07/05/2021	Markos Asprou and Lenos Hadjidemetriou		
2	21/05/2021	Markos Asprou and Lenos Hadjidemetriou	Complete Sections 1.5-3.2	
3	17/06/2021	Markos Asprou and Lenos Hadjidemetriou	Complete Sections 4 and 5	
4	03/08/2021	Markos Asprou and Lenos Hadjidemetriou	Revise step by step analysis to be consistent with the sequence diagrams	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Enhance of active power flexibility (i.e., ramping, droop control and power regulation) through the use of distributed flexible resources (energy storage and PV systems)
Objective(s)	• Maintain frequency stability • Demonstrate congestion management for maintaining capacity limits of the grid
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
Cyprus power system favors the massive installation of PV due to the climate conditions (abundant of sun) in order to achieve the national environmental target. The high penetration of renewables in combination with the islanded nature of the system creates critical challenges related to frequency stability and balancing (due to the unpredicted nature of RES). In addition, several distribution feeders in the island experience large concentration of PVs and as a result, local congestion problems (voltage and thermal limit violations) appear. Active power flexibilities provided within this use case will enhance the frequency stability, relieve the congestion of the system, and achieve a cost-effective operation of the system. This business use case

exploits the flexible resources of the distribution grid (large energy storage systems, PV parks, prosumers) to provide active power related services in the framework of primary, secondary reserve such as:

• Droop control of flexible resources to support frequency,

• Ramping control to compensate large power fluctuations.

Furthermore, the business use case will enable the participation of the distributed resources in the intra-day market by providing active flexibility services, such as:

• Peak shaving service to relieve local congestion problems,

• Power regulation to track day-ahead profile.

All these services will be procured by both the transmission and distribution system operators (TSO and DSO) to the TSO market and the DSO local market. The communication between the TSO and the DSO control center with the TSO market and the DSO local market respectively will be facilitated through the OneNet system. The energy market will allocate the services to the different flexible actors (aggregators and prosumers) according to the market rules. The activation of these services will be coordinated by the operators and/or based on the grid operating conditions.

The provision of droop and ramping control are currently provided by the conventional generation plants at the transmission level of the system, while this business use case will enable the distributed resources to provide and remunerated for these services. In addition, peak shaving services can provide local congestion management capabilities to minimize PV curtailments and increase the penetration of photovoltaic energy.

Complete description

The TSO and DSO monitor the system in real time to ensure the proper operation of the system within the desired limits. The monitoring of the transmission system is facilitated by PMUs and SCADA measurements while the monitoring of the distribution grid is enabled by smart meter and SCADA. In this BUC the Active Balancing congestion management (ABCM) platform at the TSO and DSO control center (ABCM-T and ABCM-D) play a critical role, while the OneNet system facilitates the information exchange between the different actors. In this BUC two distinct services are included namely the frequency balancing and the congestion management. A high-level description for the frequency balancing is provided below:

- The TSO procures frequency balancing products to the TSO and DSO local market.
- TSO and DSO send the location-based prequalified operational limits (as they were calculated through the ABCM-T and ABCM-D platforms) to the two markets respectively in order to ensure the safe operation of the transmission and distribution grid.
- FSPs at the transmission and distribution level send their bids in the TSO market and the local DSO market
- The local DSO market is cleared and the awarded availability bids are forwarded to the TSO market
- The TSO market is cleared and the awarded activation bids are sent to the FSPs at the transmission and distribution level.
- In the occurrence of a frequency event the awarded FSPs are activated automatically and (at the transmission and distribution level) provide frequency balancing.
- The TSO and DSO through the ABCM-T and ABCM-D platforms evaluate the response of their FSPs to the frequency event and send an evaluation report to the market.

In the case of the congestion management the services are limited only to the distribution grid therefore only the FSPs at the distribution grid provides congestion management services in order to overcome

overloading condition to the distribution grid. A high-level description for the congestion management is provided below:

- The DSO procures congestion management products to the DSO local market.
- DSO sends the location-based prequalified operational limits (as they were calculated through the ABCM-D platform) to the DSO local market in order to ensure the safe operation of the distribution grid.
- FSPs at the distribution level send their activation bids in the local DSO market.
- The local DSO market is cleared and the awarded activation bids are sent to the qualified FSPs at the distribution level.
- In the occurrence of a feeder overloading the awarded FSPs are activated through coordination signals sent by the ABCM-D platform in order to overcome grid congestion.
- The DSO through the ABCM-D platform evaluate the response of their FSPs to the congestion management event and send an evaluation report to the DSO local market.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Rate of Change of Frequency (ROCOF)	This indicator considers the maximum rate of change of frequency (in Hz/s) after an intense disturbance on system balancing	Frequency Stability
2	Frequency Nadir	This indicator considers the minimum frequency (in Hz) observed after an intense disturbance on system balancing	Frequency Stability
3	Overloading	This indicator will provide information for the duration and the intensity of the overloading conditions occurs at the distribution grid	Congestion management
4	System operating cost	The overall operational cost for the system to serve the demand considering forecasting uncertainties.	Cost-effective operation of the system

1.6. Use case conditions

Use case conditions
Assumptions- Prerequisites
The Active power flexibility use case will be based on the following assumptions: • The use case will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system. • The TSO, DSO control center and the energy market will be emulated in the demo architecture. • The energy market will be based on a generic market setup in the absence of an energy market in Cyprus • Additional PVs and energy storage systems will be installed to represent near future conditions. • Aggregators and prosumers will be emulated in the demonstration considering online coordination capabilities by system operators. The Active power flexibility use case has the following prerequisites: • Provision of PMU data from the transmission system • Provision of SCADA data and/or smart meter data from the distribution grid • Adoption of a generic energy market setup.

1.7. Further information to the use case for classification/mapping

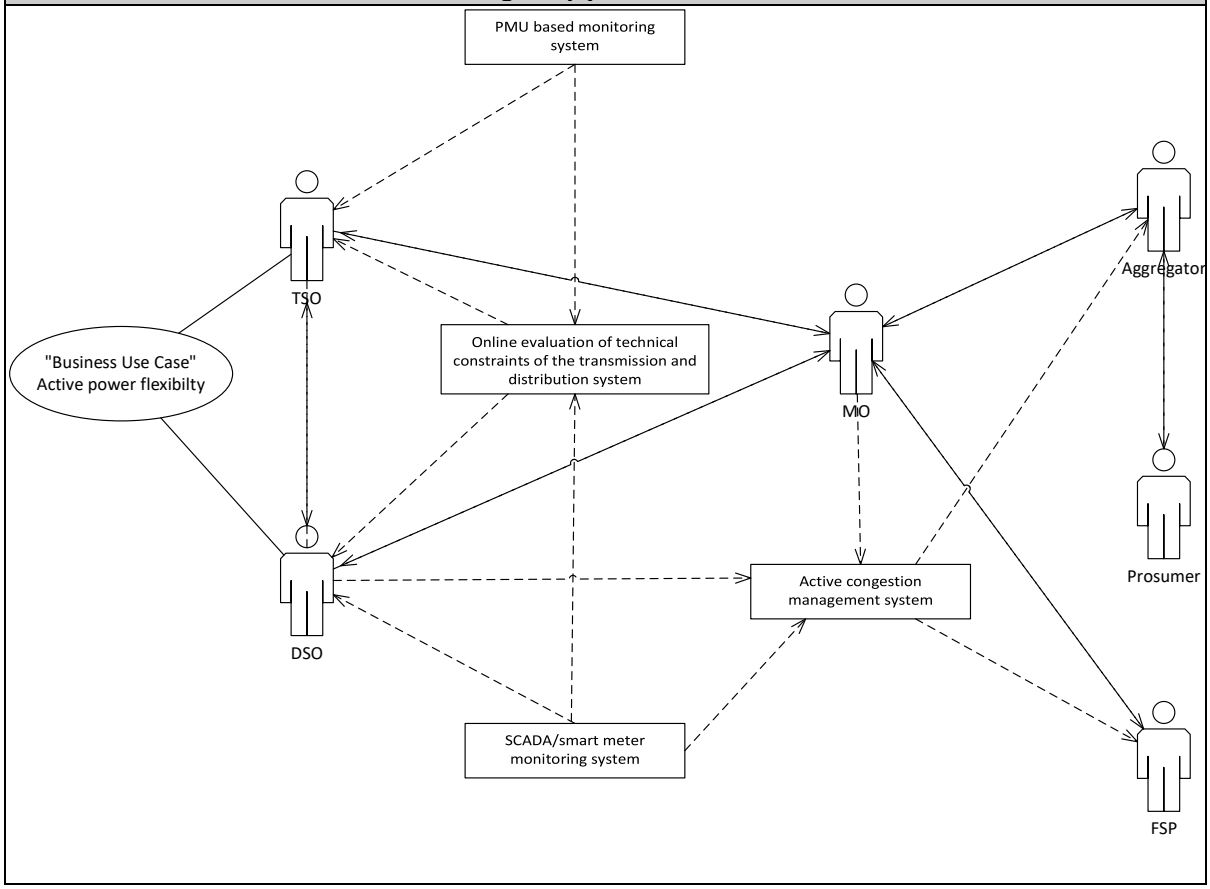
Classification information
Relation to other use cases
Level of depth
Prioritization
High
Generic, regional or national relation
Regional and national
Nature of the use case
Further keywords for classification
Active power, flexibility, frequency stability, congestion management

1.8. General remarks

There are no general remarks.

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors			
Grouping (e.g., domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Transmission system Operator	Business	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the transmission grid to meet reasonable demands for the transmission of electricity.	Transmission system Operator will procure products related to frequency and congestion management services. In addition, TSO will procure products related to day-ahead active power management services.
Distribution system operator	Business	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, for ensuring the long-term ability of the distribution grid to meet reasonable demands for the distribution of electricity.	Distribution system operator will procure products related to the congestion management services and will coordinate the provision of services.
Aggregator	Business	A party that aggregates resources for usage by a service provider for energy market services.	Aggregator will provide congestion and frequency management services, as well as day-ahead active power management services.
Prosumer	Business	A party that produces and consumes electricity.	Prosumer will provide congestion and frequency management services
Market operator	Business	A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility.	The market operator will award market products related to frequency and congestion management services, while MO will also handle products related to the day ahead active power management services.
Flexibility Service Provider (FSP)	Business	A party providing flexibility services to energy stakeholders via bilateral agreements or flexibility markets.	FSP will provide frequency and congestion management services

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Frequency disturbance	In the occurrence of a grid fault the protection mechanisms clear the fault, but a generation unit is lost and as a consequence an intense frequency disturbance occurs risking the frequency stability of the power system. The flexible resources (FSP, aggregators, prosumers) are triggered automatically and provide automatic frequency support and synthetic inertia to balance the frequency. The flexible resources participating in this scenario have already been awarded by the market (declaring their availability through bids) and their bids have been pre-qualified by the DSO in order to participate to the frequency support provision.	-FSP (energy storage, PVs) - Aggregators -Prosumers -TSO	Automatic trigger by the local frequency measurements at the flexible resources coupling point	-Enough flexible resources able to provide automatic frequency support	Flexible resources will increase or decrease their active power output in order to support the frequency stability.
2	Overloading conditions	Overloading conditions are observed in the distribution grid either by increased load demand or by intense reverse power flow due to PV generation. The flexible resources are coordinated by the DSO to provide active power regulation services in order to relieve the local congestion of the distribution grid. The flexible resources participating in this scenario have already been awarded by the market (declaring their	-FSP (energy storage, PVs) - Aggregators -Prosumers -DSO	Measured load flow at the distribution feeder	- PMU, sensor and smart meters are connected with the SCADA and AMI system to measure in real time the distribution grid operating conditions	Flexible resources will increase or decrease their active power output to shift an amount of energy to relieve congestion in the distribution grid.

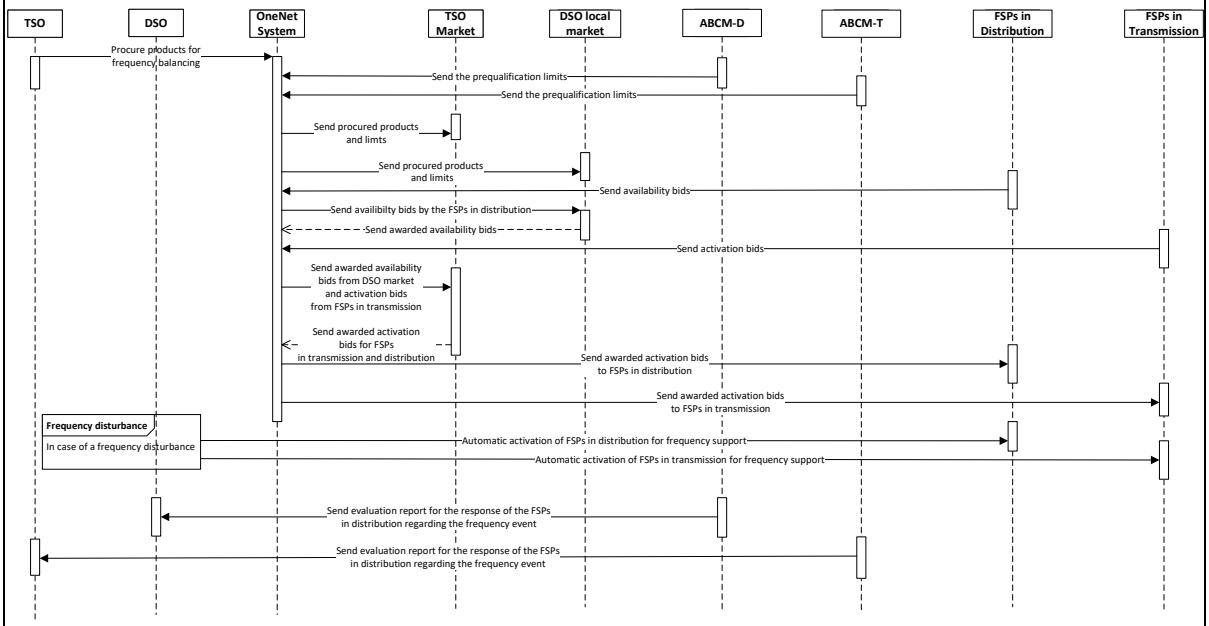
		availability through bids) and their bids have been pre-qualified by the DSO in order to participate to the active power control product for peak shaving services.				

4.2. Steps - Scenarios

Scenario name #1: Frequency disturbance

Scenario #1 description

A grid fault occurs, the protection mechanisms clear the fault, but a generation unit is lost and as a consequence an intense frequency disturbance occurs risking the frequency stability of the power system. The flexible resources (FSP, aggregators, prosumers) are triggered automatically and provide automatic frequency support and synthetic inertia to balance the frequency.



Scenario step by step analysis

Scenario								
Scenario name	Frequency disturbance							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Products procurement for	Procurement of Products	TSO sends procured products to TSO market	CREATE	TSO	TSO market and DSO	I1-01	

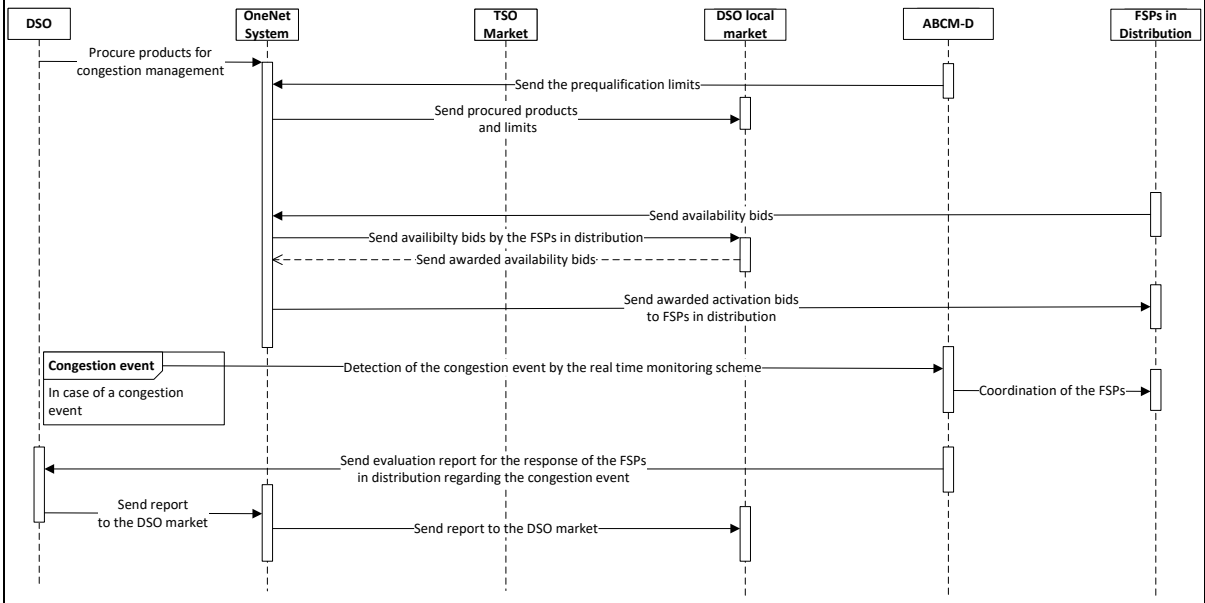
	frequency balancing		and DSO local market through the OneNet System			local market		
1.2	Prequalification of location-based limits	Prequalification	DSO and TSO determines the admissible limits (for having a safe operation of the grid) at the MV/LV and HV/MV interface respectively. This is done through using ABCM-D and ABCM-T platforms. The limits are sent to TSO and local DSO market through the OneNet system.	EXECUTE	TSO, DSO	TSO market and DSO local market	I1-02	
1.3	Bidding to the local DSO and TSO market for the frequency products	Bidding	FSPs in the transmission and distribution level bid for the frequency procured products in their respective market through the OneNet system.	CREATE	FSP	TSO market and DSO local market	I1-03	
1.4	Awarded bids are sent to the FSPs	Market clearing	TSO and DSO local market are cleared and the awarded bids are sent through the OneNet system to the FSPs	EXECUTE	TSO and market and DSO local market	FSPs	I1-04	
1.5	Frequency disturbance	Trigger of the event	A grid fault occurs, the	CREATE	TSO (transmissi	TSO, FSP,	I1-05	

			protection mechanisms clear the fault, but a generation unit is lost and as a consequence an intense frequency disturbance occurs risking the frequency stability of the power system.		on monitoring system)	Aggregator, Prosumer		
1.6	Frequency support	Provision of frequency support	The flexible resources (FSP, aggregators, prosumers) provide automatic frequency support and synthetic inertia to balance the frequency.	EXECUTE	FSP, Aggregator, Prosumer	TSO and DSO	I1-06	
1.7	FSPs evaluation response	Online evaluation of the frequency stability and the response of the FSPs to the frequency event	TSOs and DSOs through the ABCM-T and ABCM-D platforms evaluate the response of the FSPs to the frequency event. The evaluation is based on real time monitoring data. The evaluation is sent to the DSO local market and the TSO market	REPORT	TSO and DSO	Local DSO market and TSO market	I1-07	

Scenario name #2: Overloading conditions

Scenario #2 description

Overloading conditions are observed in the distribution grid either by increased load demand or by intense reverse power flow due to PV generation. The flexible resources are coordinated by the DSO to provide active power regulation services in order to relieve the local congestion of the distribution grid.



Scenario step by step analysis

Scenario								
Scenario name		Overloading conditions						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1	Products procurement for congestion management	Procurement of Products	DSO sends procured products to the DSO local market through the OneNet System	CREATE	DSO	DSO local market	I2-01	
2.2	Prequalification of location-based limits	Prequalification	DSO determines the admissible limits (for having a safe operation of the grid) at the MV/LV interface. This is done	EXECUTE	DSO	DSO local market	I2-02	

			through using ABCM-D. The limits are sent to local DSO market through the OneNet system.					
2.3	Bidding to the local DSO market for the frequency products	Bidding	FSPs in the distribution level bid for the congestion management procured products in the market through the OneNet system.	CREAT E	FSPs	DSO local market	I2-03	
2.4	Awarded bids are sent to the FSPs	Market clearing	DSO local market are cleared, and the awarded bids are sent through the OneNet system to the FSPs	EXECU TE	DSO local market	FSPs	I2-04	
2.5	Observe congestion to the distribution grid (overloading conditions)	Monitoring the distribution grid	Measurement s from distribution substations are received by the DSO SCADA. Measurement s from smart meters are received by the DSO AMI. The ABCM-D platform will process the measurement based on monitoring schemes and alarms will be provided in case of overloading conditions.	Report	SCADA, smart meters	DSO	I2-05	
2.6	Decision making to	Coordination of available	Based on the location and the	CREAT E	DSO	FSP, Aggregato	I2-06	

	relieve congestion	flexible resources	overloading conditions, the DSO defines the coordination set-points for the activation of the flexible resources through the ABCM-D platform. The coordination signals are sent to the flexible resources through the OneNet system.			r, Prosumer		
2.7	Provision of congestion management services	Relieve of overloading conditions	The flexible resources increase or decrease the active power output to provide energy shift and peak shaving services according to the DSO coordination set points in order to relieve the congestion.	EXECUTE	FSP, Aggregator, Prosumer	DSO	I2-07	
2.8	FSPs evaluation response	Online evaluation of the congestion management process and the response of the FSPs to the overloading conditions	DSO monitor the flexible resources based on smart meters for evaluating their responsiveness to the requested product. The evaluation report is provided to the market.	REPORT	DSO	Market operator	I2-08	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I1-01	Procured products	TSO procures products for frequency balancing services.	Communication between the TSO control center and the market through OneNet system
I1-02	Prequalified limits	TSO and DSO send to market the location based prequalified limits that should be respected.	Communication between the TSO and DSO control center and the market through OneNet system
I1-03	Bids of the FSPs	FSPs send bids for the frequency balancing products to the market	Communication between the FSPs and the market through OneNet system
I1-04	Awarded bids	Market sends the awarded bids to the qualified FSPs in both transmission and distribution level.	Communication between the market and the FSPs.
I1-05	Measurements	PMUs report the frequency measurements to the TSO control center for event notification.	Communication between the substations and the control center through IEEE C37.118
I1-06	Measurements	PMUs report the frequency measurements to the TSO and DSO control center for evaluating the response of the FSPs. The evaluation is performed through the ABCM-T and ABCM-D platform.	Communication between the substations and the control center through IEEE C37.118
I1-07	Report	TSO and DSO report to the market operator the evaluation report for the frequency support by the flexible resources.	Communication between TSO, DSO and the Market through OneNet system.
I2-01	Procured products	DSO procures products for congestion management services.	Communication between the DSO control center and the market through OneNet system
I2-02	Prequalified limits	DSO send to market the location based prequalified limits that should be respected.	Communication between the DSO control center and the market through OneNet system
I2-03	Bids of the FSPs	FSPs send bids for the congestion management products to the market.	Communication between the FSPs and the market through OneNet system
I2-04	Awarded bids	Market sends the awarded bids to the qualified FSPs in the distribution level.	Communication between the market and the FSPs.
I2-05	Measurements	Measurements from smart meters are reported to the DSO AMI.	Communication between the smart meters and the DSO AMI through Ethernet, PLC or GPRS.
I2-06	Coordination signals	Coordination signals are sent to the flexible resources by the DSO.	Communication between the DSO and the flexible resources through Ethernet, MQTT, or GPRS.

I2-07	Measurements	Smart meters and SCADA measurements are used for evaluating the response of FSPs during the congestion management event.	Communication between the flexible resources and the DSO through Ethernet, MQTT, or GPRS.
I2-08	Report	DSO report to the market operator the evaluation report for the congestion management services by the flexible resources.	Communication between DSO and the Market Operator

Reactive power flexibility and power quality

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
SOCL-CY-02	Country market layer	Reactive power flexibility and power quality

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	07/05/2021	Markos Asprou and Lenos Hadjidemetriou		
2	21/05/2021	Markos Asprou and Lenos Hadjidemetriou	Complete Sections 1.5-3.2	
3	17/06/2021	Markos Asprou and Lenos Hadjidemetriou	Complete Sections 4 and 5	
4	03/08/2021	Markos Asprou and Lenos Hadjidemetriou	Revise step by step analysis to be consistent with the sequence diagrams	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Enhance of reactive power flexibility and power quality (i.e., voltage support, congestion management, phase balancing) through the use of distributed flexible resources (energy storage and PV systems)
Objective(s)	• Maintain voltage stability • Demonstrate congestion management for maintaining capacity limits of the grid • Achieve power quality enhancement
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
Cyprus power system favors the massive installation of PV due to the climate conditions (abundant of sun) in order to achieve the national environmental target. The high penetration of renewables in specific feeders causes local congestion problems (voltage and thermal limit violations) in the distribution grid. In addition, the majority of loads are single phase connected to the grid, creating intense phase imbalances and thus the power quality and the grid capacity are negatively affected. Reactive power flexibilities provided within this use case will enhance the voltage stability, relieve the congestion of the system and increase the system efficiency, while phase balancing services will improve the power quality and increase the system capacity by symmetrizing the phase loading. Therefore, this business use case exploits the flexible resources of the distribution grid (large energy storage systems, PV parks, prosumers) to provide reactive power and phase balancing services. These services will be procured by the distribution system operator (DSO) to the DSO local market. The information exchange between the DSO control center and the local DSO market will be facilitated by

the OneNet system. The energy market will allocate the services to the different flexible actors (aggregators and prosumers) according to the market rules. The activation of these services will be coordinated by the operators and/or based on the grid operating conditions.

Currently, the reactive/voltage support is performed by reactors/capacitors installed in the transmission level or by predefined support schemes (i.e., cosφ(P)) provided by the PV inverters in the distribution grid. In addition, phase balancing has recently introduced in the IEEE standards for microgrids but has not been used in distribution grids. In this business use, reactive support and phase balancing will be provided by flexible resources and will be online coordinated by DSO to increase efficiency, relieve congestion, reduce curtailments and increase PV penetration. The flexible resources will be remunerated for these services enhancing their competitiveness in the energy market.

Complete description

The DSO monitors the system in real time to ensure the proper operation of the system within the desired limits. The monitoring of the distribution grid is enabled by smart meter and SCADA. In this BUC the Active Balancing congestion management platform at the DSO control center (ABCM-D) play a critical role, while the OneNet system facilitates the information exchange between the different actors in the distribution grid. A high-level description for the congestion management is provided below:

- The DSO procures congestion management products (phase balancing and reactive support) to the DSO local market.
- The DSO sends the location-based prequalified operational limits (as they were calculated through the ABCM-D platform) to the DSO local market in order to ensure the safe operation of the distribution grid.
- FSPs at the distribution level send their activation bids in the local DSO market
- The local DSO market is cleared and the awarded activation bids are sent to the qualified FSPs at the distribution level.
- In the occurrence of a power quality issue or voltage limit violation the awarded FSPs are activated through coordination signals sent by the ABCM-D platform in order to overcome grid congestion.
- The DSO through the ABCM-D platform evaluate the response of their FSPs to the congestion management event and send an evaluation report to the DSO local market.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Voltage limits violations	This indicator will provide information for the duration and the intensity of the over/under-voltage conditions occurs at the distribution grid	Congestion management, Voltage stability
2	Energy losses	Energy losses dissipated to the distribution grid	Congestion management
3	Loading asymmetries	This indicator will provide information about the loading asymmetry of the three phases, before and after the power quality enhancement	Power quality enhancement
4	Overloading	This indicator will provide information for the duration and the intensity of the overloading conditions occurs at the distribution grid	Congestion management

1.6. Use case conditions

Use case conditions
Assumptions

Prerequisites
The Reactive power flexibility use case will be based on the following assumptions: • The use case will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system. • The TSO, DSO control center and the energy market will be emulated in the demo architecture. • The energy market will be based on a generic market setup in the absence of an energy market in Cyprus • Additional PVs and energy storage systems will be installed to represent near future conditions. • Aggregators and prosumers will be emulated in the demonstration considering online coordination capabilities by system operators. The Reactive power flexibility use case has the following prerequisites: • Provision of PMU data from the transmission system • Provision of SCADA data and/or smart meter data from the distribution grid • Adoption of a generic energy market setup.

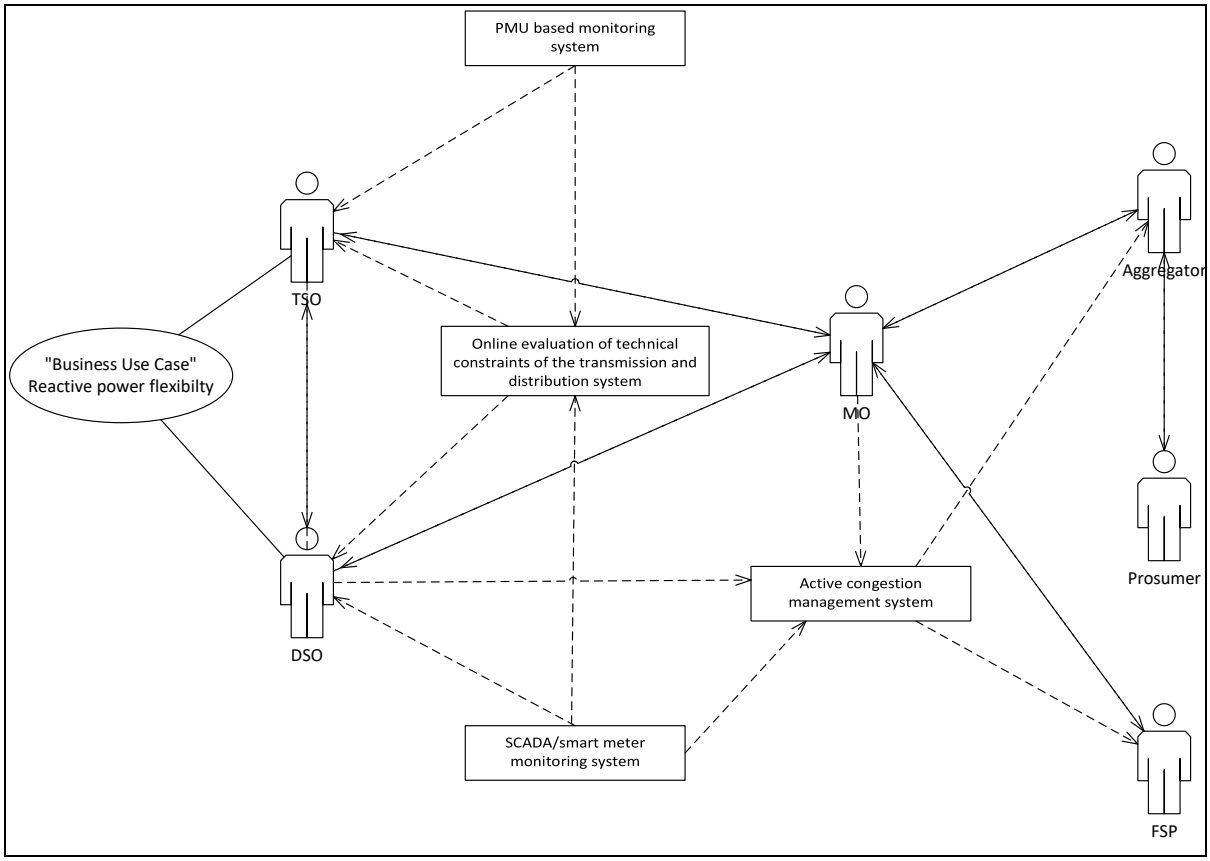
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
Level of depth
Prioritisation
High
Generic, regional or national relation
Regional and national
Nature of the use case
Further keywords for classification
Reactive power, flexibility, voltage stability, congestion, power quality

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Transmission system Operator	Business	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the transmission grid to meet reasonable demands for the transmission of electricity.	Transmission system Operator will procure products related to congestion management and voltage stability services.
Distribution system operator	Business	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, for ensuring the long-term ability of the distribution grid to meet reasonable demands for the distribution of electricity.	Distribution system operator will procure products related to the congestion management, power quality and voltage stability services and will coordinate the provision of services.
Aggregator	Business	A party that aggregates resources for usage by a service provider for energy market services.	Aggregator will provide congestion, voltage stability,

			and phase balancing services.
Prosumer	Business	A party that produces and consumes electricity.	Prosumer will provide congestion, voltage stability and phase balancing services
Market operator	Business	A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility.	The market operator will award market products related to congestion management, voltage stability and power quality services.
Flexibility Service Provider (FSP)	Business	A party providing flexibility services to energy stakeholders via bilateral agreements or flexibility markets.	FSP will provide congestion management, voltage stability and phase balancing services.

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

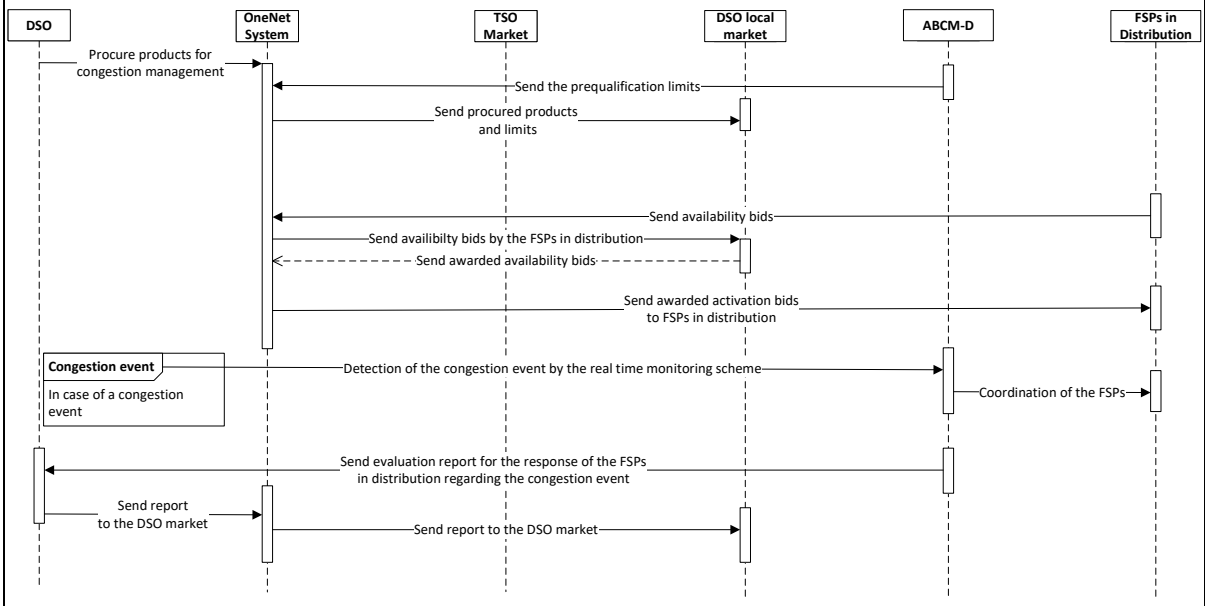
Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Reactive power compensation and power quality enhancement	Monitoring and evaluation of the distribution grid operating conditions by the DSO. In case of voltage or power factor limit violation the DSO will coordinate the flexible resources to provide reactive power flexibility and power quality services (phase balancing). The flexible resources participating in this scenario have already been awarded by the market (declaring their availability through bids) and their bids have been pre-qualified by the DSO in order to participate to the reactive power compensation and power quality enhancement.	-FSP (energy storage, PVs) - Aggregators -Prosumers -DSO	Measured operating condition in distribution feeder	- Sensor and smart meters are connected with the SCADA and AMI system to measure in real time the distribution grid operating conditions	Flexible resources will regulate the provision of reactive power flexibility and power quality services to relieve the congestion in the distribution grid and improve the grid efficiency and power quality.

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

Monitoring and evaluation of the distribution grid operating conditions by the DSO. In case of voltage or power factor limit violation the DSO will coordinate the flexible resources to provide reactive power flexibility and power quality services (phase balancing).



Scenario step by step analysis

Scenario								
Scenario name		Reactive power compensation and power quality enhancement						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Products procurement for congestion management	Procurement of Products	DSO sends procured products to the DSO local market through the OneNet System	CREATE	DSO	DSO local market	I1-01	
1.2	Prequalification of location-based limits	Prequalification	DSO determines the admissible limits (for having a safe operation of the grid) at the MV/LV interface. This is done through using	EXECUTE	DSO	DSO local market	I1-02	

			ABCM-D. The limits are sent to local DSO market through the OneNet system.					
1.3	Bidding to the local DSO market for the frequency products	Bidding	FSPs in the distribution level bid for the congestion management procured products in the market through the OneNet system.	CREATE	FSPs	DSO local market	I1-03	
1.4	Awarded bids are sent to the FSPs	Market clearing	DSO local market are cleared, and the awarded bids are sent through the OneNet system to the FSPs	EXECUTE	DSO local market	FSPs	I1-04	
1.5	Observe congestion to the distribution grid (power quality and power factor issues)	Monitoring the distribution grid	Measurements from distribution substations are received by the DSO SCADA. Measurements from smart meters are received by the DSO AMI. The ABCM-D platform will process the measurement based on monitoring schemes and alarms will be provided in case of power quality or power factor limit violation.	Report	SCADA, smart meters	DSO	I1-05	
2.6	Decision making to	Coordination of available	Based on the location of the congestion	CREATE	DSO	FSP, Aggregato	I1-06	

	relieve congestion	flexible resources	(power quality and power factor limit violation) the DSO defines the coordination set-points for the activation of the flexible resources through the ABCM-D platform. The coordination signals are sent to the flexible resources through the OneNet system.			r, Prosumer		
2.7	Provision of congestion management services	Improvement of power quality and power factor	The flexible resources increase or decrease the reactive power output to provide phase balancing and power factor correction services according to the DSO coordination set points in order to relieve the congestion.	EXECUTE	FSP, Aggregator, Prosumer	DSO	I1-07	
2.8	FSPs evaluation response	Online evaluation of the congestion management process and the response of the FSPs to the event	DSO monitor the flexible resources based on smart meters for evaluating their responsiveness to the requested product. The evaluation report is provided to the market.	REPORT	DSO	Market operator	I1-08	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I1-01	Procured products	DSO procures products for congestion management services.	Communication between the DSO control center and the market through OneNet system
I1-02	Prequalified limits	DSO send to market the location based prequalified limits that should be respected.	Communication between the DSO control center and the market through OneNet system
I1-03	Bids of the FSPs	FSPs send bids for the congestion management products to the market.	Communication between the FSPs and the market through OneNet system
I1-04	Awarded bids	Market sends the awarded bids to the qualified FSPs in the distribution level.	Communication between the market and the FSPs.
I1-05	Measurements	Measurements from smart meters are reported to the DSO AMI.	Communication between the smart meters and the DSO AMI through Ethernet, PLC or GPRS.
I1-06	Coordination signals	Coordination signals are sent to the flexible resources by the DSO.	Communication between the DSO and the flexible resources through Ethernet, MQTT, or GPRS.
I1-07	Measurements	Smart meters and SCADA measurements are used for evaluating the response of FSPs during the congestion management event.	Communication between the flexible resources and the DSO through Ethernet, MQTT, or GPRS.
I1-08	Report	DSO report to the market operator the evaluation report for the congestion management services by the flexible resources.	Communication between DSO and the Market Operator

9.2.2.2 Greek demo

Enhanced Active/Reactive Power Management for TSO-DSO coordination

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
SOCL-GR-01	GR	Enhanced Active/Reactive Power Management for TSO-DSO coordination

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	07/05/2021	Nenad Sijakovic and Aleksandar Terzic		
2	21/05/2021	Nenad Sijakovic and Aleksandar Terzic		
3	21.08.2021	Nenad Sijakovic and Aleksandar Terzic		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Improved identification of the available flexibility resources, focused on a DSO voltage level, together with the improved identification of the power system flexibility needs, focused on a TSO voltage level grid, on a longer time span and wider geographical scope than the one being utilised today, through a simultaneous DSO and TSO and grid simulations backed up by AI based calculation engines.
Objective(s)	- Frequency stability - Load flow and contingency monitoring and predictions - Predictive congestion management for maintaining secure and stable power system operation - Cost-effective operation of the system - Early warning on a hazardous power system regimes, - Better FSPs planning and managing flexibility resources. - Better energy predictions and power system state predictions - Improved identification of the available flexibility resources on all power system levels. - Improved prediction of the system flexibility needs.
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
Identification of the available flexibility resources, from residential prosumers to the centralised WPPs and SPPs connected to the distribution grid or any local micro-grid (local energy community), through improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration and its presentation with the improved observability on a higher operational control and monitoring levels, including regional, RSC level. In parallel an improved power system state estimation

will be developed in order to better predict system flexibility needs, with the wider geographical observability and longer “look into the future”.

Complete description

F-channel application, that will be developed under WP8 – southern cluster (Greece) will be capable of identifying flexibility resources more precisely and simultaneously for both DSO and TSO grid levels, mainly under OneNet focusing on the lower voltage levels prosumers, that are usually not being covered with that detailed energy predictions, as well as identifying the power system state (the need for the flexibility services) in a much more precise manner and longer time horizons than it is being done today, covering wider geographical scope than it is being covered today by national control centres, and/or RSCs. The aim is to improve production/consumption predictions for different voltage level entities, from residential prosumers to the centralized WPPs and SPPs connected to the distribution grid or any local micro grid (local energy communities), through improved forecasting efficiency from increased spatial resolution NWPs and AI integration into the short to mid-term power system planning simulations.

- Improved identification of the available flexibility resources.
- Improved prediction of the system flexibility needs.

The application itself will not depend on the exact product being utilized within the market, or the market model itself (it will be possible to use it for different services and products, and different market models). It will focus on a predictive management of a products and need for those products. Possibility for products from a micro grid and DSO levels to be recognised and available for utilisation on higher voltage levels (TSOs, RSCs…) as well as on the administrative aggregator’s level:

- improved system-oriented predictions and forecasting efficiency ->limit the volume of flexibility needs,
- identification of the flexibility resources to procure grid services, and
- better FSPs planning and managing flexibility resources.

The main foreseen benefits/functionalities related to this particular business case (Enhanced Power Management for TSO-DSO coordination) are as follows:

- Identification of the available flexibility resources from DSO and microgrid voltage levels
- DSO, DG and micro grid POI management (Point of Interest updates, technical data, historic data, forecasted data…)
- Change View - different aggregation level simulations (Energy predictions and system state predictions for different aggregation levels of DSO grid and local micro grid: unit level (distributed gen. unit, OHL tower/section), plant level (solar park, wind park, OHL, substation), local micro grid level (part of the DSO grid), DSO/TSO grid level calculations.)
- Improved congestion management process on TSO and RSC side (Improved short-term forecasts, contingency analysis and capacity calculations through utilisation of the information from DSO and/or local micro grid operators.)
- Improved frequency control on TSO side
- Improved Voltage control on DSO and TSO side
- Improved System adequacy on DSO and TSO side
- Improved Islanded operation on DSO and TSO side

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Energy production prediction error		- Frequency stability - Load flow and contingency monitoring and predictions - Predictive congestion management for maintaining secure and stable power system operation

			- Early warning on a hazardous power system regimes, - Better FSPs planning and managing flexibility resources. - Better energy predictions and power system state predictions - Improved identification of the available flexibility resources on all power system levels. - Improved prediction of the system flexibility needs.
2	Load prediction error		- Frequency stability - Load flow and contingency monitoring and predictions - Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes, - Better FSPs planning and managing flexibility resources. - Better energy predictions and power system state predictions - Improved identification of the available flexibility resources on all power system levels. - Improved prediction of the system flexibility needs.
3	Load flow prediction error		- Frequency stability - Load flow and contingency monitoring and predictions - Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes, - Better FSPs planning and managing flexibility resources. - Better energy predictions and power system state predictions - Improved identification of the available flexibility resources on all power system levels. - Improved prediction of the system flexibility needs.
4	Capacity prediction error		- Load flow and contingency monitoring and predictions - Predictive congestion management for maintaining secure and stable power system operation
5	Transmission losses prediction error		- Cost-effective operation of the system
6	Contingency identification rate		- Better energy predictions and power system state predictions

			- Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes
7	Early warning on a hazardous power system regimes rate		- Better energy predictions and power system state predictions - Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes

1.6. Use case conditions

Use case conditions		
Assumptions		
• The use case will be developed and demonstrated in a non-invasive, offline environment using the power system simulation models, • Aggregators and prosumers will be simulated in the demonstration. • Additional DERs will be simulated, if necessary, in order to represent the near future conditions		
Prerequisites		
1	Availability of the network and market data	• Network models (in raw or uct file exchange format) data: IPTO and HEDNO network models (400 kV, 220 kV, 150 kV, 110 kV, 35 kV and 20 kV) voltage levels), • Geospatial data: GPS coordinates, locations of considered RES production POIs and other power system elements of interest, including detailed routing and positions of each tower for the analysed WPPs and OHLs. • Technical data: Technical data on wind turbines, solar parks, OHLs • Historic weather and energy data: historic measured and forecasted data related to the weather and energy production/consumption of the analysed points of interest in Greece (Crete and Peloponnese). • Information on the current practice and state of the art with the tools used for the forecasting, congestion management and balancing in TSO, DSO and producer/aggregator. • Energy policy information: Information on applicable EU Directives and Regulations that are of interest for TSO-DSO coordination.
2	Active participation of the primary users (TSO, DSO, aggregator)	TSO, DSO and aggregator's departments for short term planning as well as departments for system operations and control should be deeply involved in the simulations and testing of the platform.

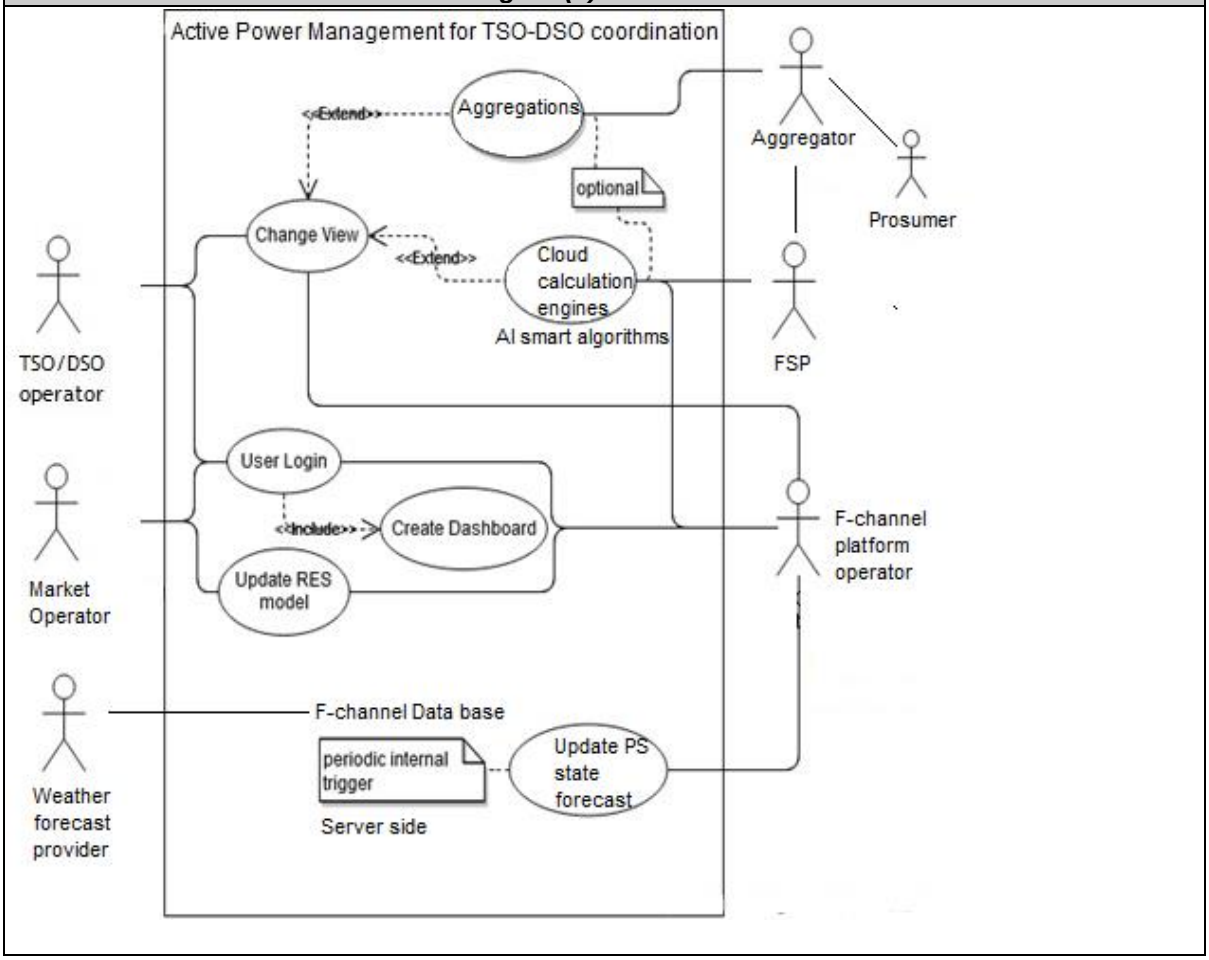
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
As already stated, the F-channel application itself will not depend on the exact product being utilized within the market, or the market model itself (it will be possible to use it for different services and products, and different market models) at the same time to demonstrate its usefulness and supremacy over existing similar tools and application with various Use Cases, that will be defined and

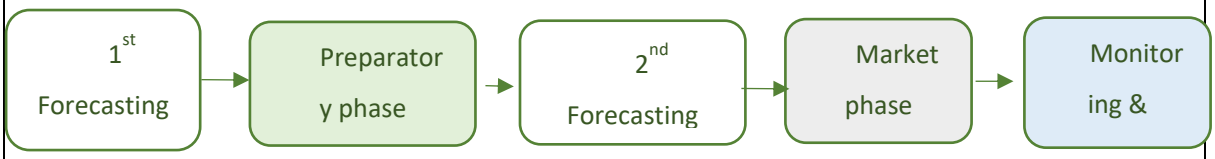
implemented under OneNet project. The immediate connection can be found with the following system use cases: - Enhanced severe weather condition management and outage management, - Active power flexibility, - Reactive power flexibility.
Level of depth
Prioritisation
High
Generic, regional or national relation
Use case can be implemented in any geographical region on local, national, or regional level.
Nature of the use case
Further keywords for classification
Predictive congestion management, Power system forecasts, Energy predictions, Load forecast, Flexibility resources identification, Flexibility system needs predictions

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


Market process diagram:



Forecasting phase:

- Makes a forecast of potential flexibility resources
- Exchange information about potential flexibility resources
- Informs potential flexibility resources
- Optimize Portfolio

Preparatory phase:

- Define the prequalification requirements
- Send the prequalification requirements
- FSP notifies that he is interested in providing flexibility services.
- Send the prequalification requirements
- Forward the fulfilled prequalification requirements
- Evaluation of the Product & Grid prequalification requirements
- Request additional prequalification information
- Send additional prequalification information
- Accept / Reject registration on Market
- Notify of prequalification result

2nd forecasting phase:

- Makes a forecast of possible congestion areas
- Exchange information about possible congestion areas
- Informs possible congestion areas
- Publish the possible congestion areas
- Optimize Portfolio
- Makes a forecast of the grid status
- Check power flows
- Detect possible congestions
- System reconfiguration
- Assesses the amount of flexibility required
- Exchange information about the amount of flexibility required

Market phase:

- Offer active power flexibility products
- Informs the amount of flexibility required
- Capacity Bids Selection
- Selects the bids that may be a solution
- Sends the capacity bids
- Technical evaluation of the bids
- Accept bids
- Sorts the bids by a merit order list
- Sends the accepted/rejected capacity bids
- Notifies the result and if accepted commits the FSP to make bid available on the ST Market
- Selects the bids that may be a solution
- Sends the bids
- Technical evaluation of the bids
- Accept bids
- Sorts the bids by a merit order list
- Send the accepted/rejected bids
- Check the Location of the bids
- Notifies the result and if accepted commits the FSP to make bid available on the ST Market
- Sends the information of the bid
- Evaluates grid constraints
- Accept/Reject bid
- Notifies the result and if accepted commits the FSP to make bid available on the ST Market

Monitoring & activation phase:

- Sharing of accepted bids
- Checks grid constrains
- Informs what Bids can/cannot be activated
- Allows/Not allow bid activation
- Informs the result
- Informs the activation of the bid

3. Technical details

3.1. Actors

Actors	
Grouping (e.g. domains, zones)	***Group description***

Actor name	*Actor type*	*Actor description*	*Further information specific to this use case*
Weather forecast provider;	Information provider	Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid.	POI weather forecasts are used as an input data for energy predictions, as well as for AI base PS state forecast.
Load Forecasting operator (DSO/Micro-grid operator);	Information provider	DSO/Short term planning department load forecasting operator is responsible for consumption short term, mid-term and long-term forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.	Load forecasts are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis.
Production Forecasting operator (DSO/Micro-grid operator);	Information provider	DSO/Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid-term and long-term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.	Production forecasts (in the case of F-channel, wind and solar parks production forecasts) are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis.
Production Forecasting operator (TSO/Aggregator);	Information receiver/provider	TSO/Aggregator Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid-term and long-term production forecasts, later on used for TSO level modelling under f-channel	Production forecasts (in the case of F-channel, wind and solar parks production forecasts) are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis.

		platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.	
Load Forecasting operator (TSO/Aggregator);	Information receiver/ provider	TSO/Aggregator Short term planning department load forecasting operator is responsible for consumption short term, mid-term and long-term forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.	Load forecasts are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis.
Flexibility Register Operator (FRO);	Information receiver		
Production scheduling operator (market operator);	Information receiver		
DACF operator (TSO and corresponding expert in DSO);	Information receiver/ provider	An expert from TSO/Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures…If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power system and first neighbouring systems.	DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the IGM - Individual Grid Model, and perform n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models.
2DACF operator (TSO and corresponding expert in DSO);	Information receiver/ provider	The same as previous	The same as previous
IGM manager (TSO and corresponding expert in DSO);	Information receiver/ provider	TSO/Short term planning department Expert/s responsible	IGM is being produced using production forecasts, load

		for development, maintenance and regular updates of Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis.	forecasts and condition forecasts outputs.
ATC calculator (TSO and RSC);	Information receiver/ provider	TSO/Short term planning department Expert in charge of short to long term available capacity calculations, flow-based or ATC based (bilateral or composite values).	IGM is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs. IGM is than being transferred back to TSO main server and processed by ATC calculator for further available capacity calculations or simulations are done in a virtual f-channel grid environment.
Power system control expert (TSO/DSO);	Information receiver	TSO Operational personnel working on intraday - real time power system control and operations in a dispatching room, using DACF, 2DACF, Outage schedules, production schedules and Contingency Analysis outputs that are prepared on a 2day-ahead, or day-ahead basis. Also, these experts are using SCADA/EMS in order to perform intraday 5-15 min simulations and contingency analysis in order to update of the same analysis in a real time....	IGM, with 2-4 per day updates, is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs, covered by EUROPAN forecasting tool. IGM is than being transferred back to TSO main server and processed by operational personnel.
Balancing mechanism operator (TSO)	Information receiver		

RES Scheduling operator (TSO based);	Information receiver		
Losses calculator (TSO)	Information receiver	Improved forecasting of grid losses and available future capacities	
Regional DACF operator (RSC)	Information receiver	An expert from RSC-Regional Security Centre, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of proposed mitigation measures. If the DACF is performed by a RSC than targeted, analysed system is usually regional, CCR based network model (CGM - Common Grid Model).	RSC's DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the CGM - Common Grid Model, and performed n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models, in this case covering its CCR.
Regional 2DACF operator (RSC)	Information receiver	The same as previous	The same as previous
CGM manager (RSC)	Information receiver	TSO/Short term planning department or and RSC's Expert/s responsible for development, maintenance and regular updates of a Common Grid Models containing consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...CGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis.	CGM is being produced using production forecasts, load forecasts and condition forecasts submodule outputs. CGM in the case of the EUROPAN platform represents an interface between a simulation/calculation/analysis tool that already exist in the RSC and/or TSO Energy Management Systems.
ATC coordinated calculator (TSO or RSC)	Information receiver	RSC's Expert in charge of short to long term available capacity calculations, flow-	CGM is being processed under EUROPAN platform, being updated with the new production, load and capacity/rating values for

		based or ATC based (bilateral or composite values), calculated in a coordinated manner for all regional borders simultaneously or at least during the same calculation process.	selected POIs, covered by EUROPAN forecasting tool. CGM is than being transferred back to RSC main server and processed by ATC calculator for further available capacity calculations.
Production Forecasting/Scheduling operator (Regional RES coordinator)	Information receiver	Future regional RES production coordinators…Still does not exist but is foreseen by CEP…It will have a coordination role for all RES units, not only national/system located but all regional RES production will be run from this body. The role and relationship with the EUROPAN will be similar to what is now being used by TSOs for this same functionality which covers production forecasts.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Contingency identification and mitigation	Potential contingencies are identified up front (predicted) in the distribution and transmission grids via improved power system state prediction tools. The flexible resources are coordinated by the DSO and TSO to provide active power regulation services in order to relieve the local contingency of the grid. The	-FSP (energy storage, PVs) -Aggregators -Prosumers -DSO -TSO	Predicted contingency in the DSO or TSO grid	- High resolution Numerical Weather Predictions with the extended geographical coverage and look into the future. Available DSO and TSO voltage level forecasted grid models.	Flexible resources will increase or decrease their active power output to shift an amount of energy to resolve contingency in the distribution or transmission grid.

		flexible resources participating in this scenario have already been awarded by the market (declaring their availability through bids) and their bids have been pre-qualified by the DSO or TSO in order to participate to the Predictive short-term local active product.				
2	Coordinated voltage control	Potential overvoltage or under voltage severe states are identified, predicted up front. This are the states that can endanger overall power system voltage stability. In case of voltage instability, the DSO will coordinate the flexible resources to provide reactive power flexibility. The flexible resources participating in this scenario have already been awarded by the market (declaring their availability through bids) and their bids have been pre-qualified by the DSO in order to participate to the reactive power compensation. It is also possible to use the reactive power from a TSO level through the interconnection transformers with the TAP change possibility.	-FSP (energy storage, PVs) -Aggregators -Prosumers -DSO -TSO	Predicted overvoltage or under voltage severe states in the DSO or TSO grid		In the occurrence of a predicted overvoltage or under voltage severe state that can endanger overall power system voltage stability. Provide/absorb of a certain amount MVarh in specific timeframes in local distribution grid through optimized coordinated tap change control on TSO-DSO interface, through an improved forecasts of the power system state on both TSO and DSO voltage levels. It can be used to regulate voltage and reduce energy losses in distribution grid and is linked with the voltage control. The reactive support product will be automatically activated, and the flexibility resource will provide reactive compensation to the distribution grid when needed. The activation time

						could be from 15 minutes to 1 hour.
3	Improved power regulation through mFRR and RR	Provide identification of flexibility resources (primary, secondary and available tertiary reserve) more precisely, as well as identification of the flexibility needs in a more precise manner and longer time horizon than it is being done today. The activation time could be from 15 minutes to 1 hour.	-FSP (energy storage, PVs) -Aggregators -Prosumers -TSO	Predicted available reserves in the DSO or TSO grid	- High resolution Numerical Weather Predictions with the extended geographical coverage and look into the future. Available DSO and TSO voltage level forecasted grid models.	Flexible resources will increase or decrease their active power output in order to support the frequency stability.

4.2. Steps - Scenarios

Scenario name #1: Contingency identification and mitigation

Scenario #1 description

Potential contingencies are identified up front (predicted) in the distribution and transmission grids via improved power system state prediction tools. The flexible resources are coordinated by the DSO and TSO to provide active power regulation services in order to relieve the local contingency of the grid. The flexible resources participating in this scenario have already been awarded by the market (declaring their availability through bids) and their bids have been pre-qualified by the DSO or TSO in order to participate to the Predictive short-term local active product.

Provide/absorb of a certain amount MWh in specific timeframes in local distribution grid. This CM product will be automatically activated, and the flexibility resource will provide peak shaving services to the distribution grid when needed. The resources could be connected to both transmission or distribution grid. The activation time could be from 15 minutes to 1 hour.

Scenario step by step analysis

Scenario								
Scenario name		Contingency identification and mitigation						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Weather predictions	Trigger of the scenario	Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather	CREATE	Weather forecast provider;	TSO, DSO short term planning departments	I1-01	

			forecasts for selected weather parameters and selected locations in the grid is providing us with the high-resolution NWP.					
1.2	Energy predictions	Calculation of energy production and consumption	DSO/TSO Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid-term and long-term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.	CREATE	Production and Load forecasting operator in DSO and TSO	IGM model operators	I1-02	
1.3	IGM updates	Updating the INDIVIDUAL Grid Models	TSO/DSO Short term planning department Expert/s responsible for development, maintenance and regular updates of Individual Grid Models containing: consumption	CREATE	IGM model operators	DACF and 2DACF operators in TSO and DSO	I1-03	

			nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems. IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis.					
1.4	Contingency predictions	Contingency analysis and identification of the problems in the system	An expert from TSO/DSO Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures…If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power	REPORT	DACF and 2DACF operators in TSO and DSO	Power system control expert (TSO/DSO);	I1-04	

			system and first neighbouring systems. Based on energy production and consumption predictions, grid simulation models are formed in order to be able to perform contingency analysis and identify potential contingencies in the grid.					
1.5	Mitigation measure identification	Identification of the list of potential mitigation measures	An expert from TSO/DSO Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of possible mitigation measures.	REPORT	DACF and 2DACF operators in TSO and DSO	Power system control expert (TSO/DSO);	I1-05	
1.6	FSP response	Evaluation of the available responsiveness of the flexible resources	Monitoring of the responsiveness of the flexible resources by the TSO and DSO in order to evaluate whether the flexible resources have the proper response to the event. The evaluation	EXECUTE	TSO and DSO, FSPs	Market operator	I1-06	

			report is provided to the market operator.					

Scenario name #2: Coordinated voltage control

Scenario #2 description

Potential overvoltage or under voltage severe states are identified, predicted up front. This are the states that can endanger overall power system voltage stability. In case of voltage instability, the DSO will coordinate the flexible resources to provide reactive power flexibility. The flexible resources participating in this scenario have already been awarded by the market (declaring their availability through bids) and their bids have been pre-qualified by the DSO in order to participate to the reactive power compensation. It is also possible to use the reactive power from a TSO level through the interconnection transformers with the TAP change possibility. In the occurrence of a predicted overvoltage or under voltage severe state that can endanger overall power system voltage stability. Provide/absorb of a certain amount MVarh in specific timeframes in local distribution grid through optimized coordinated tap change control on TSO-DSO interface, through an improved forecasts of the power system state on both TSO and DSO voltage levels. It can be used to regulate voltage and reduce energy losses in distribution grid and is linked with the voltage control. The reactive support product will be automatically activated, and the flexibility resource will provide reactive compensation to the distribution grid when needed. The activation time could be from 15 minutes to 1 hour.

Scenario step by step analysis

Scenario								
Scenario name		Coordinated voltage control						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1	Weather predictions	Trigger of the scenario	Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid is providing us with the high-	CREATE	Weather forecast provider;	TSO, DSO short term planning departments	I2-01	

			resolution NWP.					
2.2	Energy predictions	Calculation of energy production and consumption	DSO/TSO Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid-term and long-term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.	CREATE	Production and Load forecasting operator in DSO and TSO	IGM model operators	I2-02	
2.3	IGM updates	Updating the INDIVIDUAL Grid Models	TSO/DSO Short term planning department Expert/s responsible for development, maintenance and regular updates of a Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile,	CREATE	IGM model operators	DACF and 2DACF operators in TSO and DSO	I2-03	

			assumed power exchanges with the neighbouring systems...IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis.					
2.4	Voltage condition prediction	Load flow and voltage profile calculation	Voltage profile for all power system substations that are in operation.	REPORT	DACF and 2DACF operators in TSO and DSO	Power system control expert (TSO/DSO);	I2-04	
2.5	Mitigation measure identification	Identification of the list of potential mitigation measures	Identification of a FSPs that can contribute to the resolution of the identified over or under voltage in the system.	REPORT	DACF and 2DACF operators in TSO and DSO	Power system control expert (TSO/DSO);	I2-05	
2.6	Provision of reactive power flexibility services	Maintain proper and efficient grid operation	The flexible resources regulate their reactive power injection to the grid to relieve congestion, improve voltage stability and power factor and symmetrize the grid loading condition. These services are provided according to the DSO coordination set points. The provision of the services	EXECUTE	FSP, Aggregator, Prosumer	DSO	I2-06	

			is reported back to the DSO.					

Scenario name #3: Improved power regulation through mFRR and RR

Scenario #3 description

Provide identification of flexibility resources (primary, secondary and available tertiary reserve) more precisely, as well as identification of the flexibility needs in a more precise manner and longer time horizon than it is being done today. The activation time could be from 15 minutes to 1 hour. Flexible resources will increase or decrease their active power output in order to support the frequency stability.

Scenario step by step analysis

Scenario								
Scenario name		Improved power regulation through mFRR and RR						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
3.1	Weather predictions	Trigger of the scenario	Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid is providing us with the high-resolution NWP.	CREATE	Weather forecast provider;	TSO, DSO short term planning departments	I3-01	
3.2	Energy predictions	Calculation of energy production and consumption	DSO/TSO Short term planning department production forecasting operator is responsible for wind, solar	CREATE	Production and Load forecasting operator in DSO and TSO	TSO (transmission monitoring system)	I3-02	

			and hydro, short term, mid-term and long-term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.					
3.3	mFRR and RR activation necessary	Trigger of the scenario	TSO needs to activate secondary or tertiary reserve in order to maintain the frequency in the system and maintain the active power exchange on its borders like scheduled.	CREATE	TSO (transmission monitoring system)	TSO, FSP, Aggregator, Prosumer	I3-03	
3.4	Active power support	Provision of active power support	The flexible resources (FSP, aggregators, prosumers) provide active power support to the system. The flexible resources report to the TSO and DSO their activation.	EXECUTE	FSP, Aggregator, Prosumer	TSO and DSO	I3-04	
3.5	Supervision of the active power support product	Evaluation of the proper responsiveness of the flexible resources	Monitoring of the responsiveness of the flexible resources by	REPORT	TSO and DSO	Market operator	I3-05	

			the TSO and DSO in order to evaluate whether the flexible resources have the proper response to the event. The evaluation report is provided to the market operator.					

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I1-01	Weather forecast REPORT	Weather forecast vendor provides json files with the high-resolution weather forecast for the predefined Points of Interest.	File exchange or special API developed. Communication between weather forecasting vendor and TSO, DSO short term planning departments.
I1-02	Energy production and load forecast REPORT	DSO and TSO operator is performing energy production and load forecast using f-channel in built AI calculation engines.	Results are stored in a Data Base.
I1-03	Updating the INDIVIDUAL Grid Models	IGM is being updated with the current energy and production forecast.	IGM is kept in CIM xml files or stored in Data Base.
I1-04	Contingency analysis REPORT	Contingencies are identified and registered	Report is stored in the data base in TSO/DSO
I1-05	List of potential mitigation measures REPORT	Mitigation measures identified.	Report is stored in the data base in TSO/DSO
I1-06	Report	List of available FSPs.	Communication between TSO, DSO and the Market Operator
I2-01	Weather forecast REPORT	Weather forecast vendor provides json files with the high-resolution weather forecast for the predefined Points of Interest.	File exchange or special API developed. Communication between weather forecasting vendor and TSO, DSO short term planning departments.
I2-02	Energy production and load forecast REPORT	DSO and TSO operator is performing energy production and load forecast using f-	Results are stored in a Data Base.

		channel in built AI calculation engines.	
I2-03	Updating the INDIVIDUAL Grid Models	IGM is being updated with the current energy and production forecast.	IGM is kept in CIM xml files or stored in Data Base.
I2-04	Load flow and voltage profile REPORT	Over and under voltages are identified and registered	Report is stored in the data base in TSO/DSO
I2-05	List of potential mitigation measures REPORT	Mitigation measures identified.	Report is stored in the data base in TSO/DSO
I2-06	Report	DSO/TSO report to the market operator the evaluation report for the reactive power flexibility services provided by the flexible resources.	Communication between DSO/TSO and the Market Operator
I3-01	Weather forecast REPORT	Weather forecast vendor provides json files with the high-resolution weather forecast for the predefined Points of Interest.	File exchange or special API developed. Communication between weather forecasting vendor and TSO, DSO short term planning departments.
I3-02	Energy production and load forecast REPORT	DSO and TSO operator is performing energy production and load forecast using f-channel in built AI calculation engines.	Results are stored in a Data Base.
I3-03			Communication between the flexible resources and the power system operators
I3-04			Communication between the flexible resources and the power system operators
I3-05			Communication between TSO, DSO and the Market Operator

Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
SOCL-GR-02	GR	Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	07/05/2021	Nenad Sijakovic and Aleksandar Terzic		
2	21/05/2021	Nenad Sijakovic and Aleksandar Terzic		
3	21.08.2021	Nenad Sijakovic and Aleksandar Terzic		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Enhanced severe weather condition management with predictive maintenance algorithms with the enhanced storm and icing predictions in order to preserve power system from running into dangerous topological or operational states.
Objective(s)	– Predictive maintenance and outage management, – Enhanced severe weather condition management, – Outage management optimisation for increased system adequacy, – Early warning on a potentially hazardous power system topology and regimes – Avoidance of a damages caused by the severe weather conditions
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator.
Complete description
Enhanced severe weather condition management will include the following elements: distributed generation units (WPPs and SPPs, as well as individual units), micro grid OHLs, DSO OHLs and TSO OHLs of interest. Predictive maintenance algorithms with the enhanced storm and icing predictions will be developed in order to preserve system running into dangerous topological or operational state. DSO grid, local micro grid outage management that takes into account improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration together with the Early warning on a potentially hazardous power system topology and regimes and avoidance of a damages caused by the severe weather conditions.

The main foreseen benefits/functionalities related to this particular business case (Enhanced Power Management for TSO-DSO coordination) are as follows:

- Storm and icing predictive maintenance process in TSO grid, DSO grid and local microgrid
- Outage management process in TSO grid, DSO grid and local microgrid

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Ice appearance prediction error		- Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes
2	Storm appearance prediction error		- Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes
3	Optimal PS operation due to optimisation of the planned outages		- Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes
4	Early warning on a hazardous power system regimes		- Predictive congestion management for maintaining secure and stable power system operation - Early warning on a hazardous power system regimes

1.6. Use case conditions

Use case conditions		
Assumptions		
- The use case will be developed and demonstrated in a non-invasive, offline environment using the power system simulation models, - Aggregators and prosumers will be simulated in the demonstration. - Additional DERs will be simulated, if necessary, in order to represent the near future conditions		
Prerequisites		
1	Availability of the network and market data	• Network models (in raw or uct file exchange format) data: IPTO and HEDNO network models (400 kV, 220 kV, 150 kV, 110 kV, 35 kV and 20 kV) voltage levels, • Geospatial data: GPS coordinates, locations of considered RES production POIs and other power system elements of interest, including detailed routing and positions of each tower for the analysed WPPs and OHLs. • Technical data: Technical data on wind turbines, solar parks, OHLs • Historic weather and energy data: historic measured and forecasted data related to the weather and energy production/consumption of the analysed points of interest in Greece (Crete and Peloponnese).

		• Information on the current practice and state of the art with the tools used for the forecasting, congestion management and balancing in TSO, DSO and producer/aggregator. • Energy policy information: Information on applicable EU Directives and Regulations that are of interest for TSO DSO coordination.
2	Active participation of the primary users (TSO, DSO, aggregator)	TSO, DSO and aggregator's departments for short term planning as well as departments for system operations and control should be deeply involved in the simulations and testing of the platform.

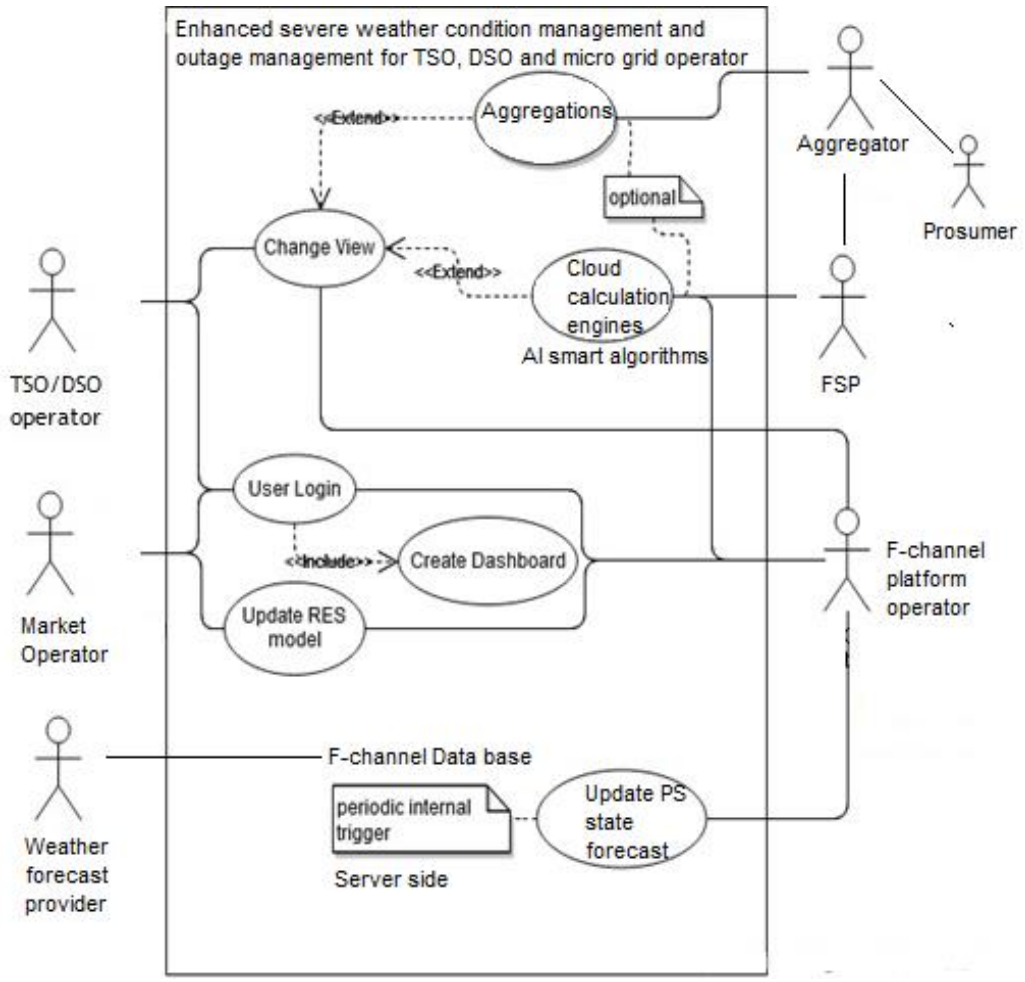
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
As already stated, the F-channel application itself will not depend on the exact product being utilized within the market, or the market model itself (it will be possible to use it for different services and products, and different market models) at the same time to demonstrate its usefulness and supremacy over existing similar tools and application with various Use Cases, that will be defined and implemented under OneNet project. The immediate connection can be found with the following system use cases: - Enhanced Active Power Management for TSO-DSO coordination, - Active power flexibility, - Reactive power flexibility.
Level of depth
Prioritisation
High
Generic, regional or national relation
Use case can be implemented in any geographical region on local, national, or regional level.
Nature of the use case
Further keywords for classification
Predictive congestion management, Power system forecasts, Early warning system, Contingency analysis, Storm management, Ice appearance management

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



Remark: the only difference with the BUC- Enhanced Active Power Management for TSO-DSO coordination is in a set of data delivered by the Weather forecasting provider as well as with the smart calculation, AI based, engines that will be utilised.

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Weather forecast provider;	Information provider	Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid.	POI weather forecasts are used as an input data for energy predictions, as well as for AI base PS state forecast.
DSO/Micro grid operator	Information provider	DSO/Micro grid operator responsible for the overall O&M	Load forecasts are using weather forecasts as an input and as an output provide further

		activates in a certain geographical area.	inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis.
Maintenance and asset management operator (TSO/DSO)	Information receiver/provider	TSO/DSO asset department expert in charge of grid maintenance planning which uses grid condition forecasts to foresee potential risks and prepare a proper mitigation or preventive measures for it.	Condition forecasts module and its alarm system presented on a GIS based Grid map is utilised by maintenance and asset management operator for the above-described purpose.
Outage scheduler (TSO/DSO)	Information receiver/provider	Expert in charge of outage planning. Outage schedules are further on used for IGM and CGM development and regular updates of a grid topology inside models. This person is an interface between TSO transmission department and TSO short-term planning department, making sure that all maintenance activities are well covered and foreseen by IGM topology updates and simulations as well.	Outage scheduler has important role in IGM regular updates, and its valuable inputs are further being used by all above listed simulations, calculations and analysis.
DACF operator (TSO and corresponding expert in DSO);	Information receiver/provider	An expert from TSO/DSO Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures. If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power system and first neighbouring systems.	DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the IGM - Individual Grid Model, and perform n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models.
2DACF operator (TSO and corresponding expert in DSO);	Information receiver/provider	The same as previous	The same as previous
IGM manager (TSO and corresponding expert in DSO);	Information receiver/provider	TSO/DSO Short term planning department Expert/s responsible for development, maintenance and regular updates of a Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...IGM models are further	IGM is being produced using production forecasts, load forecasts and condition forecasts outputs.

		used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis.	
ATC calculator (TSO and RSC);	Information receiver/provider	TSO/Short term planning department Expert in charge of short to long term available capacity calculations, flow-based or ATC based (bilateral or composite values).	IGM is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs. IGM is than being transferred back to TSO main server and processed by ATC calculator for further available capacity calculations or simulations are done in a virtual f-channel grid environment.
Flexibility Register Operator (FRO);	Information receiver		
Production scheduling operator (market operator);	Information receiver		

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Early severe state warning system / prevention and restoration	In order to avoid severe damages of the equipment and load losses it is of outmost importance to prepare the power system elements for the incoming severe weather conditions as well as for the severe power system state conditions. Provide improved identification of a severe system states and contingencies that can cause severe system states in a more precise manner and longer time horizon than it is being done today together with the improved identification of flexibility resources, as well as improved identification of the flexibility needs. The	TSO, DSO, Wind production units	Predicted contingency in the DSO or TSO grid	- High resolution Numerical Weather Predictions with the extended geographical coverage and look into the future. Available DSO and TSO voltage level forecasted grid models.	

		activation time could be from 15 minutes to 1 hour.				

4.2. Steps - Scenarios

Scenario name #1 Early severe state warning system / prevention and restoration

Scenario #1 description

In order to avoid severe damages of the equipment and load losses it is of outmost importance to prepare the power system elements for the incoming severe weather conditions as well as for the severe power system state conditions. Provide improved identification of a severe system states and contingencies that can cause severe system states in a more precise manner and longer time horizon than it is being done today together with the improved identification of flexibility resources, as well as improved identification of the flexibility needs. The activation time could be from 15 minutes to 1 hour.

Scenario step by step analysis

Scenario								
Scenario name		Contingency identification and mitigation						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Weather predictions	Trigger of the scenario	Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid is providing us with the high-resolution NWP.	CREATE	Weather forecast provider;	TSO, DSO short term planning departments	I1-01	
1.2	Energy predictions	Calculation of energy production and consumption	DSO/TSO Short term planning department production forecasting operator is	CREATE	Production and Load forecasting operator in DSO and TSO	IGM model operators	I1-02	

			responsible for wind, solar and hydro, short term, mid-term and long-term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations.					
1.3	IGM updates	Updating the INDIVIDUAL Grid Models	TSO/DSO Short term planning department Expert/s responsible for development, maintenance and regular updates of Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...IGM models are further used by DACF, 2DACF and	CREAT E	IGM model operators	DACF and 2DACF operators in TSO and DSO	I1-03	

			ATC calculator for further simulations, calculations and analysis.					
1.4	Severe power system state identification	Contingency analysis and identification of the problems in the system focusing on the severe power system state conditions	An expert from TSO/DSO Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures. If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power system and first neighbouring systems. Based on energy production and consumption predictions, grid simulation models are formed in order to be able to perform contingency analysis and identify potential	REPORT	DACF and 2DACF operators in TSO and DSO	Power system control expert (TSO/DSO);	I1-04	

			contingencies in the grid.					
1.5	Mitigation measure identification	Identification of the list of potential mitigation measures	An expert from TSO/DSO Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of possible mitigation measures.	REPORT	DACF and 2DACF operators in TSO and DSO	Power system control expert (TSO/DSO);	I1-05	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I1-01	Weather forecast REPORT	Weather forecast vendor provides json files with the high-resolution weather forecast for the predefined Points of Interest.	File exchange or special API developed. Communication between weather forecasting vendor and TSO, DSO short term planning departments.
I1-02	Energy production and load forecast REPORT	DSO and TSO operator is performing energy production and load forecast using f-channel in built AI calculation engines.	Results are stored in a Data Base.
I1-03	Updating the INDIVIDUAL Grid Models	IGM is being updated with the current energy and production forecast.	IGM is kept in CIM xml files or stored in Data Base.
I1-04	Contingency analysis and severe state REPORT	Contingencies that can lead to the severe power system state are identified and registered	Report is stored in the data base in TSO/DSO
I1-05	List of potential mitigation measures REPORT	Mitigation measures identified.	Report is stored in the data base in TSO/DSO

9.2.3 Western Cluster demo BUCs

9.2.3.1 Spanish demo

WECL-ES-01 - Long-term congestion management

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Domain***	***Name of use case***
WECL-ES-01	Local congestion management	Long-term congestion management

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	27/04/2021	COMILLAS, i-DE, UFD, OMIE		Draft
0.2	21/05/2021	COMILLAS, i-DE, UFD, OMIE	Up to section 3.2	Draft
0.3	26/06/2021	COMILLAS, i-DE, UFD, OMIE	Up to section 5	Draft
1.0	07/09/2021	COMILLAS, i-DE, UFD, OMIE	KPIs included	Approved

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	This BUC is focused on the long-term procurement of congestion management products by the DSO. The main objective of the BUC is to ensure that the DSO can procure flexibility in advance to solve specific local system loading issues on the distribution system thus deferring/eliminating the need for traditional system upgrades
Objective(s)	1. To apply market procedures to obtain flexibility services attending DSO requirements. 2. Demonstrate that long term agreements are suitable amongst different available DERs 3. Implement flexibility provision/usage through a market platform. 4. Use consumer's demand-response in efficient flexibility services.
Related business case(s)	WECL-ES-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This BUC describes the DSO long term procurement of flexibility services through a market mechanism to avoid congestions at the distribution medium or low voltage networks. It describes the exchange of information and processes that should be established between DSO, Independent Market Operator (IMO) and Flexibility Provider (FSP). This BUC is divided into five

scenarios, namely the five service steps defined in the Active System Management (ASM) report [1] listed below:

- Prepare/Pre-qualification: The process in which it is checked whether a unit can deliver the product it intends to sell.
- Plan/Forecast: Planning of grid utilization and identifying potential congestions.
- Market Phase: Market opening, qualification, bids collection, market clearing and communication of results.
- Monitoring and Activation: Grid monitoring and flexibility bids activation to solve the forecasted congestion management
- Measurement phase: Validation of delivery

Complete description

This BUC will demonstrate the long-term congestion management procurement of local flexibility products by the DSO.

This BUC describes the exchanges of information and the processes that should be established between DSO, IMO and FSP to solve distribution network local congestions.

The objective is to procure products to ensure the network remains secure and does not go beyond its firm capacity at times of peak demand. The products can be procured from weeks to years ahead delivery and is aimed towards MV/LV flexibility providers.

The DSO procures the product in the long-term (years to weeks ahead delivery). The DSO procures a band of flexibility that will be activated when needed or as scheduled, one or more times during the life of the contract. The flexibility providers receive a payment for the availability during the life of the contract and if activation is needed, the flexibility provider may receive an additional utilisation payment or not (to be defined at the contract). If the activation is not delivered, penalties may be applied to the flexibility provider. If the flexibility is delivered as contracted, the DSO proceeds with the settlement as agreed at the contract.

Scenarios:

1. **Prepare/Pre-qualification:**

The pre-qualification process starts once the flexibility service provider expresses interest in entering the flexibility market. This process serves to ensure that a particular flexibility service provider is capable of delivering a given product. This has to be ensured from two perspectives, namely the grid pre-qualification and product pre-qualification.

The former ensures that the resource meets the technical requirements to be able to deliver the product and proceed to the market phase and eventually be selected by a system operator. In principle, the grid pre-qualification will be done by the DSO, as FSPs in this BUC are connected to MV and LV grids. The grid pre-qualification may involve both internal simulations by the DSO and/or specific field tests with the FSP.

The market or product pre-qualification aims at ensuring that the FSP can participate in a particular market and can provide a particular service considering market and product design aspects. In principle, the product pre-qualification should be done by IMO.

If the results of the two types of pre-qualification are approved, the entry of the FSP into the flexibility market is allowed. The validity of the pre-qualification can be indefinite, limited to a certain period of time or conditioned to predefined aspects (e.g., grid conditions).

Considering that this BUC WECL-ES-01 describes the long-term products for the Spanish demonstration, it is also possible that the pre-qualification process starts once a market session is open, considering that a market session can last for weeks or longer.

Whenever possible, the pre-qualification processes (grid and product) will be combined or coordinate, aiming at having the simplest possible process for the FSP. Likewise, the pre-qualification processes of WECL-ES-01 and WECL-ES-02 will also aim at coordination and simplification whenever the requirement allow to.

2. **Plan/Forecast:**

In this service phase, the DSO carries internal analysis (e.g., forecasts, power flows) to detect congestions in the grid, which could be solved by the long-term procurement of flexibility. This service phase happens years to weeks ahead.

3. **Market Phase**:

Based on the flexibility needs identified in the previous market phase, the DSO is able to call a market through the market platform (described in SUC-ES-01). This market, operated by the independent market operator, will procure either availability only or availability and activation. The availability means a capacity band (e.g., in kW) with a start and finish times defined, in which the FSP is expected to provide the flexibility upon the DSO's call. Alternatively, the availability can also mean that the FSP is obliged to bid in the short-term local congestion management markets (defined in WECL-ES-02) activation products, in which capacity and duration of activation are predefined (in kWh). It is also possible to the DSO to procure activation in the long-term, defining weeks/months in advance the day, time, capacity and duration of activations.

This market phase can be classified as a **local market model**. It is an auction type of market, in which the gate opening time takes place from than more than year-ahead to weeks ahead. The gate closure time takes place a week-ahead delivery. FSPs participating should have resources connected to medium or low voltage levels.

During this phase there is a qualification process to check if the flexibility provider is able to provide the demand service in terms of quality and cost.

The results of the auction will be published.

4. **Monitoring and Activation**:

This service phase takes place close to real-time and in real-time. The DSO will monitor the conditions of the grid in real time and send the activation signals to the FSPs committed in the market phase, in accordance with the type of product procured.

When activating the FSPs, the DSO will consider the actual state of the grid. Emergency states in which the procured flexibility activations cannot be concluded are outside the scope of this BUC WECL-ES-01. Emergency states are situations in which market procedures are no longer appropriate to ensure the security of the system.

5. **Measurement phase**:

In this final service phase, the MO and/or DSO will verify if the flexibility was provided in accordance to the product procured in the market phase. This service phase can take place in the real-time and/or after the real-time. For the measurement of flexibility, a baseline has to be previously defined, to which the actual metered data of the FSP can be compared too. If the FSP is not able to deliver the flexibility in accordance with the predefined market conditions and agreed baseline, penalties may apply, which would decrease the remuneration received by FSP.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Cost Value	Compare cost for flexibility with avoided cost otherwise if flexibility was not use; e.g., cost (deferral of avoidance) of network reinforcement.	All
2	ICT costs	The term ICT cost comprises the communications and information technologies, including the software for the aggregation and market clearing process. Only those ICT costs that are directly related to the implementation of each coordination scheme will be considered.	• Implement flexibility provision/usage through a market platform. • Use consumer's demand-response in efficient flexibility services.
4	Available Flexibility	Flexible power that can be used for balancing specific grid segment, i.e., the available power flexibility in a defined period (eg. per day) that can be allocated by the DSO at a specific grid segment. Measured in MW. This in relation with the total amount of power in the specific grid segment in the same period.	• Demonstrate that long term agreements are suitable amongst different available DERs • Use consumer's demand-response in efficient flexibility services.
3	Accuracy of load forecast	This indicator measures the error of the load forecast in distribution system	• To apply market procedures to obtain flexibility services attending DSO requirements. • Use consumer's demand-response in efficient flexibility services.
5	Power Deviation	Tracking error between a set-point requested by the SO and the measure	All
6	Congestion reduction	This indicator measures the percentage decrease of load demand in the requested asset by a flexibility provider resource.	All
7	Volume of transactions	This indicator measures the number of transactions. This indicator will be used in order to measure the number of offered and cleared bids for each service.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs
8	Number of transactions	This indicator measures the percentage of products tested in the demos with respect to the number of products initially targeted by the demos.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs

9	Number of products	This indicator measures the percentage of products tested in the demos with respect to the number of products initially targeted by the demos.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs
10	Active participation	This indicator measures the percentage of customers actively participating in the demo with respect to the total customers that accepted the participation. This indicator will be used to evaluate customer engagement plan.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs

1.6. Use case conditions

Use case conditions
Assumptions
The DSO is allowed to use flexibility solutions to defer/eliminate traditional capital investments where they are appropriate and cost-effective. A congestion constraint and the associated investment to solve it, will be simulated in the demo in order to compare it with a flexibility solution. It is assumed that settlement conditions are well defined and clearly state eventual needs for compensations and/or financial adjustments among affected parties in the flexibility provision process (e.g., BRPs, BSPs, Aggregators).
Prerequisites
For the demo: To have at least one flexibility provider in an area where a congestion can be simulated. Analyze the area and define possible congestion and solutions with and without flexibility providers. To include in business regulation needs to be defined: Individual DERs, aggregators, and independent aggregators have to be allowed by regulation to provide flexibility to the DSO. DSO have to be able to procure flexibility from FSPs, as well as receive financial compensation for the flexibility procurement and have economic incentives to do so.

1.7. Further information to the use case for classification/mapping

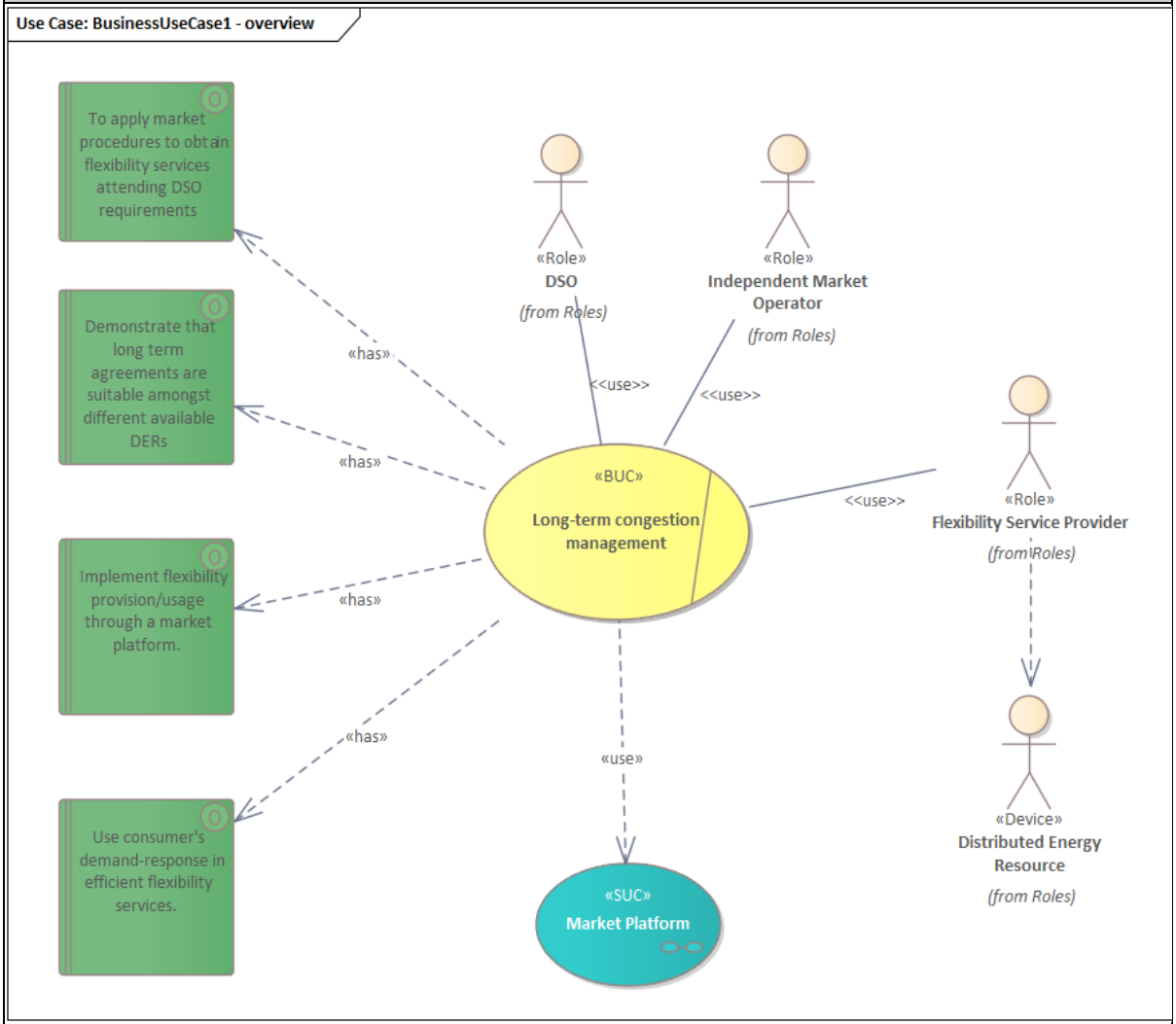
Classification information
Relation to other use cases
WECL-ES-02, SUC-ES-01
Level of depth
Generic
Prioritisation
High priority
Generic, regional or national relation
National
Nature of the use case

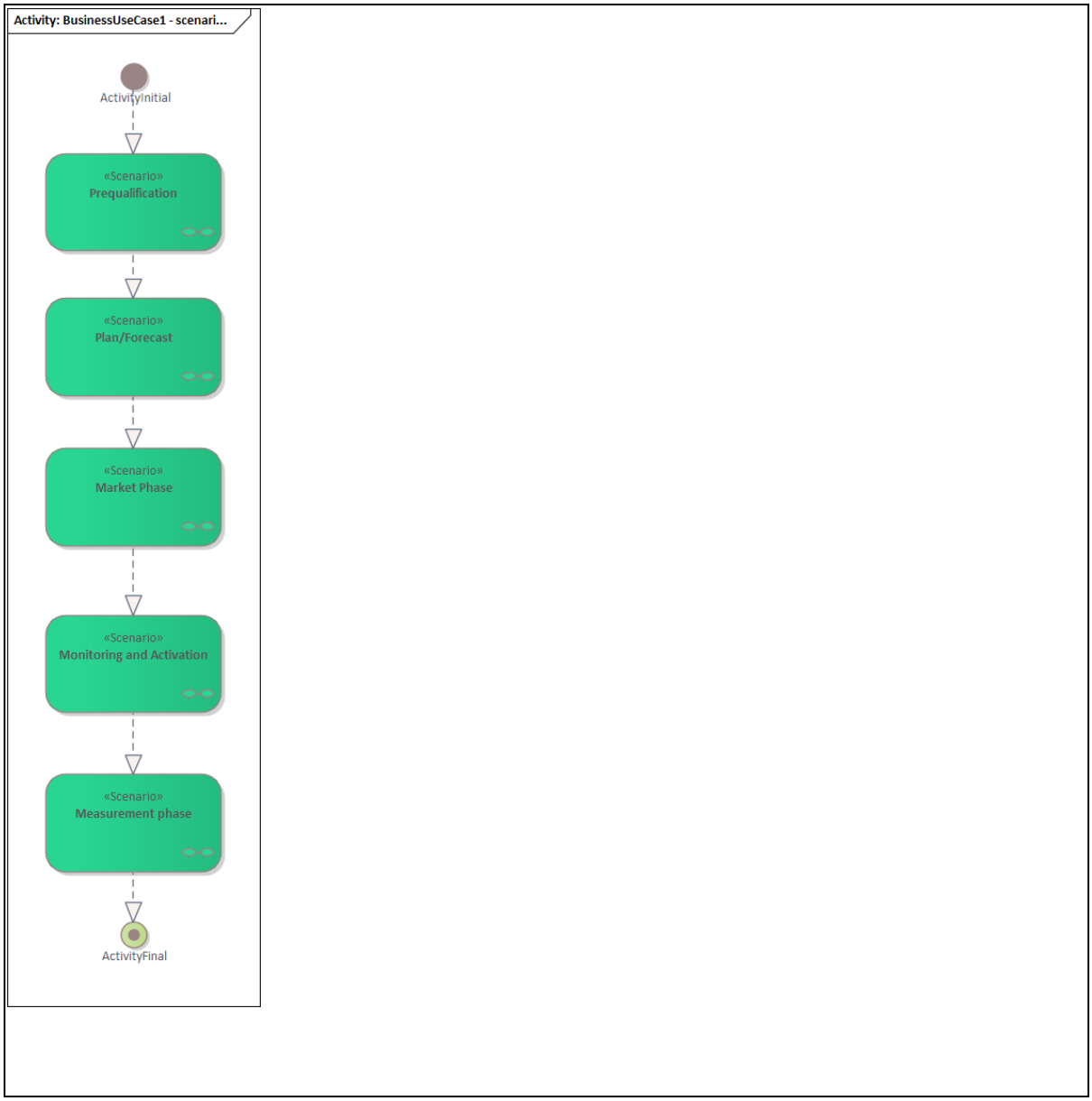
Business Use Case
Further keywords for classification
Local congestion management, Distributed energy resources, flexible providers, traditional investment, long term

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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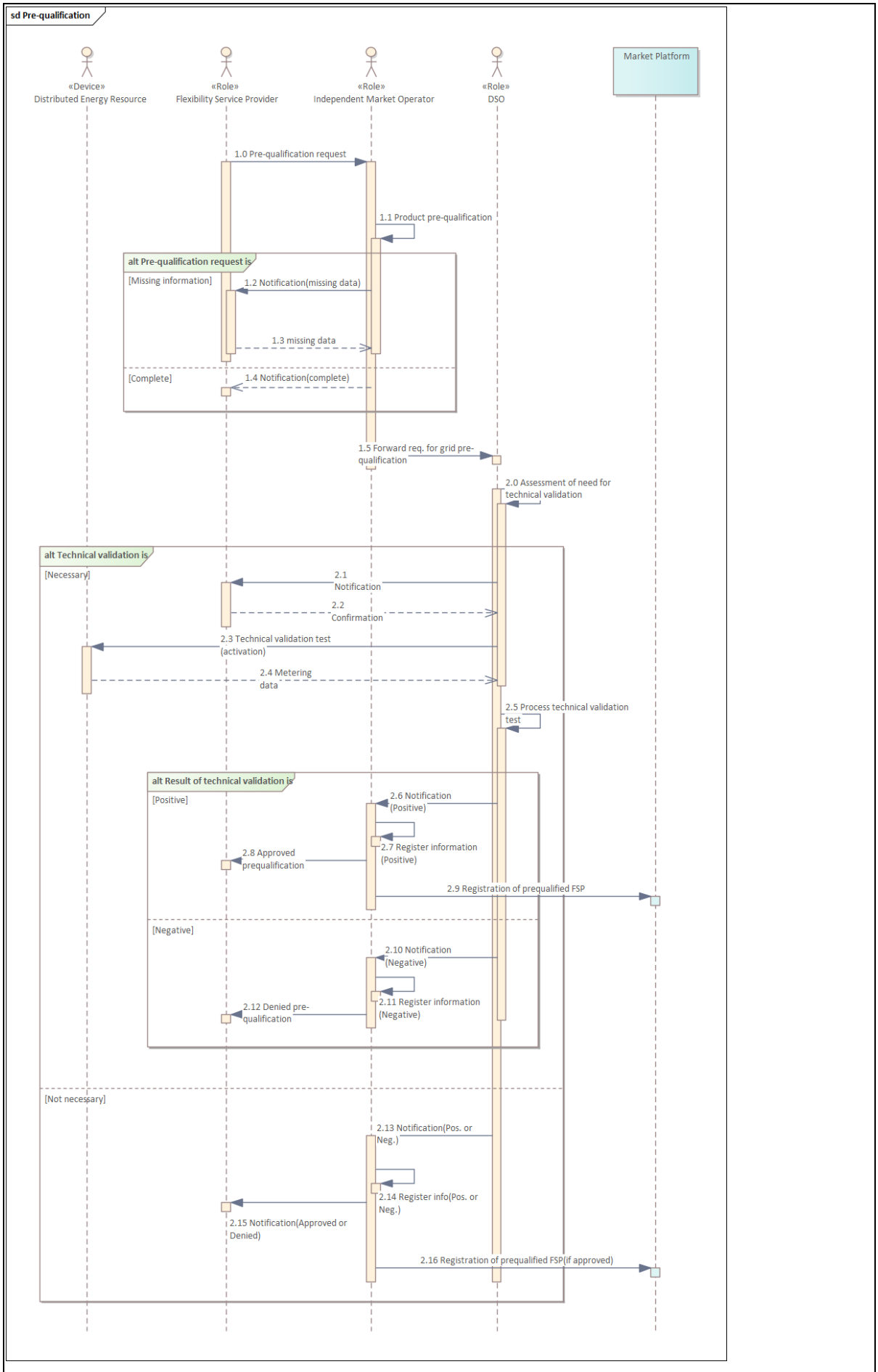
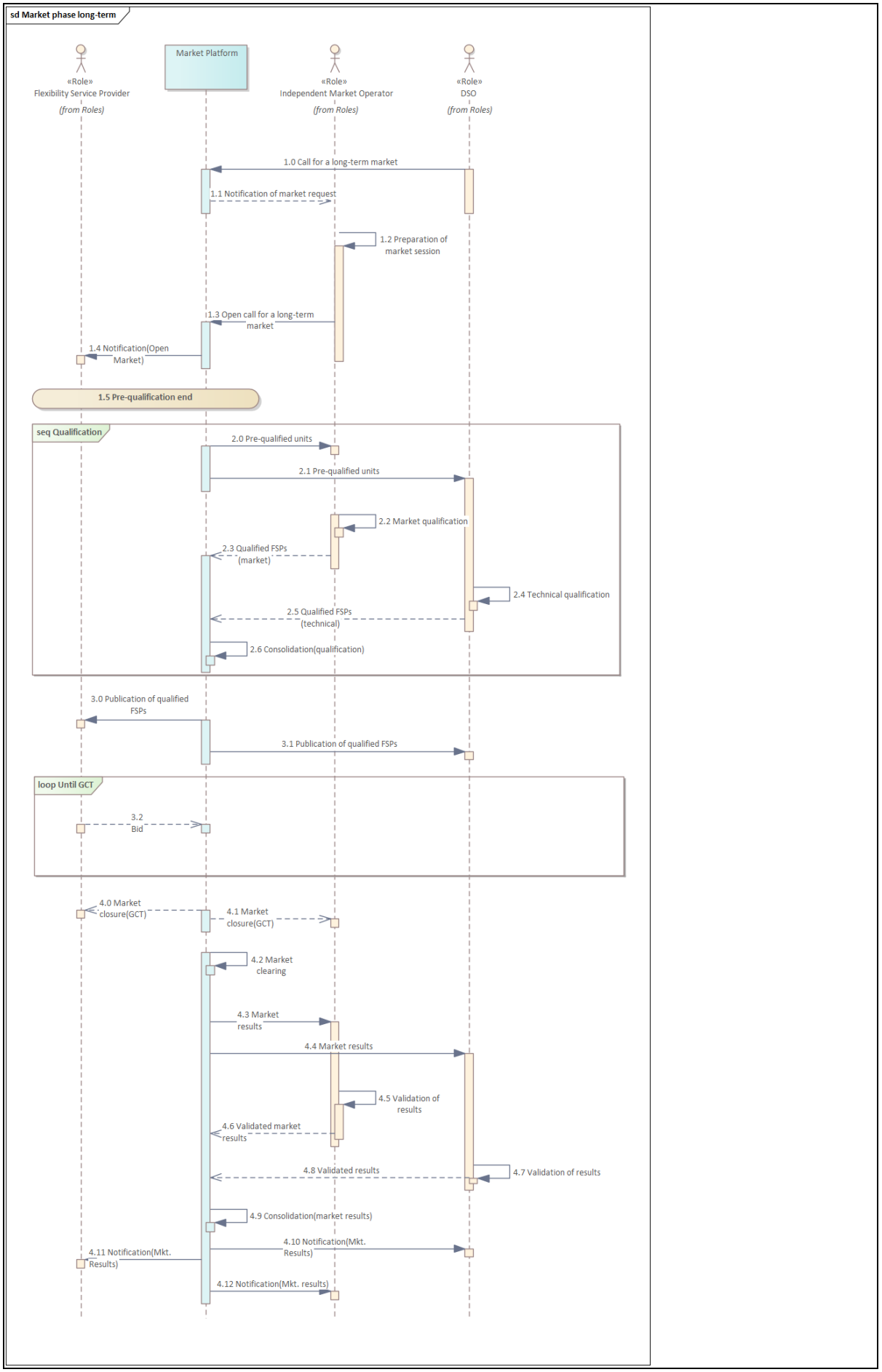
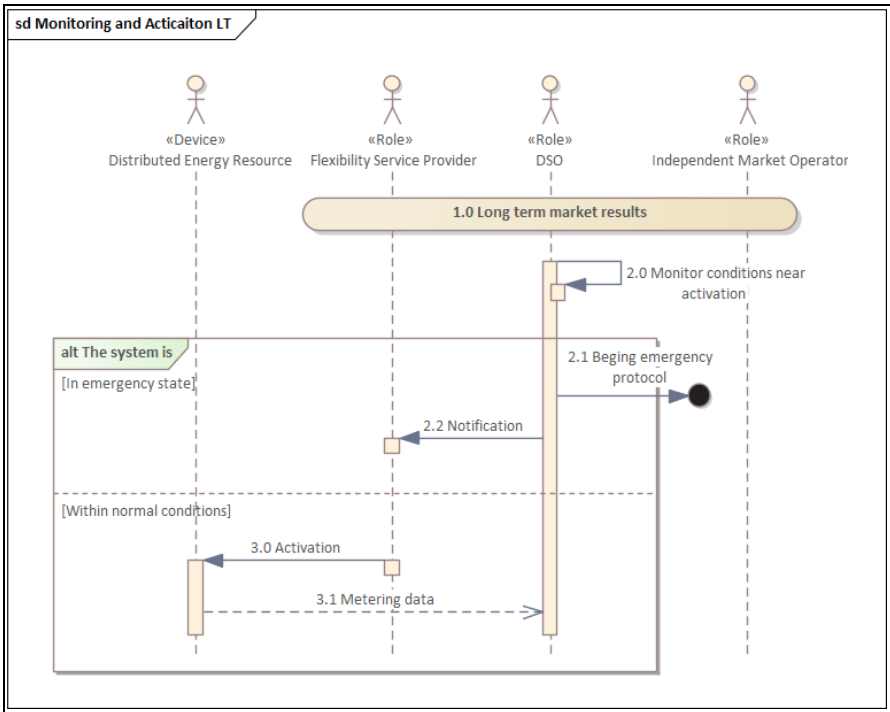
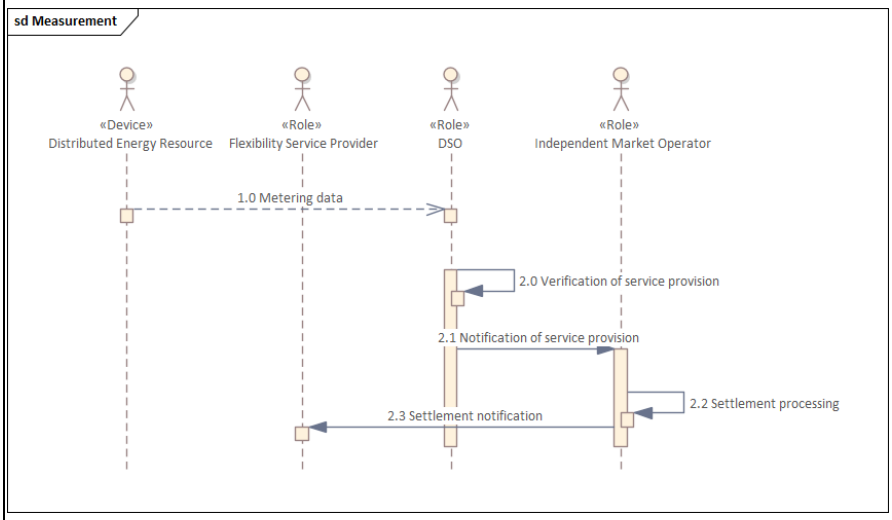
ActivityInitial
«Scenario»
Prequalification
«Scenario»
Plan/Forecast
«Scenario»
Market Phase
«Scenario»
Monitoring and Activation
«Scenario»
Measurement phase
ActivityFinal


sd Pre-qualification
«Device»
Distributed Energy Resource
«Role»
Flexibility Service Provider
«Role»
Independent Market Operator
«Role»
DSO
Market Platform
1.0 Pre-qualification request
1.1 Product pre-qualification
alt Pre-qualification request is
[Missing information]
1.2 Notification(missing data)
1.3 missing data
[Complete]
1.4 Notification(complete)
1.5 Forward req. for grid pre-qualification
2.0 Assessment of need for technical validation
alt Technical validation is
[Necessary]
2.1 Notification
2.2 Confirmation
2.3 Technical validation test (activation)
2.4 Metering data
2.5 Process technical validation test
alt Result of technical validation is
[Positive]
2.6 Notification (Positive)
2.7 Register information (Positive)
2.8 Approved prequalification
2.9 Registration of prequalified FSP
[Negative]
2.10 Notification (Negative)
2.11 Register information (Negative)
2.12 Denied pre-qualification
[Not necessary]
2.13 Notification(Pos. or Neg.)
2.14 Register info(Pos. or Neg.)
2.15 Notification(Approved or Denied)
2.16 Registration of prequalified FSP(if approved)


sd Market phase long-term
Market Platform
«Role»
Flexibility Service Provider
(from Roles)
«Role»
Independent Market Operator
(from Roles)
«Role»
DSO
(from Roles)
1.0 Call for a long-term market
1.1 Notification of market request
1.2 Preparation of market session
1.3 Open call for a long-term market
1.4 Notification(Open Market)
1.5 Pre-qualification end
seq Qualification
2.0 Pre-qualified units
2.1 Pre-qualified units
2.2 Market qualification
2.3 Qualified FSPs (market)
2.4 Technical qualification
2.5 Qualified FSPs (technical)
2.6 Consolidation(qualification)
3.0 Publication of qualified FSPs
3.1 Publication of qualified FSPs
loop Until GCT
3.2 Bid
4.0 Market closure(GCT)
4.1 Market closure(GCT)
4.2 Market clearing
4.3 Market results
4.4 Market results
4.5 Validation of results
4.6 Validated market results
4.8 Validated results
4.7 Validation of results
4.9 Consolidation(market results)
4.10 Notification(Mkt. Results)
4.11 Notification(Mkt. Results)
4.12 Notification(Mkt. results)





3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***

Distribution System Operator (DSO)	Role	According to the Article 2.6 of the Directive: "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity".	
Independent Market Operator (IMO)	Role	Responsible for calling, clearing, communicating results and possibly settling the provision of distributed flexibility. This role can be taken by an independent market operator, an existing one (e.g., a NEMO), or a system operator.	
Distributed Energy Resource (DER)	Device	Resources connected at the distribution grid capable of providing active power flexibility, either upward/downward or both. It can comprise several different roles and devices such as demand response (actor/role), distributed generation, electric vehicles, and storage systems.	
Flexibility Service Provider (FSP)	Role	Generic role which links the role customer and its possibility to provide flexibility to the roles market and grid; generic role that could be taken by many stakeholders, such as an aggregator or individual distributed energy resources.	

3.2. References

ENTSO-E Role Model;

[1]

CEDEC, EDSO, ENTSO-E, Eurelectric, and GEODE, “TSO-DSO Report: An Integrated Approach to Active System Management,” 2019. Accessed: Jul. 19, 2019. [Online]. Available: https://www.entsoe.eu/news/2019/04/16/a-toolbox-for-tsos-and-dsos-to-make-use-of-new-system-and-grid-services/

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Prepare/Pre-qualification	The process in which it is checked whether a unit can deliver the product it intends to sell.	DSO	The DSO and/or the IMO receives a request from a FSP to be pre-qualified to offer the long-term local congestion management products	The FSP complies with the prerequisites publicly made available by the DSO/IMO	The FSP is successfully verified and tested, receiving the permission to offer the products to which the prequalification was aimed at.
2	Plan/Forecast	Planning of grid utilization and identifying potential congestions.	DSO	The distribution system optimizer quantifies the amount of flexibility needed	The DSO identifies a situation in which congestion are expected in the medium or long term.	The DSO computes the amount of flexibility needed for the different types of products in the different timesteps and calls a market.
3	Market phase	Market opening, qualification, bids	IMO	The DSO calls a market for the	FSP are prequalified to	Markets are cleared and FSPs

		collection, market clearing and communication of results		procurement of flexibility calculated in scenario 2.	provide the service. Further qualification is evaluated within this scenario.	are nominated to deliver the product.
4	Monitoring and activation	Grid monitoring and flexibility bids activation to solve the forecasted congestion management	DSO	The real-time for the provision of a service procured in scenario 4 approached	The FSP and the DSO have the necessary communication infrastructure for the activation order to be sent	The FSP successfully receives the order to provide the flexibility.
5	Measurement phase	Validation of service delivery	DSO	The service is being provided in real-time or it has been already provided	Metering data is successfully received by the DSO with the necessary granularity and a baseline method was determined	The DSO compares the metered data with the baseline previously computed or sent by the FSP.

4.2. Steps – Scenarios

Prepare/Pre-qualification

Scenario #1 description

The process in which it is checked whether a unit can deliver the product it intends to sell.

Scenario step by step analysis

Scenario								
Scenario name	Prepare/Pre-qualification							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	FSP requests to be pre-qualified	Pre-qualification request	The FSP requests to the IMO to be pre-qualified to offer a certain type of product	CREATE	FSP	IMO	I.E.01 I.E.02 I.E.03 I.E.04	
1.1	IMO processes market prequalification	Product prequalification	The IMO processes the market prequalification.	EXECUTE	IMO	IMO		
1.2	FSP is notified if information provided is incomplete	Notification (missing data)	The IMO requests missing data	GET	IMO	FSP	I.E.03 I.E.04	

1.3	FSP reports back missing data	Missing data	The FSP reports back missing data	REPORT	FSP	IMO	I.E.03 I.E.04	
1.4	IMO notifies the completion of data collection	Notification (complete)	The notifies the completion on data collection process for the purpose of pre-qualification	CLOSE	IMO	FSP		
1.5	IMO forwards pre-qualification request for technical prequalification	Forward req. for grid pre-qualification	The IMO forwards pre-qualification request for technical prequalification	REPORT	IMO	DSO	I.E.03 I.E.04	
2.0[6]	DSO assess the need for a technical validation	Assessment of need for technical validation	The DSO may decide that field tests are necessary to ensure that flexibility can be provided by the applicant FSP. In this step, the DSO assess internally the need for field tests	EXECUTE	DSO	DSO		
2.1	DSO communicates the need for a technical validation	Notification	If a technical validation is necessary, the FSP is communicated on the new requirement, as well as the details for the technical validation.	REPORT	DSO	FSP		
2.2	FSP acknowledges the technical validation need	Confirmation	The FSP acknowledges the technical validation need	REPORT	FSP	DSP		

[6] Changes in numbering at the step-by-step analysis (e.g., 1.5 to 2.0) are meant to provide a more intuitive visualization of the sequence diagrams, signalling the end of one process and the start of another.

2.3	Technical validation test	Technical validation test	The DSO may send a setpoint directly to the DER at the moment of the activation.	GET	DSO	DER		
2.4	DER sends metering data	Metering data	The DER sends metering data regarding the technical pre-qualification directly to the DSO.	REPORT	DER	DSO	I.E.06	
2.5	DSO processes the results from technical validation	Process technical validation	The DSO internally processes the results of the technical validation test	EXECUTE	DSO	DSO		
2.6	DSO notifies on successful technical validation	Notification (positive)	The DSO notifies the IMO on the result of the technical validation	REPORT	DSO	IMO		
2.7	The IMO registers internally the FSP as pre-qualified	Register information (positive)	The IMO registers internally the FSP as pre-qualified	CREATE	IMO	IMO		
2.8	The FSP is communicated on the successful pre-qualification	Approved prequalification	The FSP is communicated on the successful pre-qualification	GET	IMO	FSP		
2.9	The IMO registers to the Market Platform the successful pre-qualification	Registration of pre-qualified FSP	The IMO registers to the Market Platform the successful pre-qualification	CREATE	IMO	Market Platform		
2.10	DSO notifies on unsuccessful technical validation	Notification (negative)	The DSO notifies the IMO on the result of the technical validation	REPORT	DSO	IMO		
2.11	The IMO registers internally the	Register information (negative)	The IMO registers internally the	CREATE	IMO	IMO		

	FSP as not pre-qualified		FSP as not pre-qualified					
2.12	The FSP is communicated on the unsuccessful pre-qualification	Denied pre-qualification	The FSP is communicated on the unsuccessful pre-qualification	GET	IMO	FSP		
2.13	If no technical validation is necessary, DSO informs no technical pre-qualification result	Notification (positive or negative)	If no technical validation is necessary, DSO informs no technical pre-qualification result	REPORT	DSO	IMO		
2.14	The IMO registers internally the result of the pre-qualification process (positive or negative)	Register information (positive or negative)	The IMO registers internally the result of the pre-qualification process (positive or negative)	CREATE	IMO	IMO		
2.15	The FSP is communicated on the pre-qualification result (positive or negative)	Notification (Approved or Denied)	The FSP is communicated on the pre-qualification result (positive or negative)	REPORT	IMO	FSP		
2.16	The IMO registers to the Market Platform the successful pre-qualification	Registration of pre-qualified FSP (if approved)	The IMO registers to the Market Platform the successful pre-qualification	CREATE	IMO	Market Platform		

Plan/Forecast

Scenario #2 description

Planning of grid utilization and identifying potential congestions.

Scenario step by step analysis

Scenario	
Scenario name	Offering

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1.0	DSO evaluates the need for a long-term market for flexibility	DSO evaluates the need for a long-term market for flexibility	The DSO evaluates internally the need for a long-term market for flexibility. This step is an internal activity exclusive to the DSO, and therefore no information exchanges with other actors take place. Therefore, the internal steps carried out by the DSO are not modelled in detail.	EXECUTE	DSO	DSO		

Market phase: long-term

Scenario #3 description

Market opening, qualification, bids collection, market clearing and communication of results

Scenario step by step analysis

Scenario								
Scenario name								
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1.0	DSO requests a long-term market	Call for a long-term market	DSO requests a long-term market based on the results of scenario 2 (plan and forecast). At this request, several parameters will have to be informed by	CREATE	DSO	Market Platform	I.E.07 (generic attributes) I.E.08 (product parameters)	

			the DSO. These parameters are grouped into (i) generic attributes and (ii) product parameters					
1.1	Notification of market request	Notification of market request	The IMO is notified that a market request was created by the DSO	REPORT	Market platform	IMO		
1.2	IMO validates and prepares a market session	Preparation of market session	The IMO validates the information provided by the DSO (IE07 and IE08). N.B.: Intermediated steps in which the IMO may identify missing information, request completion from the DSO, and final completion by the DSO are omitted for the sake of simplicity.	EXECUTE	IMO	IMO		
1.3	IMO opens call for a long-term market	Open call for a long-term market	The IMO, after validating the market session, opens the market session in the Market Platform	EXECUTE	IMO	Market Platform		
1.4	FSPs are notified of a market opening	Notification (Open Market)	The Market Platform notifies the FSP about a market opening.	REPORT	Market Platform	FSP	I.E.08 (not all parameters)	
1.5	Pre-qualification period ends	Pre-qualification end	Considering that the long-term products	N/A	N/A	N/A	N/A	

			can be negotiated for weeks or months, it is possible for the pre-qualification phase to run in parallel with the market phase. Nevertheless, for FSPs to be able to participate in a market session, the pre-qualification process should be concluded at this step no. 1.5					
2.0	IMO is informed of pre-qualified units	Pre-qualified units	This step market the beginning of the qualification process. The IMO receives a list of pre-qualified units for that market session	GET	Market Platform	IMO	I.E.09	
2.1	DSO is informed of pre-qualified units	Pre-qualified units	This step market the beginning of the qualification process. The DSO receives a list of pre-qualified units for that market session	GET	Market Platform	IMO	I.E.09	
2.2	IMO proceeds with the market qualification	Market qualification	The IMO proceeds with the market qualification. The IMO checks the maximum power to bid	EXECUTE	IMO	IMO		

			from FSPs and the existence of financial warranties.					
2.3	IMO registers a list of qualified units (market qualification)	Qualified FSPs (market)	The IMO registers a list of qualified units (market qualification)	REPORT	IMO	Market Platform	I.E.10 (market)	
2.4	DSO proceeds with the technical qualification	Technical qualification	A process by which the DSO verifies the DER capacity to meet the requisites of the specific requirement. All the resources in the specific area will be checked to determine which ones are capable of providing the required service.	EXECUTE	DSO	DSO		
2.5	DSO registers a list of qualified units (technical qualification)	Qualified FSPs (technical)	The DSO registers a list of qualified units (Technical qualification)	REPORT	DSO	Market Platform	I.E.10 (technical)	
2.6	The Market Platform crosschecks both qualification lists and produces the consolidated list	Consolidation (qualification)	The Market Platform crosschecks both qualification lists and produces the consolidated list	CREATE	Market Platform	Market Platform	I.E.10 (consolidated)	
3.0	The Market Platform publishes/notifies qualified FSPs	Publication of qualified FSPs	The Market Platform publishes/notifies qualified FSPs	REPORT	Market Platform	FSP	I.E.10 (consolidated)	
3.1	The Market Platform publishes/notifies qualified	Publication of qualified FSPs	The Market Platform publishes/notifies qualified	REPORT	Market Platform	DSO	I.E.10 (consolidated)	

	FSPs to the DSO		FSPs to the DSO					
3.2	FSP bids to market session	Bid	Qualified FSPs may bid to the market session as long as market session is open (before the Gate Closer Time [GCT])	CREATE	FSP	Market Platform	I.E.11	
4.0; 4.1	Market platform notifies the GCT	Market closure (GCT)	Market platform notifies the GCT	REPORT	Market Platform	FSP; IMO		
4.2	Market Platform clears the market	Market clearing	Market Platform clears the market	EXECUTE	Market Platform	Market Platform		
4.3; 4.4	Market Platform reports market results	Market results	Market Platform reports market results	REPORT	Market Platform	IMO; DSO		
4.5	IMO validates the market results	Validation of results	The IMO checks the market results for inconsistences. After that, results are validated	EXECUTE	IMO	IMO		
4.6	IMO registers the validated market results	Validated market results	IMO registers the validated market results	REPORT	IMO	Market platform	I.E.12 (market)	
4.7	DSO validates the market results	Validation of results	The DSO checks the market results for inconsistences (from a technical perspective).	EXECUTE	DSO	DSO	I.E.12 (technical)	
4.8	DSO registers the validated market results	Validated market results	DSO registers the validated market results	REPORT	DSO	Market platform	I.E.12 (technical)	
4.9	The Market Platform consolidates the market results	Consolidation (market results)	The Market Platform consolidates the market results based on the validation by	CREATE	Market Platform	Market Platform	I.E.12 (consolidated)	

			the IMO and the DSO					
4.10; 4.11; 4.12	Market participants and IMO are informed of final market results	Notification (market results)	Market participants (DSO, FSPs) and IMO are informed of final market results	REPORT	Market Platform	DSO; FSP; IMO	I.E.12 (consolidated)	

Monitoring and Activation

Scenario #4 description]

Grid monitoring and flexibility bids activation to solve the forecasted congestion management.

Scenario step by step analysis

Scenario								
Scenario name								
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.0	The DSO monitors the state of the grid near real-time (activation)	Monitoring conditions near activation	The DSO monitor the state of the grid near activation in order to ensure the security of the grid	EXECUTE	DSO	DSO		
2.1	If the grid is an emergency state, the DSO starts the emergency protocol, and the BUC is terminated	Beginning emergency state	If the grid is an emergency state, the DSO starts the emergency protocol and the BUC is terminated, as this situation lays outside the scope of this BUC.	EXECUTE; CLOSE	DSO	DSO		
2.2	If the grid is an emergency state, the DSO notifies the FSP	Notification	If the grid is an emergency state, the DSO notifies the FSP to proceed according to	REPORT	DSO	FSP		

	to proceed according to the emergency protocol (outside the scope of the BUC)		the emergency protocol (outside the scope of the BUC). For example, the FSP may be requested to proceed on a previously agreed way, may be exempted from providing flexibility, or may not be notified at all. This situation is outside the scope of this BUC.					
3.0	If the state is within normal conditions, the FSP proceeds with the activation in real-time according to the market results.	Activation	If the state is within normal conditions, the FSP proceeds with the activation in real-time according to the market results.	EXECUTE	FSP	DER		
3.1	DER reports metering data	Metering data	DER reports metering data directly to the DSO	REPORT	DER	DSO	I.E.06	

Measurement phase

Scenario #5 description

Validation of service delivery.

Scenario step by step analysis

Scenario	
Scenario name	

Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	DSO receives metering data	Metering data	DSO receives metering data (step 3.1 of scenario 4)	GET	DER	DSO	I.E.06	
2.0	The DSO validates the service provision	Verification of service provision	The DSO validates the service provision. To do so, the DSO compares the metered data with the service procured and the baseline predefined.	EXECUTE	DSO	DSO		
2.1	The DSO notifies the IMO on the service provision	Notification of service provision	The DSO informs the IMO on the level of service provision (e.g., percentage of service provision based on the deviation of the metering data to the agreed flexibility)	REPORT	DSO	IMO		
2.2	IMO proceeds with the settlement processing	Settlement processing	The IMO proceeds with the settlement processing. According to the level of service provision, penalties (reduction of agreed price/payment) may occur.	EXECUTE	IMO	IMO		
2.3	The FSP is notified on the final settlement	Settlement notification	The FSP is notified on the final settlement	REPORT	IMO	FSP		

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I.E.01	Basic Participant Information	Register and basic information about the market participant such as username and password	
I.E.02	Market participant pre-qualification information	Contact information; Fiscal data; Access contract; bank details; power of representation; confidentiality agreement; declaration of non-collusion	
I.E.03	Market resource pre-qualification information	Market participants provide information on the resources they want to prequalify: Facility/resource name; Type of technology; Location; Market participant; etc.	
I.E.04	Technical resource pre-qualification information	Verification of the installed capacity to provide the service: Power; CUPS (Universal Supply Point Code acronym in Spanish); Maximum quantity; Response time, Etc	
I.E.05	Technical validation for pre-qualification	In case of the need of a technical validation for prequalification, the FSP receives the information on the when and how the test will be conducted: day; time; power to reduce/increase; duration of the test; etc.	
I.E.06	Metering data	Metering data from DER	
I.E.07	Generic attributes	Composed of generic parameters concerning the market session being requested. E.g.: • Auction identifier • Associated DSO • Product Type: Flexibility Product • Type of negotiation: Auction • Area: Basic or aggregated.	
I.E.08	Product parameters	Composed of product parameters concerning the market session being requested. E.g.: 1. Service window: Selection of the required date and duration of the service o Start date: 01/06/2021 o Duration: 2 months o Selection of days: M, T, W, T, F, S and S. o Opening time: 8:00 PM o Closing time: 10:00 PM 2. Availability: Selection of the capacity, the direction and the estimated hours of activation. o Capacity: 4MW o Direction: Upwards (up for generation, down for consumption) o Estimated hours of activation: 120h 3. Activation window (in case of activation product): Specific subperiod in an activation	

		window when a particular DER could be activated and thus it must be available. Multiple sets of activation windows can be defined. E.g.: o Day: 01/06/2021 o Hour: 19h o Duration: 2h o Capacity to modify: 1MW o Direction: Upward 4. Local area: Selection of the trading area. Choice by postal code, connection point, lines… (to be determined). o Area: postal code 5. Activation Announcement: Time in advance that a DSO informs a DER that its activation is programmed confirmed. 6. Form of Remuneration: It establishes form of payment to winner DERs Two different terms are defined availability and activation (depending on the product). o Type of product: availability/activation o Availability/Activation cap price: X €/MW or X €/MWh	
I.E.09	List of pre-qualified units	List of pre-qualified units for a given market session	
I.E.10	List of qualified units (market, technical or consolidated)	List of qualified units for a given market session. The list can refer to the market qualification, technical qualification or the consolidated list.	
I.E.11	Bid	Composed of bidding information 1. General attributes • FSP identifier 2. Availability: Selection of the capacity, the direction and the estimated hours of activation. • Period of availability (multiple periods may be possible within the service window) • Price: for availability and/or activation Additional parameters (complex bids) may be considered (under discussion).	
I.E.12	Validate market results	Validated market results by either the IMO (market), the DSO (technical) or the consolidated market results.	

WECL-ES-02 - Short-term congestion management

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Domain***	***Name of use case***
WECL-ES-02	Local congestion management	Short-term congestion management

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	27/04/2021	COMILLAS, i-DE, UFD, OMIE		
0.2	21/05/2021	COMILLAS, i-DE, UFD, OMIE	Up to section 3.2	Draft
0.3	26/06/2021	COMILLAS, i-DE, UFD, OMIE	Up to section 5	Draft
1.0	07/09/2021	COMILLAS, i-DE, UFD, OMIE	KPIs included	Approved

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	This BUC will demonstrate the short-term local congestion management procurement of local flexibility by the DSO. Flexibility providers at both LV and MV will be able to participate. Two timeframe markets will be considered: Day ahead and intraday.
Objective(s)	1-To apply market procedures to obtain flexibility services attending short term DSO requirements, 2- Implement flexibility provision/usage through a market platform. 3- Use consumer's demand-response in efficient flexibility services.
Related business case(s)	WECL-ES-01

1.4. Narrative of Use Case

Narrative of use case
Short description
This BUC describes the DSO short term procurement of flexibility services through a market mechanism to avoid congestion management at the distribution medium or low voltage network. Two timeframe markets are considered: Day ahead and intraday. It describes the exchange of information and processes that should be established between DSO, Independent Market Operator (IMO) and Flexibility Provider (FSP). This BUC is divided into five scenarios, namely the five service steps defined in the Active System Management (ASM) report [1] listed below: • Prepare/Pre-qualification: The process in which it is checked whether a unit can deliver the product it intends to sell. • Plan/Forecast: Planning of grid utilization and identifying potential congestions. • Market Phase: Market opening, qualification, bids collection, market clearing and communication of results. • Monitoring and Activation: Grid monitoring and flexibility bids activation to solve the forecasted congestion management

Complete description

This BUC will demonstrate the short-term congestion management procurement of local flexibility products by the DSO.

This BUC describes the exchanges of information and the processes that should be established between DSO, MO and FSP to solve distribution network local congestions

Two timeframe markets are considered: Day ahead and intraday.

The “day-ahead” market will be used for short-term procurement of flexibility availability to support the network in the event of an expected/programmed fault conditions as maintenance work. The DSO will procure a band of flexibility that could be activated one or more times (to be defined in the product specifications) during the life of the contract. The flexibility providers will receive a payment for the availability during the life of the contract. If activation is needed, the flexibility provider may receive an additional utilisation payment or not (to be defined in the product specifications). If activation is needed and the flexibility provider is not able to deliver it as contracted, a penalty may apply.

The “intraday market will be used for short-term procurement of flexibility availability to help restoration or reduce the stress on the network following an unexpected failure of equipment. The product will be contracted close to real-time, when constraints in the network may arise. The product will be set as an energy product. In this product, the DSO procures flexibility with predefined activation characteristics (e.g., time of activation, duration, ramping periods etc). At activation time, the DSO monitors the delivery of the service. If the flexibility provider delivers the service, the DSO proceeds with the settlement. If the flexibility provider does not deliver the service as contracted, a penalty may apply.

Scenarios:

6. **Prepare/Pre-qualification:**

The pre-qualification process should start after a flexibility service provider expresses interest in entering the flexibility market. This process serves to ensure that a particular flexibility service provider is capable of delivering a given product. This has to be ensured from two perspective, namely the grid pre-qualification and product pre-qualification.

The former ensures that the resource contains the technical requirements to be able to deliver the product and proceed to the market phase and eventually be selected by a system operator. In principle, the grid pre-qualification will be done by the DSO, as FSP in this BUC are connected to MV and LV grids. The objective of the grid pre-qualification is to ensure that the network is capable to cope with the flexibility provision by a particular FSP. The grid pre-qualification may involve both internal simulations by the DSO and/or specific field tests with the FSP.

The market or product pre-qualification aims at ensuring that the FSP can participate in a particular market and can provide a particular service considering market and product design aspects. In principle, the product pre-qualification should be done by IMO.

If the results of the two types of pre-qualification are approved, the entry of the FSP into the flexibility market is allowed. The validity of the pre-qualification can be indefinite, limited to a certain period of time or conditioned to predefined aspects (e.g., grid conditions).

Whenever possible, the pre-qualification processes (grid and product) will be combined or coordinate, aiming at having the simplest possible process for the FSP. Likewise, the pre-qualification processes of WECL-ES-01 and WECL-ES-02 will also aim at coordination and simplification whenever the requirement allow to.

7. **Plan/Forecast:**

In this service phase, the DSO carries internal analysis (e.g., forecasts, power flows) to detect structural congestions in the grid, which could be solved by the short-term procurement of flexibility.

This service phase may happen in the day-ahead or in the intraday. Results from previous markets (e.g., from long-term markets described in WECL-ES-01) are also taken into account in order to quantify the flexibility need.

8. **Market Phase**:

Based on the flexibility needs identified in the previous market phase, the DSO is able to call a market through the market platform. This market will procure either availability or availability and activation. The availability means a capacity band (product defined in kW) with a start and finish times defined, in which the FSP is expected to provide the flexibility upon the DSO's call. Activation is predefined in terms of day, time, capacity and duration of activations (product defined in kWh). In principle, the day-ahead market will be open for availability and activation procurement, while the intraday will be used for activation procurement.

This market phase can be classified as a **local market model**.

During this phase there is a qualification process to check if the flexibility provider is able to provide the demand service in terms of quality and cost.

The results of the auction will be published to market participants. In addition, the scheduling of FSPs is integrated into to the notification sent to the TSO.

9. **Monitoring and Activation**:

This service phase takes place close to real-time and in real-time. The DSO will monitor the conditions of the grid in real time and send the activation signals to the FSPs committed in the market phase, in accordance with the type of product procured. When activating the FSPs, the DSO will consider the actual state of the grid. Emergency situations in which the procured flexibility activations cannot be concluded are outside the scope of this BUC WECL-ES-01.

Considering that this BUC describes services that could be requested close to real-time, it also foresees the possibility of both manual and automatic activation by the DSO. In the case of the latter, the DSO could send activation setpoints directly to the DER, while in the case of the former, activation setpoints are sent to the FSP that manually activates the DER's flexibility.

10. **Measurement phase**:

In this final service phase, the MO and/or DSO will verify if the flexibility was provided in accordance to the product procured in the market phase. This service phase can take place in the real-time and/or after the real-time. For the measurement of flexibility, a baseline has to be previously defined, to which the actual metered data of the FSP can be compared too. If the FSP is not able to deliver the flexibility in accordance with the predefined market conditions and agreed baseline, penalties may apply, which would decrease the remuneration received by FSP.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Cost Value	Compare cost for flexibility with avoided cost otherwise if flexibility was not use; e.g., cost (deferral of avoidance) of network reinforcement.	All

2	ICT costs	The term ICT cost comprises the communications and information technologies, including the software for the aggregation and market clearing process. Only those ICT costs that are directly related to the implementation of each coordination scheme will be considered.	• Implement flexibility provision/usage through a market platform. • Use consumer's demand-response in efficient flexibility services.
4	Available Flexibility	Flexible power that can be used for balancing specific grid segment, i.e., the available power flexibility in a defined period (e.g., per day) that can be allocated by the DSO at a specific grid segment. Measured in MW. This in relation with the total amount of power in the specific grid segment in the same period.	• Demonstrate that long term agreements are suitable amongst different available DERs • Use consumer's demand-response in efficient flexibility services.
3	Accuracy of load forecast	This indicator measures the error of the load forecast in distribution system	• To apply market procedures to obtain flexibility services attending DSO requirements. • Use consumer's demand-response in efficient flexibility services.
5	Power Deviation	Tracking error between a set-point requested by the SO and the measure	All
6	Congestion reduction	This indicator measures the percentage decrease of load demand in the requested asset by a flexibility provider resource.	All
7	Volume of transactions	This indicator measures the number of transactions. This indicator will be used in order to measure the number of offered and cleared bids for each service.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs
8	Number of transactions	This indicator measures the percentage of products tested in the demos with respect to the number of products initially targeted by the demos.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs

9	Number of products	This indicator measures the percentage of products tested in the demos with respect to the number of products initially targeted by the demos.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs
10	Active participation	This indicator measures the percentage of customers actively participating in the demo with respect to the total customers that accepted the participation. This indicator will be used to evaluate customer engagement plan.	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform. • Demonstrate that long term agreements are suitable amongst different available DERs

1.6. Use case conditions

Use case conditions
Assumptions
It is allowed to use flexibility solutions to secure or restore the network following an expected or unexpected failure if they are appropriate and cost-effective. It is assumed that settlement conditions are well defined and clearly state eventual needs for compensations and/or financial adjustments among affected parties in the flexibility provision process (e.g., BRPs, BSPs, Aggregators).
Prerequisites
To have at least one flexibility provider in an area where a congestion can be simulated. Analyze the area and define possible congestion and short-term solutions with and without flexibility providers Individual DERs, aggregators, and independent aggregators have to be allowed by regulation to provide flexibility to the DSO. DSO have to be able to procure flexibility from FSPs, as well as receive financial compensation for the flexibility procurement and have economic incentives to do so.

1.7. Further information to the use case for classification/mapping

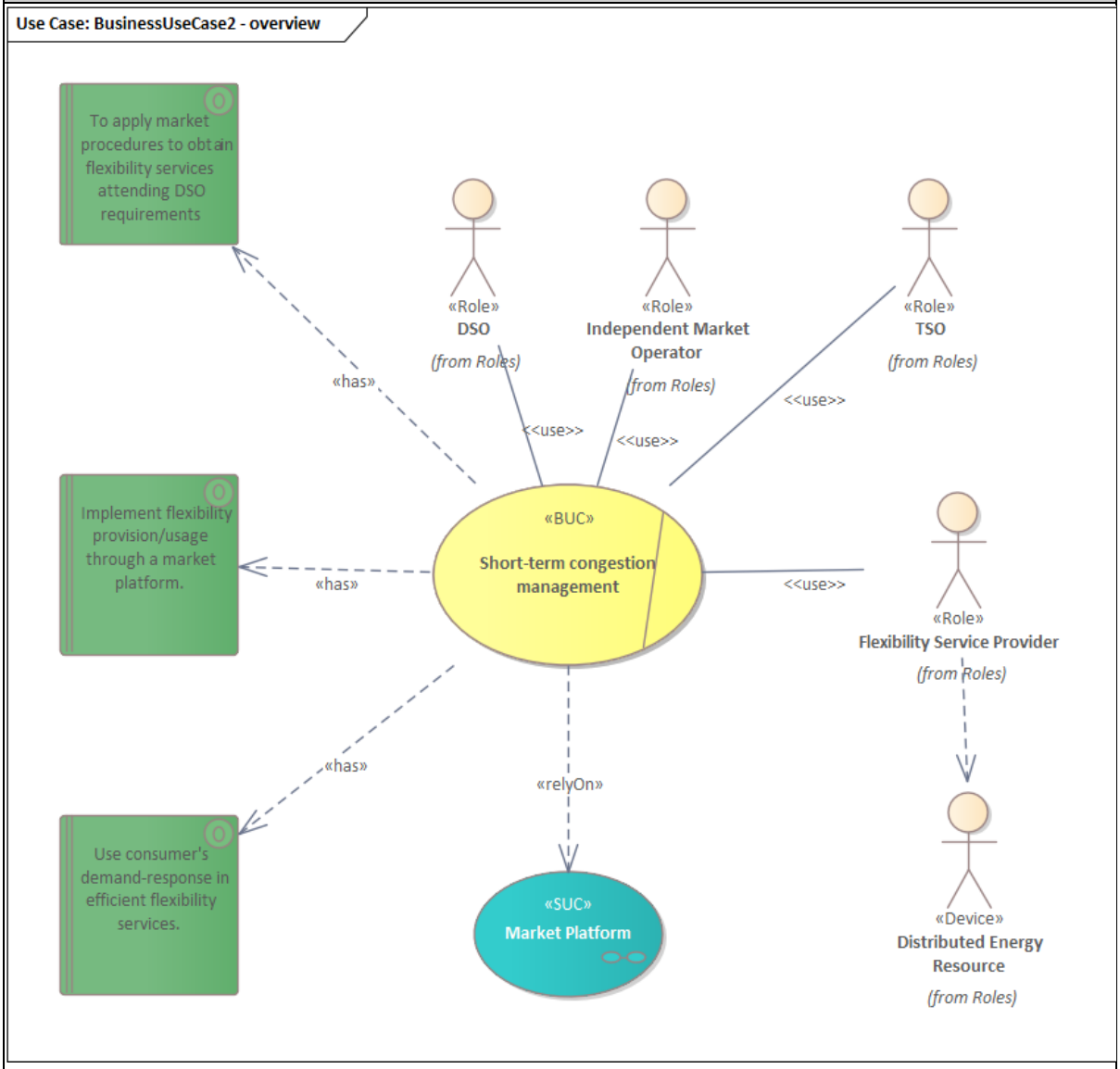
Classification information
Relation to other use cases
WECL-ES-01, SUC-ES-01
Level of depth
Generic
Prioritisation
High priority

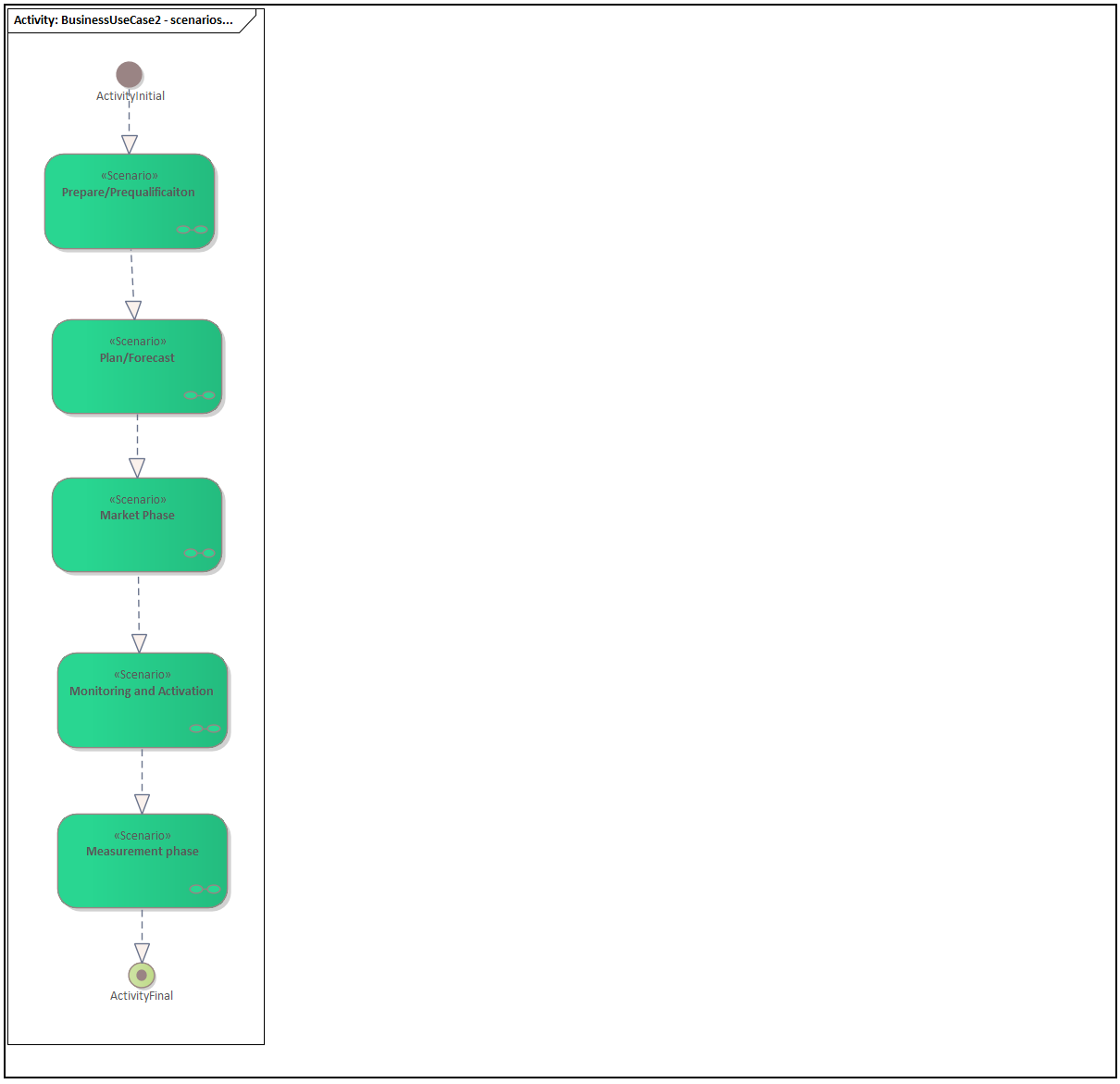
Generic, regional or national relation
National
Nature of the use case
Business Use Case
Further keywords for classification
Local congestion management, Distributed energy resources, flexible providers, traditional short-term solutions, short term

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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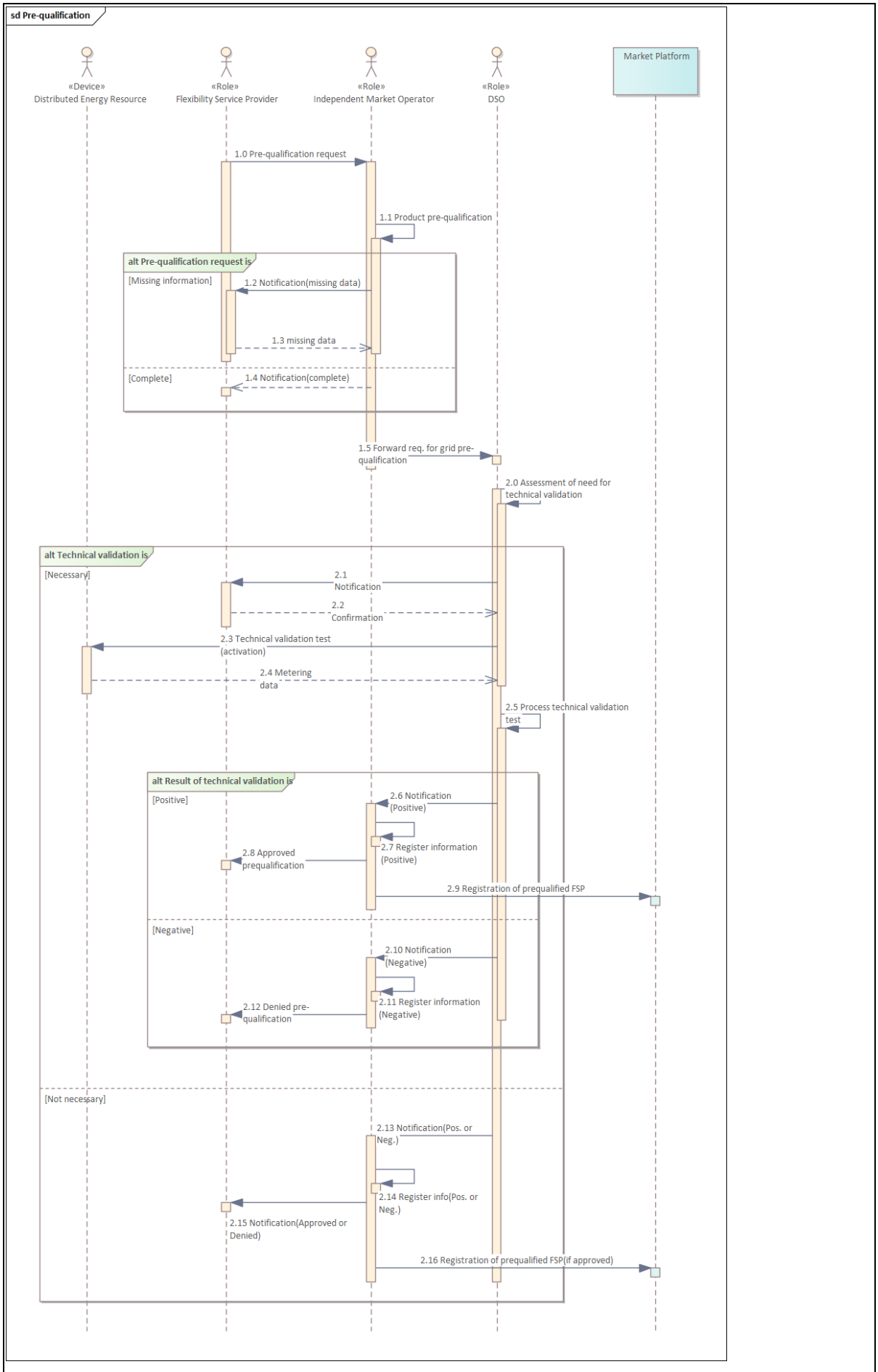
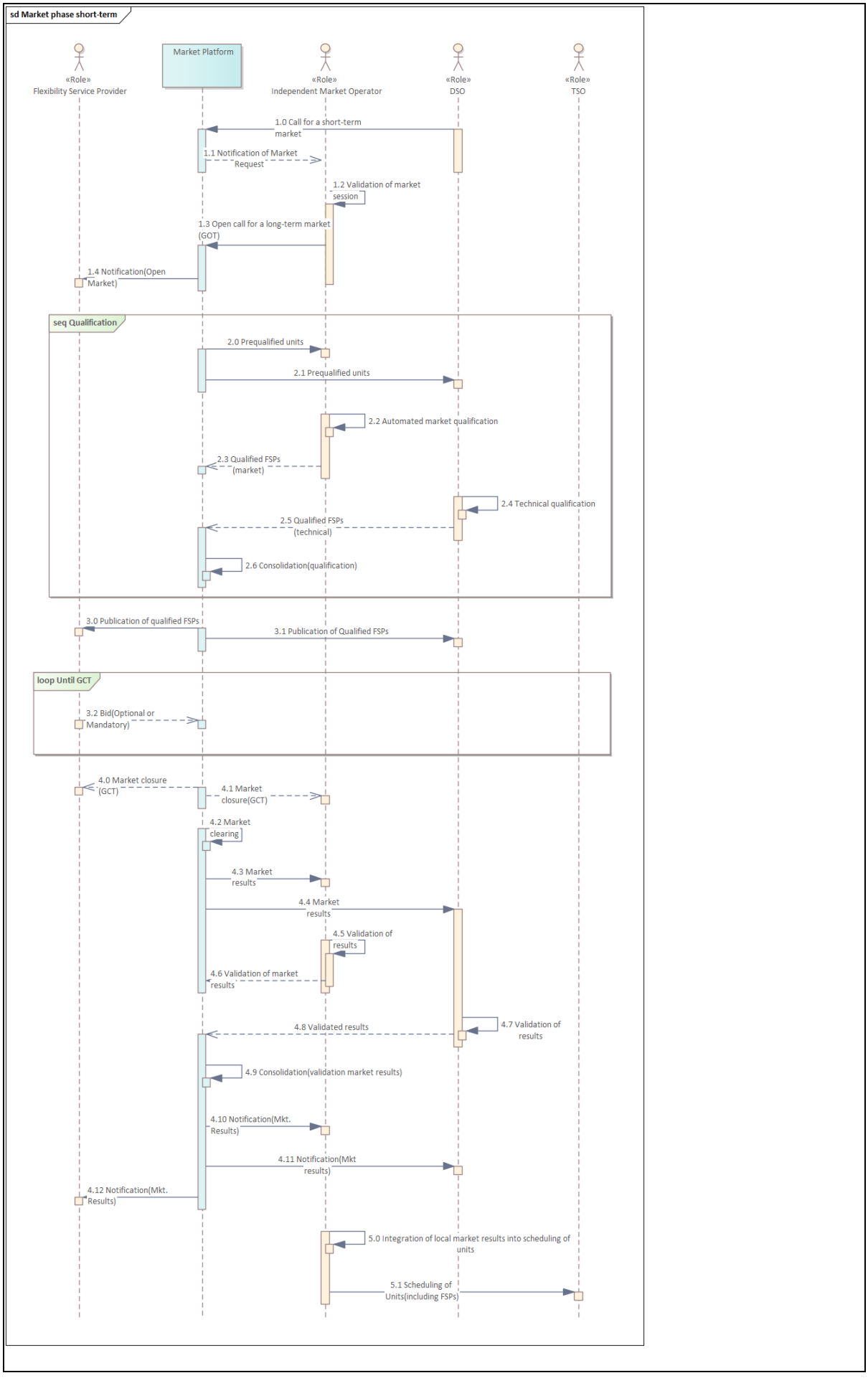
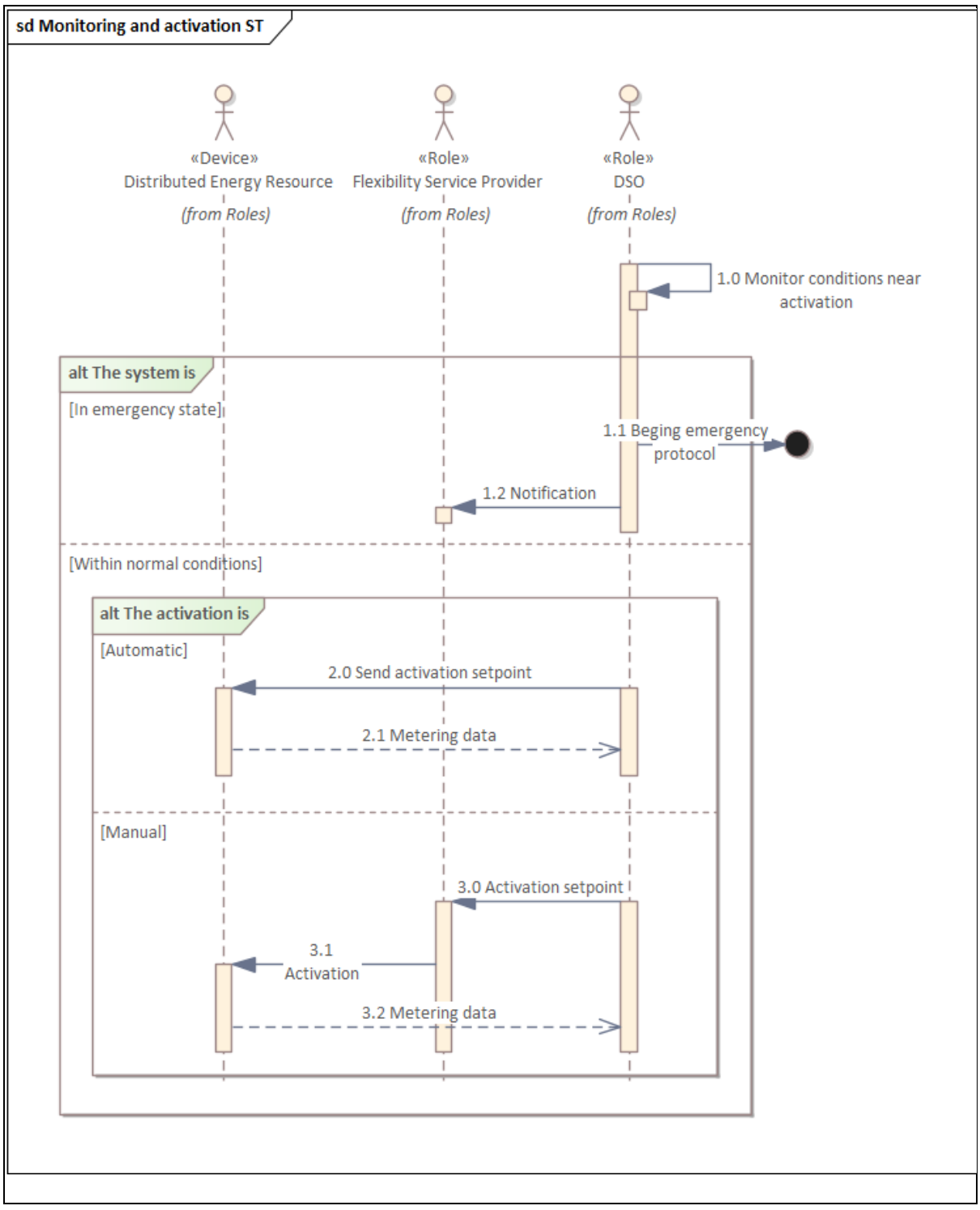
ActivityInitial
«Scenario»
Prepare/Prequalificaiton
«Scenario»
Plan/Forecast
«Scenario»
Market Phase
«Scenario»
Monitoring and Activation
«Scenario»
Measurement phase
ActivityFinal


sd Pre-qualification
«Device»
Distributed Energy Resource
«Role»
Flexibility Service Provider
«Role»
Independent Market Operator
«Role»
DSO
Market Platform
1.0 Pre-qualification request
1.1 Product pre-qualification
alt Pre-qualification request is
[Missing information]
1.2 Notification(missing data)
1.3 missing data
[Complete]
1.4 Notification(complete)
1.5 Forward req. for grid pre-qualification
2.0 Assessment of need for technical validation
alt Technical validation is
[Necessary]
2.1 Notification
2.2 Confirmation
2.3 Technical validation test (activation)
2.4 Metering data
2.5 Process technical validation test
alt Result of technical validation is
[Positive]
2.6 Notification (Positive)
2.7 Register information (Positive)
2.8 Approved prequalification
2.9 Registration of prequalified FSP
[Negative]
2.10 Notification (Negative)
2.11 Register information (Negative)
2.12 Denied pre-qualification
[Not necessary]
2.13 Notification(Pos. or Neg.)
2.14 Register info(Pos. or Neg.)
2.15 Notification(Approved or Denied)
2.16 Registration of prequalified FSP(if approved)


sd Market phase short-term
«Role»
Flexibility Service Provider
Market Platform
«Role»
Independent Market Operator
«Role»
DSO
«Role»
TSO
1.0 Call for a short-term market
1.1 Notification of Market Request
1.2 Validation of market session
1.3 Open call for a long-term market (GOT)
1.4 Notification(Open Market)
seq Qualification
2.0 Prequalified units
2.1 Prequalified units
2.2 Automated market qualification
2.3 Qualified FSPs (market)
2.4 Technical qualification
2.5 Qualified FSPs (technical)
2.6 Consolidation(qualification)
3.0 Publication of qualified FSPs
3.1 Publication of Qualified FSPs
loop Until GCT
3.2 Bid(Optional or Mandatory)
4.0 Market closure (GCT)
4.1 Market closure(GCT)
4.2 Market clearing
4.3 Market results
4.4 Market results
4.5 Validation of results
4.6 Validation of market results
4.7 Validation of results
4.8 Validated results
4.9 Consolidation(validation market results)
4.10 Notification(Mkt. Results)
4.11 Notification(Mkt results)
4.12 Notification(Mkt. Results)
5.0 Integration of local market results into scheduling of units
5.1 Scheduling of Units(including FSPs)


sd Monitoring and activation ST
«Device»
Distributed Energy Resource
(from Roles)
«Role»
Flexibility Service Provider
(from Roles)
«Role»
DSO
(from Roles)
1.0 Monitor conditions near activation
alt The system is
[In emergency state]
1.1 Beging emergency protocol
1.2 Notification
[Within normal conditions]
alt The activation is
[Automatic]
2.0 Send activation setpoint
2.1 Metering data
[Manual]
3.0 Activation setpoint
3.1 Activation
3.2 Metering data

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Distribution System Operator (DSO)	Role	According to the Article 2.6 of the Directive: "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity".	
Transmission System Operator (TSO)	Role	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area.	
Independent Market Operator (IMO)	Role	Responsible for calling, clearing, communicating results and possibly settling the provision of distributed flexibility. This role can be taken by an independent market operator, an existing one (e.g., a NEMO), or a system operator.	
Distributed Energy Resource (DER)	Device	Resources connected at the distribution grid capable of providing active power flexibility, either upward/downward or both. It can comprise several different roles and devices such as demand response (actor/role), distributed generation, electric vehicles, and storage systems.	
Flexibility Service Provider (FSP)	Role	Generic role which links the role customer and its possibility to provide flexibility to the roles market and grid; generic role that could be taken by many stakeholders, such as an aggregator or individual distributed energy resources.	

3.2. References

ENTSO-E Role Model;

[1]

CEDEC, EDSO, ENTSO-E, Eurelectric, and GEODE, “TSO-DSO Report: An Integrated Approach to Active System Management,” 2019. Accessed: Jul. 19, 2019. [Online]. Available: https://www.entsoe.eu/news/2019/04/16/a-toolbox-for-tsos-and-dsos-to-make-use-of-new-system-and-grid-services/

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Prepare/Pre-qualification	The process in which it is checked whether a unit can deliver the product it intends to sell.	DSO	The DSO and/or the IMO receives a request from a FSP to be pre-qualified to offer the long-term local congestion management products	The FSP complies with the prerequisites publicly made available by the DSO/IMO	The FSP is successfully verified and tested, receiving the permission to offer the products to which the prequalification was aimed at.
2	Plan/Forecast	Planning of grid utilization and identifying potential congestions.	DSO	The distribution system optimizer quantifies the amount of flexibility needed	The DSO identifies a situation in which congestion are expected in the medium or long term.	The DSO computes the amount of flexibility needed for the different types of products in the different timesteps and calls a market.
3	Market phase	Market opening, qualification, bids collection, market clearing and communication of results	IMO	The DSO calls a market for the procurement of flexibility calculated in scenario 2.	FSP are prequalified to provide the service	Markets are cleared and FSPs are nominated to provide the product.
4	Monitoring and activation	Grid monitoring and flexibility bids activation to solve the forecasted congestion management	DSO	The real-time for the provision of a service procured in scenario 4 approached	The FSP and the DSO have the necessary communication infrastructure for the activation order to be sent	The FSP successfully receives the order to provide the flexibility.
5	Measurement phase	Validation of service delivery	DSO	The service is being provided in real-time or it has been already provided	Metering data is successfully received by the DSO with the necessary granularity and a baseline method was determined	The DSO compares the metered data with the baseline previously computed or sent by the FSP.

4.2. Steps - Scenarios

Prepare/Pre-qualification

Scenario #1 description

The process in which it is checked whether a unit can deliver the product it intends to sell.

Scenario step by step analysis

Scenario								
Scenario name	Prepare/Pre-qualification							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	FSP requests to be pre-qualified	Pre-qualification request	The FSP requests to the IMO to be pre-qualified to offer a certain type of product	CREATE	FSP	IMO	I.E.01 I.E.02 I.E.03 I.E.04	
1.1	IMO processes market prequalification	Product prequalification	The IMO processes the market prequalification.	EXECUTE	IMO	IMO		
1.2	FSP is notified if information provided is incomplete	Notification (missing data)	The IMO requests missing data	GET	IMO	FSP	I.E.03 I.E.04	
1.3	FSP reports back missing data	Missing data	The FSP reports back missing data	REPORT	FSP	IMO	I.E.03 I.E.04	
1.4	IMO notifies the completion of data collection	Notification (complete)	The notifies the completion on data collection process for the purpose of pre-qualification	CLOSE	IMO	FSP		
1.5	IMO forwards pre-qualification request for technical prequalification	Forward req. for grid pre-qualification	The IMO forwards pre-qualification request for technical prequalification	REPORT	IMO	DSO	I.E.03 I.E.04	
2.0[7]	DSO assess the need for a technical validation	Assessment of need for technical validation	The DSO may decide that field tests are necessary to ensure that flexibility can be provided by the applicant FSP. In this	EXECUTE	DSO	DSO		

[7] Changes in numbering at the step-by-step analysis (e.g., 1.5 to 2.0) are meant to provide a more intuitive visualization of the sequence diagrams, signalling the end of one process and the start of another.

			step, the DSO assess internally the need for field tests					
2.1	DSO communicates the need for a technical validation	Notification	If a technical validation is necessary, the FSP is communicated on the new requirement, as well as the details for the technical validation.	REPORT	DSO	FSP		
2.2	FSP acknowledges the technical validation need	Confirmation	The FSP acknowledges the technical validation need	REPORT	FSP	DSP		
2.3	Technical validation test	Technical validation test	The DSO may send a setpoint directly to the DER at the moment of the activation.	GET	DSO	DER		
2.4	DER sends metering data	Metering data	The DER sends metering data regarding the technical pre-qualification directly to the DSO.	REPORT	DER	DSO	I.E.06	
2.5	DSO processes the results from technical validation	Process technical validation	The DSO internally processes the results of the technical validation test	EXECUTE	DSO	DSO		
2.6	DSO notifies on successful technical validation	Notification (positive)	The DSO notifies the IMO on the result of the technical validation	REPORT	DSO	IMO		
2.7	The IMO registers internally the FSP as pre-qualified	Register information (positive)	The IMO registers internally the FSP as pre-qualified	CREATE	IMO	IMO		

2.8	The FSP is communicated on the successful pre-qualification	Approved prequalification	The FSP is communicated on the successful pre-qualification	GET	IMO	FSP		
2.9	The IMO registers to the Market Platform the successful pre-qualification	Registration of pre-qualified FSP	The IMO registers to the Market Platform the successful pre-qualification	CREATE	IMO	Market Platform		
2.10	DSO notifies on unsuccessful technical validation	Notification (negative)	The DSO notifies the IMO on the result of the technical validation	REPORT	DSO	IMO		
2.11	The IMO registers internally the FSP as not pre-qualified	Register information (negative)	The IMO registers internally the FSP as not pre-qualified	CREATE	IMO	IMO		
2.12	The FSP is communicated on the unsuccessful pre-qualification	Denied pre-qualification	The FSP is communicated on the unsuccessful pre-qualification	GET	IMO	FSP		
2.13	If no technical validation is necessary, DSO informs no technical pre-qualification result	Notification (positive or negative)	If no technical validation is necessary, DSO informs no technical pre-qualification result	REPORT	DSO	IMO		
2.14	The IMO registers internally the result of the pre-qualification process (positive or negative)	Register information (positive or negative)	The IMO registers internally the result of the pre-qualification process (positive or negative)	CREATE	IMO	IMO		
2.15	The FSP is communicated on the pre-qualification result	Notification (Approved or Denied)	The FSP is communicated on the pre-qualification result (positive or negative)	REPORT	IMO	FSP		

	(positive or negative)							
2.16	The IMO registers to the Market Platform the successful pre-qualification	Registration of pre-qualified FSP (if approved)	The IMO registers to the Market Platform the successful pre-qualification	CREATE	IMO	Market Platform		

Plan/Forecast

Scenario #2 description

Planning of grid utilization and identifying potential congestions.

Scenario step by step analysis

Scenario								
Scenario name		Offering						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	DSO evaluates the need for a short-term market for flexibility	DSO evaluates the need for a short-term market for flexibility	The DSO evaluates internally the need for a short-term market for flexibility. This step is an internal activity exclusive to the DSO, and therefore no information exchanges with other actors take place. Therefore, the internal steps carried out by the DSO are not modelled in detail.	EXECUTE	DSO	DSO		

Market phase: short-term

Scenario #3 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name								
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	DSO requests a short-term market	Call for a short-term market	DSO requests a short-term market based on the results of scenario 2 (plan and forecast). At this request, several parameters will have to be informed by the DSO. These parameters are grouped into (i) generic attributes and (ii) product parameters	CREATE	DSO	Market Platform	I.E.07 (generic attributes) I.E.08 (product parameters)	
1.1	Notification of market request	Notification of market request	The IMO is notified that a market request was created by the DSO	REPORT	Market platform	IMO		
1.2	IMO validates and prepares a market session	Preparation of market session	The IMO validates the information provided by the DSO (IE07 and IE08). N.B.: Intermediated steps in which the IMO may identify missing information, request completion from the DSO, and final	EXECUTE	IMO	IMO		

			completion by the DSO are omitted for the sake of simplicity.					
1.3	IMO opens call for a short-term market	Open call for a short-term market	The IMO, after validating the market session, opens the market session in the Market Platform	EXECUTE	IMO	Market Platform		
1.4	FSPs are notified of a market opening	Notification (Open Market)	The Market Platform notifies the FSP about a market opening.	REPORT	Market Platform	FSP	I.E.08 (not all parameters)	
2.0	IMO is informed of pre-qualified units	Pre-qualified units	This step market the beginning of the qualification process. The IMO receives a list of pre-qualified units for that market session. Differently from the long-term market, at the beginning of the market phase, all FSPs should already be pre-qualified.	GET	Market Platform	IMO	I.E.09	
2.1	DSO is informed of pre-qualified units	Pre-qualified units	This step market the beginning of the qualification process. The DSO receives a list of pre-qualified units for that market session. Differently	GET	Market Platform	IMO	I.E.09	

			from the long-term market, at the beginning of the market phase, all FSPs should already be pre-qualified.					
2.2	IMO proceeds with the market qualification	Market qualification	The IMO proceeds with the market qualification. The IMO checks the maximum power to bid from FSPs and the existence of financial warranties.	EXECUTE	IMO	IMO		
2.3	IMO registers a list of qualified units (market qualification)	Qualified FSPs (market)	The IMO registers a list of qualified units (market qualification)	REPORT	IMO	Market Platform	I.E.10 (market)	
2.4	DSO proceeds with the technical qualification	Technical qualification	A process by which the DSO verifies the DER capacity to meet the requisites of the specific requirement. All the resources in the specific area will be checked to determine which ones are capable of providing the required service.	EXECUTE	DSO	DSO		
2.5	DSO registers a list of qualified units (technical qualification)	Qualified FSPs (technical)	The DSO registers a list of qualified units (Technical qualification)	REPORT	DSO	Market Platform	I.E.10 (technical)	

2.6	The Market Platform crosschecks both qualification lists and produces the consolidated list	Consolidation (qualification)	The Market Platform crosschecks both qualification lists and produces the consolidated list	CREATE	Market Platform	Market Platform	I.E.10 (consolidated)	
3.0	The Market Platform publishes/notifies qualified FSPs	Publication of qualified FSPs	The Market Platform publishes/notifies qualified FSPs	REPORT	Market Platform	FSP	I.E.10 (consolidated)	
3.1	The Market Platform publishes/notifies qualified FSPs to the DSO	Publication of qualified FSPs	The Market Platform publishes/notifies qualified FSPs to the DSO	REPORT	Market Platform	DSO	I.E.10 (consolidated)	
3.2	FSP bids to market session	Bid	Qualified FSPs may bid to the market session as long as market session is open (before the Gate Closer Time [GCT])	CREATE	FSP	Market Platform	I.E.11	
4.0; 4.1	Market platform notifies the GCT	Market closure (GCT)	Market platform notifies the GCT	REPORT	Market Platform	FSP; IMO		
4.2	Market Platform clears the market	Market clearing	Market Platform clears the market	EXECUTE	Market Platform	Market Platform		
4.3; 4.4	Market Platform reports market results	Market results	Market Platform reports market results	REPORT	Market Platform	IMO; DSO		
4.5	IMO validates the market results	Validation of results	The IMO checks the market results for inconsistences. After that, results are validated	EXECUTE	IMO	IMO		
4.6	IMO registers the validated market results	Validated market results	IMO registers the validated market results	REPORT	IMO	Market platform	I.E.12 (market)	

4.7	DSO validates the market results	Validation of results	The DSO checks the market results for inconsistences (from a technical perspective).	EXECUTE	DSO	DSO	I.E.12 (technical)	
4.8	DSO registers the validated market results	Validated market results	DSO registers the validated market results	REPORT	DSO	Market platform	I.E.12 (technical)	
4.9	The Market Platform consolidates the market results	Consolidation (market results)	The Market Platform consolidates the market results based on the validation by the IMO and the DSO	CREATE	Market Platform	Market Platform	I.E.12 (consolidated)	
4.10; 4.11; 4.12	Market participants and IMO are informed of final market results	Notification (market results)	Market participants (DSO, FSPs) and IMO are informed of final market results	REPORT	Market Platform	DSO; FSP; IMO	I.E.12 (consolidated)	
5.0	The IMO integrates the market results in the short term with all other market results	Integration of local market results into scheduling of units	The IMO integrates the market results in the short term with all other market results	CREATE	IMO	IMO		
5.1	The IMO reports the scheduling of units, including the results of local flexibility markets, to the TSO	Scheduling of Units	The IMO reports the scheduling of units, including the results of local flexibility markets, to the TSO	REPORT	IMO	TSO	I.E.13	

Monitoring and activation

Scenario #3 description

Grid monitoring and flexibility bids activation to solve the forecasted congestion management.

Scenario step by step analysis

Scenario

Scenario name								
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	The DSO monitors the state of the grid near real-time (activation)	Monitoring conditions near activation	The DSO monitor the state of the grid near activation in order to ensure the security of the grid	EXECUTE	DSO	DSO		
1.1	If the grid is an emergency state, the DSO starts the emergency protocol, and the BUC is terminated	Beginning emergency state	If the grid is an emergency state, the DSO starts the emergency protocol and the BUC is terminated, as this situation lays outside the scope of this BUC.	EXECUTE; CLOSE	DSO	DSO		
1.2	If the grid is an emergency state, the DSO notifies the FSP to proceed according to the emergency protocol (outside the scope of the BUC)	Notification	If the grid is an emergency state, the DSO notifies the FSP to proceed according to the emergency protocol (outside the scope of the BUC). For example, the FSP may be requested to proceed on a previously agreed way, may be exempted from providing flexibility, or may not be notified at all. This situation is outside the scope of this BUC.	REPORT	DSO	FSP		

2.0	If the state is within normal conditions and the activation type is automatic, the DSO sends the setpoint directly to the DER	Send activation setpoint	If the state is within normal conditions and the activation type is automatic, the DSO sends the setpoint directly to the DER	REPORT; EXECUTE	DSO	DER		
2.1	DER reports metering data	Metering data	DER reports metering data directly to the DSO	REPORT	DER	DSO	I.E.06	
3.0	If the state is within normal conditions and the activation type is manual, the DSO sends the setpoint to the FSP	Activation setpoint	If the state is within normal conditions and the activation type is manual, the DSO sends the setpoint to the FSP	REPORT	DSO	FSP		
3.1	The FSP proceeds with the activation in real-time according to the market results.	Activation	If the state is within normal conditions, the FSP proceeds with the activation in real-time according to the market results.	EXECUTE	FSP	DER		
3.2	DER reports metering data	Metering data	DER reports metering data directly to the DSO	REPORT	DER	DSO	I.E.06	

Measurement phase

Scenario #3 description

Validation of service delivery

Scenario step by step analysis

Scenario								
Scenario name								
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.0	DSO receives metering data	Metering data	DSO receives metering data (step 3.1 of scenario 4)	GET	DER	DSO	I.E.06	
2.0	The DSO validates the service provision	Verification of service provision	The DSO validates the service provision. To do so, the DSO compares the metered data with the service procured and the baseline predefined.	EXECUTE	DSO	DSO		
2.1	The DSO notifies the IMO on the service provision	Notification of service provision	The DSO informs the IMO on the level of service provision (e.g., percentage of service provision based on the deviation of the metering data to the agreed flexibility)	REPORT	DSO	IMO		
2.2	IMO proceeds with the settlement processing	Settlement processing	The IMO proceeds with the settlement processing. According to the level of service provision, penalties (reduction of agreed price/payment) may occur.	EXECUTE	IMO	IMO		
2.3	The FSP is notified on the	Settlement notification	The FSP is notified on the	REPORT	IMO	FSP		

	final settlement		final settlement					

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I.E.01	Basic Participant Information	Register and basic information about the market participant such as username and password	
I.E.02	Market participant pre-qualification information	Contact information; Fiscal data; Access contract; bank details; power of representation; confidentiality agreement; declaration of non-collusion	
I.E.03	Market resource pre-qualification information	Market participants provide information on the resources they want to prequalify: Facility/resource name; Type of technology; Location; Market participant; etc.	
I.E.04	Technical resource pre-qualification information	Verification of the installed capacity to provide the service: Power; CUPS (Universal Supply Point Code acronym in Spanish); Maximum quantity; Response time, Etc	
I.E.05	Technical validation for pre-qualification	In case of the need of a technical validation for prequalification, the FSP receives the information on the when and how the test will be conducted: day; time; power to reduce/increase; duration of the test; etc.	
I.E.06	Metering data	Metering data from DER	
I.E.07	Generic attributes	Composed of generic parameters concerning the market session being requested. E.g.: • Auction identifier • Associated DSO • Product Type: Flexibility Product • Type of negotiation: Auction Area: Basic or aggregated.	
I.E.08	Product parameters	Composed of product parameters concerning the market session being requested. E.g.: 7. Service window: Selection of the required date and duration of the service o Start date/hour: 01/06/2021 o Duration: 3h o Opening time: 8:00 PM o Closing time: 10:00 PM 8. Availability: Selection of the capacity, the direction and the estimated hours of activation. o Capacity: 4MW o Direction: Upwards (up for generation, down for consumption)	

		9. Activation window (in case of activation product): Specific subperiod in an activation window when a particular DER could be activated and thus it must be available. Multiple sets of activation windows can be defined. E.g.: o Day: 01/06/2021 o Hour: 19h o Duration: 2h o Capacity to modify: 1MW o Direction: Upward 10. Local area: Selection of the trading area. Choice by postal code, connection point, lines… (to be determined). o Area: postal code 11. Activation Announcement: Time in advance that a DSO informs a DER that its activation is programmed confirmed. 12. Form of Remuneration: It establishes form of payment to winner DERs Two different terms are defined availability and activation (depending on the product). o Type of product: availability/activation o Availability/Activation cap price: X €/MW or X €/MWh	
I.E.09	List of pre-qualified units	List of pre-qualified units for a given market session	
I.E.10	List of qualified units (market, technical or consolidated)	List of qualified units for a given market session. The list can refer to the market qualification, technical qualification or the consolidated list.	
I.E.11	Bid	Composed of bidding information 3. General attributes • FSP identifier 4. Availability: Selection of the capacity, the direction and the estimated hours of activation. • Period of availability (multiple periods may be possible within the service window) • Price: for availability and/or activation Additional parameters (complex bids) may be considered (under discussion).	
I.E.12	Validate market results	Validated market results by either the IMO (market), the DSO (technical) or the consolidated market results.	
I.E.13	Scheduling of FSPs	Scheduling of FSPs	

9.2.3.2 Portuguese demo

Exchange of Information for Congestion Management – Short Term

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
WECL-PT-01		Exchange of Information for Congestion Management – Short Term

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	07/05/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*This BUC is focused on describing in detail each process phase of the ASM report, stating what information should be exchanged and what rules should be established between DSO and TSO in order to procure congestion management products for short-term (intraday, day-ahead).*
Objective(s)	1- Design and detail each process phase of ASM report so that it can serve as a basis for future developments. 2- Coordination of the use of flexibility for different voltage levels. 3- Identify what information should be shared between DSO and TSO for each of the flexibility procurement process phases for short terms congestion management, namely for the technical selection and validation of the bids by the relevant system operator. 4- Develop information exchange mechanisms to enable market-based procurement of flexibility products.
Related business case(s)	***WECL-PT-02, WECL-PT-03***

1.4. Narrative of Use Case

Narrative of use case
Short description
Flexible resources connected to transmission and distribution system can provide flexibility to system operators to eliminate congestions through a market mechanism.

This BUC in transmission and/or distribution system, in order to keep power flows within the accepted thermal limits of the lines. These information exchanges of information mechanisms should be adaptable to any future market model or governance issues.

Some different time frame markets will be examined:

- Day Ahead
- Intraday

For each time frame, we will approach some of the following process phases of ASM report:

- Prepare/Pre-qualification: The process in which it is checked whether a unit can deliver the product it intends to sell, taking into account the network conditions.
- Plan/Forecast: Planning of grid utilization and identifying potential congestions.
- Market Phase: Bids collection and selection, short-term contracts (capacity products) and short-term products/services (selection of energy products)
- Monitoring and Activation: Grid monitoring and flexibility bids activation to solve the forecasted congestion management
- Measurement and Settlement phase: Validation of delivery

Some of the above process phases may be similar for both time frames.
In this Business Use Case, the measurement and settlement phase will not be addressed.
The developed information exchange mechanisms will be implemented in order to have a verification process.

Complete description

Flexible resources connected to transmission and distribution system can provide flexibility to system operators to eliminate congestions through a market mechanism.

This BUC describes the exchanges of information and the processes that should be established for different scenarios: pre-qualification, plan/forecast, market phase and monitoring and activation phase. For each scenario, we will always take into account different timeframes (intraday and day-ahead) and how they are related.

Pre-qualification

The pre-qualification process should start after a flexibility service provider expresses interest in entering the flexibility market. This process serves to ensure that a particular flexibility service provider is capable of delivering a given product. In order to do that, two types of pre-qualification should be considered: Product Pre-qualification and Grid Pre-qualification.

The former ensures that the resource contains the technical requirements to be able to deliver the product and proceed to the market phase and eventually selected by a system operator. These technical requirements are defined by DSO and TSO and after the FSP indicates the attributes of the product it wants to deliver, a pre-qualification test should be performed to verify that all attributes are in compliance with the technical requirements. This test may be repeated on a periodic basis or whenever the characteristics of the product are found to change significantly.

The product pre-qualification can be done either by the DSO or TSO, regardless of its location. In case a system operator wants to activate a product already pre-qualified by another system operator, the former should have access to this information in order to make the process more efficient and not to pre-qualify the same product twice.

Regarding grid pre-qualification, this process ensures that the product provided by the Flexible Service Provider will not cause constraints in the networks where it is connected. This process can be avoided if the System Operators have already identified the areas where flexibility is always allowed. The grid pre-qualification should be performed by the System Operator of the network to which the product is

connected in order to verify if the maximum capacity of the product does not impact the network it is connected to.

If the results of the two types of pre-qualification are approved, the entry of the FSP into the flexibility market is allowed.

The Pre-qualification scenario is independent of the timeframe, since it is a process that happens before the market phase.

Plan/Forecast

In this phase the System Operators take into account the utilization of their grid. Based on forecasts the Systems Operators checks the power flows to detect whether or not there will be possible congestion in the network. In case the grid capacity is insufficient to meet the forecasted electricity production or consumption, System Operators may resort to the flexibility market to resolve this type of issue. This phase is done for two different timeframes, day-ahead and intraday. On the one hand, the day-ahead forecasts are made for D-1. On the other hand, the intraday forecasts are made every 4 hours in order to improve the accuracy of the predicted flow of electricity that were made for the day-ahead.

The objectives of this phase are to identify possible congestions in the network and to support the procurement in the flexibility markets.

Market Phase

The market phase starts after the system operators forecast network congestion. In this phase, the system operators are focused on collecting and selecting bids from FSPs. These bids can be in the day-ahead market, which occurs on D-1, in the intraday market, which occurs already inside D every 4 hours, or they can come from the long-term market (BUC-2). The intraday market is a complement to the day-ahead market. The possible failures or unforeseen events that were not covered in the day-ahead should be corrected in the intraday market.

In the bid selection process, the SO should pay attention to whether the bid is located in its own network, or in another network. In the latter case, the SO should consult the SO where the bid is located so it can evaluate the constraints that may arise if the bid is accepted and activated. After this phase, the need arises to sort the accepted bids by a merit order list.

This Business Use Case will address a multi-level market model.

Monitoring and Activation

This phase occurs after the list of bids sorted by a merit order is defined. The SO selects the bid it wants to activate, if the bid is located in the network of another SO, the latter should be consulted to validate the activation of this bid. If the SO's need is not resolved this process is repeated iteratively until the SO needs are solved.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions	
Assumptions	
1- DSO Market Operator	
2- TSO Market Operator	
3- FSPs (Flexible Service Providers)	
Prerequisites	
1	FSPs exchange information with their resources.
2	FSPs - Flexibility service provider – controls sufficient volume of flexibility resources and provides flexibility services to avoid grid congestion problems.

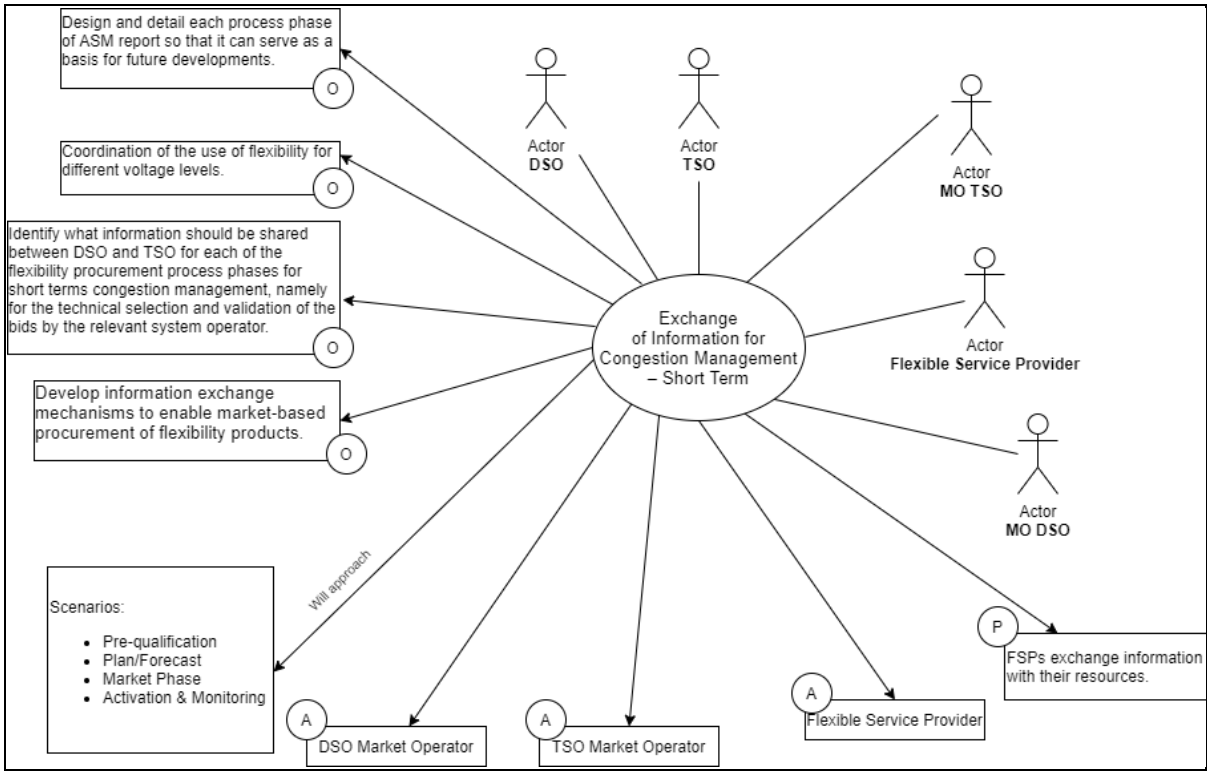
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
WECL-PT-02, WECL-PT-03
Level of depth
High Level
Prioritisation
Generic, regional or national relation
Generic
Nature of the use case
Business Use Case
Further keywords for classification
Congestion management, DSO-TSO Coordination, DSO-TSO Exchange of Information

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
DSO	Role	According to the EDSO, the DSOs are “the operating managers (and sometimes owners) of energy distribution networks, operating at low, medium and, in some member states, high voltage levels (LV, MV)”.	
TSO	Role	According to the European Commission, the TSO is “an organisation committed to transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure”. The certification procedure for TSOs is listed in Article 10 of the 2009 Electricity and Gas Directives.	
MO DSO	Role	According to Article 2(7) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast), market operator designates “an entity that provides a service whereby the offers to sell electricity are matched with bids to buy electricity”.	
MO TSO	Role	According to Article 2(7) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast), market operator designates	

		“an entity that provides a service whereby the offers to sell electricity are matched with bids to buy electricity”.	
FSP	Role	Defined as any legal entity that offers flexibility services in the market.	

3.2. References

4. Step by step analysis of use case

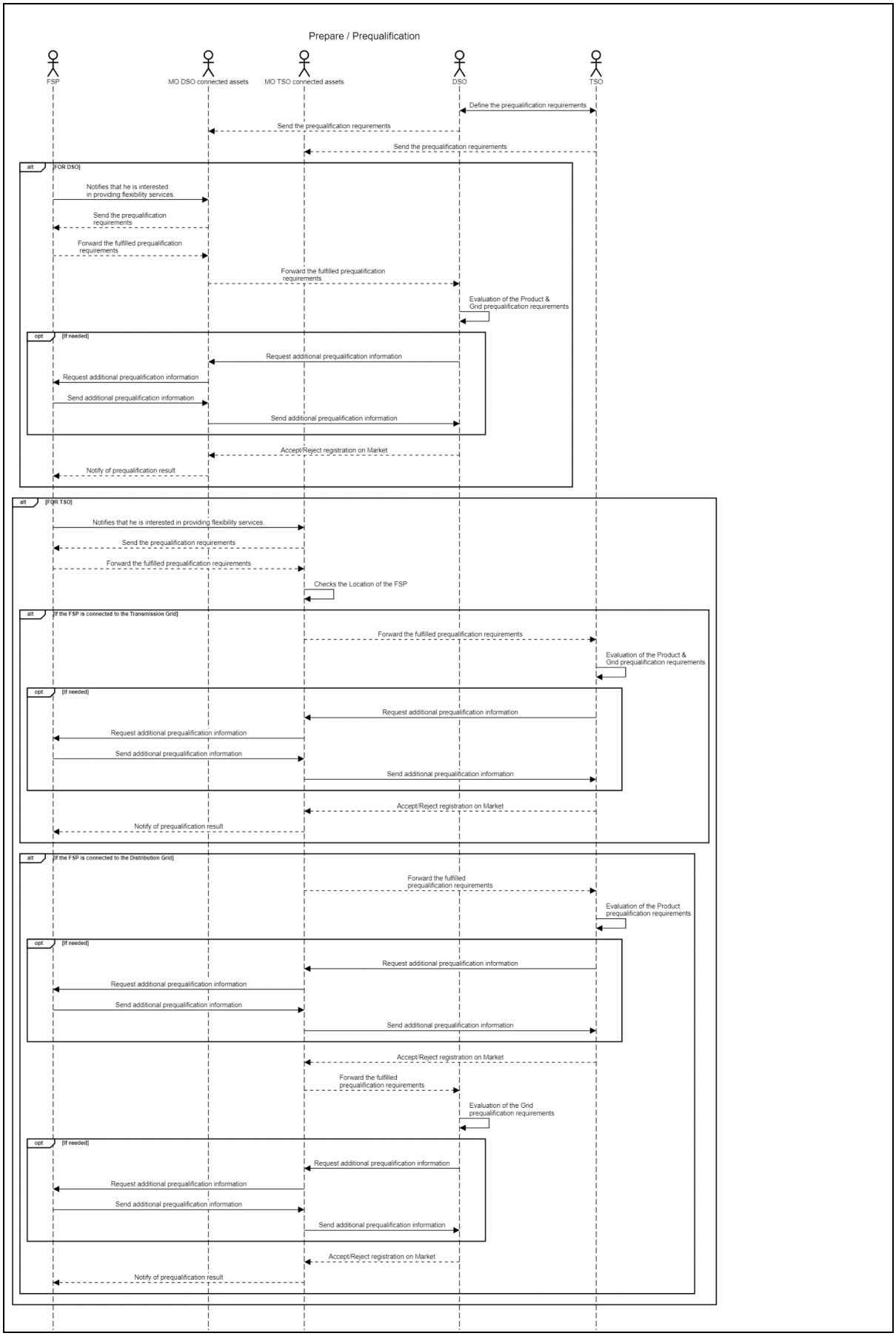
4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Prepare/Prequalification	The process in which it is checked whether a unit can deliver the product it intends to sell, taking into account the network conditions	DSO/TSO	FSP/MO notifies the SO that he is interested in providing flexibility services.		
2	Plan/Forecast	Planning of grid utilization and identifying potential congestions.	DSO/TSO			
3	Market Phase	Bids collection and selection, short-term contracts (capacity products) and short-term products/services (selection of energy products).	DSO TSO MO DSO MO TSO	FSP offers products		
4	Monitoring & Activation	Grid monitoring and flexibility bids activation to solve the forecasted congestion management.	DSO/TSO			

4.2. Steps - Scenarios

Prepare/Prequalification

Scenario #1 description


Prepare / Prequalification
FSP
MO DSO connected assets
MO TSO connected assets
DSO
TSO
Define the prequalification requirements
Send the prequalification requirements
Send the prequalification requirements
alt
[FOR DSO]
Notifies that he is interested in providing flexibility services.
Send the prequalification requirements
Forward the fulfilled prequalification requirements
Forward the fulfilled prequalification requirements
Evaluation of the Product & Grid prequalification requirements
opt
[If needed]
Request additional prequalification information
Request additional prequalification information
Send additional prequalification information
Send additional prequalification information
Accept/Reject registration on Market
Notify of prequalification result
alt
[FOR TSO]
Notifies that he is interested in providing flexibility services.
Send the prequalification requirements
Forward the fulfilled prequalification requirements
Checks the Location of the FSP
alt
[If the FSP is connected to the Transmission Grid]
Forward the fulfilled prequalification requirements
Evaluation of the Product & Grid prequalification requirements
opt
[If needed]
Request additional prequalification information
Request additional prequalification information
Send additional prequalification information
Send additional prequalification information
Accept/Reject registration on Market
Notify of prequalification result
alt
[If the FSP is connected to the Distribution Grid]
Forward the fulfilled prequalification requirements
Evaluation of the Product prequalification requirements
opt
[If needed]
Request additional prequalification information
Request additional prequalification information
Send additional prequalification information
Send additional prequalification information
Accept/Reject registration on Market
Forward the fulfilled prequalification requirements
Evaluation of the Grid prequalification requirements
opt
[If needed]
Request additional prequalification information
Request additional prequalification information
Send additional prequalification information
Send additional prequalification information
Accept/Reject registration on Market
Notify of prequalification result

Scenario step by step analysis

Scenario								
Scenario name		Prepare/Prequalification						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
1.1		Define the prequalification requirements			DSO&TSO			
1.2		Send the prequalification requirements			DSO	MO DSO	Info1	
1.3		Send the prequalification requirements			TSO	MO TSO	Info1	
1.4		Notifies that he is interested in providing flexibility services.	FOR DSO		FSP	MO DSO		
1.5		Send the prequalification requirements	FOR DSO		MO DSO	FSP	Info1	
1.6		Forward the fulfilled prequalification requirements	FOR DSO		FSP	MO DSO		
1.7		Forward the fulfilled prequalification requirements	FOR DSO		MO DSO	DSO	Info2	
1.8		Evaluation of the Product & Grid prequalification requirements	FOR DSO		DSO	DSO		
1.9		Request additional prequalification information	FOR DSO		DSO	MO DSO		
1.10		Request additional prequalification information	FOR DSO		MO DSO	FSP		
1.11		Send additional prequalification information	FOR DSO		FSP	MO DSO		
1.12		Send additional prequalification information	FOR DSO		MO DSO	DSO		

1.13		Accept / Reject registration on Market	FOR DSO		DSO	MO DSO	Info3	
1.14		Notify of prequalification result	FOR DSO		MO DSO	FSP		
1.15		Notifies that he is interested in providing flexibility services.	FOR TSO		FSP	MO TSO		
1.16		Send the prequalification requirements	FOR TSO		MO TSO	FSP	Info1	
1.17		Forward the fulfilled prequalification requirements	FOR TSO		FSP	MO TSO		
1.18		Checks the Location of the FSP	FOR TSO		MO TSO	MO TSO		
1.19		Forward the fulfilled prequalification requirements	FOR TSO. If the FSP is connected to the Transmission Grid		MO TSO	TSO	Info4	
1.20		Evaluation of the Product & Grid prequalification requirements	FOR TSO. If the FSP is connected to the Transmission Grid		TSO	TSO		
1.21		Request additional prequalification information	FOR TSO. If the FSP is connected to the Transmission Grid		TSO	MO TSO		
1.22		Request additional prequalification information	FOR TSO. If the FSP is connected to the Transmission Grid		MO TSO	FSP		
1.23		Send additional prequalification information	FOR TSO. If the FSP is connected to the Transmission Grid		FSP	MO TSO		
1.24		Send additional prequalification information	FOR TSO. If the FSP is connected to		MO TSO	TSO		

			the Transmission Grid					
1.25		Accept/Reject registration on Market	FOR TSO. If the FSP is connected to the Transmission Grid		TSO	MO TSO	Info5	
1.26		Notify of prequalification result	FOR TSO. If the FSP is connected to the Transmission Grid		MO TSO	FSP		
1.28		Forward the fulfilled prequalification requirements	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	TSO	Info4	
1.29		Evaluation of the Product prequalification requirements	FOR TSO. If the FSP is connected to the Distribution Grid.		TSO	TSO		
1.30		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		TSO	MO TSO		
1.31		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	FSP		
1.32		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		FSP	MO TSO		
1.33		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	TSO		
1.34		Accept/Reject registration on Market	FOR TSO. If the FSP is connected to the Distribution Grid.		TSO	MO TSO	Info5	
1.35		Forward the fulfilled prequalification requirements	FOR TSO. If the FSP is connected to		MO TSO	DSO	Info6	

			the Distribution Grid.					
1.36		Evaluation of the Grid prequalification requirements	FOR TSO. If the FSP is connected to the Distribution Grid.		DSO	DSO		
1.37		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		DSO	MO TSO		
1.38		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	FSP		
1.39		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		FSP	MO TSO		
1.40		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	DSO		
1.41		Accept/Reject registration on Market	FOR TSO. If the FSP is connected to the Distribution Grid.		DSO	MO TSO	Info7	
1.42		Notify of prequalification result	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	FSP		

- Step No 1.2 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Prequalification requirements		

- Step No 1.3 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Prequalification requirements		

- Step No 1.5 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Prequalification requirements		

- Step No 1.7 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Fulfilled prequalification requirements		

- Step No 1.13 / Accept / Reject registration on Market

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accept/Reject registration		

- Step No 1.16 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Prequalification requirements		

- Step No 1.19 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Fulfilled prequalification requirements		

- Step No 1.25 / Accept/Reject registration on Market

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Accept/Reject registration		

- Step No 1.28 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Fulfilled prequalification requirements		

- Step No 1.34 / Accept/Reject registration on Market

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accept/Reject registration		

- Step No 1.35 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Fulfilled prequalification requirements		

- Step No 1.41 / Accept/Reject registration on Market

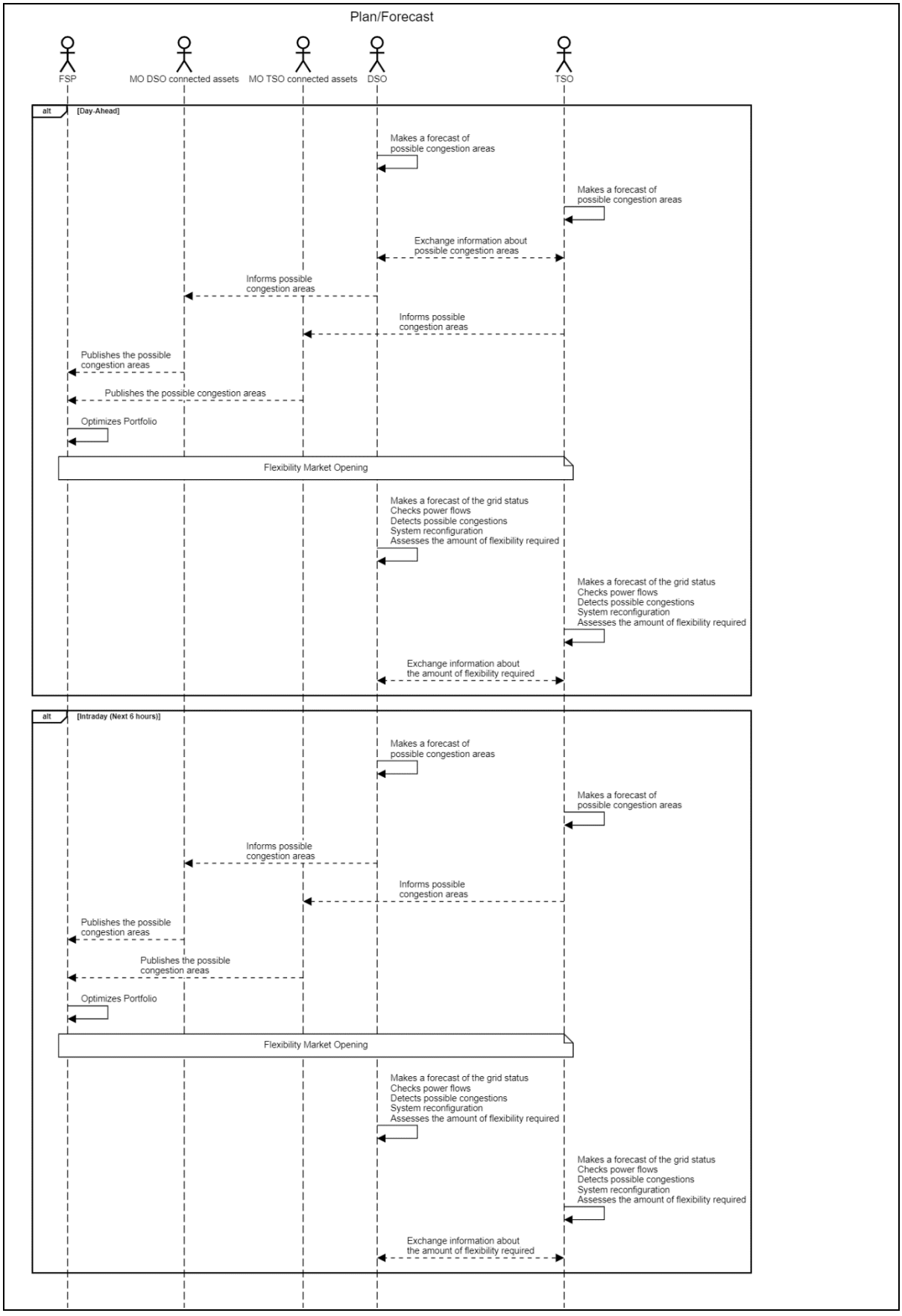
  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accept/Reject registration		

Plan/Forecast

Scenario #2 description


Plan/Forecast
FSP
MO DSO connected assets
MO TSO connected assets
DSO
TSO
alt
[Day-Ahead]
Makes a forecast of possible congestion areas
Makes a forecast of possible congestion areas
Exchange information about possible congestion areas
Informs possible congestion areas
Informs possible congestion areas
Publishes the possible congestion areas
Publishes the possible congestion areas
Optimizes Portfolio
Flexibility Market Opening
Makes a forecast of the grid status
Checks power flows
Detects possible congestions
System reconfiguration
Assesses the amount of flexibility required
Makes a forecast of the grid status
Checks power flows
Detects possible congestions
System reconfiguration
Assesses the amount of flexibility required
Exchange information about the amount of flexibility required
alt
[Intraday (Next 6 hours)]
Makes a forecast of possible congestion areas
Makes a forecast of possible congestion areas
Informs possible congestion areas
Informs possible congestion areas
Publishes the possible congestion areas
Publishes the possible congestion areas
Optimizes Portfolio
Flexibility Market Opening
Makes a forecast of the grid status
Checks power flows
Detects possible congestions
System reconfiguration
Assesses the amount of flexibility required
Makes a forecast of the grid status
Checks power flows
Detects possible congestions
System reconfiguration
Assesses the amount of flexibility required
Exchange information about the amount of flexibility required

Scenario step by step analysis

Scenario								
Scenario name		Plan/Forecast						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		Makes a forecast of possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		DSO	DSO		
2.2		Makes a forecast of possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		TSO	TSO		
2.3		Exchange information about possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		DSO/TSO	DSO/TSO	Info8	
2.4		Informs possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		DSO	MO DSO	Info9	
2.5		Informs possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		TSO	MO TSO	Info10	
2.6		Publish the possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		MO DSO	FSP		
2.7		Publish the possible congestion areas	Day-Ahead Market. Before Flexibility Market Opening		MO TSO	FSP		
2.8		Optimize Portfolio	Day-Ahead Market.		FSP	FSP		

			Before Flexibility Market Opening					
2.9		Makes a forecast of the grid status Check power flows Detect possible congestions System reconfiguration Assesses the amount of flexibility required	Day-Ahead Market. Flexibility Market Opening		DSO	DSO		
2.10		Makes a forecast of the grid status Check power flows Detect possible congestions System reconfiguration Assesses the amount of flexibility required	Day-Ahead Market. Flexibility Market Opening		TSO	TSO		
2.11		Exchange information about the amount of flexibility required	Day-Ahead Market. Flexibility Market Opening		DSO/TSO	DSO/TSO	Info11	
2.12		Makes a forecast of possible congestion areas	Intraday Market. Before Flexibility Market Opening		DSO	DSO		
2.13		Makes a forecast of possible congestion areas	Intraday Market. Before Flexibility Market Opening		DSO	DSO		
2.14		Informs possible congestion areas	Intraday Market. Before Flexibility Market Opening		DSO	MO DSO	Info8	

2.15		Informs possible congestion areas	Intraday Market. Before Flexibility Market Opening		TSO	MO TSO	Info9	
2.16		Publish the possible congestion areas	Intraday Market. Before Flexibility Market Opening		MO DSO	FSP		
2.17		Publish the possible congestion areas	Intraday Market. Before Flexibility Market Opening		MO TSO	FSP		
2.18		Optimize Portfolio	Intraday Market. Before Flexibility Market Opening		FSP	FSP		
2.19		Makes a forecast of the grid status Check power flows Detect possible congestions System reconfiguration Assesses the amount of flexibility required	Intraday Market. Flexibility Market Opening		DSO	DSO		
2.20		Makes a forecast of the grid status Check power flows Detect possible congestions System reconfiguration Assesses the amount of flexibility required	Intraday Market. Flexibility Market Opening		TSO	TSO		
2.21		Exchange information about the amount of	Intraday Market. Flexibility Market Opening		DSO/TSO	DSO/TSO	Info11	

		flexibility required						

- Step No 2.3 / Exchange information about possible congestion areas

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Possible congestion areas		

- Step No 2.4 / Informs possible congestion areas

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Possible congestion areas		

- Step No 2.5 / Informs possible congestion areas

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Possible congestion areas		

- Step No 2.11 / Exchange information about the amount of flexibility required

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Amount of flexibility required		

- Step No 2.14 / Informs possible congestion areas

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Possible congestion areas		

- Step No 2.15 / Informs possible congestion areas

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Possible congestion areas		

- Step No 2.21 / Exchange information about the amount of flexibility required

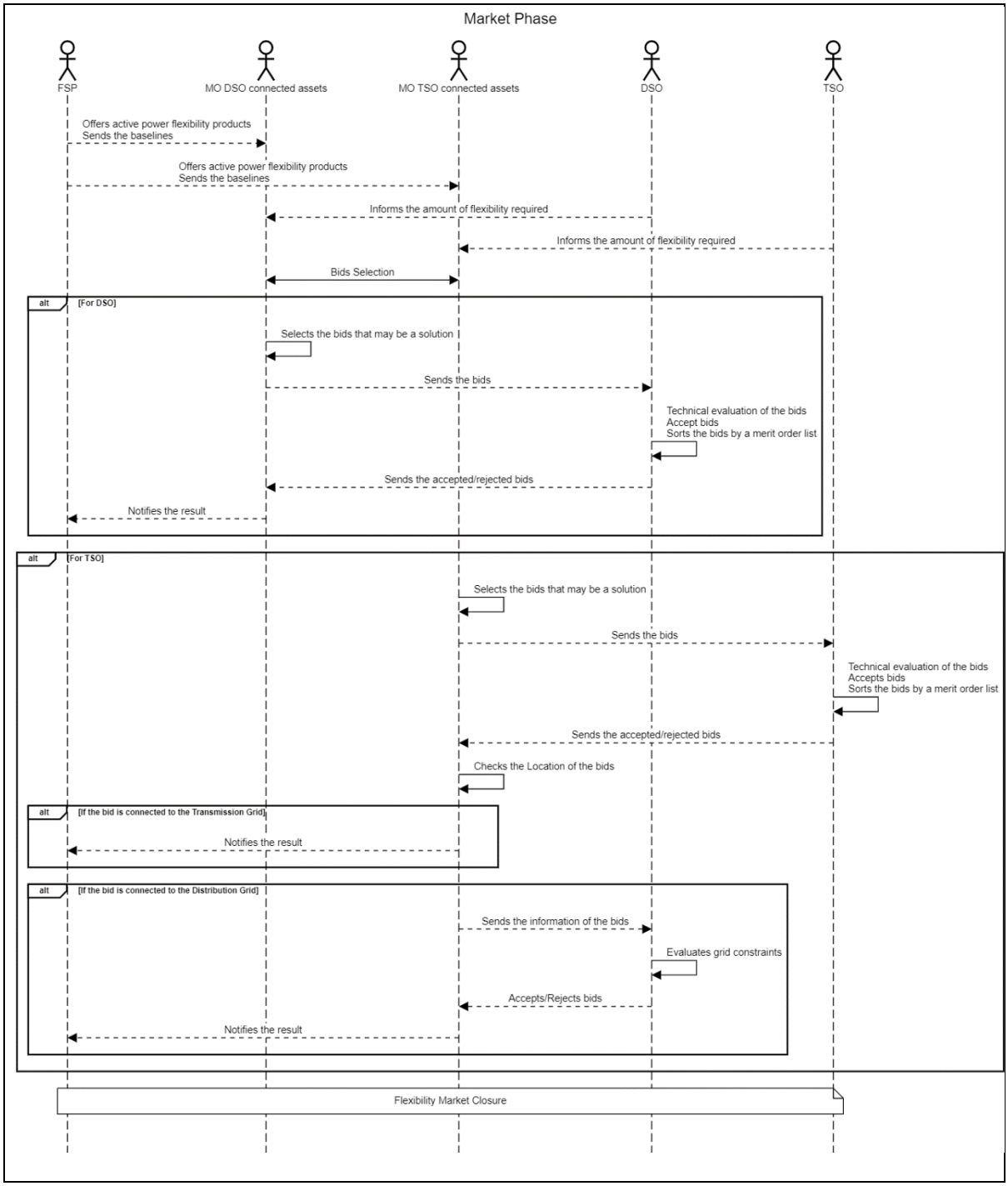
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Amount of flexibility required		

Market Phase

Scenario #3 description



Scenario step by step analysis

Scenario								
Scenario name		Market Phase						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information***	***Information receiver (actor)***	***Information***	***Requirement, R-IDs***

					producer (actor)		***exchanged (IDs)***	
3.1		Offer active power flexibility products Sends the baselines			FSP	MO DSO		
3.2		Offer active power flexibility products Sends the baselines			FSP	MO TSO		
3.3		Informs the amount of flexibility required			DSO	MO DSO	Info12	
3.4		Informs the amount of flexibility required			TSO	MO TSO	Info13	
3.5		Bids Selection			MO DSO/ MO TSO	MO DSO/ MO TSO		
3.6		Selects the bids that may be a solution	For DSO		MO DSO	MO DSO		
3.7		Send the bids	For DSO		MO DSO	DSO	Info14	
3.8		Technical evaluation of the bids Accept bids Sort the bids by a merit order list	For DSO		DSO	DSO		
3.9		Send the accepted/rejected bids	For DSO		DSO	MO DSO	Info15	
3.10		Notifies the result	For DSO		MO DSO	FSP		
3.11		Selects the bids that may be a solution	For TSO		MO TSO	MO TSO		
3.12		Send the bids	For TSO		MO TSO	TSO	Info16	
3.13		Technical evaluation of the bids Accept bids Sort the bids by a merit order list	For TSO		TSO	TSO		
3.14		Send the accepted/rejected bids	For TSO		TSO	MO TSO	Info17	
3.15		Check the Location of the bids	For TSO		MO TSO	MO TSO		

3.16		Notifies the result	For TSO If the bid is connected to the Transmission Grid		MO TSO	FSP		
3.17		Send the information of the bid	For TSO If the bid is connected to the Distribution Grid		MO TSO	DSO	Info18	
3.18		Evaluates grid constraints	For TSO If the bid is connected to the Distribution Grid		DSO	DSO		
3.19		Accept/Reject bid	For TSO If the bid is connected to the Distribution Grid		DSO	MO TSO	Info19	
3.20		Notifies the result	For TSO If the bid is connected to the Distribution Grid		MO TSO	FSP		

- Step No 3.3 / Informs the amount of flexibility required

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Amount of flexibility required		

- Step No 3.4 / Informs the amount of flexibility required

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Amount of flexibility required		

- Step No 3.7 / Send the bids

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***

Bids		

- Step No 3.9 / Send the accepted/rejected bids

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accepted/Rejected bids		

- Step No 3.12 / Send the bids

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Bids		

- Step No 3.14 / Send the accepted/rejected bids

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accepted/Rejected bids		

- Step No 3.17 / Send the information of the bid

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Information of the bid		

- Step No 3.19 / Send the accepted/rejected bids

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accepted/Rejected bids		

Monitoring & Activation

Scenario #4 description

Scenario step by step analysis

Scenario								
Scenario name		Monitoring/Activation						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
4.1		Sharing of accepted bids			DSO/TSO	DSO/TSO	Info20	
4.2		Checks grid constrains	For bids located in Distribution Grid		DSO	DSO		
4.3		Informs what Bids can/cannot be activated	For bids located in Distribution Grid		DSO	TSO	Info21	
4.4		Checks grid constrains	For bids located in Transmission Grid		TSO	TSO		
4.5		Informs what Bids can/cannot be activated	For bids located in Transmission Grid		TSO	DSO	Info22	
4.6		Allows/Not allow bid activation			DSO	MO DSO	Info23	
4.7		Allows/Not allow bid activation			TSO	MO TSO	Info24	
4.8		Informs the result			MO DSO	FSP		
4.9		Informs the result			MO TSO	FSP		
4.10		Informs the activation of the bid			FSP	MO DSO		
4.11		Informs the activation of the bid			FSP	MO TSO		

- Step No 4.1 / Sharing of accepted bids

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accepted bids		

- Step No 4.3 / Informs what Bids can/cannot be activated

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Bids can/cannot be activated		

- Step No 4.5 / Informs what Bids can/cannot be activated

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Bids can/cannot be activated		

- Step No 4.6 / Allows/Not allow bid activation

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Bids Allowed/Not Allowed to activate		

- Step No 4.7 / Allows/Not allow bid activation

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Bids Allowed/Not Allowed to activate		

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Prequalification requirements	▪ Mode of activation (If it is Automatic should be tested) ▪ Minimum Quantity (0.01 MW – 1 MW)	

		▪ Flexibility direction (load/generation reduction/increase, both) ▪ Locational information and SO connected ▪ Maximum duration of delivery period offer ▪ Single or Aggregated portfolio ▪ Capacity/Energy ▪ Maximum Full Activation time (60 minutes)	
Info2	Fulfilled prequalification requirements	For DSO. MO DSO -> DSO	Info1
Info3	Accept / Reject registration on Market	For DSO. DSO->MO DSO	
Info4	Fulfilled prequalification requirements	For TSO. MO TSO->TSO	Info1
Info5	Accept / Reject registration on Market	For TSO. TSO->MO TSO	
Info6	Fulfilled prequalification requirements	For TSO (in the Distribution Grid). MO TSO->DSO	Info4
Info7	Accept / Reject registration on Market	For TSO (in the Distribution Grid). DSO -> MO TSO	
Info8	Possible congestion areas	DSO<->TSO. Grid areas where congestion may occur	
Info9	Possible congestion areas	DSO->MO DSO. Grid areas where congestion may occur	Info8
Info10	Possible congestion areas	TSO->MO TSO. Grid areas where congestion may occur	Info8
Info11	Amount of flexibility required	DSO<->TSO. Flexibility quantity (MW)	
Info12	Informs the amount of flexibility required	DSO->MO MO DSO. Flexibility quantity (MW)	Info11
Info13	Informs the amount of flexibility required	TSO->MO MO TSO. Flexibility quantity (MW)	Info11
Info14	Sends the bids	For DSO. MO DSO->DSO. Characterization of the Bid (information, parameters, e.g., Price, location, quantity)	
Info15	Send the accepted/rejected bids	For DSO. DSO-> MO DSO. Bid ID and result (accepted/rejected)	Info14
Info16	Sends the bids	For TSO. MO TSO->TSO. For DSO. DSO-> MO DSO. Characterization of the Bid (information, parameters, e.g., Price, location, quantity)	
Info17	Send the accepted/rejected bids	For TSO. TSO-> MO TSO. Bid ID and result (accepted/rejected)	Info16
Info18	Send the information of the bid	For TSO. TSO->MO DSO. For DSO. DSO-> MO DSO. Characterization of the Bid (information, parameters, eg, location, quantity)	
Info19	Accept/Reject bid	For TSO. DSO->MO TSO. Bid ID and result (accepted/rejected)	

Info20	Sharing of accepted bids	DSO<->TSO Characterization of the Bid (information, parameters, e.g., Price, location, quantity)	
Info21	Informs what Bids can/cannot be activated	DSO->TSO. Bid ID and result (accepted/rejected)	Info20
Info22	Informs what Bids can/cannot be activated	TSO->DSO. Bid ID and result (accepted/rejected)	Info20
Info23	Allows/Not allow bid activation	DSO->MO DSO. Bid ID and result (accepted/rejected)	
Info24	Allows/Not allow bid activation	DSO->MO DSO. Bid ID and result (accepted/rejected)	

Exchange of Information for Congestion Management – Long Term

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
WECL-PT-02		Exchange of Information for Congestion Management – Long Term

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	07/05/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*This BUC describes each process phase of the ASM report, stating what information should be exchanged and what rules should be established between DSO and TSO in order to procure congestion management products for long-term (more than annually).*
Objective(s)	1- Design and detail each process phase of ASM report so that it can serve as a basis for future developments. 2- Coordination of the use of flexibility for different voltage levels. 3- Identify what information should be shared between DSO and TSO for each of the flexibility procurement process phases for long terms congestion management, namely for the technical selection and validation of the bids by the relevant system operator. 4- Develop information exchange mechanisms to enable market-based procurement of flexibility products.
Related business case(s)	***WECL-PT-01***

1.4. Narrative of Use Case

Narrative of use case
Short description
Flexible resources connected to transmission and distribution system can provide flexibility to system operators to eliminate congestions through a market mechanism. This BUC describes the exchanges of information and the rules that should be established between DSO and TSO in case of forecasted congestions in transmission and distribution system in order to keep power flows in the accepted thermal limits of the lines. DSOs and TSOs should procure flexibility in advance to solve a specific system loading issue on the distribution and transmission system thus deferring/eliminating the need for traditional system upgrades. This kind of flexibility service can also be used to support the network during planned maintenance actions.

These exchanges of information mechanisms should be compatible with any future market model or governance issues.

The market timeframe that will be examined is more than annually.

For this timeframe, we will approach some of the process phases of ASM report:

- Prepare/Pre-qualification: The process in which it is checked whether a unit can deliver the product it intends to sell, taking into account the network conditions.
- Plan/Forecast: Planning of grid utilization and identifying potential congestions.
- Market Phase: Bids collection and evaluation, long-term contracts (availability or capacity products) and long-term products/services (activation of energy products)
- Monitoring and Activation: Grid monitoring and flexibility bids activation of bids for congestion management
- Measurement and settlement phase: Validation of delivery

This Business Case is related to BUC-1, since the phases that will be covered are the same, but in a different time frame. Although some of the phases may be similar for both Use Cases, others will have to be adapted. In this Business Use Case, the measurement and settlement phase will not be addressed.

Complete description

Flexible resources connected to transmission and distribution system can provide flexibility to system operators to eliminate congestions through a market mechanism.

This BUC describes the exchanges of information and the processes that should be established for different scenarios: pre-qualification, plan/forecast, market phase and monitoring and activation phase. For each scenario, we will always take into account the more than annually timeframe.

Pre-qualification

The pre-qualification process should start after a flexibility service provider expresses interest in entering the flexibility market. This process serves to ensure that a particular flexibility service provider is capable of delivering a given product. In order to do that, two types of pre-qualification should be considered: Product Pre-qualification and Grid Pre-qualification.

The former ensures that the resource contains the technical requirements to be able to deliver the product and proceed to the market phase and eventually selected by a system operator. These technical requirements are defined by DSO and TSO and after the FSP indicates the attributes of the product it wants to deliver, a pre-qualification test should be performed to verify that all attributes are in compliance with the technical requirements. This test may be repeated on a periodic basis or whenever the characteristics of the product are found to change significantly.

The product pre-qualification can be done either by the DSO or TSO, regardless of its location. In case a system operator wants to activate a product already pre-qualified by another system operator, the former should have access to this information in order to make the process more efficient and not to pre-qualify the same product twice.

Regarding grid pre-qualification, this process ensures that the product provided by the Flexible Service Provider will not cause constraints in the networks where it is connected. This process can be avoided if the System Operators have already identified the areas where flexibility is always allowed. The grid pre-qualification should be performed by the System Operator of the network to which the product is connected in order to verify if the maximum capacity of the product does not impact the network it is connected to.

If the results of the two types of pre-qualification are approved, the entry of the FSP into the flexibility market is allowed.

The Pre-qualification scenario is independent of the time-frame, since it is a process that happens before the market phase.

Plan/Forecast

In this phase the System Operators consider the planning of grid reinforcement to solve unexpected or forecasted physical congestions related to reduced network capacity. In case the grid capacity is insufficient to meet the forecasted electricity production or consumption, System Operators should find solutions to tackle these kind of needs and may resort to the flexibility. This planning occurs 1 to 3 years in advance and the use of flexibility should be considered as a complement or even an alternative to traditional grid investments. The objectives of this phase are to identify possible congestions in the network and to support the procurement in the flexibility markets.

Market Phase

The market phase starts when the system operators forecast network congestion. For long-term timeframe this phase is divided into two stages.

1. The SO evaluates the bids and establishes agreements to reserve and activate, or just to reserve, the products that meet its needs.

2. In the short-term market (BUC-1), these products, once reserved, can be activated in order to solve SO needs.

In the bid selection process, the SO should pay attention to whether the bid is located in its own network, or in another network. In the latter case, the SO should consult the SO where the bid is located so it can evaluate the constraints that may arise if the bid is accepted and activated. After this phase, the need arises to sort the accepted bids by a merit order list.

This Business Use Case will address a multi-level market model.

Monitoring and Activation

This phase occurs after the list of bids sorted by a merit order is defined. The SO selects the bid it wants to activate, if the bid is located in the network of another SO, the latter should be consulted to validate the activation of this bid. If the SO's need is not resolved this process is repeated iteratively until the SO needs are solved.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions	
Assumptions	
1- DSO Market Operator	
2- TSO Market Operator	
3- FSPs (Flexible Service Providers)	
Prerequisites	
1	FSPs exchange information with their resources.

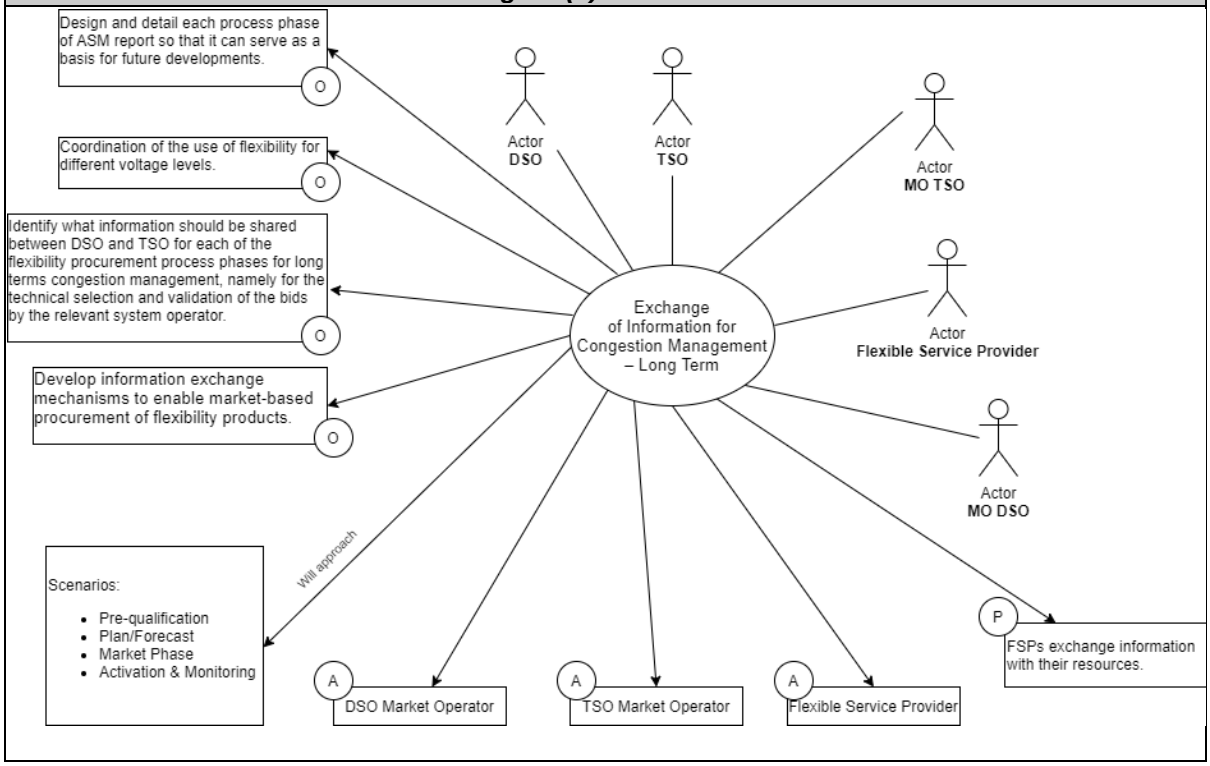
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
WECL-PT-01
Level of depth
High Level
Prioritisation
Generic, regional or national relation
Generic
Nature of the use case
Business Use Case
Further keywords for classification
Congestion management, DSO-TSO Coordination, DSO-TSO Exchange of Information

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors	
Grouping (e.g. domains, zones)	***Group description***

Actor name	*Actor type*	*Actor description*	*Further information specific to this use case*
DSO	Role	According to the EDSO, the DSOs are “the operating managers (and sometimes owners) of energy distribution networks, operating at low, medium and, in some member states, high voltage levels (LV, MV)”.	
TSO	Role	According to the European Commission, the TSO is “an organisation committed to transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure”. The certification procedure for TSOs is listed in Article 10 of the 2009 Electricity and Gas Directives.	
MO DSO	Role	According to Article 2(7) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast), market operator designates “an entity that provides a service whereby the offers to sell electricity are matched with bids to buy electricity”.	
MO TSO	Role	According to Article 2(7) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast), market operator designates “an entity that provides a service whereby the offers to sell electricity are matched with bids to buy electricity”.	
FSP	Role	Flexibility service provider controls sufficient volume of flexibility resources and provides flexibility services to avoid grid congestion problems.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

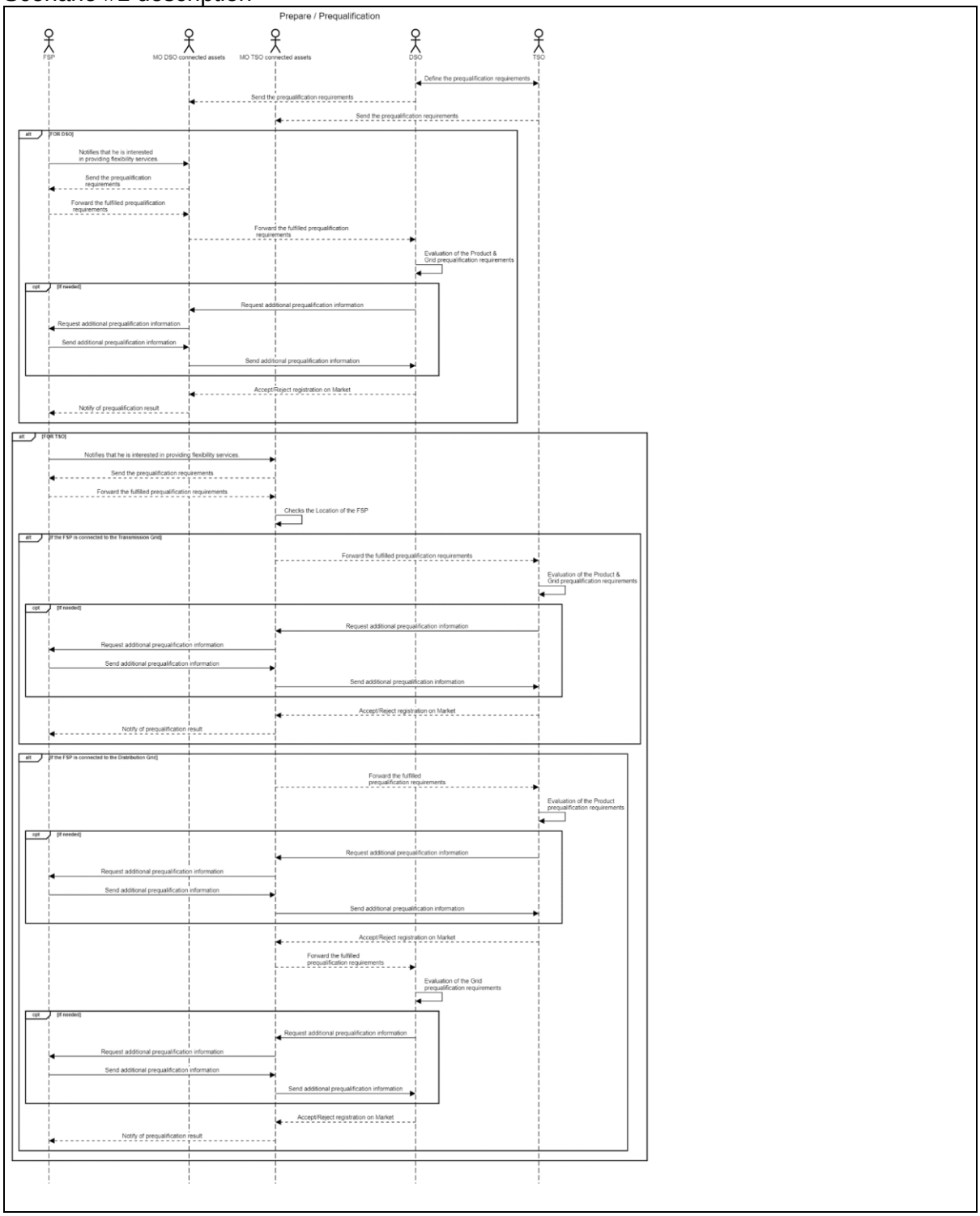
Scenario conditions						
No.	*Scenario name*	*Scenario description*	*Primary actor*	*Triggering event*	*Pre-condition*	*Post-condition*
1	Prepare/Prequalification	The process in which it is checked whether a unit can deliver the product it intends to sell, taking into account the network conditions	DSO/TSO	FSP/MO notifies the SO that he is interested in providing flexibility services.		
2	Plan/Forecast	Planning of grid utilization and identifying potential congestions.	DSO/TSO			
3	Market Phase	Bids collection and selection, Long-term contracts (capacity products)	DSO TSO MO DSO MO TSO	FSP offers products		
4	Monitoring & Activation	Grid monitoring and flexibility bids activation to solve the	DSO/TSO			

		forecasted congestion management.				

4.2. Steps - Scenarios

Prepare/Prequalification

Scenario #1 description



Scenario step by step analysis

Scenario								
Scenario name		Prepare/Prequalification						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
1.1		Define the prequalification requirements			DSO&TSO			
1.2		Send the prequalification requirements			DSO	MO DSO	Info1	
1.3		Send the prequalification requirements			TSO	MO TSO	Info1	
1.4		Notifies that he is interested in providing flexibility services.	FOR DSO		FSP	MO DSO		
1.5		Send the prequalification requirements	FOR DSO		MO DSO	FSP	Info1	
1.6		Forward the fulfilled prequalification requirements	FOR DSO		FSP	MO DSO		
1.7		Forward the fulfilled prequalification requirements	FOR DSO		MO DSO	DSO	Info2	
1.8		Evaluation of the Product & Grid prequalification requirements	FOR DSO		DSO	DSO		
1.9		Request additional prequalification information	FOR DSO		DSO	MO DSO		
1.10		Request additional prequalification information	FOR DSO		MO DSO	FSP		
1.11		Send additional prequalification information	FOR DSO		FSP	MO DSO		
1.12		Send additional prequalification information	FOR DSO		MO DSO	DSO		

1.13		Accept / Reject registration on Market	FOR DSO		DSO	MO DSO	Info3	
1.14		Notify of prequalification result	FOR DSO		MO DSO	FSP		
1.15		Notifies that he is interested in providing flexibility services.	FOR TSO		FSP	MO TSO		
1.16		Send the prequalification requirements	FOR TSO		MO TSO	FSP	Info1	
1.17		Forward the fulfilled prequalification requirements	FOR TSO		FSP	MO TSO		
1.18		Checks the Location of the FSP	FOR TSO		MO TSO	MO TSO		
1.19		Forward the fulfilled prequalification requirements	FOR TSO. If the FSP is connected to the Transmission Grid		MO TSO	TSO	Info4	
1.20		Evaluation of the Product & Grid prequalification requirements	FOR TSO. If the FSP is connected to the Transmission Grid		TSO	TSO		
1.21		Request additional prequalification information	FOR TSO. If the FSP is connected to the Transmission Grid		TSO	MO TSO		
1.22		Request additional prequalification information	FOR TSO. If the FSP is connected to the Transmission Grid		MO TSO	FSP		
1.23		Send additional prequalification information	FOR TSO. If the FSP is connected to the Transmission Grid		FSP	MO TSO		
1.24		Send additional prequalification information	FOR TSO. If the FSP is connected to		MO TSO	TSO		

			the Transmission Grid					
1.25		Accept/Reject registration on Market	FOR TSO. If the FSP is connected to the Transmission Grid		TSO	MO TSO	Info5	
1.26		Notify of prequalification result	FOR TSO. If the FSP is connected to the Transmission Grid		MO TSO	FSP		
1.28		Forward the fulfilled prequalification requirements	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	TSO	Info4	
1.29		Evaluation of the Product prequalification requirements	FOR TSO. If the FSP is connected to the Distribution Grid.		TSO	TSO		
1.30		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		TSO	MO TSO		
1.31		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	FSP		
1.32		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		FSP	MO TSO		
1.33		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	TSO		
1.34		Accept/Reject registration on Market	FOR TSO. If the FSP is connected to the Distribution Grid.		TSO	MO TSO	Info5	
1.35		Forward the fulfilled prequalification requirements	FOR TSO. If the FSP is connected to		MO TSO	DSO	Info6	

			the Distribution Grid.					
1.36		Evaluation of the Grid prequalification requirements	FOR TSO. If the FSP is connected to the Distribution Grid.		DSO	DSO		
1.37		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		DSO	MO TSO		
1.38		Request additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	FSP		
1.39		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		FSP	MO TSO		
1.40		Send additional prequalification information	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	DSO		
1.41		Accept/Reject registration on Market	FOR TSO. If the FSP is connected to the Distribution Grid.		DSO	MO TSO	Info7	
1.42		Notify of prequalification result	FOR TSO. If the FSP is connected to the Distribution Grid.		MO TSO	FSP		

- Step No 1.2 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Prequalification requirements		

- Step No 1.3 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Prequalification requirements		

- Step No 1.5 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Prequalification requirements		

- Step No 1.7 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Fulfilled prequalification requirements		

- Step No 1.13 / Accept / Reject registration on Market

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Accept/Reject registration		

- Step No 1.16 / Send the prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Prequalification requirements		

- Step No 1.19 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Fulfilled prequalification requirements		

- Step No 1.25 / Accept/Reject registration on Market

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Accept/Reject registration		

- Step No 1.28 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Fulfilled prequalification requirements		

- Step No 1.34 / Accept/Reject registration on Market

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Accept/Reject registration		

- Step No 1.35 / Forward the fulfilled prequalification requirements

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Fulfilled prequalification requirements		

- Step No 1.41 / Accept/Reject registration on Market

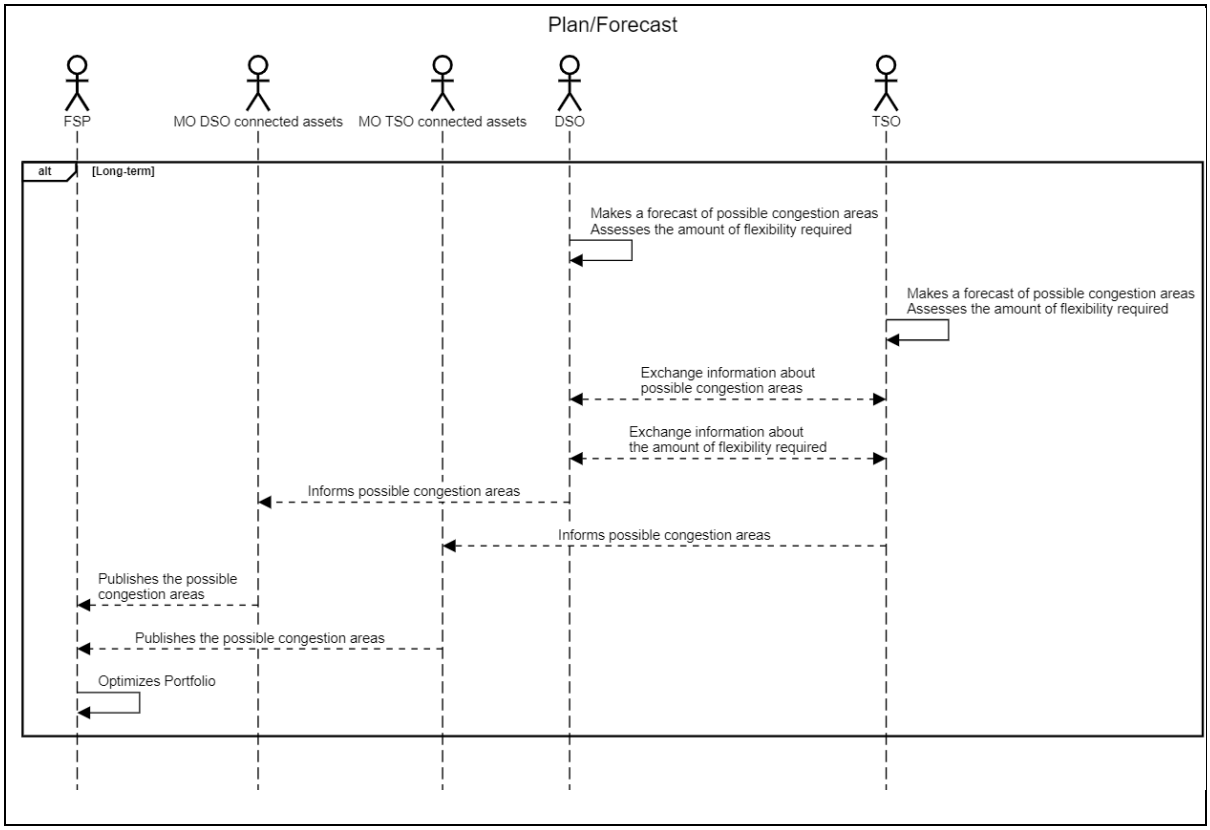
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Accept/Reject registration		

Plan/Forecast

Scenario #2 description



Scenario step by step analysis

Scenario								
Scenario name		Plan/Forecast						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		Makes a forecast of possible congestion areas Assesses the amount of flexibility required			DSO	DSO		
2.2		Makes a forecast of possible congestion areas Assesses the amount of flexibility required			TSO	TSO		

2.3		Exchange information about possible congestion areas			DSO/TSO	DSO/TSO	Info8	
2.4		Exchange information about the amount of flexibility required			DSO/TSO	DSO/TSO	Info9	
2.5		Informs possible congestion areas			DSO	MO DSO	Info10	
2.6		Informs possible congestion areas			TSO	MO TSO	Info11	
2.7		Publishes the possible congestion areas			MO DSO	FSP		
2.8		Publishes the possible congestion areas			MO TSO	FSP		
2.9		Optimize Portfolio			FSP	FSP		

- Step No 2.3 / Exchange information about possible congestion areas

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Possible congestion areas		

- Step No 2.4 / Exchange information about the amount of flexibility

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Amount of flexibility required		

- Step No 2.5 / Informs possible congestion areas

Business section:

Information sent:

Business object	***Instance name***	***Instance description***
Possible congestion areas		

- Step No 2.6 / Informs possible congestion areas

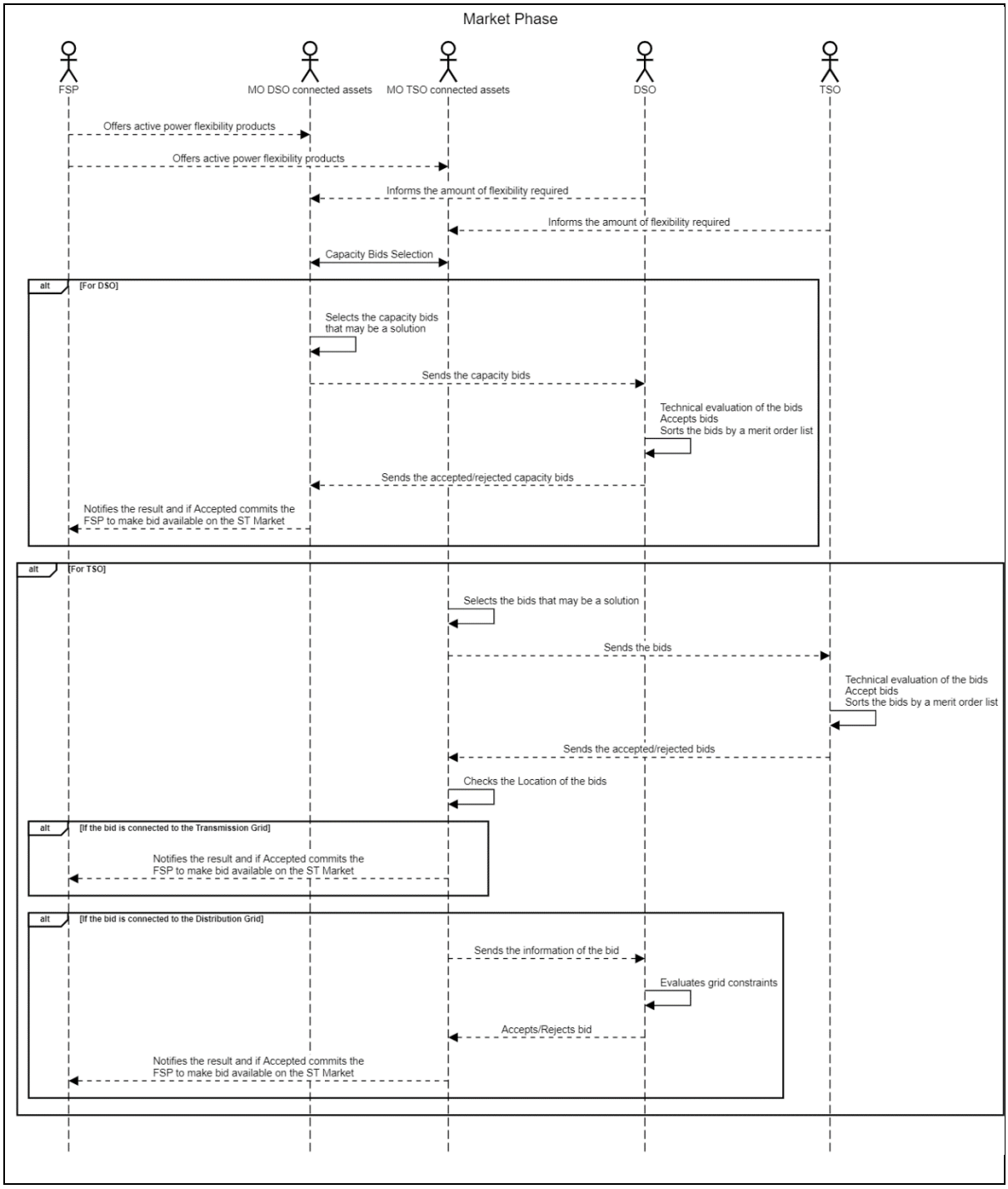
Business section:

Information sent:

Business object	***Instance name***	***Instance description***
Possible congestion areas		

Market phase

Scenario #3 description



Scenario step by step analysis

Scenario								
Scenario name		Market Phase						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information***	***Information receiver (actor)***	***Information***	***Requirement, R-IDs***

					producer (actor)		***exchanged (IDs)***	
3.1		Offer active power flexibility products			FSP	MO DSO		
3.2		Offer active power flexibility products			FSP	MO TSO		
3.3		Informs the amount of flexibility required			DSO	MO DSO	Info12	
3.4		Informs the amount of flexibility required			TSO	MO TSO	Info13	
3.5		Capacity Bids Selection			MO DSO/ MO TSO	MO DSO/ MO TSO		
3.6		Selects the bids that may be a solution	For DSO		MO DSO	MO DSO		
3.7		Sends the capacity bids	For DSO		MO DSO	DSO	Info14	
3.8		Technical evaluation of the bids Accept bids Sorts the bids by a merit order list	For DSO		DSO	DSO		
3.9		Sends the accepted/rejected capacity bids	For DSO		DSO	MO DSO	Info15	
3.10		Notifies the result and if accepted commits the FSP to make bid available on the ST Market	For DSO		MO DSO	FSP		
3.11		Selects the bids that may be a solution	For TSO		MO TSO	MO TSO		
3.12		Sends the bids	For TSO		MO TSO	TSO	Info16	
3.13		Technical evaluation of the bids Accept bids Sorts the bids by a merit order list	For TSO		TSO	TSO		
3.14		Send the accepted/rejected bids	For TSO		TSO	MO TSO	Info17	

3.15		Check the Location of the bids	For TSO		MO TSO	MO TSO		
3.16		Notifies the result and If accepted commits the FSP to make bid available on the ST Market	For TSO If the bid is connected to the Transmission Grid		MO TSO	FSP		
3.17		Sends the information of the bid	For TSO If the bid is connected to the Distribution Grid		MO TSO	DSO	Info18	
3.18		Evaluates grid constraints	For TSO If the bid is connected to the Distribution Grid		DSO	DSO		
3.19		Accept/Reject bid	For TSO If the bid is connected to the Distribution Grid		DSO	MO TSO	Info19	
3.20		Notifies the result and if accepted commits the FSP to make bid available on the ST Market	For TSO If the bid is connected to the Distribution Grid		MO TSO	FSP		

- Step No 3.3 / Informs the amount of flexibility required

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Amount of flexibility required		

- Step No 3.4 / Informs the amount of flexibility required

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Amount of flexibility required		

- Step No 3.7 / Send the bids

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Bids		

- Step No 3.9 / Send the accepted/rejected bids

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Accepted/Rejected bids		

- Step No 3.12 / Send the bids

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Bids		

- Step No 3.14 / Send the accepted/rejected bids

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Accepted/Rejected bids		

- Step No 3.17 / Send the information of the bid

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Information of the bid		

- Step No 3.19 / Send the accepted/rejected bids

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Accepted/Rejected bids		

Monitoring & Activation

Scenario #4 description

Scenario step by step analysis

Scenario								
Scenario name		Monitoring/Activation						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
4.1		Sharing of accepted bids			DSO/TSO	DSO/TSO	Info20	
4.2		Checks grid constrains	For bids located in Distribution Grid		DSO	DSO		
4.3		Informs what Bids can/cannot be activated	For bids located in Distribution Grid		DSO	TSO	Info21	
4.4		Checks grid constrains	For bids located in Transmission Grid		TSO	TSO		
4.5		Informs what Bids can/cannot be activated	For bids located in Transmission Grid		TSO	DSO	Info22	
4.6		Allows/Not allow bid activation			DSO	MO DSO	Info23	
4.7		Allows/Not allow bid activation			TSO	MO TSO	Info24	
4.8		Informs the result			MO DSO	FSP		
4.9		Informs the result			MO TSO	FSP		
4.10		Informs the activation of the bid			FSP	MO DSO		
4.11		Informs the activation of the bid			FSP	MO TSO		

- Step No 4.1 / Sharing of accepted bids

  Business section:

  Information sent:

Business object	Instance name	Instance description
Accepted bids		

- Step No 4.3 / Informs what Bids can/cannot be activated

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Bids can/cannot be activated		

- Step No 4.5 / Informs what Bids can/cannot be activated

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Bids can/cannot be activated		

- Step No 4.6 / Allows/Not allow bid activation

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Bids Allowed/Not Allowed to activate		

- Step No 4.7 / Allows/Not allow bid activation

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Bids Allowed/Not Allowed to activate		

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Prequalification requirements	▪ Mode of activation (If it is Automatic should be tested) ▪ Minimum Quantity (0.01 MW – 1 MW) ▪ Flexibility direction (load/generation reduction/increase, both) ▪ Locational information and SO connected ▪ Maximum duration of delivery period offer	

		▪ Single or Aggregated portfolio? ▪ Capacity/Energy ▪ Maximum Full Activation time (60 minutes)	
Info2	Fulfilled prequalification requirements	For DSO. MO DSO -> DSO	Info1
Info3	Accept / Reject registration on Market	For DSO. DSO->MO DSO	
Info4	Fulfilled prequalification requirements	For TSO. MO TSO->TSO	Info1
Info5	Accept / Reject registration on Market	For TSO. TSO->MO TSO	
Info6	Fulfilled prequalification requirements	For TSO (in the Distribution Grid). MO TSO->DSO	Info4
Info7	Accept / Reject registration on Market	For TSO (in the Distribution Grid). DSO -> MO TSO	
Info8	Possible congestion areas	DSO<->TSO. Grid areas where congestion may occur	
Info9	Amount of flexibility required	DSO<->TSO. Flexibility quantity (MW)	
Info10	Possible congestion areas	DSO->MO DSO. Grid areas where congestion may occur	Info8
Info11	Possible congestion areas	TSO->MO TSO. Grid areas where congestion may occur	Info8
Info12	Informs the amount of flexibility required	DSO->MO MO DSO. Flexibility quantity (MW)	Info11
Info13	Informs the amount of flexibility required	TSO->MO MO TSO. Flexibility quantity (MW)	Info11
Info14	Sends the capacity bids	For DSO. MO DSO->DSO. Characterization of the Bid (information, parameters, e.g., Price, location, quantity)	
Info15	Send the accepted/rejected capacity bids	For DSO. DSO-> MO DSO. Bid ID and result (accepted/rejected)	Info14
Info16	Sends the capacity bids	For TSO. MO TSO->TSO. For DSO. DSO-> MO DSO. Characterization of the Bid (information, parameters, e.g., Price, location, quantity)	
Info17	Send the accepted/rejected capacity bids	For TSO. TSO-> MO TSO. Bid ID and result (accepted/rejected)	Info16
Info18	Send the information of the bid	For TSO. TSO->MO DSO. For DSO. DSO-> MO DSO. Characterization of the Bid (information, parameters, e.g., location, quantity)	
Info19	Accept/Reject bid	For TSO. DSO->MO TSO. Bid ID and result (accepted/rejected)	

Info20	Sharing of accepted bids	DSO<->TSO Characterization of the Bid (information, parameters, e.g., Price, location, quantity)	
Info21	Informs what Bids can/cannot be activated	DSO->TSO. Bid ID and result (accepted/rejected)	Info20
Info22	Informs what Bids can/cannot be activated	TSO->DSO. Bid ID and result (accepted/rejected)	Info20
Info23	Allows/Not allow bid activation	DSO->MO DSO. Bid ID and result (accepted/rejected)	
Info24	Allows/Not allow bid activation	DSO->MO DSO. Bid ID and result (accepted/rejected)	

Exchange of Information for Operational Planning

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
WECL-PT-03		Exchange of Information for Operational Planning

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	07/05/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	This BUC is focused on defining and describing the TSO and DSO information exchange, aiming to improve and facilitate long-term to short-term operational planning for both networks.
Objective(s)	1- Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of DSO operation. 2- Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of TSO operation. 3- Anticipate and solve distribution grid constraints. 4- Anticipate and solve transmission grid constraints. 5- Develop information exchange mechanisms to share the identified information.
Related business case(s)	WECL-PT-01, WECL-PT-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This BUC focus on the enhancement of information exchange that enables better operational planning for DSOs and TSOs.
Complete description
The increase in generation from renewable resources, with its uncertainty, and the increase in the use of electricity (due to EVs for example) means that system operators have to improve their strategies for managing the grid more efficiently in order to avoid unnecessary investments. In this BUC, our strategy is to optimize coordination between DSO and TSO by identifying and sharing the information that enables better operational planning for their networks. This Business Case is related to BUC-1 and BUC-2, since some of the information covered in this use case can be used in both.

This UC explores and intends to define the information exchange principles between TSO and DSO in order to improve the operation of both networks, in multiple domains and timeframes.

For the long term, will be defined the information that needs to be exchanged bidirectionally regarding the expected evolution of the transmission and distribution grids and their associated supply, consumption, production and flexibility services configuration.

Concerning the medium term, the effort will be focused on the definition of the information regarding the capacity and availability for load connection in the EHV/HV substation, as well as the information regarding the load transfers availability between EHV/HV interconnecting points, providing a better management of the distribution network loops by the DSO. This allows, in case of emergency, the possibility of the DSO to manage the transfer of load between networks.

For the efficient use of the flexibility services and enhancement of the operational planning, the increase of the information exchanged on short-term is key. Once well-defined the observability area of both operators around the TSO-DSO border, the focus will be in the definition of information to exchange about:

- Short-circuit power at the TSO-DSO border;
- Scheduled maintenance actions in the observability area
- Aggregated consumption and production forecast by technology (solar, wind, hydro, etc)

The short-circuit power at the HV bay in the physical border of the TSO-DSO interface (EHV/HV substations) is important to keep tracking due to the increase of the DER that actively contribute to the increase of the short-circuit levels. The short-circuit levels should be tracked in order to ensure that they are kept bellow the rated short circuit current of the circuit breakers in the interface TSO/DSO. This information should be computed and exchanged after the gate-closure time of the day-ahead market in order to use the market results to robustly forecast the short-circuit levels at nodal level in the observability area.

Due to the impact that distribution network loops, close to the TSO-DSO interface, can have in the transmission power flows, the share of the information about the scheduled maintenance plans becomes crucial for the TSO operational planning. On the other side, to the DSO, the TSO can share information about the connectivity status and maintenance plans of the transmission lines between EHV/HV substation with some impact in the distribution grids power flows near the border.

For an efficient and secure operation of the power system, it is fundamental to include an accurate forecast of the load and generation into the TSO operational planning framework. Having in mind that the DSO has their own forecasting methods for the DERs generation and load connected to the distribution networks. Both forecasts can be aggregated by technology and per grid node of the observability area. This information, when shared with the TSO, can have great potential to enhance the TSO operational planning activities

The final goal of this use case is to set a greater cooperation in information exchanges between TSO-DSO within a common observability area for operational planning purposes and identify future flexibility needs in the transmission and distribution networks.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

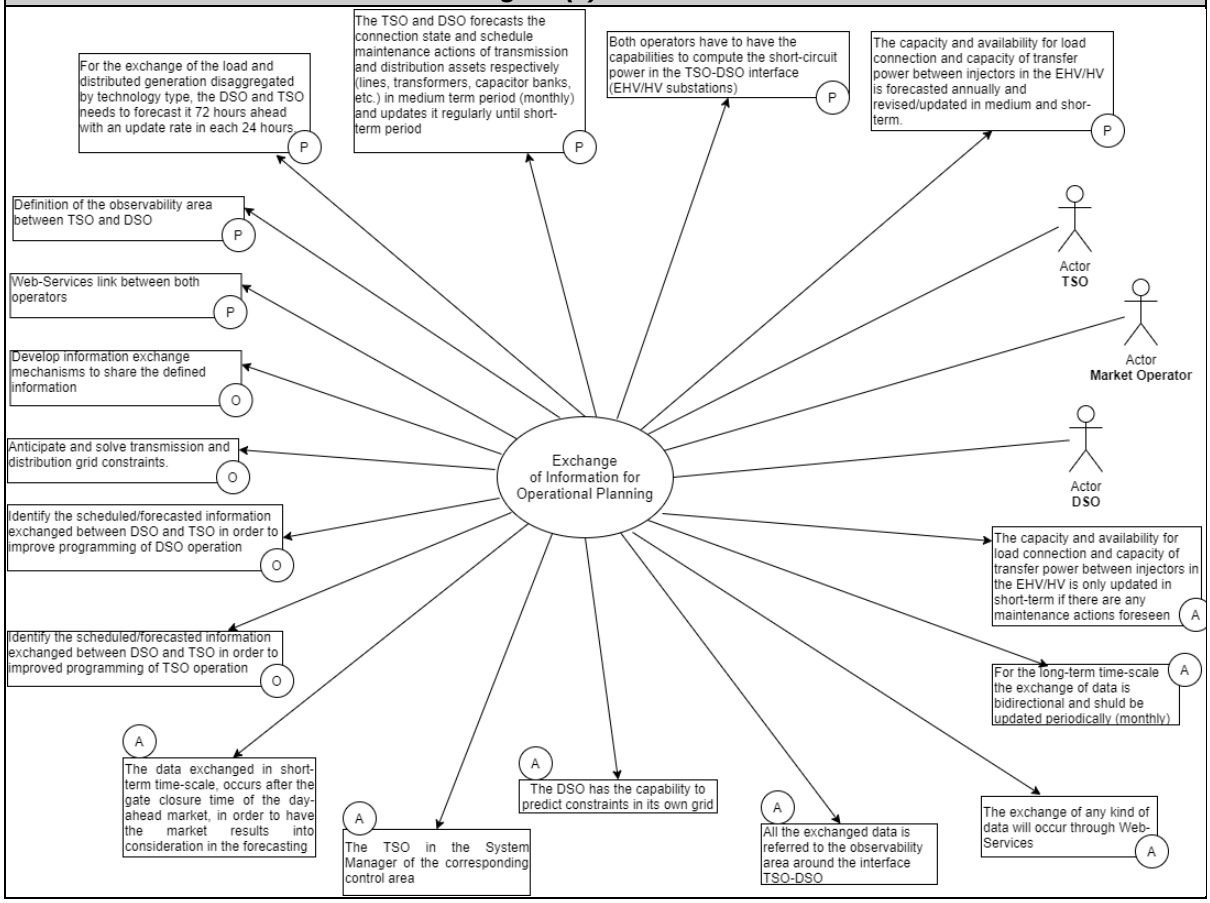
Use case conditions	
Assumptions	
1- The data exchanged in short-term timescale, occurs after the gate closure time of the day-ahead market, in order to have the market results into consideration in the forecasting processes	
2- The TSO is the System Manager of the corresponding control area	
3- The DSO has the capability to predict constraints in its own grid	
4- All the exchanged data is referred to the observability area around the interface TSO-DSO	
5- The exchange of any kind of data will occur through Web-Services	
6- For the long-term timescale, the exchange of data is bidirectional and should be updated periodically (monthly).	
7- The capacity and availability for load connection and capacity of transfer power between injectors in the EHV/HV is only updated in short-term if there are any maintenance actions foreseen.	
Prerequisites	
1	Definition of the observability area between TSO and DSO
2	For the exchange of the load and distributed generation disaggregated by technology type, the DSO and TSO needs to forecast it 72 hours ahead with an update rate in each 24 hours
3	The TSO and DSO forecasts the connection state and schedule maintenance actions of transmission and distribution assets respectively (lines, transformers, capacitor banks, etc.) in medium term period (monthly) and updates it regularly until short-term period.
4	Web-Services link between both operators
5	Both operators have to have the capabilities to compute the short-circuit power in the TSO-DSO interface (EHV/HV substations)
6	The capacity and availability for load connection and capacity of transfer power between injectors in the EHV/HV is forecasted annually and revised/updated in medium and short-term.

1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
This BUC 3 defines some information exchanges with the objective of enhance operational planning activities of the TSO and DSO, namely in what concerns to the use of flexibility for the Congestion Management (described in BUC-1 and BUC-2).
Level of depth
Generic use case
Prioritisation
High level of priority
Generic, regional or national relation
Generic
Nature of the use case
Business Use Case
Further keywords for classification
TSO-DSO coordination, data exchange, operational planning, observability area

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
TSO-Transmission System Operator	Role	According to the European Commission, the TSO is “an organisation committed to transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure”. The certification procedure for TSOs is listed in Article 10 of the 2009 Electricity and Gas Directives.	
DSO-Distribution System Operator	Role	According to the EDSO, the DSOs are “the operating managers (and sometimes owners) of energy distribution networks, operating at low, medium and, in some member states, high voltage levels (LV, MV)”.	

Market Operator	Role	According to Article 2(7) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast), market operator designates “an entity that provides a service whereby the offers to sell electricity are matched with bids to buy electricity”.	

3.2. References

4. Step by step analysis of use case

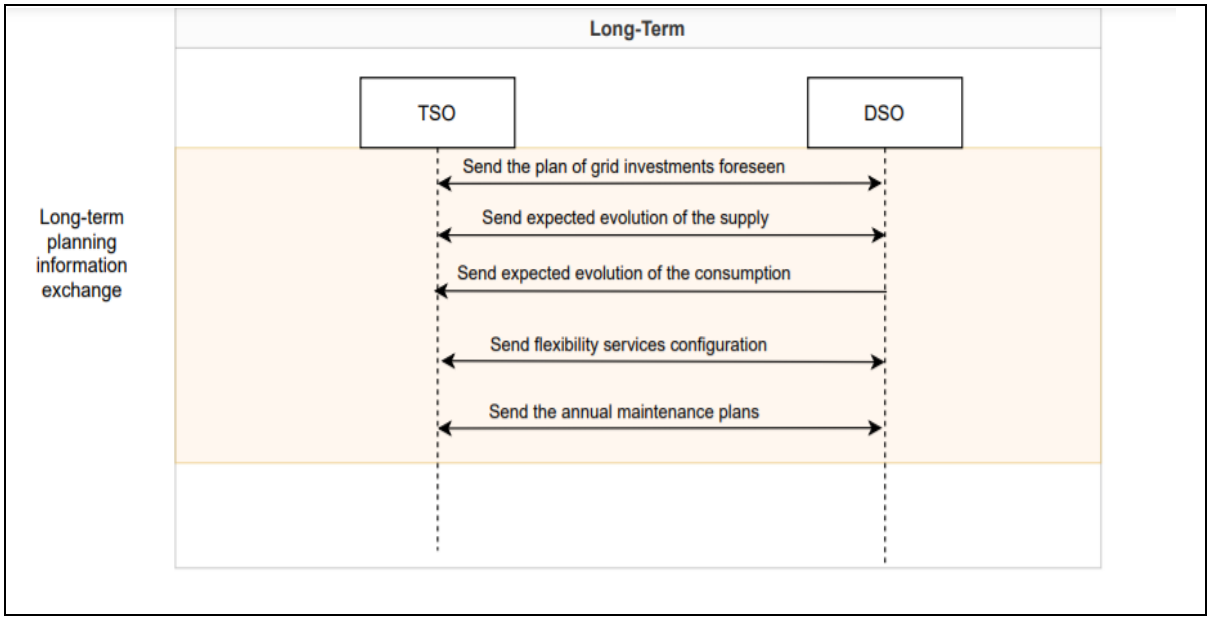
4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Long-term information exchange	Describes the information exchange for operational planning in long-term time frame	TSO/DSO			
2	Medium-term information exchange	Describes the information exchange for operational planning in medium-term time frame	TSO/DSO			
3	Short-term information exchange	Describes the information exchange for operational planning in short-term time frame	TSO/DSO	Market clearance results		

4.2. Steps - Scenarios

Scenario name “Long-term information exchange”

Scenario #1 describes the information exchange for operational planning in long-term time frame



Scenario step by step analysis

Scenario								
Scenario name		Long-term information exchange						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1		Send the plan of grid investments foreseen	The grid investments foreseen by each of the system operators are exchanged between them in order to update grid models and operational planning activities	REPORT	TSO/DSO	DSO/TSO	INFO 1	
1.2		Send expected evolution of the supply	Exchange the forecasted generation in the transmission and distribution grid	REPORT	TSO/DSO	DSO/TSO	INFO 2	
1.3		Send expected evolution of the consumption	Send the foreseen evolution of the load connected to the grid	REPORT	DSO	TSO	INFO 3	
1.4		Send flexibility services configuration	Exchange of the flexibility services	REPORT	TSO/DSO	DSO/TSO	INFO 4	

			configurations between both operators in order to update the dedicated markets accordingly					
1.5		Send the annual maintenance plans	The annual maintenance plans in both of the grids (transmission and distribution) are shared between the operators annually	REPORT	TSO/DSO	DSO/TSO	INFO 5	

- Step No 1.1 / Send the plan of grid investments foreseen

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Plan of grid investments foreseen		

- Step No 1.2 / Send expected evolution of the supply

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Expected supply evolution		

- Step No 1.3 / Send expected evolution of the consumption

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Expected consumption evolution		

- Step No 1.4 / Send flexibility services configuration

  Business section:

  Information sent:

Business object	Instance name	Instance description
Flexibility services configuration		

- Step No 1.5 / Send the annual maintenance plans

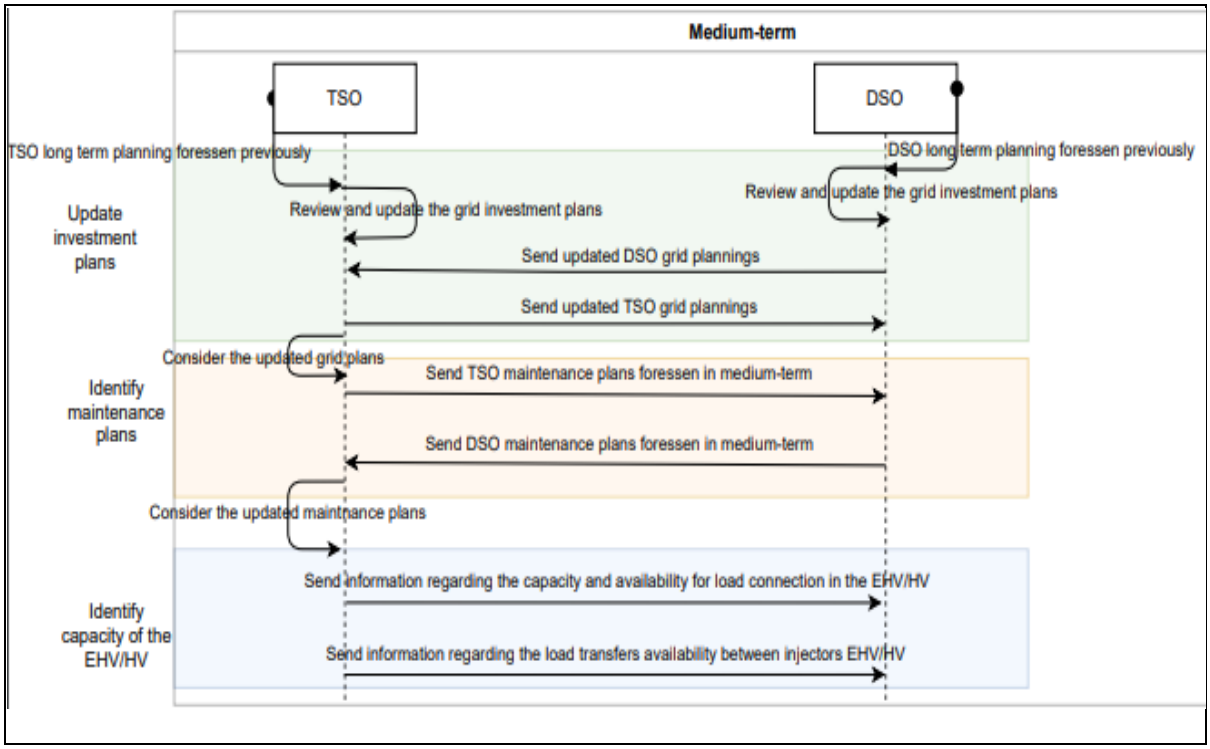
  Business section:

  Information sent:

Business object	Instance name	Instance description
Annual maintenance plan		

Scenario name "Medium-term information exchange"

Scenario #2 describes the information exchange for operational planning in medium-term time frame



Scenario step by step analysis

Scenario								
Scenario name	Medium-term information exchange							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
2.1		TSO long term planning foreseen	TSO uses the long-term plans as basis for the		TSO			

		previously (long-term)	medium-term updates					
2.2		DSO long term planning foreseen previously (long-term)	DSO uses the long-term plans as basis for the medium-term updates		DSO			
2.3		Review and update the grid investment plans	Having as basis the long-term investment plans both operators update it in medium-term	EXECUTE	TSO/DSO			
2.4		Send updated DSO grid planning	Exchange of the updated grid planning of the distribution grid	REPORT	DSO	TSO	INFO 6	
2.5		Send updated TSO grid planning	Exchange of the updated grid planning of the transmission grid	REPORT	TSO	DSO	INFO 7	
2.6		Send TSO maintenance plans foreseen in medium-term	Using as basis the long-term maintenance plan, the TSO updates it and send it to the DSO	EXECUTE And REPORT	TSO	DSO	INFO 8	
2.7		Send DSO maintenance plans foreseen in medium-term	Using as basis the long-term maintenance plan, the DSO updates it and send it to the TSO	EXECUTE And REPORT	DSO	TSO	INFO 9	
2.8		Send information regarding the capacity and availability for load connection in the EHV/HV	The TSO provides information about the capacity and availability for load connection in the EHV/HV substations	REPORT	TSO	DSO	INFO 10	
2.9		Send information regarding the load transfers availability between injectors EHV/HV	The TSO provides information about the load transfers availability between injectors EHV/HV	REPORT	TSO	DSO	INFO 11	

- Step No 2.4 / Send updated DSO grid planning

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Updated DSO grid planning		

- Step No 2.5 / Send updated TSO grid planning

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Updated TSO grid planning		

- Step No 2.6 / Send TSO maintenance plans foreseen in medium-term

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Medium-term TSO maintenance plans		

- Step No 2.7 / Send DSO maintenance plans foreseen in medium-term

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Medium-term DSO maintenance plans		

- Step No 2.8 / Send information regarding the capacity and availability for load connection in the EHV/HV

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Capacity and availability for load connection in the EHV/HV		

- Step No 2.9 / Send information regarding the load transfers availability between injectors EHV/HV

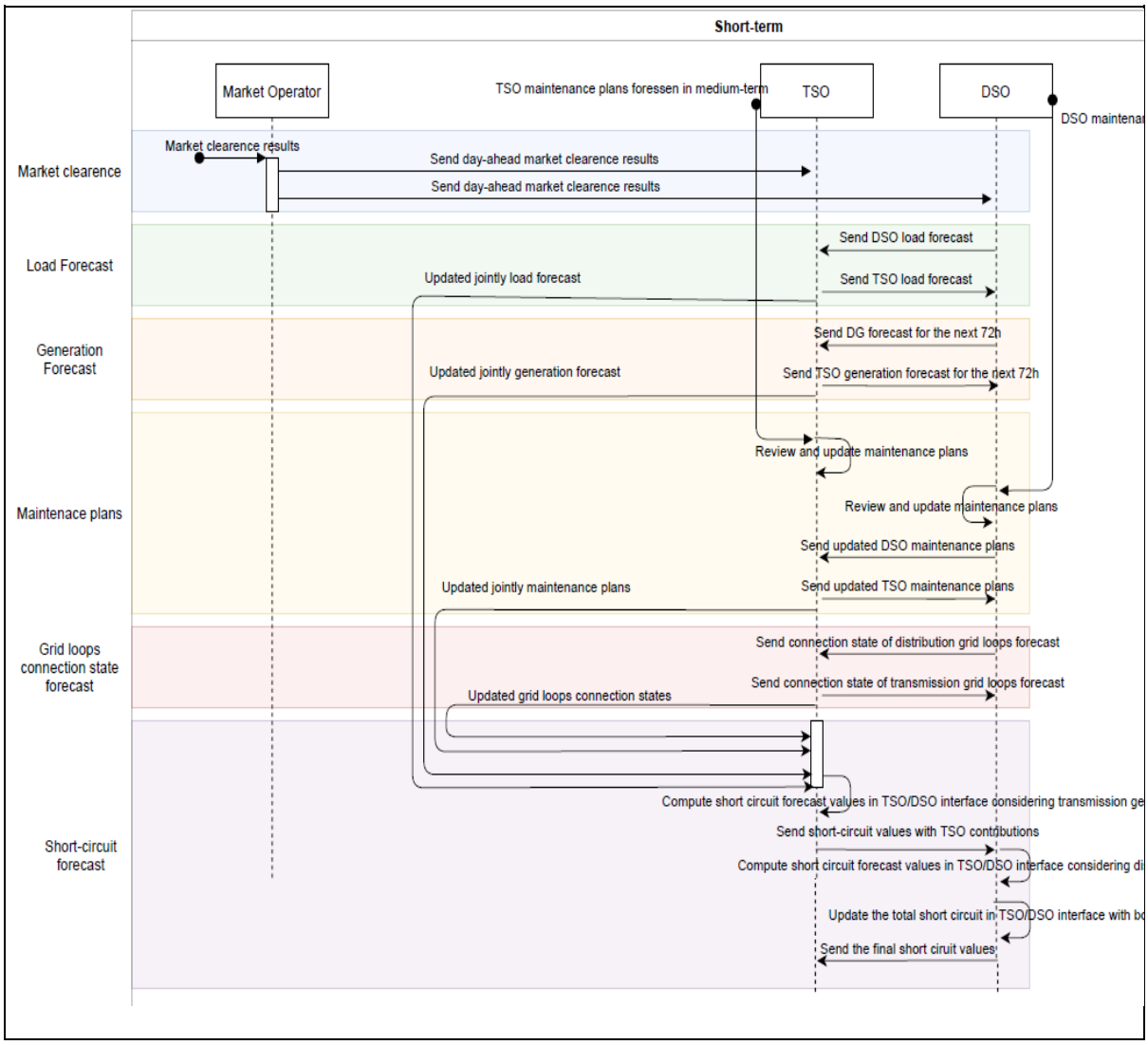
Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Load transfers availability between injectors EHV/HV		

Scenario 3 “Short-term information exchange”

Scenario #3 describes the information exchange for operational planning in short-term time frame



Scenario step by step analysis

Scenario

Scenario name		Short-term information exchange						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
3.1		Send day-ahead market clearance results	The wholesale market operator provides the day-ahead market clearance results	REPORT	Market Operator	TSO/DSO	INFO 12	
3.2		Send DSO load forecast	DSO exchanges with TSO load forecasts aggregated by node belonging to the observability area.	REPORT	DSO	TSO	INFO 13	
3.3		Send TSO load forecast	TSO exchanges with DSO load forecasts aggregated by node belonging to the observability area.	REPORT	TSO	DSO	INFO 14	
3.4		Updated jointly load forecast	Update the load forecast based on the analysis of both forecasts for future operational planning purposes	EXECUTE	TSO			
3.5		Send DG forecast for the next 72h	DSO exchanges with TSO distributed generation forecasts aggregated by node belonging to the observability area. The DG is split by	REPORT	DSO	TSO	INFO 15	

			technology type.					
3.6		Send TSO generation forecast for the next 72h	TSO exchanges with DSO generation forecasts aggregated by node belonging to the observability area, split by technology type.	REPORT	TSO	DSO	INFO 16	
3.7		Updated jointly generation forecast	Update the generation forecast based on the analysis of both forecasts for future operational planning purposes	EXECUTE	TSO			
3.8		TSO maintenance plans foreseen in medium-term	TSO uses the medium-term maintenance plans as basis for the short-term updates		TSO			
3.9		DSO maintenance plans foreseen in medium-term	DSO uses the medium-term maintenance plans as basis for the short-term updates		DSO			
3.10		Review and update maintenance plans	Having as basis the medium-term maintenance plans both operators update it in short-term	EXECUTE	TSO/DSO			
3.11		Send updated DSO maintenance plans	Exchange of the DSO updated maintenance plans	REPORT	DSO	TSO	INFO 17	
3.12		Send updated TSO maintenance plans	Exchange of the TSO updated maintenance plans	REPORT	TSO	DSO	INFO 18	

3.13		Updated jointly maintenance plans	Merge the updated maintenance plans of both operators for future operational planning purposes	EXECUTE	TSO			
3.14		Send connection state of distribution grid loops forecast	DSO exchanges with TSO the forecasted connection state of distribution grid loops	REPORT	DSO	TSO	INFO 19	
3.15		Send connection state of transmission grid loops forecast	TSO exchanges with DSO the forecasted connection state of transmission grid loops	REPORT	TSO	DSO	INFO 20	
3.16		Updated grid loops connection states	Merge the updated grid loops connection states forecasts of both operators for future operational planning purposes	EXECUTE	TSO			
3.17		Compute short circuit forecast values in TSO/DSO interface considering transmission generation contribution	Having into consideration the day-ahead forecasts the TSO computes the short circuit forecast values in TSO/DSO interface considering just the generation connected to its grid.	EXECUTE	TSO			
3.18		Send short-circuit values with TSO contributions	The TSO send the information of the forecast Ssc for the 24	REPORT	TSO	DSO	INFO 21	

			hours of the next day.					
3.19		Compute short circuit forecast values in TSO/DSO interface considering distribution generation contribution	The DSO computes the short-circuit values in TSO/DSO interface, having into consideration the active contribution from the sources connected to its grid	EXECUTE	DSO			
3.20		Update the total short circuit in TSO/DSO interface with both contributions	Sum up both of the contributions (transmission and distribution) for the total short circuit values in TSO/DSO interface	EXECUTE	DSO			
3.21		Send the final short-circuit values	The DSO send to the TSO the final short-circuit values in the TSO/DSO interface	EXECUTE	DSO	TSO	INFO 22	

- Step No 3.1 / Send day-ahead market clearance results

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Day-ahead market clearance results		

- Step No 3.2 / Send DSO load forecast

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
DSO load forecast		

- Step No 3.3 / Send TSO load forecast

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
TSO load forecast		

- Step No 3.5 / Send DG forecast for the next 72h

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
DG forecast for the next 72h		

- Step No 3.6 / Send TSO generation forecast for the next 72h

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
TSO generation forecast for the next 72h		

- Step No 3.11 / Send updated DSO maintenance plans

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Updated DSO maintenance plans		

- Step No 3.12 / Send updated TSO maintenance plans

Business section:

Information sent:

Business object	*Instance name*	*Instance description*
Updated TSO maintenance plans		

- Step No 3.14 / Send connection state of distribution grid loops forecast

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

Connection state of distribution grid loops forecast		

- Step No 3.15 / Send connection state of transmission grid loops forecast

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Connection state of transmission grid loops forecast		

- Step No 3.18 / Send short-circuit values with TSO contributions

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Short-circuit values with TSO contributions		

- Step No 3.21 / Send the final short-circuit values

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
Final short-circuit values		

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
INFO 1	Plan of grid investments foreseen		
INFO 2	Expected supply evolution		
INFO 3	Expected consumption evolution		
INFO 4	Flexibility services configuration		
INFO 5	Annual maintenance plan		
INFO 6	Updated DSO grid planning		
INFO 7	Updated TSO grid planning		
INFO 8	Medium-term TSO maintenance plans		

INFO 9	Medium-term DSO maintenance plans		
INFO 10	Capacity and availability for load connection in the EHV/HV		
INFO 11	Load transfers availability between injectors EHV/HV		
INFO 12	Day-ahead market clearance results		
INFO 13	DSO load forecast		
INFO 14	TSO load forecast		
INFO 15	DG forecast for the next 72h		
INFO 16	TSO generation forecast for the next 72h		
INFO 17	Updated DSO maintenance plans		
INFO 18	Updated TSO maintenance plans		
INFO 19	Connection state of distribution grid loops forecast		
INFO 20	Connection state of transmission grid loops forecast		
INFO 21	Short-circuit values with TSO contributions		
INFO 22	Final short-circuit values		

9.2.3.3 French demo

WECL-FR-01 - Improved monitoring of flexibility for congestion management

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
WECL-FR-01		Improved monitoring of flexibility for congestion management

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	27/04/2021	COMILLAS		
1.0	16/07/2021	ENEDIS, RTE, COMILLAS		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Simplify and optimize the management of renewable production curtailments
Objective(s)	Faced with the challenges of the energy transition, ENEDIS and RTE are experimenting with new technological solutions to integrate new flexibility levers to manage congestions on their networks. This use case “System for Trackability of Renewable Activations” based on blockchain technology, aims to simplify and optimize the management of renewable production curtailments, by covering the entire life cycle of a flexibility offer, from the formulation of offers to the control of their activations for invoicing. The final goal is to build a platform enabling such objectives and test it for each participating entity on a chosen area of the French network.
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
Simplify and optimize the management of renewable production curtailments. Blockchain technology will be used to establish a decentralized trust framework among renewable energy generators, market participants, the DSO and the TSO.
Complete description
Using permissioned blockchain technologies, a shared ledger will be implemented in order to establish a decentralized trust framework among renewable energy generators, market participants, the DSO and the TSO. All participants will access to the previously mentionned shared platform that will provide more transparency and visibility while preserving business confidentiality, and shared governance rules

will be defined to account for the role and needs of each involved party. The platform should in particular host and give acces to the following information: generators' flexibilities offers, activation orders, metering data.

The blockchain based demonstrator will be validated on two experiments :

- The first one will be coupled with a new grid automaton system that will act near real-time to resolve grid constraints by activating the most technically and economically optimal remedial action.
- The second one will focus on production curtailement orders sent by the DSO

The area of Melle-Longchamps located in the South-West of France has been chosen to conduct these two cases that will involve TSO, DSO and generators.

From a business perspective, this BUC is mainly focused on the improvement of the "market phase", "monitoring and activation" and service phases "Measurement & settlement phase", as described below.

Market phase: In this service phase, the process of contract signature, flexibility requests, offers and production forecasts collection will be improved by the use of a decentralized system described in the SUC-FR-01 STAR. The market algorithm, however, is outside the scope of this BUC.

Monitoring and Activation: TSO, DSO and Flexibility Providers (FSPs) will improve data exchange close to real-time and at real-time improving transparency among market participants.

Measurement & settlement phase: In this service phase, the process of measurement and settlement will be improved by the use of a decentralized system described in the SUC-FR-01 STAR. Beyond that, the platform can also provide information upon request to the different actors after the service provision is complete (ex-post)

The scenarios of the BUC are two, namely:

1. Congestion management by automation
2. Manual congestion management

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Number of flexibility service provider assets involved in the service	There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the number of assets involved.	

1.6. Use case conditions

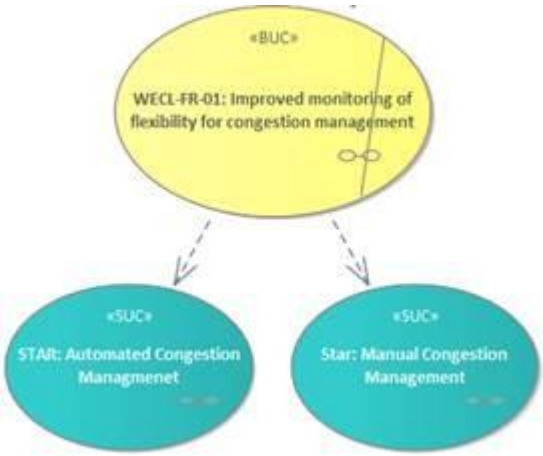
Use case conditions		
Assumptions		
• Markets for flexibility are assumed to be the ones in place for both TSO and DSO		
Prerequisites		

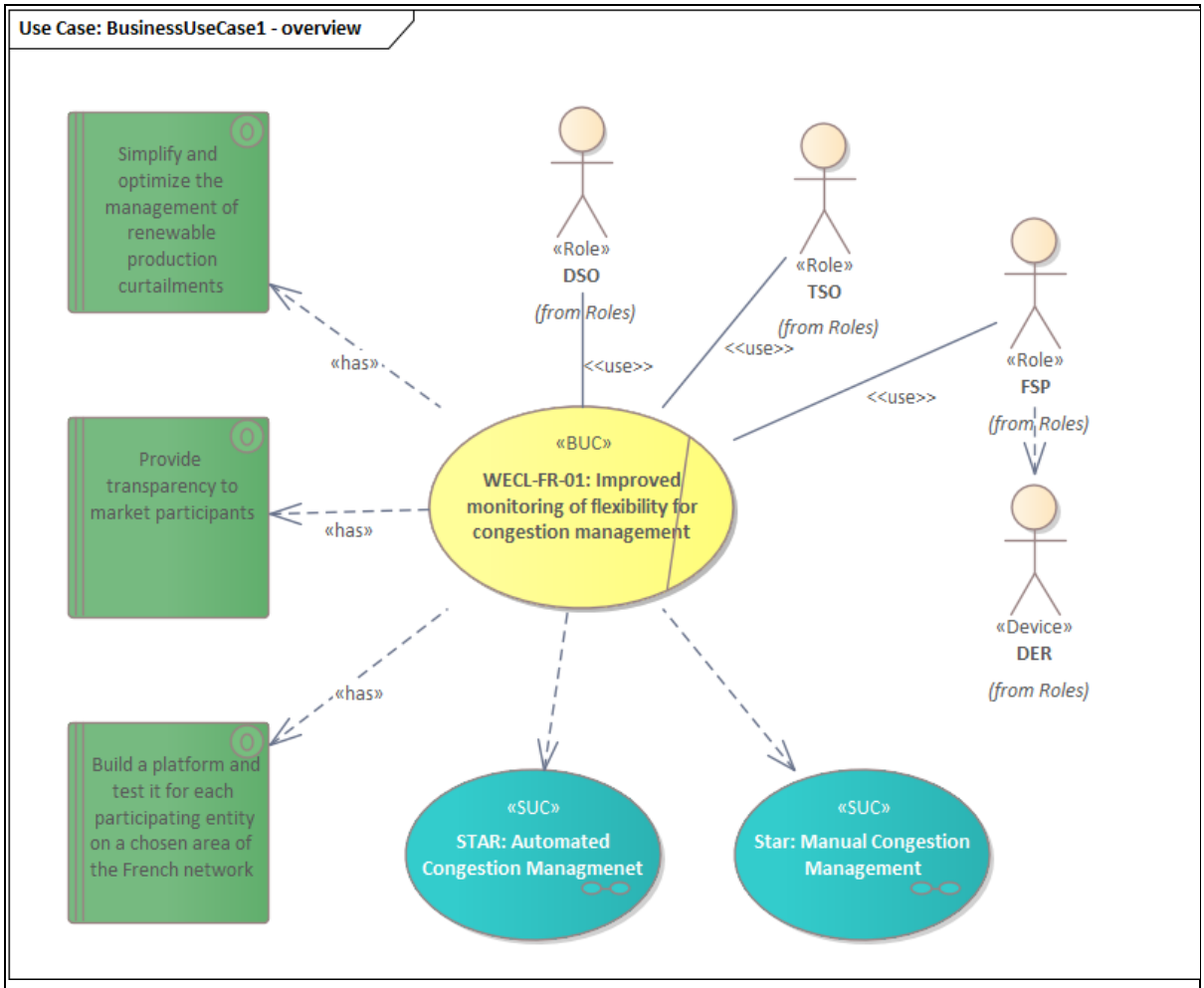
1.7. Further information to the use case for classification/mapping

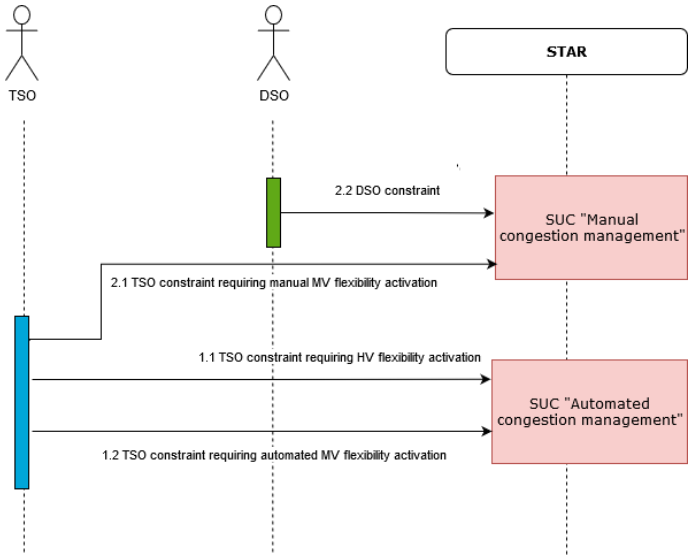
Classification information
Relation to other use cases
SUC-FR-01 “STAR”
Level of depth
Generic
Prioritisation
High
Generic, regional or national relation
Generic
Nature of the use case
Business Use Case
Further keywords for classification
TSO-DSO coordination, information exchange, DER flexibility activation

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



Use Case: BusinessUseCase1 - overview
Simplify and optimize the management of renewable production curtailments
Provide transparency to market participants
Build a platform and test it for each participating entity on a chosen area of the French network
«has»
«has»
«has»
«Role»
DSO
(from Roles)
«Role»
TSO
(from Roles)
«Role»
FSP
(from Roles)
«Device»
DER
(from Roles)
<<use>>
<<use>>
<<use>>
«BUC»
WECL-FR-01: Improved monitoring of flexibility for congestion management
«SUC»
STAR: Automated Congestion Managmenet
«SUC»
Star: Manual Congestion Management


TSO
DSO
STAR
2.2 DSO constraint
SUC "Manual congestion management"
2.1 TSO constraint requiring manual MV flexibility activation
1.1 TSO constraint requiring HV flexibility activation
SUC "Automated congestion management"
1.2 TSO constraint requiring automated MV flexibility activation

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Distribution System Operator (DSO)	Role	According to the Article 2.6 of the Directive: "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity".	
Transmission System Operator (TSO) Market Operator	Role	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area.	
Distributed Energy Resource	Device	Resources connected at the distribution grid capable of providing active power flexibility, either upward/downward or both. It can comprise several different roles and devices such as demand response (actor/role), distributed generation, electric vehicles, and storage systems. Loads which could modify their consumption according to external set points are often also considered as DER	
Flexibility Service Provider (FSP)	Role	Generic role which links the role customer and its possibility to provide flexibility to the roles market and grid; generic role that could be taken by many stakeholders, such as an aggregator or individual distributed energy resources.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Congestion management by automation	Grid automation system that will act near real-time to	TSO	Congestion management on	Automate NAZA	

		resolve grid constraints by activating the most technically and economically optimal remedial action		TSO or DSO network		
2	Manual congestion management	Manual activation of flexibility in order to solve congestions	TSO/DSO	Congestion management DSO		

4.2. Steps - Scenarios

Congestion management by automation

Scenario #1 description

When a constraint appears, the activation order to solve the constraint is tracked to STAR platform

Scenario step by step analysis

Scenario								
Scenario name		Congestion management by automation						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1		TSO constraint on TSO network		Producer curtailment	TSO	DER	Activation Order	
1.2		TSO constraint on DSO network		Producer curtailment	DSO	DER	Activation Order	

- Step No 1.1 / TSO constraint on TSO Network

  Business section:
  Information sent:

Business object	***Instance name***	***Instance description***
Activation order		

- Step No 1.2 / TSO Constraint on DSO Network

  Business section:
  Information sent:

Business object	***Instance name***	***Instance description***
Activation Order		

Manual congestion management

Scenario #2 description

When a constraint appears, the activation order to solve the constraint is tracked to STAR platform

Scenario step by step analysis

Scenario								
Scenario name		Manual congestion management						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		DSO constraint on DSO Network		Production curtailment	DSO	DER	Activation order	
2.2		TSO constraint on DSO Network		Production curtailment	DSO	DER	Activation order	

- Step No 2.1 / DSO constraint on DSO network

  Business section:
  Information sent:

Business object	***Instance name***	***Instance description***
Activation order		

- Step No 2.2 / TSO constraint on DSO Network

  Business section:
  Information sent:

Business object	***Instance name***	***Instance description***
Activation order		

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Activation order	Activation order	3 types of activation order is exchanged: – Order sent by the TSO to DSO – Order sent by DSO to DER – Response from DER to DSO/TSO	

WECL-FR-02 - Improved TSO-DSO information exchange for DER activation

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
WECL-FR-02		Improved TSO-DSO information exchange for DER activation

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	27/04/2021	COMILLAS		
1.0	16/07/2021	ENEDIS, RTE, COMILLAS		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Enhanced information exchange between TSO and DSO
Objective(s)	In addition to the demonstrator, **studies** will be carried out on the management of the constraints between DSO and TSO in case of activation of a flexibility. When a TSO or DSO activates flexibilities on its networks (such as renewable curtailments), it can generate contingencies on the other system operator's network (ie **congestion or voltage constraints**). With the foreseen extensive use of flexibilities close to real-time, system operators won't have the possibility to perform ad hoc security analysis for every flexibility activation demand.One of the solutions that could be considered in the study would have the **TSO and DSO to agree in advance on a** constraint envelope within which the controls sent to the flexibilities must be kept in check so that we can guarantee that activations **are safe for each other and that can be used without further prior approval,** the so-called " shared DSO/TSO congestion management in case of activation of distributed flexibility". The aim of such workstream is to develop a method that would guarantee that the activation of curtailment by one TSO or DSO will not trigger other constraints on one or another network.
Related business case(s)	N/A

1.4. Narrative of Use Case

Narrative of use case
Short description
In this BUC, the main objective is to improve the information exchange between TSO and DSO in the context of local DER flexibility activation. Considering the five service phases described in the ASM

report, this BUC is focused on the improvement of the “plan-forecast” and/or “monitoring and activation” service phase. The other service phases lay outside the scope of this BUC.

Complete description

When a TSO or DSO activates flexibilities on its network (such as renewable curtailments), it can generate contingencies on the other system operator's network (i.e., congestion or voltage constraints). For example, reducing the active power of a producer could consequently affect its reactive power injection and create unforeseen voltage constraints. RTE and ENEDIS will therefore carry out a study to determine a common methodology on how to identify rapidly such unwanted flexibility activations.

As the operators aim to eliminate congestions as fast as possible, the methodology should focus on quick response solutions. A first idea to consider would be, in order to skip the step of a prior approval, that TSO and DSO could agree in advance on a set of flexibilities that are safe for each other, the so-called “shared DSO/TSO congestion management in case of activation of distributed flexibility”.

As envisioned, the study would determine what type of contingencies should be avoided, the calculations method and their timing.

From a business perspective, this BUC is mainly focused on the improvement of the "pre-qualification" process of the ASM report. In the case of the former, TSO and DSO may be able to agree, at the operational planning phase, which DER are safe to be activated. In the latter service phase, TSO and DSO will enhance information exchange for an efficient and safe activation.

Scenarios:

Pre-qualification phase: TSO and DSO will coordinate and agree on which DER can be activated without creating constraints among SOs networks. They will improve data exchange in order to avoid mutual congestions created by DER flexibility activation. The activations come from the markets organized by the TSO and the DSO (outside the scope of this BUC).

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions		
Assumptions		
• Markets for flexibility are assumed to be the ones in place for both TSO and DSO		
Prerequisites		

1.7. Further information to the use case for classification/mapping

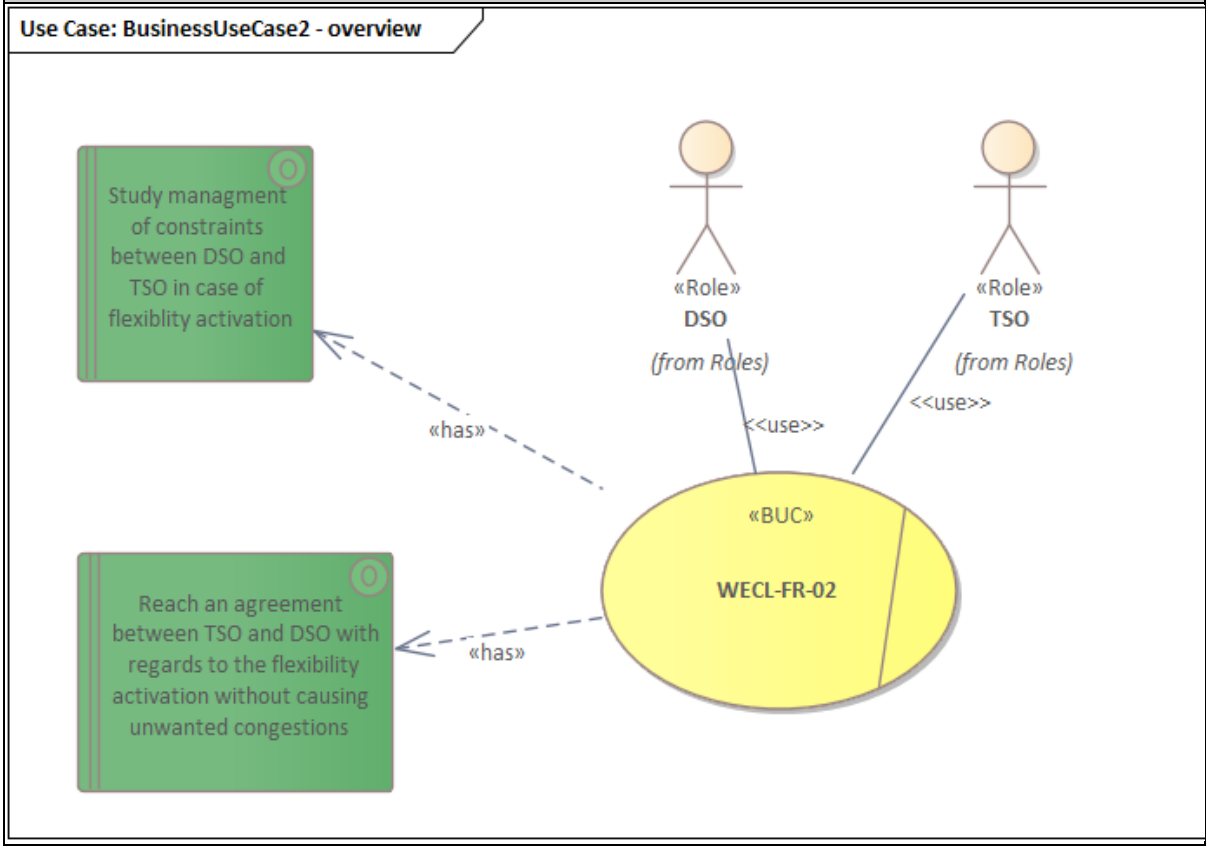
Classification information
Relation to other use cases
NA
Level of depth
Generic
Prioritisation
High
Generic, regional or national relation
Generic
Nature of the use case
Business Use Case

Further keywords for classification
TSO-DSO coordination, information exchange, DER flexibility activation

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		*Group description*	
Actor name	*Actor type*	*Actor description*	*Further information specific to this use case*
Distribution System Operator (DSO)	Role	According to the Article 2.6 of the Directive: "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity".	

Transmission System Operator (TSO) Market Operator	Role	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area.	

3.2. References

9.2.4 Eastern Cluster demo BUCs

9.2.4.1 Polish demo demo

Prequalification of resources provided by Flexibility Service Providers to support flexibility services in the Polish demo

Based on IEC 62559-2 edition 1

1. Description of the Use Case

1.1. Name of Use Case

Use Case Identification		
ID	***Area / Domain(s)/ Zone(s)***	***Name of Use Case***
EACL-PL-01	Market for flexibilities	Prequalification of resources provided by Flexibility Service Providers to support flexibility services in the Polish demo

1.2. Version Management

Version Management				
Version No.	***Date***	***Name of Author(s)***	***Changes***	***Approval Status***
1	2021-02-01	Wojciech Lubczyński (PSE)	Initial draft	
2	2021-03-10	Wojciech Lubczyński (PSE)	Full draft without diagrams	
3	2021-03-17 2021-03-18	Wojciech Lubczyński (PSE)	Correction after the internal meeting on 17'th March	
4	2021-03-28 2021-04-02	Wojciech Lubczyński (PSE)	Correction and additions taking into account discussions in PSE (ŁSz)	
5	2021-04-13	Wojciech Lubczyński (PSE)	Correction after PSE's discussion on comments of Łukasz Szczepaniak	
6	2021-05-03	Wojciech Lubczyński (PSE)	The change of BUC title and taking into account two direction of products in static grid assessment phase.	
7	2021-05-17 – 2021-05-20	Wojciech Lubczyński (PSE)	Update of list of actors and their definition and adding of diagrams; adding assumptions	
8	2021-05-25 – 2021-05-26	Wojciech Lubczyński (PSE)	Adapting the template to the new format	
9	2021-06-14	Wojciech Lubczyński (PSE)	Minor editorial connection and adding the diagrams	

1.3. Scope and Objectives of Use Case

Scope and Objectives of Use Case	
Scope	The description of prequalification of resources (DER) to participate in the flexibility market represented by Flexibility Platform (FP)

Objective(s)	To register DER in the Flexibility Register (FR), which will enable the submission of bids on FP and participation in the flexibility market
Related business case(s)	

1.4. Narrative of Use Case

Narrative of Use Case
Short description
The use case describes the prequalification process of DERs introduced by Flexibility Service Provider (FSP) to be registered in Flexibility Register. This registration is the prerequisite to participate in flexibility market processes on FP. The DER can be based on generation resources, energy storage and consumption (households, SMEs and industrial enterprises). The FSP can own one or more DERs or can be an aggregator which aggregates several DERs in its portfolio (called as FSPA)
Complete description
Summary of use case **Scenario 1 –FSP prequalification:** • **Market prequalification** Description: FSP registers itself on FP as natural or legal person. In details it contains: ○ The statement of legal and financial status ○ The confirmation of access to FP (rules, RODO confirmation etc.) ○ The declaration of the entire volume The status of FSP (pending) is registered in FR • **Certification of DER** Description: Declaration of DER or DERs FSP declares its flexibility potential ready to provide services. In details it contains: ○ The declaration of DERs and their technical characteristics ○ The statement of connection point for each DER (PoC), its location and metering data availability The status (pending) of FSP and DERs are registered in FR • SO to which DER is connected confirms the right status of DER, its connection, location and availability of metering data. It is done for each DER declared by FSP. SO confirms location for each DER by assigning it to the TSO-DSO coupling point. In the case of incorrect assignment, SO makes an appropriate correction. The status (pending) of each DER associated with FSP is reported in FR. • **Product prequalification** Description: Based on the list of available products published by FP, FSP decides on the bases of which products it is going to provide flexibility services. • FP checks whether the characteristic of DER fits with the characteristic of the chosen product. FP executes the automatic comparison of both characteristics: the products and DER or DERs managed by FSP. In case of positive checking, FP registers the DER or DERs allocated to the FSP in FR as qualified for the product in question. In case of mismatch, the message is sent to FSP and request for prequalification is rejected. It is done for each selected products. • FP requires from FSP additional actions and confirmation in case of balancing products. There are additional requirements and procedures related to balancing products, in particular FSP should operate in the balancing market through a balancing service provider (BSP) or obtain this status itself. For specific products some tests confirming compliance with the requirements may be required. When the FSP fulfils these requirements, the result is reflected in the FR, confirming a positive product prequalification.

- **Static grid prequalification**
  Description:
  FP, in the grid prequalification process, initiates the process asking all impacted SOs to check if the activation of DER under consideration can be accepted i.e., does not violate grid security limits. The responsible SO assesses and decides the outcome of the grid prequalification process. If no, and DER is not divisible, the DER is rejected and message regarding DER rejection in the grid prequalification process is sent to the FSP. If no, and DER is divisible, the FP reduces the capacity to the limit set by SO and informs (sends the message to) the FSP that the DER is registered in FR, but with the capacity limit. If yes, the status of DER (qualified) is registered in the FR.
  The static grid prequalification is performed for the most critical separately up and down products among those selected by FSP that may cause network congestion.
  The status of FSP (registered) is registered in the FR.

End

<u>Scenario 2 – FSPA (aggregator) prequalification</u>:

- **Market prequalification**
  Description: FSPA registers itself on FP as a legal entity. In details it contains:
  - The statement of legal and financial status
  - The confirmation of access to FP (rules, RODO confirmation etc.)
  - The declaration of the entire portfolio volume

  The status of FSPA (pending) is registered in FR.

- **Certification of portfolio**
  Description:
- FSPA declares its flexibility potential ready to provide services. In details it contains:
  - Split of the entire portfolio into dedicated subportfolios assigned to the TSO-DSO coupling points. One DER can only be assigned to one subportfolio
  - The declaration of each DER above the threshold (called SDER) and its technical characteristics with allocation of this SDER to subportfolio
  - The statement of connection points and location of each DER in the portfolio and metering data availability of each DERs in the portfolio.

  The status of FSPA (pending) and each subportfolio is registered in FR.

- SOs to which DERs are connected checks each specific subportfolio related to the TSO-DSO coupling point. In details:
  - SO confirms the right status of each SDER in this subportfolio. It is done for each SDER notified by aggregator.
  - SO confirms each DER, regardless the type, in terms of connection to the network, location and availability of metering data.
  - SO confirms location for each subportfolio by assigning it to the TSO-DSO coupling point. In the case of incorrect assignment, SO makes an appropriate correction.
- The status (pending) of each subportfolio, including SDER inside is registered in FR.

- **Product prequalification**
  Description:
  Based on the list of available products published in FP, FSPA decides on the basis of which products it is going to provide flexibility services. In details:
  - FSPA for each selected product decides which population of DERs can provide the service defined by selected product. This creates the product-specific pool of DERs characterized by their PoCs. One DER can be assigned to different pools representing different products.
  - FP checks whether the characteristic of this pool is compatible with the characteristic of the chosen by FSPA product.
  - FP executes the automatic comparison of both characteristics: the products and the pool managed by FSPA
  - In case of positive checking, FR registers the pool and allocates it virtually to a given product.

- In case of mismatch, the message is sent to FSPA and request of prequalification of a given pool is rejected.
- This is done for each product selected by FSPA.

- FP requires from FSPA additional actions and confirmation in case of balancing products.
  There are additional requirements and procedures related to balancing products. For specific products some tests confirming compliance with the requirements may be required, in particular FSPA should operate in the balancing market through a balancing service provider (BSP) or obtain this status itself.
  When FSPA fulfils these requirements, the result is reflected in FR.

- **Static grid prequalification**
  Description: FP, in the grid prequalification process, initiates the process asking all impacted SOs to check if the activation under consideration of all subportfolios, including SDERs can be accepted.
  In case if for a given subportfolio congestion with high probability can occur, the resources which may cause it are withdrawal from given subportfolio if they are indivisible or limited if they are divisible. In such case the message is sent to the FSPA.
  If a given subportfolio does not cause any congestion the relevant information regarding this subportfolio is registered in FR.

- Registration of subportfolio
  The result of the grid prequalification is registered for each subportfolio and for entire portfolio in the FR and relevant information is sent by FP to the FSPA.
  The static grid prequalification is performed for the most critical separately up and down products among those selected by FSPA that may cause network congestion.
  The status of FSPA (registered) is registered in FR.

End
(x) product prequalification and grid prequalification steps might be performed in reversed order then described here.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Easy access	Ease of access to the service market - flexibility, including accessibility, no redundant barriers to entry, user-friendliness.	
2	Number of registered users	Number of registered users of the flexibility platform for which the pre-qualification process has been completed	

1.6. Use case conditions

1.7. Assumptions

1	The use case assumes a single marketplace operated by Flexibility Platform
2	The Flexibility Platform is intended only to resources connected to MV and LV networks
3	Resources should be described by location (e.g., by PoC)
4	The resources are grouped into a resource group and are allocated to a TSO-DSO coupling point

5	Flexibility Service Providers and System Operators do not need their own applications to connect to the Flexibility Platform. They have direct access to the relevant functionalities of Flexibility Platform
6	There is a separate use case allows to introduce TSO, DSO, BSP and products
7	At least one product related to a system service already exist in FP list

1.8. Triggering Events and Preconditions

Actor/System/Information/ Contract	*Triggering Event*	*Pre-conditions*
FSP or FSPA	New FSP has the resource (DER) or resources (DERs) and is interested in providing flexibility services	
FSP or FSPA	A significant new resource (SDER) has appeared in an already prequalified FSP or FSPA which may impact products	The FSP or FSPA is prequalified already
FSPA	The significant amount of resources or SDER are withdraw from portfolio of FSPA	The FSPA is prequalified already
SO	The SO requires re-certification of a specific FSP or FSPA due to network reconfiguration that may impact the ability of the FSP or FSP to deliver the service or services	The FSP or FSPA is prequalified already

1.9. Further information to the use case for classification/mapping

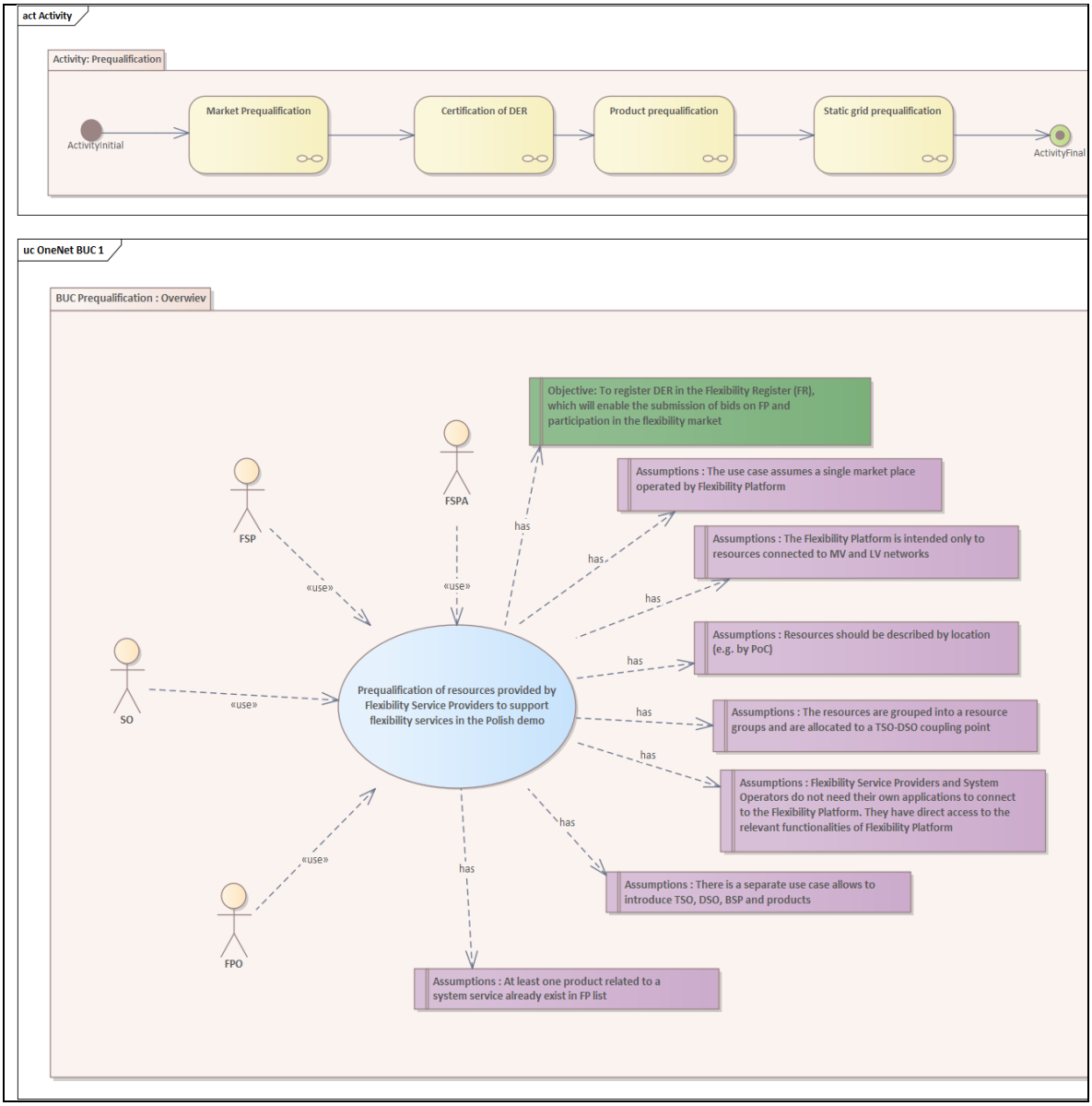
Classification information
Relation to other use cases
Prerequisite for other BUC
Level of depth
Prioritisation
Generic, regional or national relation
National Polish Flexibility Market
Nature of the use case
Business Use Case
Further keywords for classification

1.10. General remarks

General Remarks
This use case precedes any other activity in the flexibility market, such as bidding, activation and settlement of the flexibility services. It is product agnostic. The use case is designed to handle only resources connected to MV and LV networks.

2. Diagrams of Use Case

Diagram(s) of Use Case



3. Technical Details

3.1. Actors

Actors			
Grouping		**Group Description**	
Actor Name *see Actor List*	**Actor Type** *see Actor List*	**Actor Description** *see Actor List*	**Further information specific to this Use Case**
Transmission System Operator (TSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet	

		reasonable demands for the transmission of electricity	
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	
System Operator (SO)	Business	Transmission System Operator or Distribution System Operator	
Flexibility Service Provider (FSP)	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market who owns at least one distributed energy resources	
Flexibility Service Provider being Aggregator (FSPA)	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resource (DER).	Definition of DER is in Part 7.
Market Operator (MO) or Flexibility Platform Operator (FPO)	Business	A natural or legal person who organizes auctions (continuous auction, discrete auctions, call for tenders) between buyers and sellers of electricity-related products in the markets. Manage/operate the platform for trading (where bids and offers are collected). Clear the market and communicate results.	
Balancing Service Provider	Business	A market participant with reserve-providing units or reserve-providing groups able to provide balancing services to TSO or a market participant providing either or both balancing energy and balancing capacity to transmission system operators	BSP is a type of FSP or FSPA providing balancing services
Metered Data Responsible	Business	A party responsible for the establishment and validation of measured data based on the collected data received from the Metered Data Collector. The party is responsible for the history of metered data for a Metering Point.	
Metered Data Collector	Business	A party responsible for meter reading and quality control of the reading.	

3.2. References

References						
No.	***References Type***	***Reference***	***Status***	***Impact on Use Case***	***Originator / Organisation***	***Link***

4. Step by Step Analysis of Use Case

4.1. Overview of Scenarios

Scenario Conditions					
No.	**Scenario Name**	**Primary Actor**	**Triggering Event**	**Pre-Condition**	**Post-Condition**
1	Market prequalification of FSP	FSP	FSP is willing to provide flexibility service to SO	FSP gets resources ready to provide services	FSP registered in FR as a market participant
2	Certification of DER	FSP	FSP declares resources	FSP is registered in FR as a market participant	Resources of FSP are certified in FR
3	Product prequalification	FSP	FSP declares what products is going to provide	Any product description defined by any SO available on the FP	Confirmation that the product or products selected by FSP can be provided
4	Grid prequalification of FSP's impact	FPO	Product prequalification	Any constraints reported by SOs	Registration of DERs prequalification in FR
5	Market Prequalificatio n of FSPA	FSPA	FSPA is willing to provide flexibility service to SO	FSPA gets portfolio of resources ready to provide services	FSPA registered in FR as a market participant
6	Certification of portfolios, including SDER	FSPA	FSPA declares resources	FSPA is registered as a market participant	Subportfolio or subportfolios of FSPA are certified in FR
7	Product prequalification	FSPA	FSPA declares what products is going to provide	Any product description defined by any SO available on the FP	Confirmation that the product or products selected by FSPA can be provided
8	Grid prequalification of FSPA's impact	FPO	Product prequalification	Any constraints reported by SOs	Registration of portfolio splitted into subportfolios and registration of prequalification in FR

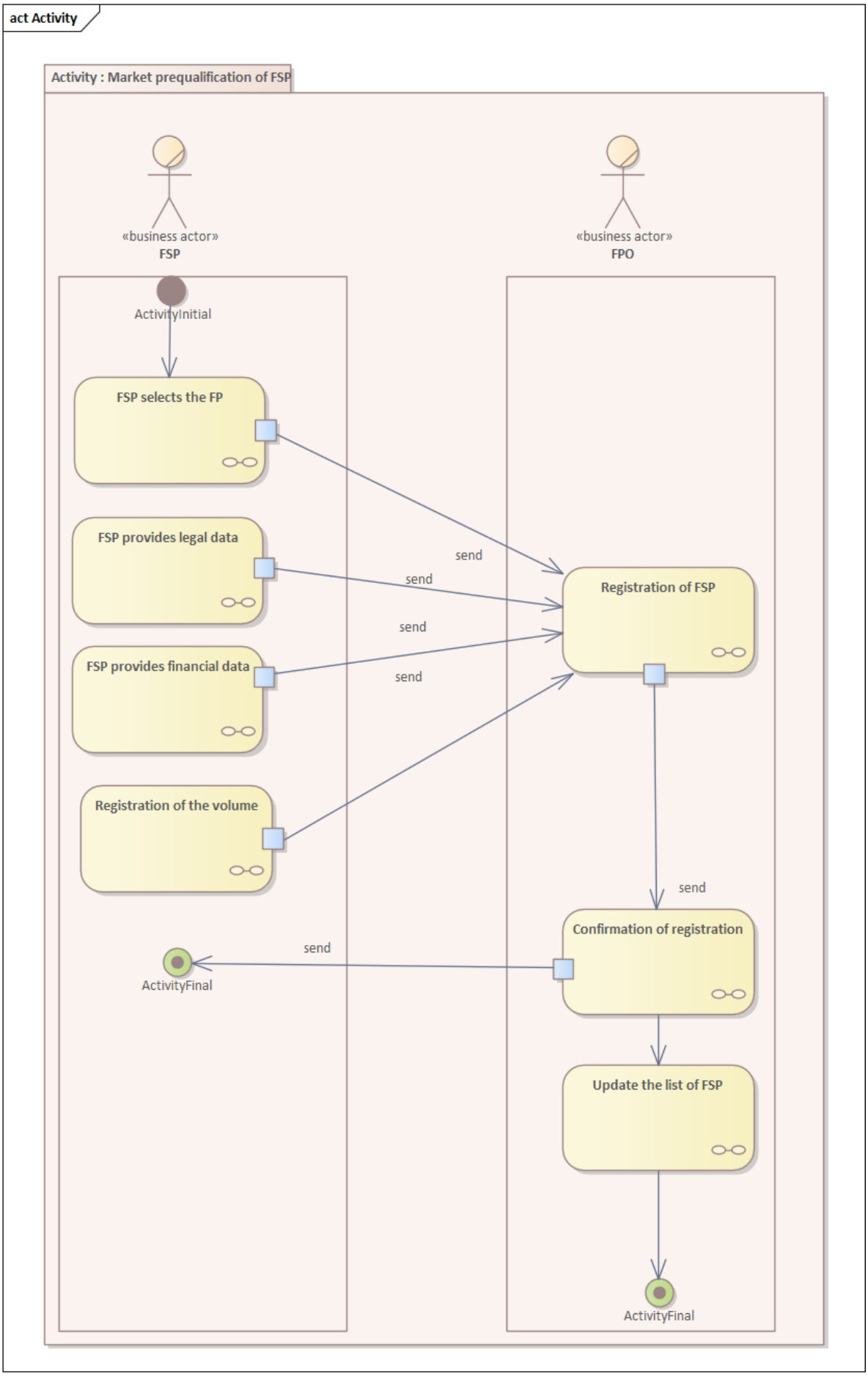
4.2. 4.2 Steps – Scenarios

Market prequalification of FSP

The purpose of market prequalification is to confirm the legal and financial status of FSP and provide it with access to the flexibility platform.

There is a separate scenario for FSP being aggregator.

Diagram:

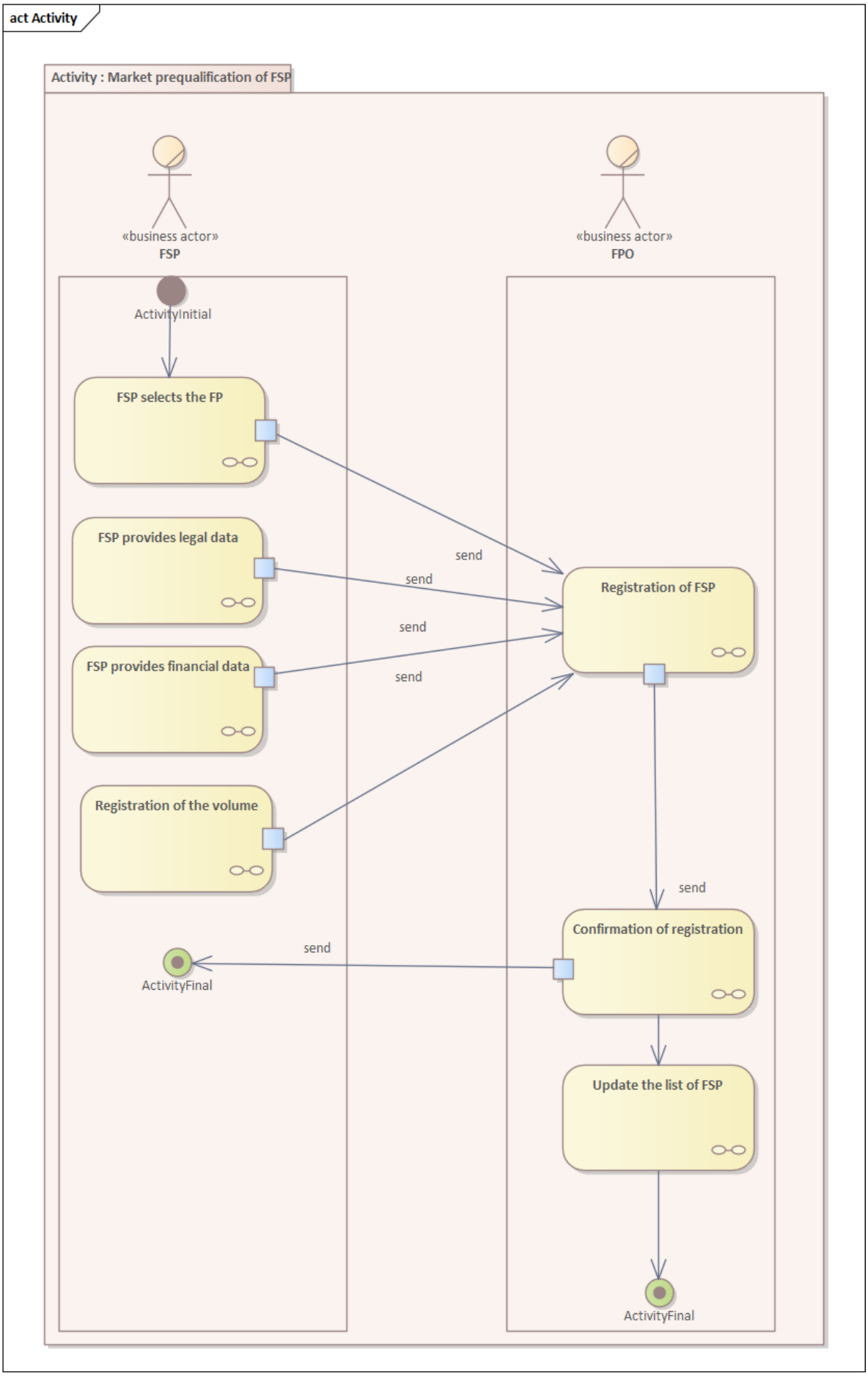

act Activity
Activity : Market prequalification of FSP
«business actor»
FSP
«business actor»
FPO
ActivityInitial
FSP selects the FP
FSP provides legal data
FSP provides financial data
Registration of the volume
send
send
send
send
Registration of FSP
send
Confirmation of registration
send
ActivityFinal
Update the list of FSP
ActivityFinal

Scenario								
Scenario Name:		**No. 1 - Market prequalification of FSP**						
Step No.	***Event***	***Name of Process/ Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		FSP selects the FP	FSP accepts set of rules of participation to get the access to the FP	Send	FSP	FPO	Confirmation	
2		FSP provides legal data	FSP provides the basic legal data of the entity	Send	FSP	FPO	Set of legal information on the entity	
3		FSP provides financial data	FSP provides the financial status and details of bank account	Send	FSP	FPO	Set of financial information on the entity	
4		Registration of the volume	FSP provides the information of the volume	Send	FSP	FPO	Info about the entire volume of resources dedicated for services providing	
5		Registration of the FSP	FPO registers the FSP in the FR	Send	FPO	FSP	Confirmation of registering in FR	
6		Update the list of FSP	FPO adds the FSP to the list of participants in the flexibility register		FPO			

Certification

The certification process aims to provide technical data of the resources constituting the DER proving the basic service capacity. The system operator who verifies the possibility of providing services also takes part in the certification process.

Diagram


act Activity
Activity : Market prequalification of FSP
«business actor»
FSP
«business actor»
FPO
ActivityInitial
FSP selects the FP
FSP provides legal data
FSP provides financial data
Registration of the volume
send
send
send
send
Registration of FSP
send
Confirmation of registration
send
ActivityFinal
Update the list of FSP
ActivityFinal

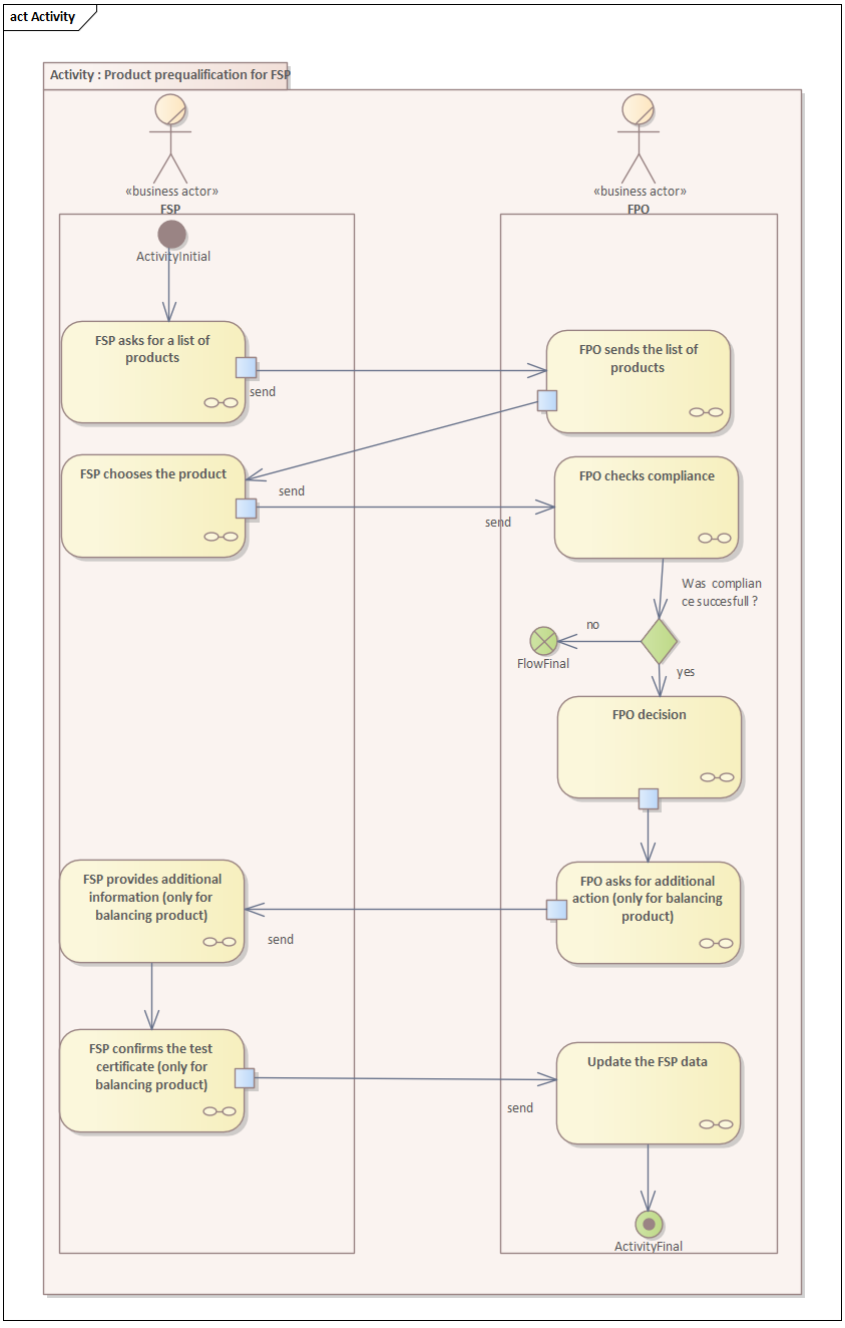
Scenario								
Scenario Name:		**No. 2 – Certification of FSP's DER(s)**						
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (Actor)**	**Information Exchanged**	**Requirements, R-ID**
1		Declaration of DERs	FSP declares the list of DERs	Send	FSP	FPO	ID of each DER and PoC	
2		Specification of DER	FSP provides a technical specification for each DER	Send	FSP	FPO	Technical specification for each DER (type, technology, technical parameters) and declaration of compliance with legal requirements	
3		Metering declaration	FSP declares the SOs to which DERs are connected, the smart meters for each DER and their location	Send	FSP	FPO	Declaration related to SOs, PoCs and locations	
4		Data exchange declaration	FSP declares the fulfilment of data exchange readiness according to SO GL	Send	FSP	FPO	Declaration according to SO GL (depending on type of DER)	
5		FPO requires confirmation	FPO sends request to SOs to which DERs are connected	Send	FPO	SO	Request to SO to confirm DER characteristic and connection with provision of metering data	Iterative process for each DER and SO
6		SO sends the confirmation or rejection	SO sends to FPO the confirmation in case if all parameters are correct and rejection in case of mismatch. SO supplements location for each DER, including by assigning it to the TSO-DSO coupling point.	Send	SO	FPO	Confirmation or rejection	Iterative process for each DER and SO
7	Rejection of DER	FPO sends a message to FSP	FPO sends a message with the reason of rejection of DER	Send	FPO	FSP	Rejection information	
8		Update the FSP data in	FPO registers all DERs which	Send	FPO	FSP	Confirmation of certification of DER	

		FR	are confirmed by SO in flexibility register					

Product prequalification

The purpose of product prequalification is to confirm the feasibility of delivering the products selected by FSP. It is an iterative process for each product separately. In the case of balancing products, additional conditions must be met.

Diagram



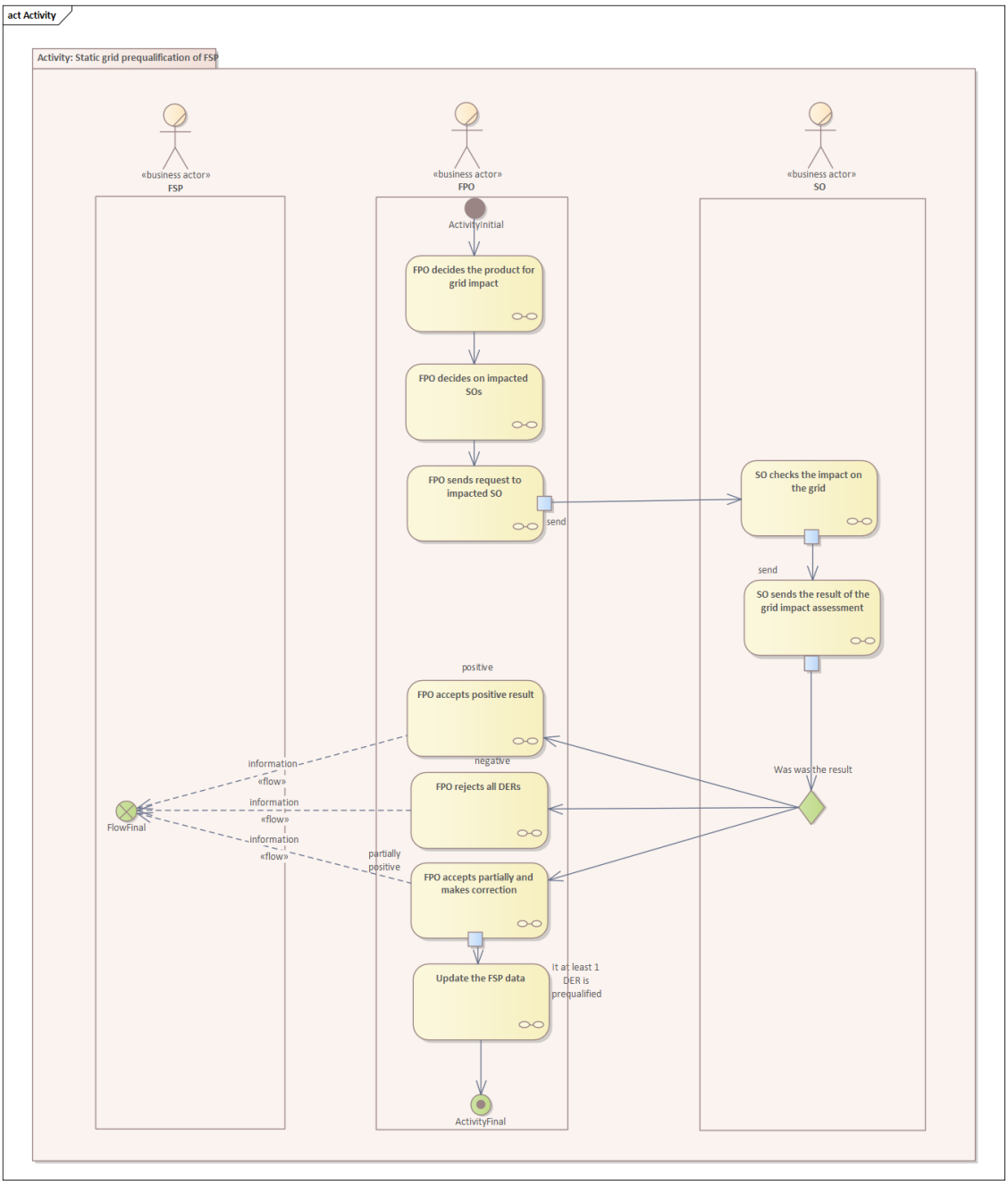
Scenario								
Scenario Name :		**No. 3 – Product prequalification for FSP**						
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (Actor)**	**Information Exchanged**	**Require-ments , R-ID**
1		FSP asks for a list of products	FSP sends the request for a list of products	Send	FSP	FPO	Request for a list of products	
2		FPO sends the list of products	FPO makes available the list of products with their characteristics	Send	FPO	FSP	List of products with their characteristics	
3		FSP chooses the product	FSP indicates the product it wants to supply	Send	FSP	FPO	Information on the selected products	Iterative action for subsequent products
4		FPO checks compliance	FPO compares the parameters of DERs and decides on the compliance with selected product		FPO			Iterative action for subsequent products
5		FPO decision	In case of incompatibility FPO rejects	Send	FPO	FSP	Rejection for selected product	Iterative action for subsequent products
6		FPO asks for additional action (only for balancing product)	FPO sends the request to FSP asking for additional action in case of balancing product	Send	FPO	FSP	Request for additional action	Iterative action for subsequent product
7		FSP provides additional information (only for balancing product)	FSP provides additional information and additional confirmation depending on the type of balancing product	Send	FSP	FPO	Additional information and additional confirmation	Iterative action for subsequent product
8		FSP confirms the test certificate (only for balancing product)	FSP confirms the certificate of correct passing of the test of balancing service	Send	FSP	FPO	Certificate of test	Iterative action for subsequent product
9		Update the FSP data	The FPO records FSPs readiness to supply products that		FPO			

			have passed the compliance test in the Flexibility Registry					

Static grid prequalification

The purpose of static grid prequalification is to reject or limit those resources that will always breach the grid security limit under normal circumstances.

Diagram:



Scenario								
Scenario Name:		**No. 4 - Static grid prequalification of FSP**						
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		FPO decides the product for grid impact	The FPO decides which products (separately up and down) among all the products selected by the FSP will have the greatest impact on the network		FPO			
2		FPO decides on impacted SOs	FPO checks which SOs can be impacted by activation of DERs		FPO			
3		FPO sends request to the impacted SO	FPO sends the request to those SOs to which the DERs are connected	Send	FPO	SO	Request for SO's action	Iterative action for subsequent SOs
4		SO checks the impact on the grid	SO checks whether the activation of FSP's DERs may endanger grid security		SO			Iterative action for subsequent SOs
5		SO sends the result of the grid impact assessment	SO having checked the grid impact assessment sends the message to the FPO with result of the assessment	Send	SO	FPO	Message=OK or Message=NOK or Message=LIMIT (accepted capacity)	Iterative action for subsequent SOs
6	All messages=OK	FPO accepts positive result	FPO accepts result and registers all FSP's DERs in flexible register and sends a message to FSP	Send	FPO	FSP	A message about correct prequalification	
7	Messages=NOK for all FSP's DERs	FPO rejects all DERs	FPO rejects all FSP's DER and sends a message to FSP	Send	FPO	FSP	A message about rejection of all DERs	
8	For some DERs messages=OK or	FPO accepts partially and makes correctio	FPO rejects DERs which didn't pass the grid assessment and registers others DERs in	Send	FPO	FSP	A message about correct prequalification with additional information about rejection of some	

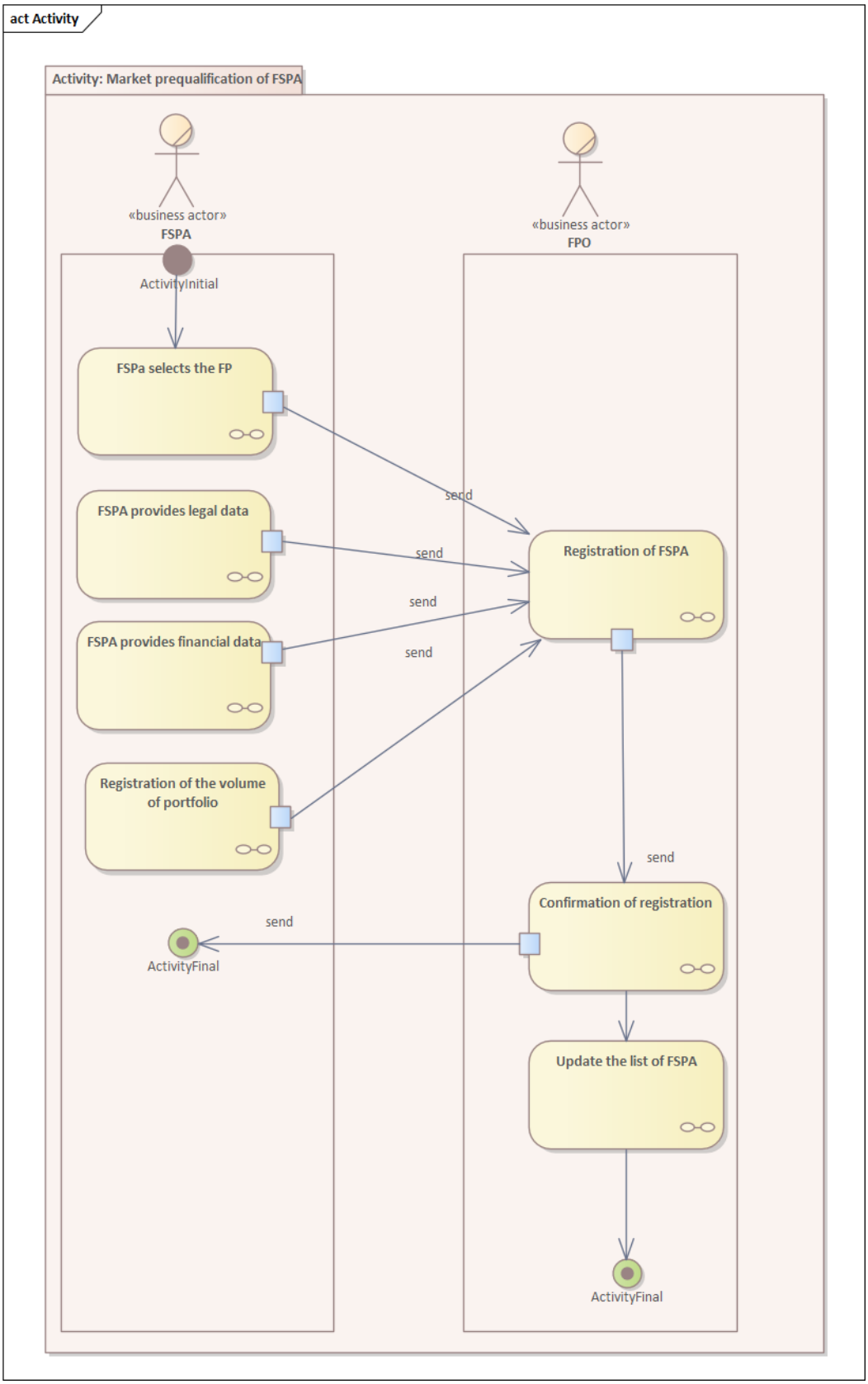
	LIMIT, for some NOK	n	flexible register. In case of limited capacity of DER there is additional message with information how much capacity is accepted. FPO also sends a message to FSP about successful prequalification				DERs and correct prequalification of the remaining DERs (with additional information about limited capacity).	
9	If at least one DER is prequalified	Update the FSP data	FPO registers FSP in FR as ready to deliver selected products		FPO			

Market prequalification of FSPA

The purpose of market prequalification is to confirm the legal and financial status of FSPA and provide it with access to the flexibility platform.

There is a separate scenario for FSP being aggregator.

Diagram:

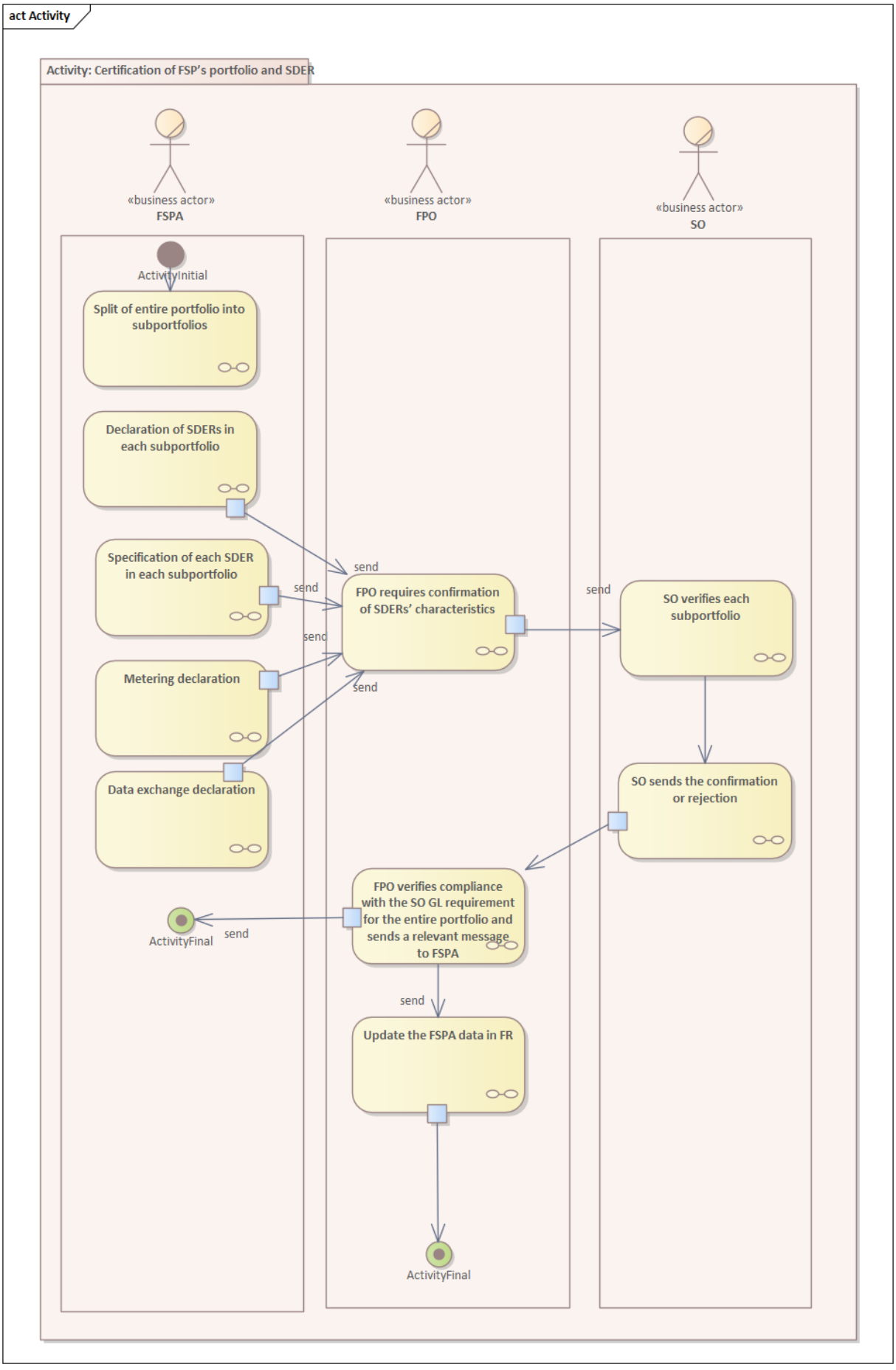

act Activity
Activity: Market prequalification of FSPA
«business actor»
FSPA
«business actor»
FPO
ActivityInitial
FSPa selects the FP
FSPA provides legal data
FSPA provides financial data
Registration of the volume of portfolio
Registration of FSPA
Confirmation of registration
Update the list of FSPA
send
send
send
send
send
send
ActivityFinal
ActivityFinal

Scenario								
Scenario Name:		**No. 5 - Market prequalification of FSPA**						
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (Actor)**	**Information Exchanged**	**Requirements, R-ID**
1		FSPA selects the FP	FSPA accepts set of rules of participation to get the access to the FP	Send	FSPA	FPO	Confirmation	
2		FSPA provides legal data	FSPA provides the basic legal data of the entity	Send	FSPA	FPO	Set of legal information on the entity	
3		FSPA provides financial data	FSPA provides the financial status and details of bank account	Send	FSPA	FPO	Set of financial information on the entity	
4		Registration of the volume of portfolio	FSPA provides the information of the entire volume of portfolio	Send	FSPA	FPO	Info about the entire volume of portfolio	
5		Registration of the FSPA	FPO registers the FSP in the FR	Send	FPO	FSPA	Confirmation of registering in FR	
6		Update the list of FSPA	FPO adds the FSP to the list of participants in the flexibility register		FPO			

Certification of portfolio and SDER

The certification process aims to provide technical data of the resources constituting the SDER proving the basic service capacity and basic information of portfolios allocated to the TSO-DSO coupling points. The system operator who verifies the possibility of providing services also takes part in the certification process.

Diagram


act Activity
Activity: Certification of FSP's portfolio and SDER
«business actor»
FSPA
«business actor»
FPO
«business actor»
SO
ActivityInitial
Split of entire portfolio into subportfolios
Declaration of SDERs in each subportfolio
Specification of each SDER in each subportfolio
Metering declaration
Data exchange declaration
send
send
send
send
send
FPO requires confirmation of SDERs' characteristics
SO verifies each subportfolio
SO sends the confirmation or rejection
FPO verifies compliance with the SO GL requirement for the entire portfolio and sends a relevant message to FSPA
send
ActivityFinal
send
Update the FSPA data in FR
ActivityFinal

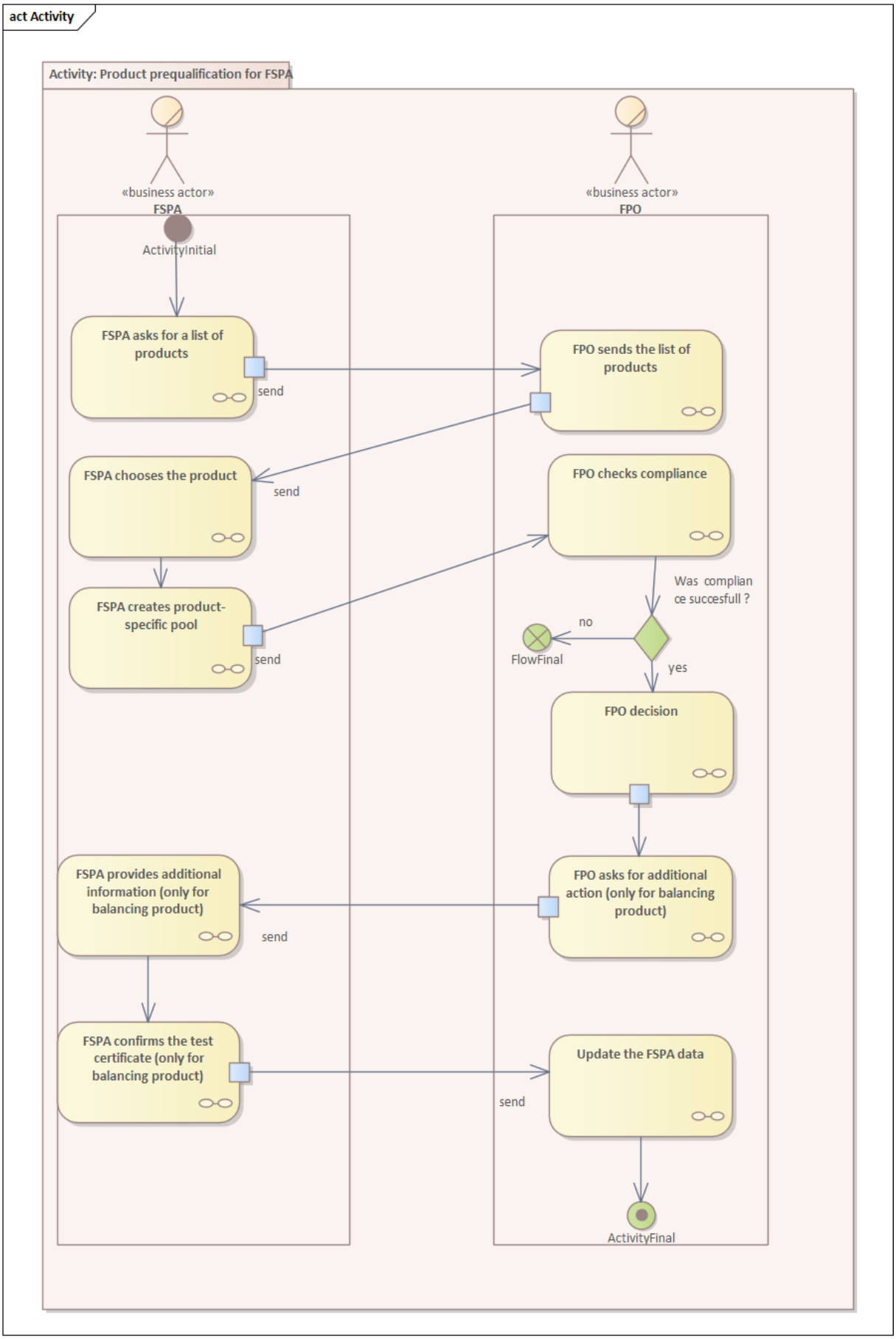
Scenario								
Scenario Name:		**No. 6 – Certification of FSP's portfolio and SDER**						
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (Actor)**	**Information Exchanged**	**Requirements, R-ID**
1		Split of entire portfolio into subportfolios	FSPA splits entire portfolio into dedicated subportfolios assigned to the TSO-DSO coupling points		FSPA			
2		Declaration of SDERs in each subportfolio	FSPA declares the list of SDERs allocated to each subportfolio	Send	FSPA	FPO	ID of each SDER and PoC	
3		Specification of each SDER in each subportfolio	FSPA provides with technical specification for each SDER with its allocation to subportfolio	Send	FSPA	FPO	Technical specification for each SDER (type, technology, technical parameters) and allocation to subportfolio	
4		Metering declaration	FSPA declares the SOs to which SDERs are connected, the smart meters for each DER and their locations	Send	FSPA	FPO	Declaration related to SOs, PoCs and locations	
5		Data exchange declaration	FSPA declares the fulfilment of data exchange readiness according to SO GL	Send	FSPA	FPO	Declaration according to SO GL with specific information, including specific information regarding SDER (depending on type of SDER)	
6		FPO requires confirmation of SDERs' characteristics	FPO sends request to SOs to which SDERs are connected	Send	FPO	SO	Request to SO to confirm SDER characteristic and fulfilment of SO GL requirements for each SDER	Iterative process for each SDER
7		SO sends the confirmation or rejection	SO sends to FPO the confirmation in case if all parameters are correct and rejection in case of mismatch	Send	SO	FPO	Confirmation or rejection of SDERs' characteristic or requirements for each SDER separately	Iterative process for each SDER
7		FPO requires confirmation of connection with metering data and	FPO sends request to SOs to which DERs are connected	Send	FPO	SO	Request to SO to confirm each DER's connection with provision of metering data and location	Iterative process for each DER

		location						
8		SO sends the confirmation or rejection	SO verifies and sends to FPO the confirmation in case if all information are correct and rejection in case of mismatch	Send	SO	FPO	Confirmation or rejection of DERs connection and metering data and location information for each DER separately	Iterative process for each DER
9		SO verifies each subportfolio	SO verifies the right allocation of DERs in each subportfolio and makes correction in case if inconsistency		SO			Iterative process for each DER
10		FPO verifies compliance with the SO GL requirement for the entire portfolio and sends a relevant message to FSPA	FPO checks compliance with the SO GL requirements and in the event of failure to meet the condition, FPO sends a message with the reason of rejection of	Send	FPO	FSPA	Rejection information	
11		Update the FSPA data in FR	FPO registers all subportfolios and DERs they contain, which are confirmed by SOs. FPO sends the message to the FSPA on certifying the portfolio	Send	FPO	FSPA	Confirmation of certification of portfolio	

Product prequalification

The purpose of product prequalification is to confirm the feasibility of delivering the products selected by FSPA. It is an iterative process for each product separately. In the case of balancing products, additional conditions must be met.

Diagram


act Activity
Activity: Product prequalification for FSPA
«business actor»
FSPA
«business actor»
FPO
ActivityInitial
FSPA asks for a list of products
send
FPO sends the list of products
FSPA chooses the product
send
FPO checks compliance
Was complian ce succesfull ?
FSPA creates product-specific pool
send
no
FlowFinal
yes
FPO decision
FSPA provides additional information (only for balancing product)
send
FPO asks for additional action (only for balancing product)
FSPA confirms the test certificate (only for balancing product)
send
Update the FSPA data
ActivityFinal

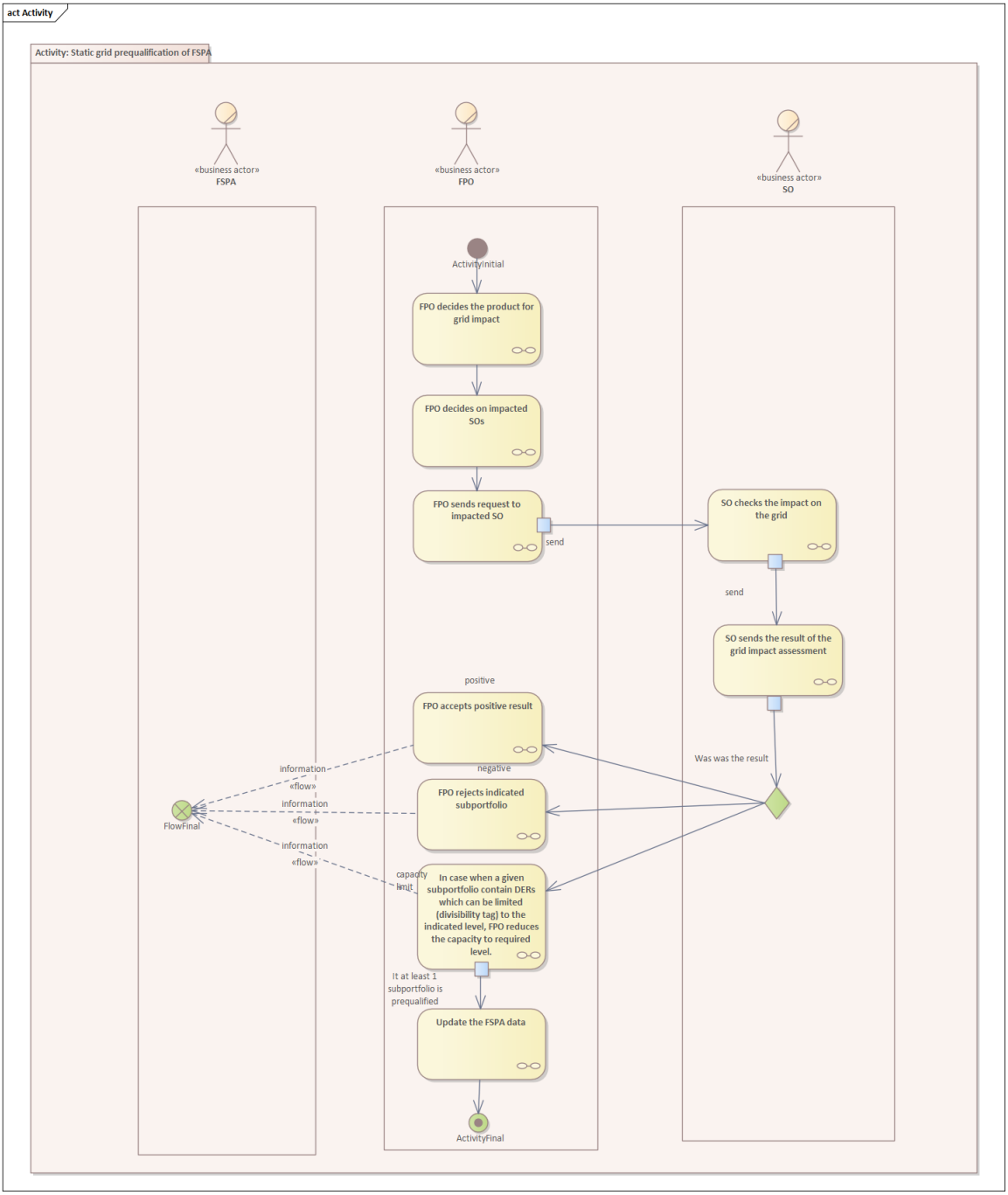
Scenario								
Scenario Name:		**No. 7 – Product prequalification for FSPA**						
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (Actor)**	**Information Exchanged**	**Requirements, R-ID**
1		FSPA ask for list of products	FSPA send the request for a list of products	Send	FSPA	FPO	Request for a list of products	
2		FPO sends the list of products	FPO make available the list of products with their characteristics	Send	FPO	FSPA	List of products with their characteristics	
3		FSPA choses the product	FSPA indicates the product it wants to supply	Send	FSPA	FPO	Information on the chosen products	Iterative action for subsequent products
4		FSPA creates product-specific pool	FSPA for selected product creates the pool of DERs ready to deliver the product and send the information to the FPO	Send	FSPA	FPO	List of DERs allocated to the product-specific pool	Iterative action for subsequent products
5		FPO checks compliance	FPO compares the parameter of product-specific pool, including SDERs and decides on the compliance with chosen product		FPO			Iterative action for subsequent products
6		FPO decision	In case of incompatibility FPO rejects	Send	FPO	FSPA	Rejection for selected product	Iterative action for subsequent products
7		FPO ask for additional action (Only for balancing product)	FPO sends the request to FSPA asking for additional action in case of balancing product	Send	FPO	FSPA	Request for additional action	Iterative action for subsequent products
8		FSPA provides additional information (Only for balancing product)	FSPA provides additional information and present additional confirmation depending on the type of balancing product	Send	FSPA	FPO	Additional information and additional confirmation	Iterative action for subsequent products
9		FSPA confirms the test certificate (Only for) balancing product	FSPA confirms the certificate of correct passing of the test of balancing service	Send	FSPA	FPO	Certificate of test	Iterative action for subsequent products
10		Update the FSPA data	The FPO records in the Flexibility Register FSPA's product-specific pools ready to	Send	FPO	FSPA	Confirmation of specific-pool registration in FR	

			deliver products that have passed the compliance test					

Static grid prequalification

The purpose of static grid prequalification is to reject or limit those resources that will always breach the grid security limit under normal circumstances.

Diagram:



Scenario								
Scenario Name:		**No. 8 - Static grid prequalification of FSPA**						
Step No.	**Event**	**Name of Process/ Activity**	**Description of Process/ Activity**	**Service**	**Information Producer (Actor)**	**Information Receiver (5Actor)**	**Information Exchanged**	**Require-ments, R-ID**
1		FPO decides the product for grid impact	The FPO decides which products (separately up and down) among all the products selected by the FSP will have the greatest impact on the network		FPO			
2		FPO decides on impacted SOs	FPO checks which DSO can be impacted by activation of SDER		FPO			
3		FPO sends request to the impacted SO	FPO sends a request to those SOs to which the SDERs are connected	Send	FPO	SO	Request for SO's action	Iterative action for subsequent subportfolios and SOs
4		SO checks the grid impact	SO checks whether the activation of FSPA's subportfolios including SDERs may endanger grid security		SO			Iterative action for subsequent subportfolios and SOs
5		SO sends result of the grid impact assessment	SO having checked the grid impact assessment sends the message to the FPO with result of the assessment	Send	SO	FPO	Message=OK or Message=NOK or Message=LIMIT (accepted capacity)	Iterative action for subsequent subportfolios and SOs
6	Message OK for a given subportfolion	FPO accept positive result	FPO accept result and registers a given subportfolio in flexible register and sends a message to FSPA	Send	FPO	FSPA	A message about correct prequalification for a given subportfolio	Iterative action for subsequent subportfolios and SOs
7	Message NOK for a given subportfolion		FPO rejects indicated subportfolio and sends a message to FSPA	Send	FPO	FSPA	A message about rejection of a given subportfolio	Iterative action for subsequent subportfolios and SOs
8	Message LIMIT (capacity limit) for a given subportfolion		In case when a given subportfolio contain DERs which can be limited (divisibility tag) to the indicated level, FPO reduces the capacity to required level. In other cases, the subportfolio is rejected.	Send	FPO	FSPA	A message about reduction (if it is possible) is sent with the level of available capacity. Otherwise, a rejection message is sent.	Iterative action for subsequent subportfolios and SOs
9	If at	Update	FPO registers FSPA in		FPO			

	least one subportfolio is prequalified	the FSPA data	FR as ready to deliver selected products					

5. Information Exchanged

Information Exchanged		
Name of Information (ID)	***Description of Information Exchanged***	***Requirements to information data***

6. Requirements (optional)

Requirements (optional)	
Categories for Requirements	**Category Description**
Requirement ID	**Requirement Description**

7. Common Terms and Definitions

Common Terms and Definitions	
Term	**Definition**
PoC – Point of Connection or Accounting Point	Type of metering point where energy supplier change can take place and for which commercial business processes are defined
Metering Point	An entity where energy products are measured or computed.
TSO-DSO coupling point	Connection point where DSO's MV network is connected to the MV/110 kV substation
DER – Distributed Energy Resource	Distributed energy resource can be generation unit, energy storage unit or consumption unit.
SDER – Significant Distributed Energy Resources	Significant distributed energy resource can be generation unit, energy storage unit or consumption unit with capacity above the threshold set in the market rules
Flexibility Platform - FP	IT system that either facilitates or coordinates the trade, dispatch and/or settlement of flexibility services to system operators.
Flexibility Register - FR	A part of Flexibility Platform. Contains structural information on the location of connection points that can provide flexibility services to system operators, status of prequalification of each DER, products parameters and other information. A full list of data contained will be developed in the project.

8. Custom Information (optional)

Custom Information (optional)		
Key	***Value***	***Refers to Section***

Managing flexibility delivered by DER to provide balancing services to TSO

ased on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-PL-02	Polish Flexibility Market	Managing flexibility delivered by DER to provide balancing services to TSO.

1.2. Version management

Version management				
-Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	2021-04-22	Wojciech Lubczyński (PSE)	First draft	
0.2	2021-04-23	Wojciech Lubczyński (PSE)	First draft (1.1 – 1.4)	
0.3	2021-04-26	Grzegorz Sawicki (PSE)	Remarks	
0.4	2021-05-05 2021-05-10	Wojciech Lubczyński (PSE)	Extension by DA CM & VR	
0.5	2021-05-11	Grzegorz Sawicki	Remarks	
0.6	2021-05-12	Wojciech Lubczyński (PSE)	Accepting changes, removing comments and making minor correction (change from “voltage regulation” to “voltage control”	
0.7	2021-05-17	Wojciech Lubczyński (PSE)	Introducing actors and activity diagram	
0.8	2021-05-20	Grzegorz Sawicki	Corrections and additions to p.1.5-3.4. Changes due to implementation of KM2 products	
0.9	2021-05-21	Grzegorz Sawicki	Changes accepted, removing comments and some additional agreed changes.	
1.0	2021-05-27	Grzegorz Sawicki	New template	
1.1	2021-06-18	Grzegorz Sawicki	Changes agreed on basis of other BUC	
1.2	2021-07-19	Grzegorz Sawicki	Fulfilling points 3.5. – 4.1. Cancelling references to CM and VC purchased by DSO in day-ahead perspective. Changes due to modifications of	

			SUC – bidding for day ahead balancing.	
1.3	2021-08-31 2021-09-07	Grzegorz Sawicki Łukasz Szczepaniak Robert Kielak Ewelina Makuła Wojciech Lubczyński Radian Karpuk Przemysław Kacprzak	Changes due to agreed modifications in the of day -ahead purchasing process of balancing capacity products and balancing energy.	
1.4	2021-09-09	Grzegorz Sawicki	Corrections and additions	
1.5	2021-09-10	Polish demo participants	Version ready to send	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Bring the flexibility provided by resources connected to the distribution network (Low and Medium voltage, LV/MV) in the form of active power and/or active energy to the polish TSO balancing market.
Objective(s)	Ensuring that the energy system is balanced and frequency is kept within the permitted range. Opening a balancing market for resources connected to the distribution network (LV/MV). Developing rules for coordination between TSO and DSO when using flexibility services. Creating revenue opportunities for market participants for providing balancing services in the form of balancing capacity products and balancing energy.
Related business case(s)	Prequalification, CM&VC for DSO, BSP.

1.4. Narrative of Use Case

Narrative of use case
Short description
The use case describes the process of purchasing flexible services in day-ahead horizon based on active power and/or active energy for TSO needs and then using these services for balancing purposes. Balancing services for TSO are procured on a continuous basis. The purchase of services takes place on Balancing Market platform according to the rules described in *Terms and Conditions related to Balancing*. Only Balancing Service Providers (BSPs) who have positively passed the prequalification process can offer balancing services. In case their resources are located in DSO's grid (LV/MV) submitting bids for balancing services is only possible through the Flexibility Platform. In the day-ahead mode, it is distinguished by the acquisition of capacity (Primary Balancing Capacity Market) and balancing energy (Day-Ahead Balancing Energy Market).
Complete description
Summary of use case The process carried out on the Flexibility Platform in day-ahead time frame consists of the following steps:

Scenario 1 – Determination of TSO needs in terms of capacity

- Every morning TSO also announces information on the constraints in the network.
- The Flexibility Platform Operator (FPO) takes the above-mentioned information from TSO and makes it available as soon as possible on the Flexibility Platform to interested parties.
- Every morning the Flexibility Platform may also make available information on the constraints in the distribution network that may affect the technical feasibility of potential offers for balancing capacity products and balancing energy.

Scenario 2 – Collecting offers for balancing capacity products from BSPs whose sources are located in the DSO network:

- Every morning the Flexibility Platform enables BSPs to submit offers for individual balancing capacity products (such as: FCR, aFRR, mFRR, RR – it will be decided later which exactly). Wherein:
  - only BSPs with a valid contract concluded with TSO, who have individual sources of flexibility or have it on the basis of relevant contracts with FSPs, are entitled to submit offers for balancing services,
  - only BSPs whose sources of flexibility have been pre-qualified to deliver these products may submit offers for individual capacity products,
  - bids are submitted specifying the product, according to *Terms and Conditions related to Balancing.*
- When submitting an offer through the Flexibility Platform, BSP is obliged to precisely indicate which resource it intends to provide the balancing service in order to enable the assessment of the feasibility of such an offer from the point of view of the DSO network.

Scenario 3 alternatively:

Scenario 3a – Verification of technical feasibility of offers for balancing capacity products and selection of offers on the Flexibility Platform

- DSO provides and updates the current DSO network constrains / model in individual coupling points to the Flexibility Platform.
- Every morning the Flexibility Platform performs a technical feasibility assessment of offers for balancing capacity products in couple of steps.
- The Flexibility Platform pre-verifies submitted offers including:
  - BSP's rights to submit an offer for a given product.
  - The amount of services offered (including flexibility services and balancing services contracted) in relation to the available installed power in a given BSPs resource.
  - The feasibility of offers in terms of restrictions in the distribution network announced by DSO.
  - The feasibility of the bids in terms of limitations in the transmission network announced by TSO.
- Offers that do not meet the conditions of the above-mentioned pre-verification are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.
- Every morning the Flexibility Platform verifies technical feasibility of submitted offers that are not subject to rejection in pre-verification phase. Wherein:
  - the Flexibility Platform is entitled to eliminate those offers that, if activated by TSO, may cause problems in the DSO network.
  - the Flexibility Platform is entitled to reduce divisible offers to optimize the results of verification.

- Offers that do not meet the conditions of the above-mentioned verification are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.
- Every morning the aggregated offer of the network (AGNO) is constructed by the Flexibility Platform from the offers that are not subject to rejection and are positively verified. Wherein:
    - when designing the AGNO, the existing constraints in the DSO network are taken into account, which remain known and have not been resolved as part of the DSO acquiring flexibility services for constraint management and voltage control.
    - From among positively verified offers, the first ones are selected for those capacity products whose price is the most advantageous in relation to the anticipated prices of individual capacity products (which can bring the greatest social welfare if activated by TSO).
- Offers that are not a part of AGNO are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.

Scenario 3b – Verification of technical feasibility of offers for balancing capacity products and selection of offers by DSO

- Every morning the Flexibility Platform performs a technical feasibility assessment of offers for balancing capacity products in couple of steps.
- The Flexibility Platform pre-verifies submitted offers including:
    - BSP's rights to submit an offer for a given product.
    - The amount of services offered (including flexibility services and balancing services contracted) in relation to the available installed power in a given BSPs resource.
    - The feasibility of offers in terms of restrictions in the distribution network announced by DSO.
    - The feasibility of the bids in terms of limitations in the transmission network announced by TSO.
- Offers that do not meet the conditions of the above-mentioned pre-verification are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.
- Every morning the DSO verifies technical feasibility of submitted offers that are not subject to rejection in pre-verification phase. Wherein:
    - DSO sees only the products and sources offered; it does not see the prices at which offers are submitted by individual BSPs.
    - DSO is entitled to reduce divisible offers or to eliminate those offers that, if activated by TSO, may cause problems in the DSO network.
    - DSO is not entitled to other offers modifications.
    - DSO is obliged to explain the modifications made to offers at the request of BSP.
- Offers that do not meet the conditions of the above-mentioned verification can be rejected by DSO and an appropriate message is passed to the BSPs by the Flexibility Platform.
- Every morning the aggregated offer of the network (AGNO) is constructed by the Flexibility Platform from the offers that are not subject to rejection and are positively verified. Wherein:
    - when designing the AGNO, the existing constraints in the DSO network are taken into account, which remain known and have not been resolved as part of the DSO acquiring flexibility services for constraint management and voltage control.
    - From among positively verified offers, the first ones are selected for those capacity products whose price is the most advantageous in relation to the anticipated prices of individual capacity products (which can bring the greatest social welfare if activated by TSO).
- Offers that are not a part of AGNO are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.

Scenario 4 – Transfer of offers for balancing capacity products to the Balancing Market within the Primary Balancing Capacity Market

- Every day the Flexibility Platform transfers offers of individual BSPs for balancing capacity products.
- The transfer of offers consists in providing information about offers to the Technical Market Operator (TMO) cooperating with the FPO. Wherein:
  - A file with information about offers is generated automatically on the Flexibility Platform and sent in a predefined format to the TMO.
  - information about offers contains all the required items in accordance with the *Terms and Conditions related to Balancing*.
- Every morning (within the window for balancing capacity offers on Balancing Market) the TMO transfers offers to the Balancing Market using the end of the TSO IT system. An appropriate message is passed to the BSPs.

Scenario 5 – Selection of offers for balancing capacity products on the Balancing Market

- Bids for balancing capacity products are selected on the Balancing Market in accordance with the principles set forth in the *Terms and Conditions related to Balancing.*

Scenario 6 – Information about offers for balancing capacity products selected on the Balancing Market

- information on the selection of offers for balancing products is provided by TSO to the TMO in accordance with the rules set out in the *Terms and Conditions related to Balancing*.
- The TMO informs the FPO, DSO and individual BSPs about the accepted offers for balancing products that were submitted by BSPs via the Flexibility Platform.

Scenario 7 - Collecting offers for balancing energy from BSPs whose sources are located in the DSO network:

- Every morning (but after information about offers for balancing capacity products selected on the Balancing Market) the Flexibility Platform enables BSPs to submit offers for balancing energy. Wherein:
  - only BSPs with a valid contract concluded with TSO, who have individual sources of flexibility or have it on the basis of relevant contracts with FSPs, are entitled to submit offers for balancing energy,
  - only BSPs whose sources of flexibility have been pre-qualified to deliver balancing energy may submit offers,
  - bids are submitted according to *Terms and Conditions related to Balancing.*
- Every BSP whose offer for any of the balancing capacity products was selected by TSO in the Primary Balancing Capacity Market phase is obliged to submit an offer for balancing energy in accordance with *Terms and Conditions related to Balancing.*
- When submitting an offer through the Flexibility Platform, BSP is obliged to precisely indicate which resource it intends to provide the balancing energy in order to enable the assessment of the feasibility of such an offer from the point of view of the DSO network.

Scenario 8 alternatively:

Scenario 8a – Verification of technical feasibility of offers for balancing energy and selection of offers on the Flexibility Platform

- After information about offers for balancing capacity products selected on the Balancing Market DSO can update the current DSO network model in individual coupling points and

provide it to the Flexibility Platform (providing that DSO takes into account the acceptance by TSO of BSPs offers for capacity products).

- Every morning the Flexibility Platform performs a technical feasibility assessment of offers for balancing energy in couple of steps.
- The Flexibility Platform pre-verifies submitted offers including:
  - BSP's rights to submit an offer for balancing energy.
  - The amount of balancing energy offered (including flexibility services and balancing services contracted) in relation to the available installed power in a given BSPs resource.
  - The feasibility of offers in terms of restrictions in the distribution network announced by DSO.
  - The feasibility of the bids in terms of limitations in the transmission network announced by TSO.
- Offers that do not meet the conditions of the above-mentioned pre-verification are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.
- Every morning the Flexibility Platform verifies technical feasibility of submitted offers that are not subject to rejection in pre-verification phase. Wherein:
  - the Flexibility Platform is entitled to eliminate those offers elements that, if activated by TSO, may cause problems in the DSO network.
  - the Flexibility Platform is entitled to other reduce divisible offers to optimize the results of verification.
- Offers that do not meet the conditions of the above-mentioned verification are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.
- Every morning the aggregated offer of the network (AGNO) is constructed by the Flexibility Platform from the offers that are not subject to rejection and are positively verified. Wherein:
  - When designing the AGNO, the existing constraints in the DSO network are taken into account, which remain known and have not been resolved as part of the DSO acquiring flexibility services for constraint management and voltage control.
  - From among positively verified offers, the first ones are selected for those balancing energy offers whose price is the most advantageous (which are the cheapest if activated by TSO. Merit Order List (MOL) is prepared.
- Offers that are not a part of AGNO are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.

Scenario 8b – Verification of technical feasibility of offers for balancing energy and selection of offers by DSO

- Every morning the Flexibility Platform performs a technical feasibility assessment of offers for balancing energy in couple of steps.
- The Flexibility Platform pre-verifies submitted offers including:
  - BSP's rights to submit an offer for balancing energy.
  - The amount of balancing energy offered (including flexibility services and balancing services contracted) in relation to the available installed power in a given BSPs resource.
  - The feasibility of offers in terms of restrictions in the distribution network announced by DSO.
  - The feasibility of the bids in terms of limitations in the transmission network announced by TSO.

- Offers that do not meet the conditions of the above-mentioned pre-verification are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.
- Every morning the DSO verifies technical feasibility of submitted offers that are not subject to rejection in pre-verification phase. Wherein:
    - DSO does not see the prices at which offers are submitted by individual BSPs.
    - DSO is entitled to eliminate those offers elements that, if activated by TSO, may cause problems in the DSO network.
    - DSO is not entitled to other offers modifications.
    - DSO is obliged to explain the modifications made to offers at the request of BSP.
- Offers that do not meet the conditions of the above-mentioned verification can be rejected by DSO and an appropriate message is passed to the BSPs by the Flexibility Platform.
- Every morning the aggregated offer of the network (AGNO) is constructed by the Flexibility Platform from the offers that are not subject to rejection and are positively verified. Wherein:
    - When designing the AGNO, the existing constraints in the DSO network are taken into account, which remain known and have not been resolved as part of the DSO acquiring flexibility services for constraint management and voltage control.
    - From among positively verified offers, the first ones are selected for those balancing energy offers whose price is the most advantageous (which are the cheapest if activated by TSO) Merit Order List (MOL) is prepared.
- Offers that are not a part of AGNO are automatically rejected by the Flexibility Platform and an appropriate message is passed to the BSPs.

Scenario 9 – Transfer of offers for balancing energy to the Balancing Market within the Balancing Energy Market

- Every day the Flexibility Platform transfers offers of individual BSPs for balancing energy.
- The transfer of offers consists in providing information about offers to the TMO cooperating with FPO with an appropriate message is passed to the BSPs. Wherein:
    - A file with information about offers is generated automatically on the Flexibility Platform and sent in a predefined format to the TMO.
    - Information about offers contains all the required items in accordance with the *Terms and Conditions related to Balancing*.
- Every morning (within the window for balancing energy offers on Balancing Market) the TMO transfers offers to the Balancing Market using the end of the TSO IT system.

Scenario 10 – Selection of offers for balancing energy on the Balancing Market

- Bids for balancing energy are selected on the Balancing Market in accordance with the principles set forth in the *Terms and Conditions related to Balancing.*

Scenario 11 – Information about offers for balancing energy selected on the Balancing Market

- Information on the selection of offers for balancing energy is provided by TSO to the TMO in accordance with the rules set out in the *Terms and Conditions related to Balancing*.
- The TMO informs the FPO, DSO and individual BSPs about the accepted offers for balancing energy that were submitted by BSPs via the Flexibility Platform.

Scenario 12 – Delivery of balancing capacity products and/or balancing energy

- Activation signals for delivery of balancing capacity products and/or balancing energy are provided by TSO to the BSPs in accordance with the rules set out in the *Terms and Conditions related to Balancing*.

- Monitoring of delivery is also provided according to the *Terms and Conditions related to Balancing*.

Scenario 13 – Settlements for balancing capacity products or balancing energy between TSO and BSPs

- Settlements for balancing capacity products or balancing energy Activation are carried out periodically in accordance with the rules set out in the *Terms and Conditions related to Balancing*.
- Settlements consist of:
  - Gathering information about BSPs that successfully delivered the services – balancing capacity products and/or balancing energy.
  - Provision of BSPs' metering data (by DSO) for a specific period of time.
  - Confirmation that the activated balancing services have been successfully delivered.
  - Identification of balancing services that were not or partially performed.
  - Creating of information for the settlement of balancing services for each BSP, including penalties.

Scenario 14 – Settlements for balancing capacity products or balancing energy between BSPs and FSPs and FSPAs

- Settlements for balancing capacity products or balancing energy are carried out periodically on the basis of settlements between TSO and BSPs.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

1.7. Assumptions

1	The use case assumes a single marketplace operated by Flexibility Platform.
2	The Flexibility Platform is intended only to resources connected to MV and LV networks.
3	Resources should be described by location (e.g., by PoC).
4	The resources are grouped into resource groups and are allocated to a TSO-DSO coupling point.
5	Flexibility Service Providers and System Operators do not need their own applications to connect to the Flexibility Platform. They have direct access to the relevant functionalities of Flexibility Platform.

1.8. Triggering Events and Preconditions

Use Case Conditions			
Actor/System/Information/ Contract	***Triggering Event***	***Pre-conditions***	***Assumption***
TSO	The TSO requires balancing services on the DA time horizon	The rules of participation in balancing market are defined and well known. Balancing products are defined.	FSP and/or FSPA with their resources have been successfully prequalified for balancing services and operates through the

			BSP that is already registered.
BSP	BSP submits bids on the Flexibility Platform in accordance with specific time slots for balancing services (balancing capacity products and/or balancing energy) on the DA time horizon	Bids for balancing services delivered by FSP and/or FSPA connected to DSOs grid and represented by BSP are collected via flexibility platform.	Submitting bids for particular services is allowed only for BSP that represent prequalified FSP and / or FSPA.
Technical Market Operator TMO	TMO sends bids for balancing services to the Balancing Market, that passed the verification on the Flexibility Platform and by DSO.	After verification there are Bids for balancing services that are technically feasible in case of activation.	Bids are selected on the Balancing Market in accordance with the implemented market mechanisms

1.9. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
EACL-PL-01 Prequalification, EACL-PL-03 CM&VC for DSO, EACL-PL-04 BSP
Level of depth
-
Prioritisation
-
Generic, regional or national relation
National Polish Flexibility Market
Nature of the use case
Business Use Case
Further keywords for classification
Balancing services, FSP, FSPA

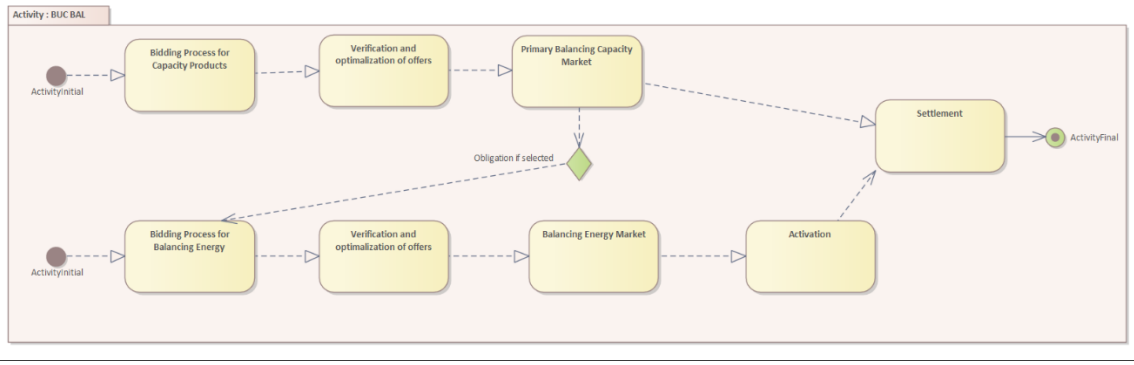
1.10. General Remarks

General Remarks
• Business Use Case is product agnostic. • Business Use Case is designed to handle only resources connected to MV and LV grid.

2. Diagrams of Use Case

Diagram(s) of Use Case
Business Use Case overview:

act Activity



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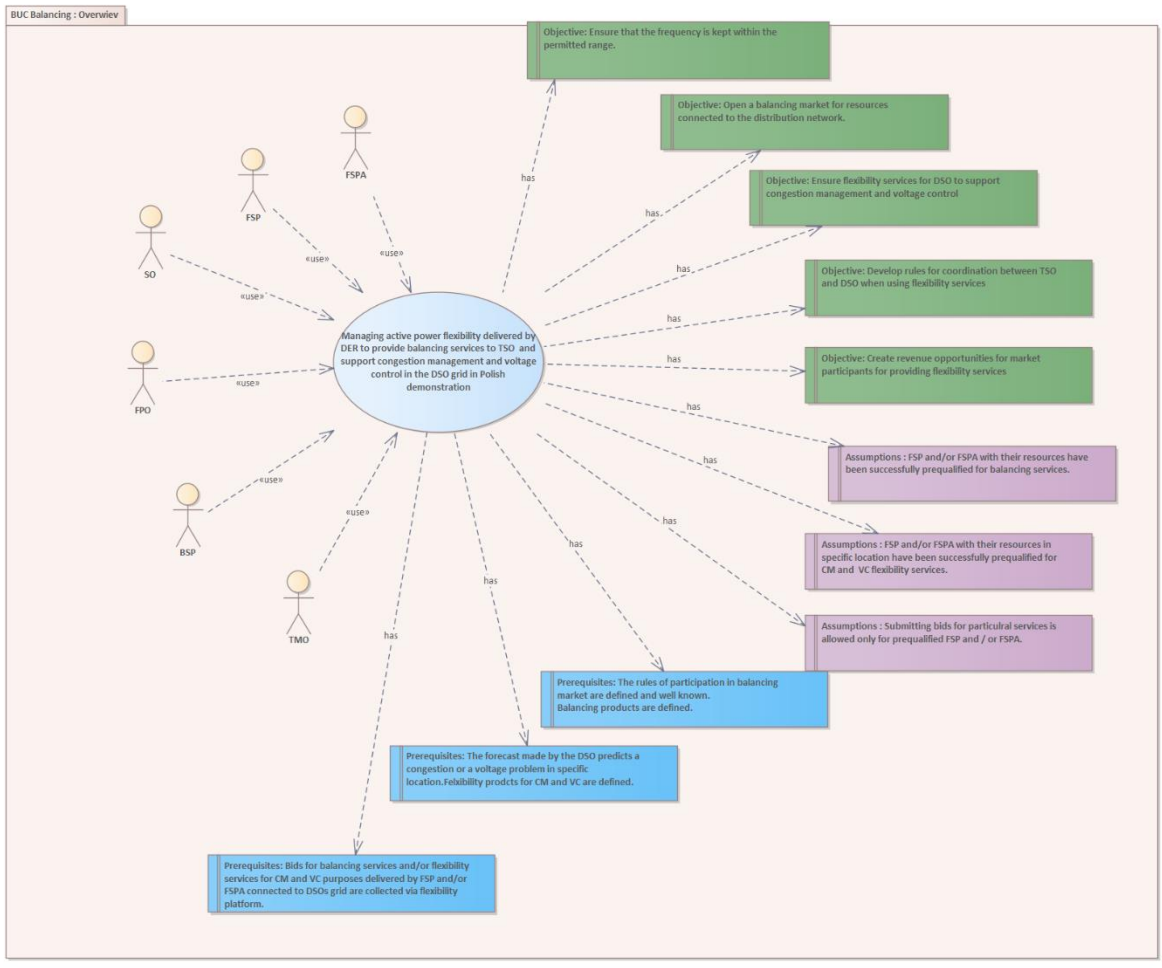


3. Technical Details

3.1. Actors

Actors			
Grouping		***Group Description***	
Actor Name see Actor List	***Actor Type see Actor List***	***Actor Description see Actor List***	***Further information specific to this Use Case***
Transmission System Operator (TSO)	Business	A natural person or institution who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	
Distribution System Operator (DSO)	Business	A natural person or institution who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	
System Operator (SO)	Business	Transmission System Operator or Distribution System Operator	
Flexibility Service Provider (FSP)	Business	A party who is a market participant providing flexibility services to any electricity market who owns at least one distributed energy resources	
Flexibility Service Provider being Aggregator (FSPA)	Business	A party who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resource.	
Flexibility Platform Operator (FPO)	Business	Organize auctions (continuous auction, discrete auctions, call for tenders) between buyers and sellers of electricity-related products in the markets. Manage/operate the platform for trading (where bids and offers are collected) Clear the market and communicate results.	
Balancing Service Provider	Business	A market participant with reserve-providing units or reserve-providing groups able to provide balancing services to TSO	
Technical Market Operator (TMO)	Business	The entity that is responsible for the administration of the Unit Schedule of the Balancing Market Participant in the scope commercial and technical.	

3.2. References

4. Step by Step Analysis of Use Case

4.1. Overview of Scenarios

Scenario Conditions					
No.	***Scenario Name***	***Primary Actor***	***Triggering Event***	***Pre-Condition***	***Post-Condition***
1	Determination of TSO needs in terms of capacity	TSO	Announcement	TSO has needs for balancing services	TSOs needs published
2	Collecting offers for balancing capacity products from BSPs whose sources are located in the DSO network	FPO	Opening the window for offers on Flexibility Platform	BSPs are prequalified and have capability to put an offer in response to TSOs needs	BSPs put their offers
3	Verification of technical feasibility of offers for balancing capacity products and selection of offers on the Flexibility Platform	FPO & DSO [or alternatively FPO]	Verification of offers	There are BSPs offers	Offers are verified, AGNO is prepared
4	Transfer of offers for balancing capacity products to the Balancing Market within the Primary Balancing Capacity Market	TMO	Transfer of offers (AGNO)	There is AGNO	AGNO sent to Balancing Market
5	Selection of offers for balancing capacity products on the Balancing Market	TSO	Balancing Market process	There is AGNO	Offers are chosen
6	Information about offers for balancing capacity products selected on	TSO	Balancing Market process	Offers are chosen	TMO/BSPs are informed

	the Balancing Market				
7	Collecting offers for balancing energy from BSPs whose sources are located in the DSO network	FPO	Opening the window for offers on Flexibility Platform	BSPs are prequalified and have capability to put an offer in response to TSOs needs	BSPs put their offers
8	Verification of technical feasibility of offers for balancing energy and selection of offers by DSO	FPO & DSO [or alternatively FPO]	Verification of offers	There are BSPs offers	Offers are verified, AGNO is prepared
9	Transfer of offers for balancing energy to the Balancing Market within the Balancing Energy Market	TMO	Transfer of offers (AGNO)	There is AGNO	AGNO sent to Balancing Market
10	Selection of offers for balancing energy on the Balancing Market	TSO	Balancing Market process	There is AGNO	Offers are chosen
11	Information about offers for balancing energy selected on the Balancing Market	TSO	Balancing Market process	Offers are chosen	TMO/BSPs are informed
12	Delivery of balancing capacity products and/or balancing energy	TSO	Activation Signal	There is need to activate the BSPs' resource	Resource is activated
13	Settlements for balancing capacity products or balancing energy between TSO and BSPs	TSO	Settlement	There is a basis for settlement	Settlement completed
14	Settlements for balancing	BSP	Settlement	There is a basis for settlement	Settlement completed

	capacity products or balancing energy between BSPs and FSPs and FSPAs				

4.2. Steps – Scenarios (to be defined after publishing a new version of *Terms and Conditions related to Balancing*)

Event-driven Active Power Management for Congestion Management and voltage control by the DSO

1. Description of the Use Case

1.1. Name of Use Case

Use Case Identification		
ID	***Area / Domain(s)/ Zone(s)***	***Name of Use Case***
EACL-PL-03	Polish DEMO	Event-driven Active Power Management for Congestion Management and voltage control by the DSO

1.2. Version Management

Version Management				
Version No.	***Date***	***Name of Author(s)***	***Changes***	***Approval Status***
0.1	01.04.2021	Dominik Falkowski	First draft version of BUC (up to 1.5)	
0.2	10.05.2021	Wojciech Lubczyński	Remarks	
0.3	21.05.2021	Dominik Falkowski	Corrections and additions to p.1.5-3.4.	
0.4	26.05.2021	Dominik Falkowski	Adjusted to new template. Added diagrams to BUC.	
0.5	07.06.2021	Dominik Falkowski	Developed draft for part 4	
0.6	01.07.2021	Dominik Falkowski	Remarks	
0.7	23.07.2021	Dominik Falkowski	Combining BUC for planned work with the DA activities	
0.8	27.07.2021	Wojciech Lubczyński	Remarks	
0.9	10.09.2021	Dominik Falkowski	Diagrams and minor changes	

1.3. Scope and Objectives of Use Case

Scope and Objectives of Use Case	
Scope	The scope of BUC covers the use by the distribution system operator (DSO) of the service providers' active power capabilities to eliminate congestion and voltage violations in the distribution network. The services would be purchased using an IT Flexibility platform on market condition.
Objective(s)	• Elimination of congestion in the distribution network using active power • Elimination of voltage violations in the distribution MV and LV network, using active power • Coordination of TSO and DSO activities in the field of congestion management and voltage control
Related business case(s)	Prequalification, DA BAL

1.4. Narrative of Use Case

Narrative of Use Case
Short description
The use case describes the general process of purchasing flexible services based on active power for congestion management in the distribution network and elimination voltage violations in the

distribution MV and LV network by the DSO. BUC is described as a general process covering possibilities of acquiring services in the day ahead and medium term time frame. The purchase of services takes place using the market platform from flexibility service providers (FSP) who have positively passed the prequalification process. Services may be purchased by DSOs. The active power flexibility services in the medium time frame can be used by DSO to solve network problems that could occur during network modernization and maintenance work, especially during planned works that required outages and are performed under abnormal grid configuration. Day ahead congestions and voltage violations can appear due to incorrect forecast of the DER generation, change of the load or change of grid topology of DSO or TSO. In both cases buying flexibility services by DSO will be event driven. The auction will be called by DSO only in specific situations when the need appears in the network.

Complete description

Summary of use case

Scenario 1
This scenario describes actions that need to be performed as a first for acquiring services from the market. It focuses on the bidding process for the congestion management and voltage control for DSOs needs in the cases of day ahead auctions and medium term auctions. In both cases procedure is the same. The difference is in the timeline of each step. In the case of the medium term auction, DSO in the first step pays for the capacity from FSP for the selected period of time and in case of activation, DSO pays for the energy. In the case of the bids selected in the Day ahead auctions, DSO pays for the energy,

- Selection/Bidding
  Description: The process of selecting offers from the market to solve the DSO problem related to network congestion or voltage violations with the use of active power management.
  The DSO opens an auction with detailed information about the location affected by the problem and providing all the required parameters to receive offers. Offers are submitted by FSPs who have successfully passed the prequalification process. Before selecting an offer, network analyses are performed, which eliminates offers that have a negative impact on the operation of the DSO network reporting the need or others DSOs. In detail, it includes:
  - DSO calls the auction on the Flexibility Platform for an action related to active power change for a strictly defined network area for the congestion or voltage violations as a result of the event in the network. The triggering event will be different for the day ahead auctions and the medium term auctions.
  - Flexibility Platform informs FSPs about the new need for service from the DSO side and the appearance of the auction. Flexibility platform collects all bids submitted within the specified by DSO time frame
  - The MOL stack is created
  - Collected offers are analysed in terms of the possibility of solving a network problem, taking into account the impact on networks of others DSOs (in the case under consideration and in the specific network operation state)
  - Choosing the optimal offers
  - Based on analysis an offer / offers that allow to remove congestion or solve voltage problems from the network are selected.
  - The selected offer or offers are stored by the flexibility platform, then dispatched the day before delivery and added to the group of offers sourced in the day-ahead process.

Scenario 2
This scenario describes the process of activation FSPs resources, previously acquired bids by the DSO during the auction. This process will be used for Day ahead auctions and medium term auctions with some of the additional steps for the medium term cases. The main difference is the verification in the day ahead if the activation of medium term bid is needed.

- Delivery for DSO:
  - Activation of offers is initiated by the DSO, which sends information to the flexibility platform, which then sends activation requests to individual FSPs.
  - Selected FSPs activate their DERs and acknowledge it by sending a message to the flexibility platform.
  - DSO monitors delivery in near real time.

Remark: In the case when the service for the needs of DSO is performed through the balancing product that was also selected in the balancing process, the activation rules are the same as for the balancing market.

Scenario 3

This scenario describes settlement for auctions of both described previously cases: day ahead and medium term auctions.

- Settlement (carried out periodically) consists of:
  - Gathering information about DER and DERs that successfully delivered the services – active power and/or active energy.
  - Use of the baseline for all required DERs and DERs for a specific period of time.
  - Provision of metering data for all required DERs and DERs for a specific period of time.
  - Confirmation that the activated services have been successfully delivered.
  - Identification of services that were not or partially performed.
  - Create information for the settlement of balancing services for each BSP, including penalties.
  - Create information for the settlement of CM and VC services by FSPs for DSOs, including penalties.

End

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions		
Assumptions		
The use case assumes a single market place operated by Flexibility Platform		
The Flexibility Platform is dedicated mainly to resources connected to MV and LV networks		
Resources need to be described by location (e.g. by Point of Connection)		
Flexibility Service Providers and System Operators do not need their own applications to connect to the Flexibility Platform. They have direct access to the relevant functionalities of Flexibility Platform		
There is a separate use case that allows introducing of TSO, DSO, BSP and products		
There are FSPs that have successfully passed the pre-qualification process for a needed product.		
The coordination between DSO and TSO is established in case of the day ahead balancing and congestion management and voltage control actions.		
Prerequisites		
1.	DSO	Identification of congestion or voltage violation in the DSO network that may arise in day ahead perspective using dispatcher tools
2.	DSO	Identification of potential congestion or voltage violation in the DSO network in the medium term as a result of planned work and maintenance in the network using planning tools.

1.7. Further information to the use case for classification/mapping

Classification Information
Relation to Other Use Cases
Prequalification, BAL
Level of Depth

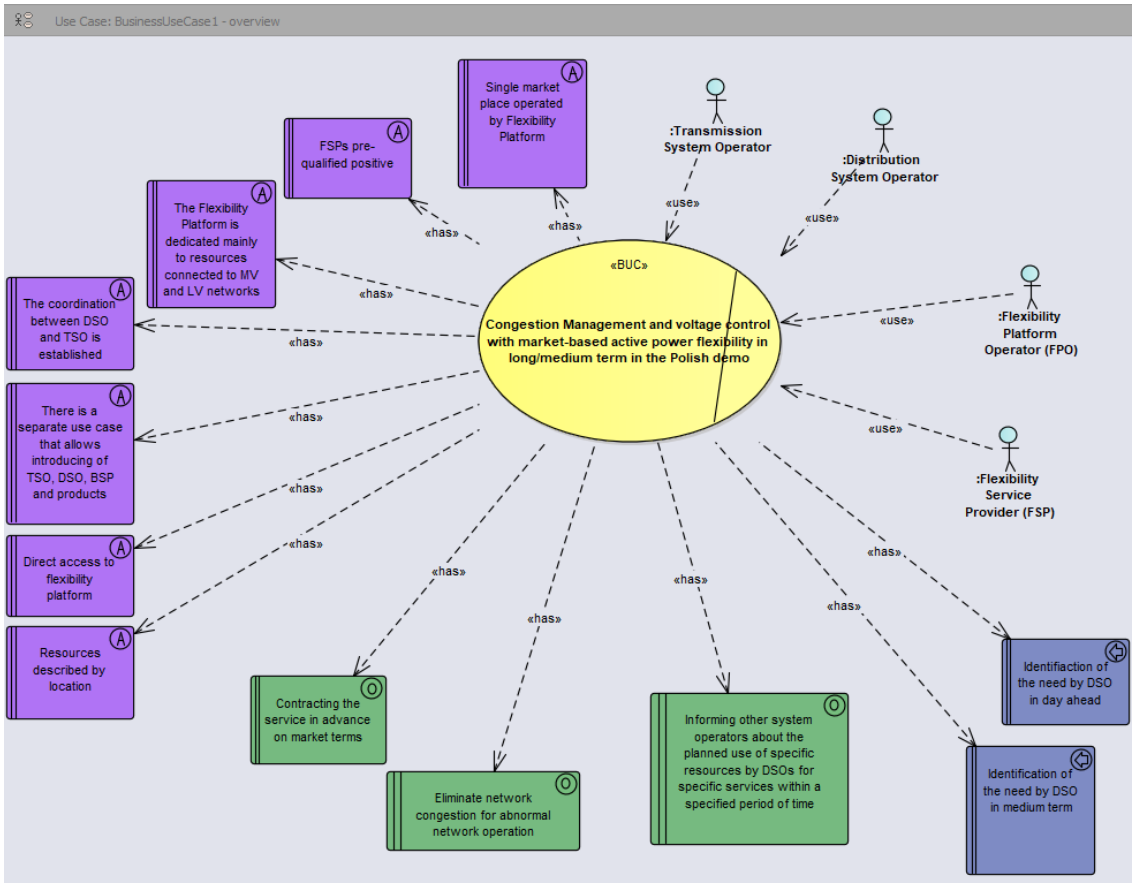
Prioritisation
Generic, Regional or National Relation
National Poland Flexibility Market
Viewpoint
Business Use Case
Further Keywords for Classification
Medium term, day ahead, planed work DSO, Operational, Congestion management, Voltage control, voltage violation

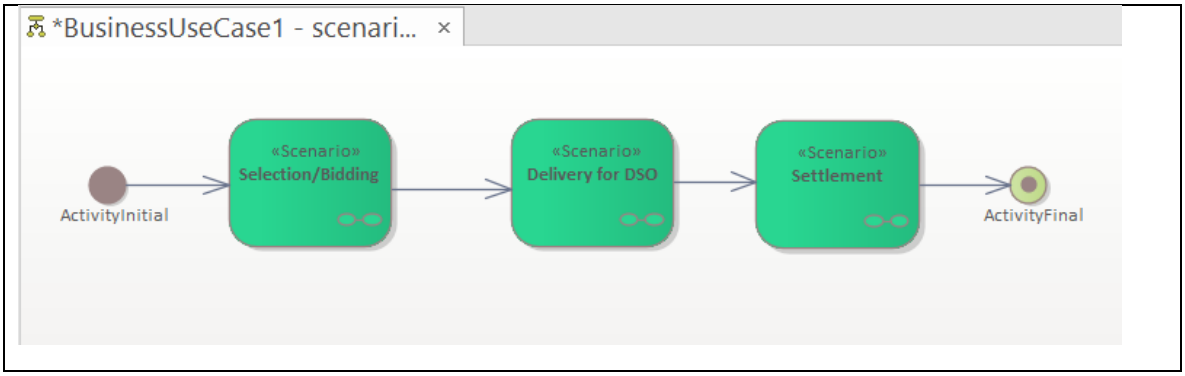
1.8. General remarks

General Remarks
• Business Use Case is product agnostic. • Business Use Case is designed to handle resources connected to MV and LV grid.

2. Diagrams of Use Case

Diagram(s) of Use Case





3. Technical Details

3.1. Actors

Actors			
Grouping		***Group Description***	
Actor Name see Actor List	***Actor Type see Actor List***	***Actor Description see Actor List***	***Further information specific to this Use Case***
Transmission System Operator (TSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	
Flexibility Service Provider (FSP)	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market who owns at least one distributed energy resources	

Flexibility Service Provider being Aggregator (FSPA)	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resources (DER).	
Market Operator (MO) or Flexibility Platform Operator (FPO)	Business	A natural or legal person who organizes auctions (continuous auction, discrete auctions, call for tenders) between buyers and sellers of electricity-related products in the markets. Manage/operate the platform for trading (where bids and offers are collected). Clear the market and communicate results.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Selection/Bidding for mid-term and day-ahead	The DSO decide to call for an auction for active power management to eliminate the congestion and voltage violation in the network to ensure the performance of planned work in the future (Medium Term case) or because some congestion or voltage violation appears in day ahead scenario due to deviations of the forecast or random events in the grid.	DSO	Call for auction by DSO for the specific location	DSO identify congestion or voltage violation for the planned work in the network using analytic tools for planning or in case of the day ahead auctions, by using dispatchers tools	When bids are matched, flexibility of the market is contracted for use in the future for congestion management or voltage violation by the DSO. If this does not happen, the DSO won't perform planned work in the network or use other technical solutions. In case of the day ahead auctions, DSO will use nonmarket

						solutions to solve the problem in the network.
2	Delivery for DSO	Activation and delivery of a previously selected and contracted offer by the DSO to ensure appropriate power supply parameters in the distribution network for planned work or day ahead operational	DSO	Final confirmation by the DSO of the legitimacy of activating the client's resource	Selected and contracted bid that solves problems in the DSO network related to day ahead problems or planned work in terms of congestion and voltage violation as part of the previously launched auction by DSO	Delivery of the service by the customer by the submitted and contracted offer by the client, which solves problems in the DSO network related to planned work or random events that was detected the day before.
3	Settlement	Market platform operator collects all data that are necessary to create an invoice for the provided services. Base on the contracted bid, baselines and meter data MPO verifies which offers have been made correctly, which have been partially made and those that have not been performed. Performs financial calculations and prepares invoices.	MPO	End of the billing period	At least one activation of the contracted service has been performed in a given billing period. MPO has all the information on the offers and services provided and it is possible to obtain measurement data from customers' meters.	Settlements were made for all services whose delivery was completed in a given billing period. Invoices for system operators have been sent.

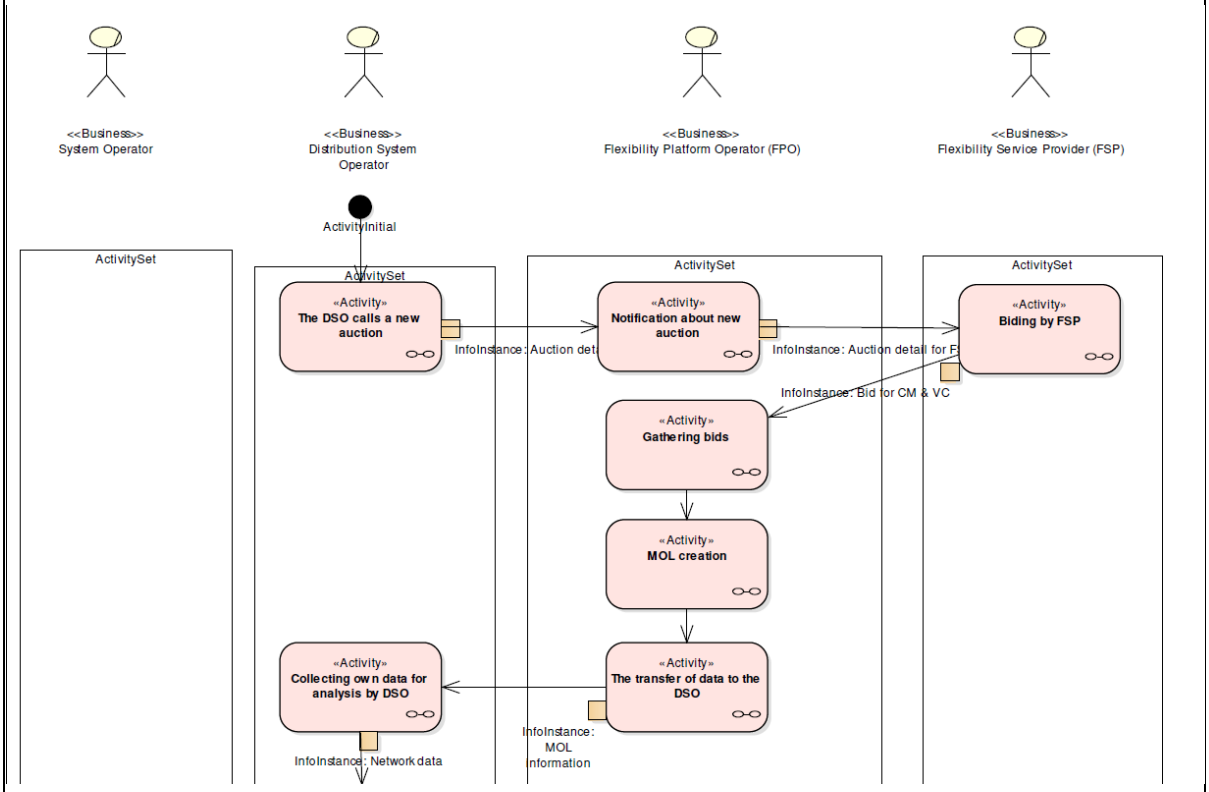
4.2. Steps - Scenarios

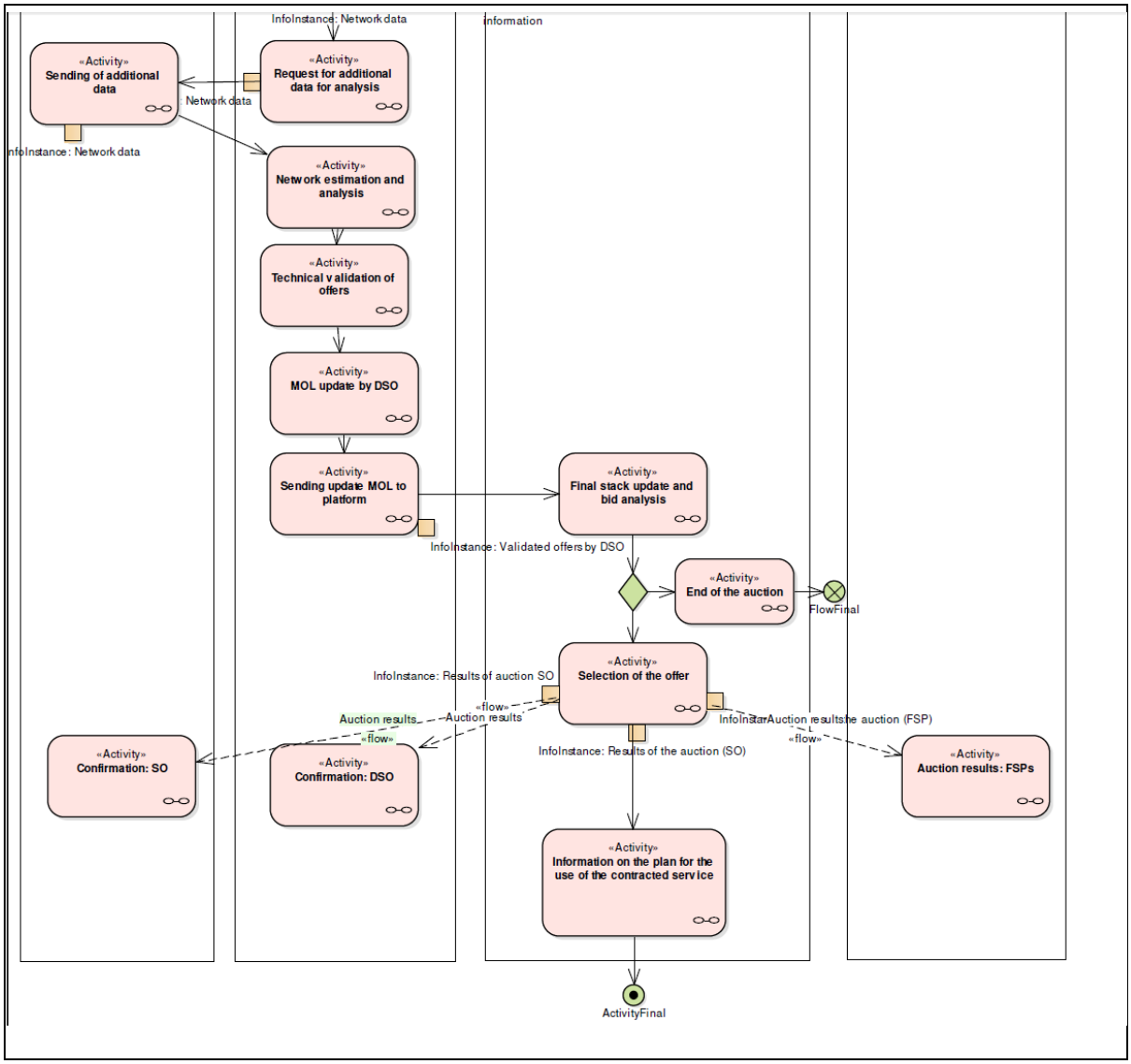
Scenario name #1

Scenario #1 description

Based on the results of network analyzes the DSO identifies the problem with congestion or voltage violation in the distribution network as a result of the specific event. In the case of scheduled works, it

can be . specific network configuration, preventing the execution of the planned work. For the day ahead operational the cause of the network problem may be related to deviation in the forecast or some network failure that has an impact on the grid configuration. The DSO decides to launch an auction in order to take advantage of the available sources of flexibility in the market to guarantee that the correct grid operation during normal operational and planned work is under consideration. The auction is launched a day ahead or several weeks in advance for planned works and concerns active power control activity by customers connected to specific locations in the distribution network for which problems have been identified. In case of medium term auctions launched for planned works, DSO contracts capacity and energy from FSP. One of the key elements is coordination between DSO and TSO in the field of contracting bids for CM and balancing. Coordination is needed so that the actions of one party do not cause problems for the other party. Thanks to the coordination of activities, it is also possible to obtain an optimal solution in economic terms (solving balancing and CM problems using the same offers).





Scenario step by step analysis

Scenario								
Scenario name		Selection/Bidding for DSOs needs						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1		The DSO calls a new auction	The DSO calls the auction due to identified congestion or voltage violation problems	Creates	DSO	FPO	Area (Network localization), volume of active power, delivery time,	

			linked to the future problems in the network .				auction duration, maximum price for the bids	
1.2		Notification about new auction	The platform operator, based on the request from the DSO, sends notification about new auction for the active power management service in accordance with the parameters provided by the DSO	sends	FPO	FSP	Infomration about new auction: Area (Network localization), volume of active power, delivery time, auction duration	
1.3		Biding by FSP	FSPs who wish to participate in the auction and have passed the pre-qualification process submit their bids to the platform	Sends	FSP	FPO	customer ID, price, active power volume, ID of the resource indicated for the provision of the service,	
1.4		Gathering bids	Flexibility Platform Operator closes the auctions at the appointed time and collects all submitted bids	Collects	FPO	FPO		
1.5		MOL creation	The platform creates a Merit order list based on the collected offers,	Creates	FPO	FPO		
1.6		The transfer of data to the DSO	The platform sends the MOL to the DSO that	sends	FPO	DSO	Localizatio n of the source, ID of the	

			launched the auctions to verify their impact on the network				offer, active power volume,	
1.7		Collecting own data for analysis by DSO	The DSO obtains measurement data, profiles and forecasts for the selected network area	collects	DSO	DSO	Measurement data, load and generation profile, network topology	
1.8		Request for additional data for analysis	DSO sends a request to other market participants to provide additional data needed for the analysis (TSO, OSDn)	sends	DSO	SO	Measurement data, load and generation profile,	
1.9		Sending of additional data	Market participants send additional information requested by the DSO who launched the auction	sends	SO	DSO	Measurement data, load and generation profile,	
1.10		Network estimation and analysis	Based on the acquired network data, the network operation status is estimated	calculates	DSO	DSO		
1.11		Technical validation of offers	DSO performs an analysis of the impact of individual offers on the network and the possibility of network solving the problem in the selected area of the network using power flow analyzes		DSO	DSO		

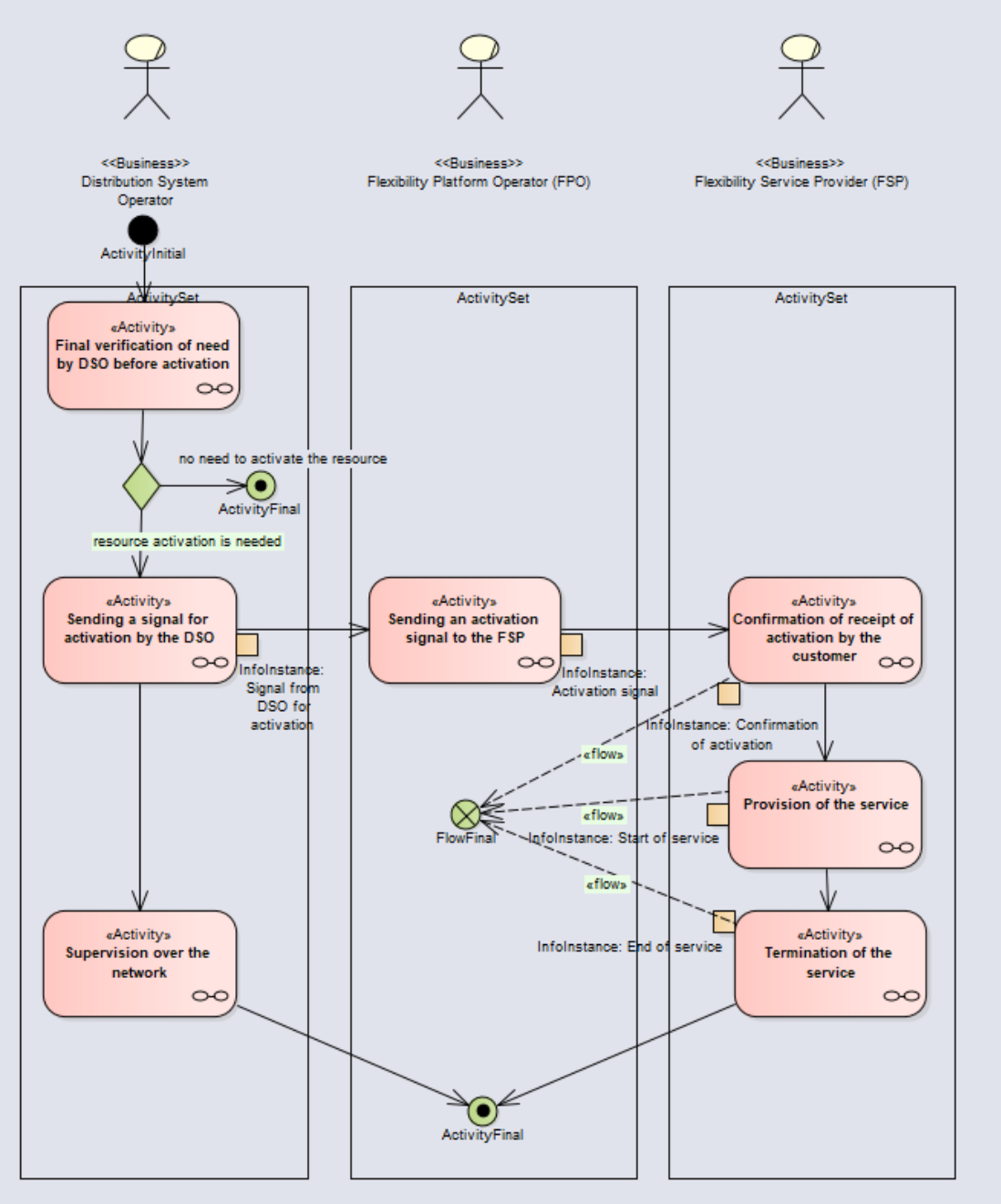
1.12		MOL update by DSO	The DSO updates the stack of offers based on the results of the power flow analyses performed	update	DSO	DSO		
1.13		Sending update MOL to platform	The DSO sends information which of the pre-sent offers give the expected technical result	sends	DSO	FPO	ID of the offer that passed the network analysis process positively	
1.14		Final stack update and bid analysis	The Flexibility platform operator updates the stack of offers and analyses the MOL taking into account the economic and technical conditions	Selects	FPO	FPO		
1.14 a		Selection of the offer	The Flexibility platform operator selects the optimal offer that meets technical and economic expectations	Selects	FPO	FPO		
1.14 b		End of the auction	In case of divergent prices expected by DSOs and submitted by FSP, the auction is terminated	Selects	FPO	FPO		
1.15		Auction results: FSPs	The platform informs the FSPs who participated in the auction about its result. If an offer is	Sends	FPO	FSP	Information about the choice (or not) of a given offer	

			selected, it informs the relevant customer about the selection of its offer					
1.16		Confirmation: DSO	The platform informs the DSO about the auction result and possibly about the selection of tghe optimal offer	Sends	FPO	DSO	Information about the end of the auction and possible selected offer: location, price, power, planned date and time of delivery of the contracted bid	
1.17		Confirmation: SO	If an offer is selected, the platform provides information to the TSO about the planned use of the offer on a strictly defined date	Sends	FPO	SO	Information about the end of the auction and possible selected offer: location, power, planned date and time of delivery of the contracted bid	
1.18		Information on the plan for the use of the contracted service	Entering the selected offer for a given day into the activation plan to include it in the analyzes for the day ahead (in case of the MT auctions)		FPO	FPO	location, power, planned date and time of delivery of the contracted bid	

Scenario name #2

Scenario #2 description

Activation and delivery of the offer by a strictly defined FSPs resource under the previously contracted offer for the DSO. After contracting the offer under scenario 1, the DSO performs the final assessment of the feasibility of planned work and the legitimacy of using the offer. After the final confirmation of the necessity to activate the offer for medium term auctions, the DSO sends information to the platform operator about the commencement of activation of the contracted offer. Based on the information received from the platform operator, the FSP activates his resource and provides the service following the contracted offer. The DSO supervises the execution of the offer by the client in real-time.



Scenario step by step analysis

Scenario								
Scenario name	Activation and delivery of the offer only for DSOs							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
2.1		Final verification of need by DSO before activation	The DSO performs the final analysis verifying the possibilities and legitimacy of activating the previously contracted offer (in case of the medium term auctions)		DSO	DSO		
2.1.1		resource activation is needed	positive verification indicating the need to activate the resource purchased under the auction					
2.1.2		no need to activate the resource	termination of the process due to the disappearance of the need for flexibility services					
2.2		Sending a signal for activation by the DSO	After the DSO decides the necessity and legitimacy of the offer activation, it sends information to the platform with a request to start the resource activation procedure.	sends	DSO	FPO	Id of the offer to be activated along with information about the scope of the change in active power	
2.3		Sending an activation signal to the FSP	The flexibility platform operator sends a signal		FPO	FSP	Activation signal	

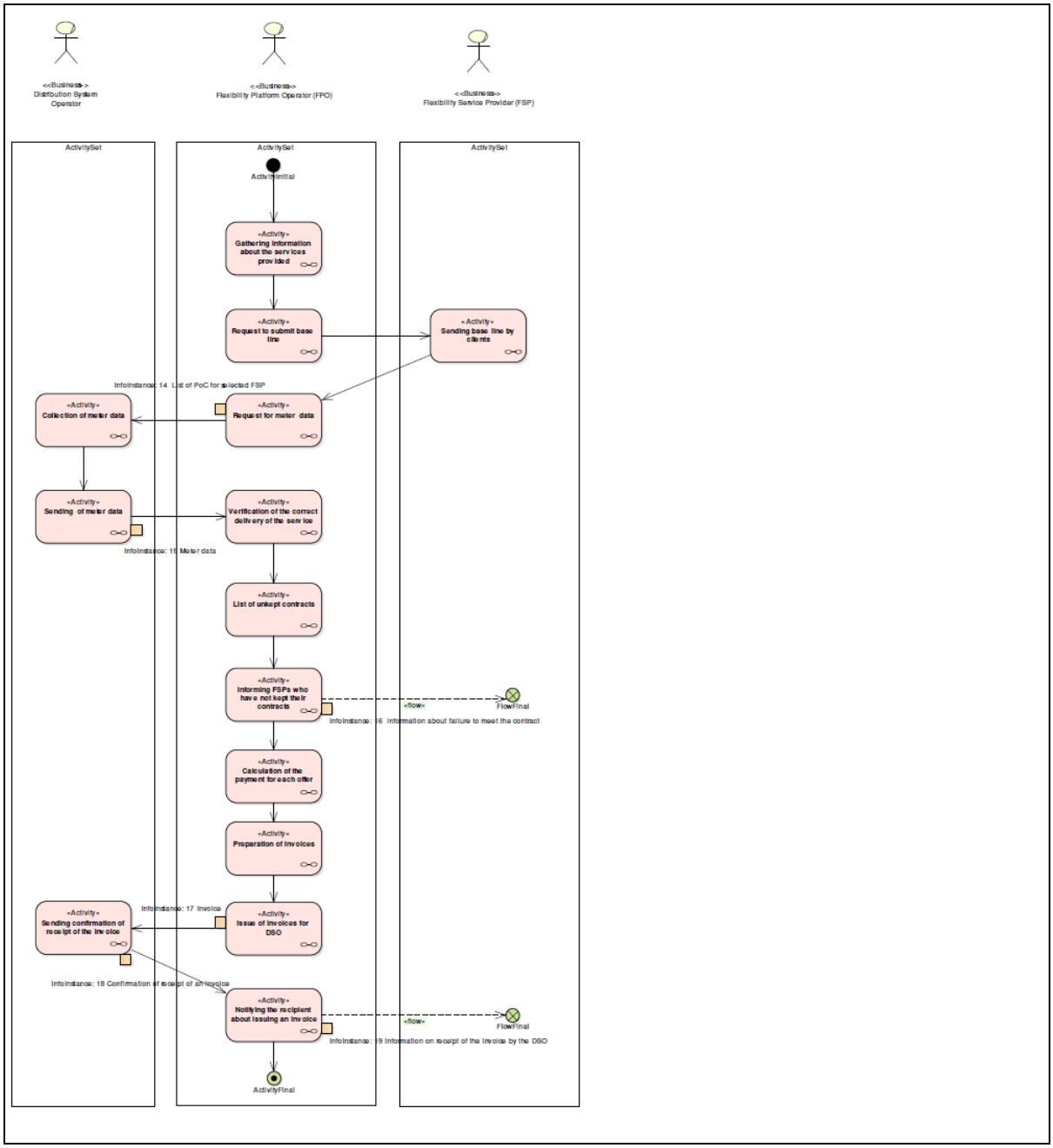
			with information about the need to activate the FSPs resource under the contracted service					
2.4		Confirmation of receipt of activation by the customer	The client sends a confirmation to the flexibility platform operator about receiving the activation signal		FSP	FPO	Feedback confirming receipt of the activation signal	
2.5		Provision of the service	FSP starts providing the service following the contracted offer and sends such information to the platform operator		FSP	FPO	Information about the start of service by FSP	
2.6		Termination of the service	The customer ends the service following the contracted offer and sends such information to the platform operator		FSP	FPO	Information on termination of service provision by FSP	
2.7		Supervision over the network	The DSO supervises and verifies in real time the provision of the service by the FSP based on the information received from the platform operator and its network monitoring systems. In case when the		DSO	DSO		

			provided service is not sufficient to solve problem, DSO use nonmarket solutions to solve the problem that appears in the network.					

Scenario name #3

Scenario #3 description

Settlement of services for a given period of time (performed cyclically, e.g. every month for the preceding month).



Scenario step by step analysis

Scenario								
Scenario name		Settlement of the service						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
3.1		Gathering information	Collecting by the flexibility	gathers	FPO	FPO		

		about the services provided	platform operator information about all contracted services in a given period					
3.2		Request to submit base line	The flexibility platform operator sends a request for customers to provide all the baselines needed for the billing of services	sends	FPO	FSP		
3.3		Sending base line by clients	FSP send baseline for the indicated resources	Sends	FSP	FPO		
3.4		Request for meter data	The flexibility platform operator sends a request to provide metering data from meters to the indicated clients for a specified period when the service was provided	Sends	FPO	DSO	List of PoC with periods that are needed for billing	
3.5		Collection of meter data	Based on the platform operator's request, the entity responsible for the measurement data prepares a statement with data from meters for the indicated customers and for a given period	collects	DSO	DSO		
3.6		Sending of meter data	The DSO provides a file with	sends	DSO	FPO	Summary of measurem	

			measurement data for each of the FSPs indicated by the platform operator				ent data for the indicated PoC for a specified period	
3.7		Verification of the correct delivery of the service	The platform operator verifies the correctness of the delivery of each of the contracted offers based on the received meter and baseline data.	verifies	FPO	FPO		
3.8		List of unkept contracts	The platform operator compiles a list of offers that have not been properly delivered (only partially provided and those services that have not been delivered at all). For each of these offers, it identifies differences and deviations from the contracted offer.	verifies	FPO	FPO		
3.9		Informing FSPs who have not kept their contracts	The platform operator sends information about failure to meet the conditions of the submitted offers to the appropriate FSP		FPO	FSP	Information on the deviation of the service performance compared to the offer	
3.10		Calculation of the payment for each offer	The platform operator, based on the previously performed analysis of the performance		FPO	FPO		

			of each offer, makes financial calculations and determines what amounts should be paid for each of the offers. The calculations also take into account any fines charged for failure to perform the service following the contract.					
3.11		Preparation of invoices	The platform operator automatically prepares relevant documents and generates invoices		FPO	FPO		
3.12		Issue of invoices for DSO	The platform operator sends the appropriate invoice to the DSO		FPO	DSO	Invoice for the service provided	
3.13		Sending confirmation of receipt of the invoice	DSO sends confirmation of receipt of the invoice, from which the time of payment for the provided service is calculated		DSO	FPO	Confirmation of receipt of an invoice (can be generated automatically)	
3.14		Notifying the recipient about issuing an invoice	The platform operator sends the FSP a confirmation that the invoice has been issued and received by the DSO		FPO	FSP	Information on receipt of the invoice by the DSO	

Balancing Service Provider on the Flexibility Platform

1. Description of the Use Case

1.1. Name of Use Case

Use Case Identification		
ID	***Area / Domain(s)/ Zone(s)***	***Name of Use Case***
EACL-PL-04	Market for flexibilities	Balancing Service Provider (BSP) on the Flexibility Platform

1.2. Version Management

Version Management				
Version No.	***Date***	***Name of Author(s)***	***Changes***	***Approval Status***
0.1	2021-07-02	Wojciech Lubczyński (PSE)	Initial concept	
0.2	2021-07-05	Wojciech Lubczyński (PSE)	The initial concept supplemented by detailed description of the steps of the process	
0.3	2021-07-08	Wojciech Lubczyński (PSE)	Description improvements	
0.4	2021-07-12	Wojciech Lubczyński (PSE)	Introducing changes resulting from discussions with the System Management Dep.	
0.5	2021-07-14	Wojciech Lubczyński	Changed to the chapter 1.4 and adding diagrams in chapter 2.	
0.6	2021-07-15 2021-07-19	Wojciech Lubczyński	Step-by-step analysis added	
0.7	2021-07-26	Wojciech Lubczyński	Diagrams for step-by-step analysis added	

1.3. 1.3 Scope and Objectives of Use Case

Scope and Objectives of Use Case	
Scope	Introduction of BSP, linking it with FSP or FSPA, creation of a scheduling unit and its prequalification for the Balancing Market
Objective(s)	Enable pre-qualified FSP and FSPA resources to provide balancing services in the balancing market via BSP
Related business case(s)	EACL-PL-01 Prequalification

1.4. 1.4 Narrative of Use Case

Narrative of Use Case
Short description
BSP registration on the flexibility platform BSP verification of the technical capabilities of FSP and FSPA Creation of a scheduling unit by the BSP based on selected FSP and FSPA resources

Testing the scheduling unit and confirming that the BSP and this scheduling unit meet the conditions set out in the Terms and Condition Related to Balancing
Confirmation by TSO of BSP's ability to provide balancing services based on a scheduling unit made up of FSP and FSPA resources

Complete description

Summary of use case

- **Registration of BSP on Flexibility Platform**

Scenario 1
BSP already has a contract with TSO for the provision of balancing services

The BSP registers on the flexibility platform.

Scenario 2
BSP has no contract with the TSO for the provision of balancing services
The BSP registers on the flexibility platform.
The registering process requires to confirm fulfilment of several duties related to be the participant of the balancing market. In details, BSP must fulfil on its own or by proxy technical (scheduling operator) and communication requirements.

Common part
BSP declares its intention to create a specific scheduling unit compliant with the Terms and Condition Related to Balancing.
This declaration is publicly available on the flexibility platform with the specification of the scheduling unit type.

- **Assignment of prequalified FSP and FSPA resources to the BSP Scheduling Unit**

- BSP selects the FSP or FSPA resources already prequalified to balancing products, or
- FSP and FSPA choose BSP by offering him their resources prequalified for balancing products
- The selection is made by designating points of connection representing the resources selected by the BSP to the scheduling unit. The scheduling unit ID and list of connection points is stored in Flexibility Register.
- BSP decides to terminate the acquisition of resources if it has already obtained their sufficient volume
- When the acquisition is completed, all parties involved confirm it on the Flexibility Platform.
- BSP, based on the resources of the FSPs or FSPAs with which it has established cooperation, creates a scheduling unit that meets the criteria for providing balancing services defined in the Terms and Condition Related to Balancing.
- The scheduling unit is registered in Flexibility Register.

- **Verification and test of Scheduling Unit**

- According to the requirements defined in the Terms and Condition Related to Balancing, BSP is obliged to prequalify each Scheduling Unit. The condition consists of requirements:
    - provide schedules for the Scheduling Unit
    - be ready to receive the set-point orders,

- provide near real-time or real-time information about the status of the Scheduling Unit, including availability and information about current set-point of this Scheduling Unit.

- BSP is obliged to have ICT systems appropriate to the type of balancing services connected with TSO systems, in accordance with the technical requirements published by TSO in Terms and Condition Related to Balancing.
- BSP applies to TSO with a request to conduct tests for a given scheduling unit.
- The BSP tests the scheduling unit under the supervision of the TSO and with the participation of relevant DSOs.

- **<u>Registration of Scheduling Unit by TSO</u>**

- If all conditions defined in Terms and Condition Related to Balancing, including positive run of tests are fulfilled, TSO confirms this on the Flexibility Platform.
- The status of scheduling unit with its components controlled by BSP is registered on Flexibility Register.
- As a consequence, an agreement is concluded between BSP and TSO, or if such an agreement already exists, its appropriate modification, taking into account a new scheduling unit.

1.5. 1.5 Key performance indicators (KPI

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

1.7. Assumptions

1	The use case assumes a single marketplace operated by Flexibility Platform
2	The Flexibility Platform is intended only to resources connected to MV and LV networks
3	The resources are grouped into a resource groups and are allocated to a TSO-DSO coupling point
4	Flexibility Service Providers and System Operators do not need their own applications to connect to the Flexibility Platform. They have direct access to the relevant functionalities of Flexibility Platform
5	There are already pre-qualified resources registered in the Flexibility Register capable of providing balancing services

1.8. Triggering Events and Preconditions

Actor/System/Information/ Contract	***Triggering Event***	***Pre-conditions***
New BSP	The new BSP intends to provide balancing services for TSO based on the resources of FSP and FSPA	The BSP plans to acquire flexibility resources on the Flexibility Platform. Resources prequalified for balancing services are registered in the Flexibility Register

Existing BSP	An existing BSP intends to create a new scheduling unit based on the resources of FSP and FSPA	BSP already has the contract with TSO and plans to acquire flexibility resources on the Flexibility Platform. The resources prequalified for balancing services are registered in the Flexibility Register
Existing BSP	An existing BSP intends to change the content of an existing scheduling unit of that BSP	BSP already has the contract with TSO and an active scheduling unit
TSO	The TSO requires the recertification of a specific scheduling unit due to changes in the resources of this unit and / or conducting additional tests	BSP already has the contract with TSO and an active scheduling unit

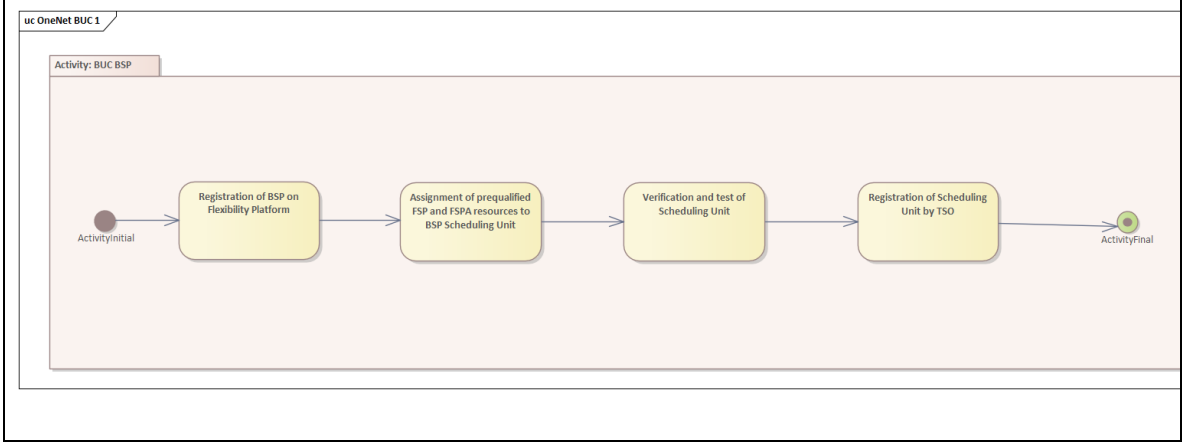
1.9. Further information to the use case for classification/mapping

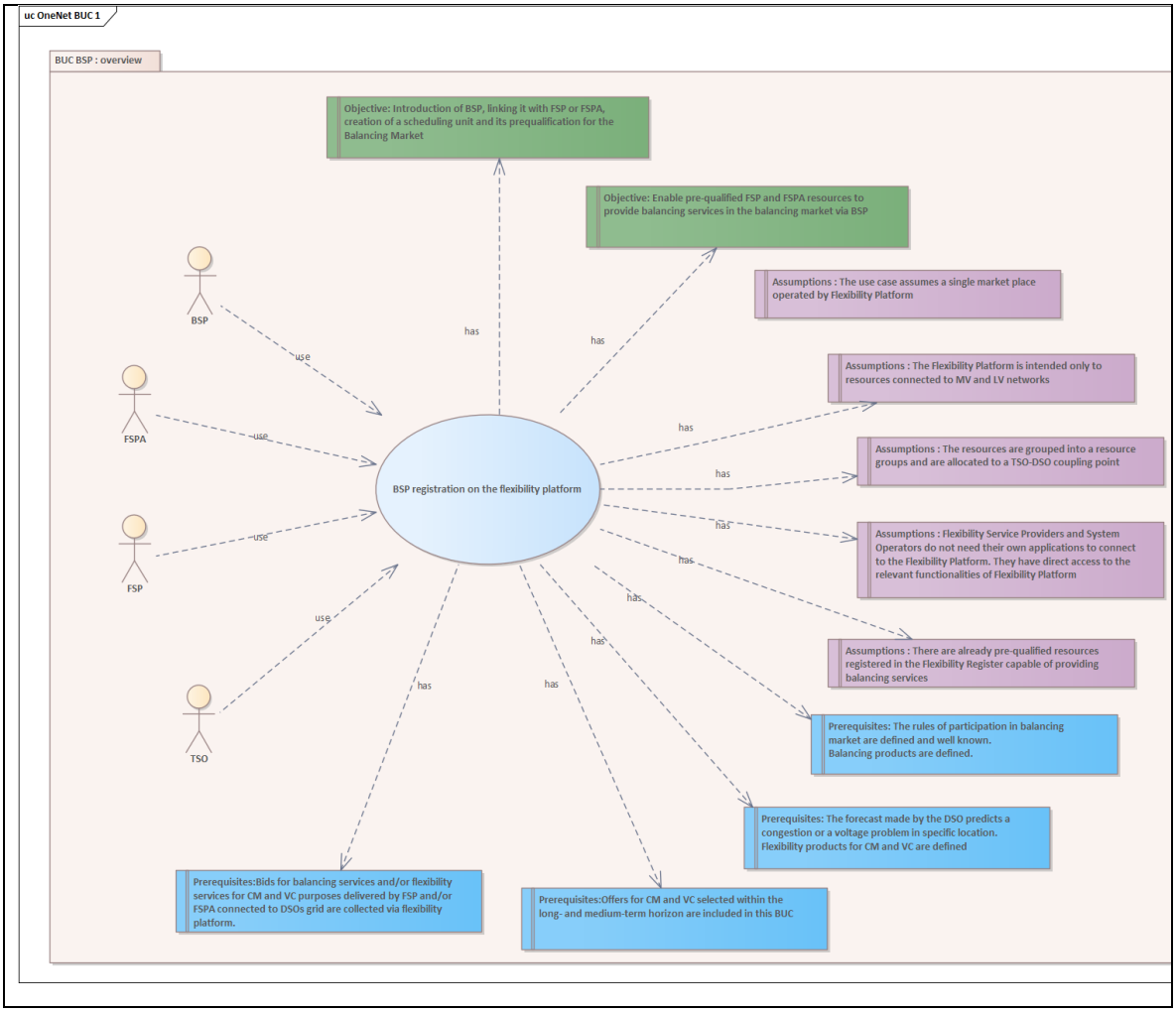
Classification information
Relation to other use cases
EACL-PL-01 Prequalification
Level of depth
Prioritisation
Generic, regional or national relation
National Polish Flexibility Market
Nature of the use case
Business Use Case
Further keywords for classification

1.10. General remarks

2. Diagrams of Use Case

Diagram(s) of Use Case





3. Technical Details

3.1. Actors

Actors			
Grouping		***Group Description***	
Actor Name *see Actor List*	***Actor Type*** *see Actor List*	***Actor Description*** *see Actor List*	***Further information specific to this Use Case***
Transmission System Operator (TSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	

Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	
System Operator (SO)	Business	Transmission System Operator or Distribution System Operator	
Flexibility Service Provider (FSP)	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market who owns at least one distributed energy resources	
Market Operator (MO) or Flexibility Platform Operator (FPO)	Business	A natural or legal person who organizes auctions (continuous auction, discrete auctions, call for tenders) between buyers and sellers of electricity-related products in the markets. Manage/operate the platform for trading (where bids and offers are collected). Clear the market and communicate results.	
Balancing Service Provider	Business	A market participant providing either or both balancing energy and balancing capacity to transmission system operators	

3.2. References

4. Step by Step Analysis of Use Case

4.1. Overview of Scenarios

Scenario Conditions					
No.	**Scenario Name**	**Primary Actor**	**Triggering Event**	**Pre-Condition**	**Post-Condition**
1	Registration of new BSP	BSP	New BSP enters on balancing market	None	The new BSP registered in FR
2	Registration of existing BSP	BSP	Existing BSP plans to create new scheduling unit	BSP already has a contract with TSO and is registered in FR	The existing BSP registered in FR
3	Assignment of resources	BSP, FSP, FSPA	BSP announces its intention to create a specific scheduling unit	BSP registered in FR and FSP's or/and FSPAs resources prequalified and registered in FR	Allocating sufficient resources to the scheduling unit

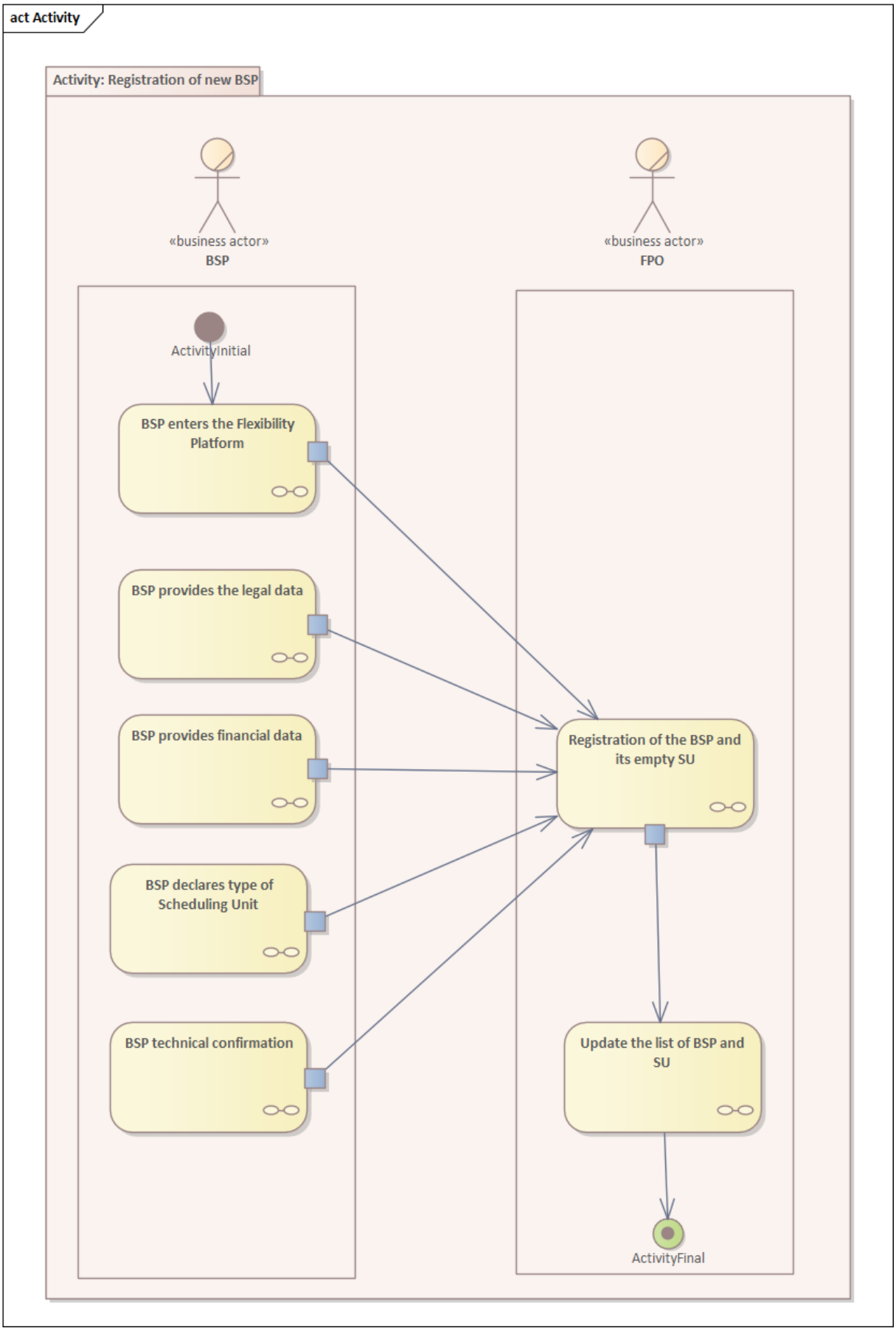
4	Verification	BSP	BSP applies to TSO	The scheduling unit ready to tests	The condition specified in the Terms and Condition Related to Balancing are met
5	Registration	BSP	BSP applies to TSO	The required conditions specified in the Terms and Condition Related to Balancing are met	The status of BSP confirmed in FR
6	Change within the scheduling unit	BSP	BSP applies to TSO	BSP already has the contract with TSO and an active scheduling unit. There was a change in scheduling unit i.e. a loss of an existing resource (?) or adding a new one	The status of BSP and its changed SU confirmed in FR
7	Request for recertificatio n demanded by TSO	TSO	The TSO requires the recertification of a specific scheduling unit due to changes in the resources of this unit and / or conducting additional tests	BSP already has the contract with TSO and an active scheduling unit	The status of BSP and its SUs confirmed in FR

4.2. Steps – Scenarios

Registration of new BSP

Registration of new BSP on Flexibility Platform and creation of new Scheduling unit

Diagram:

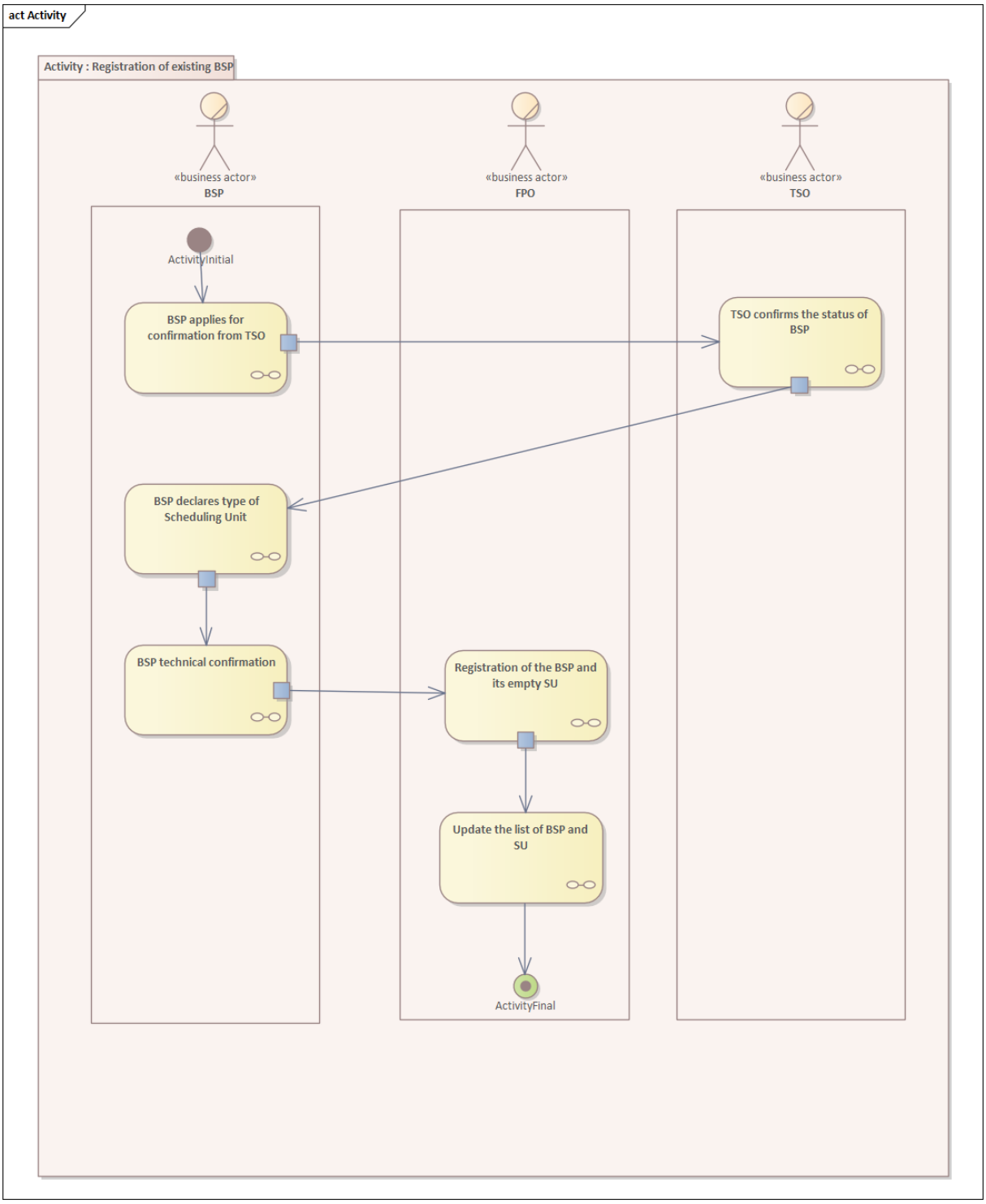

act Activity
Activity: Registration of new BSP
«business actor»
BSP
«business actor»
FPO
ActivityInitial
BSP enters the Flexibility Platform
BSP provides the legal data
BSP provides financial data
BSP declares type of Scheduling Unit
BSP technical confirmation
Registration of the BSP and its empty SU
Update the list of BSP and SU
ActivityFinal

Scenario								
Scenario Name :		**No. 1 - Registration of new BSP**						
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		BSP enters the Flexibility Platform	BSP accepts set of rules of participation to get the access to the FP	Send	BSP	FPO	Confirmation	
2		BSP provides the legal data	BSP provides the basic legal data of the entity	Send	BSP	FPO	Set of legal information on the entity	
3		BSP provides financial data	BSP provides the financial status and details of bank account	Send	BSP	FPO	Set of financial information on the entity	
4		BSP declares type of Scheduling Unit	BSP declares the type of Scheduling Unit (SU)	Send	BSP	FPO	Scheduling Unit declaration	
5		BSP technical confirmation	BSP provides the information of the fulfilment of technical and communication requirements relevant to the type of SU	Send	BSP	FPO	Technical confirmation	
6.		Registration of the BSP and its empty SU	FPO registers the BSP and empty SU in the FR	Send	FPO	BSP	Confirmation of registering in FR and SU	
7		Update the list of BSP and SU	FPO adds the BSP to the list of participants in the flexibility register and sets the status of SU as open for acquisition of resources		FPO			

Registration of existing BSP

Registration of existing BSP on Flexibility Platform and creation of new Scheduling unit.

Diagram



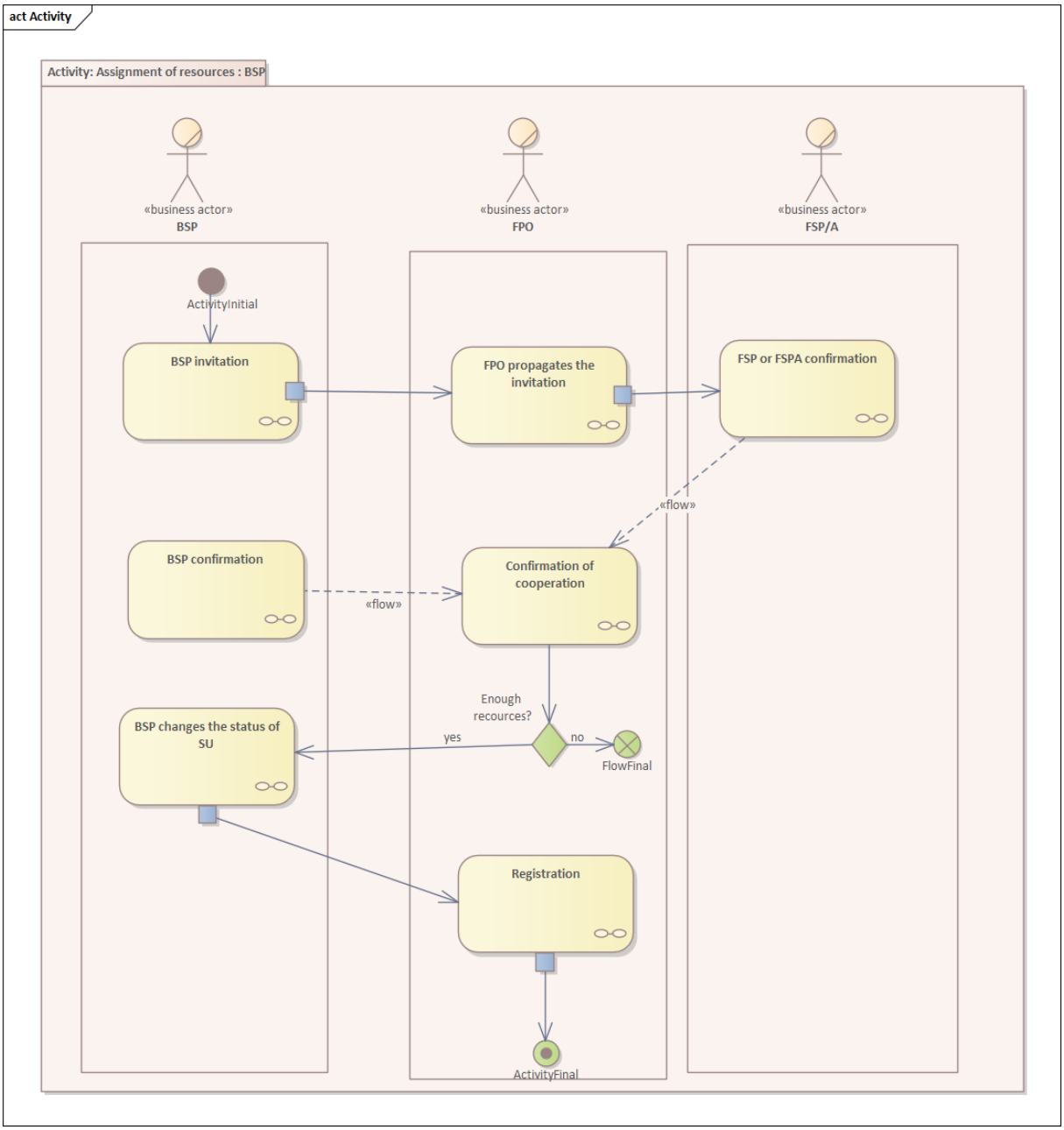
Scenario								
Scenario Name:		**No. 2 - Registration of existing BSP**						
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		BSP applies for confirmation from TSO	BSP applies for confirmation its relationship status with TSO	Send	BSP	FPO, TSO	Request for confirmation	
2		TSO confirms the status of BSP	TSO confirms the status of BSP	Send	TSO	FPO	TSO confirmation	
3		BSP declares type of new SU	BSP declares the type of the new SU	Send	BSP	FPO	New SU declaration	
4		BSP technical confirmation	BSP provides the information of the fulfilment of technical and communication requirement relevant to the new SU	Send	BSP	FPO	Technical confirmation	
5		Registration of the new empty SU of BSP	FPO registers the empty SU of BSP in the FR	Send	FPO	BSP	Confirmation of registering in new SU	
6		Update the list SU of BSP	FPO sets the status of SU as open for acquisition of resources		FPO			

Assignment of resources

Assignment of prequalified FSPs or FSPAs resources to the BSP scheduling unit.

Initiative of BSP

Diagram

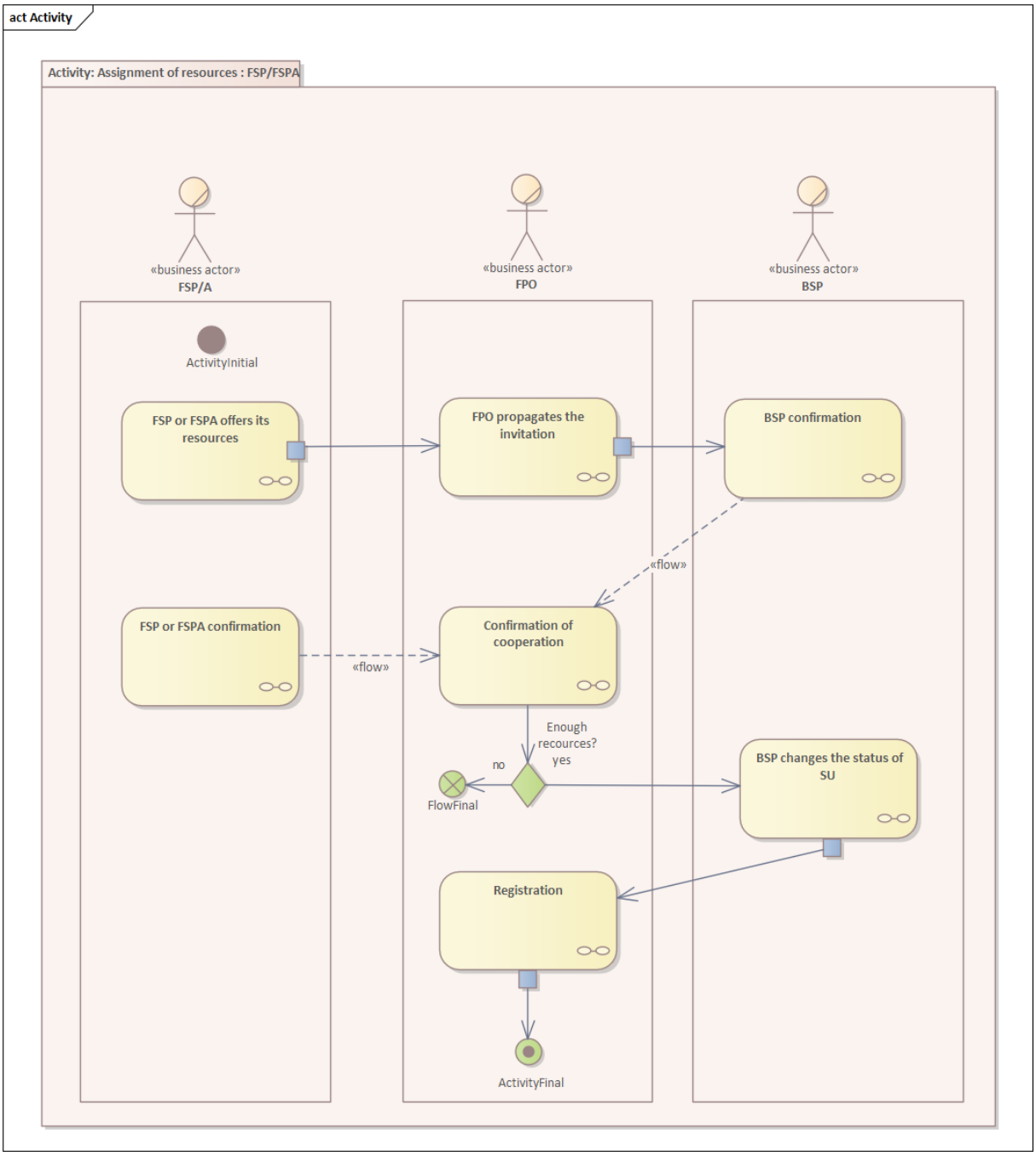


Scenario								
Scenario Name:	**No. 3.1 - Assignment of resources** – initiative of BSP							
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		BSP invitation	BSP invites FSPs and FSPAs to cooperate and indicates their	Send	BSP	FPO	Invitation with list of Points of Connectio	

			PoC resources ready to provide balancing services				n (PoC)	
2		FPO propagates the invitation	FPO resend the invitation to the FSPs and FSPAs	Send the message	FPO	FSP and/or FSPA	The message with invitation with list of PoC	
3		FSP or FSPA confirmation	FSP or FSPA confirms cooperation	Send	FSP or FSPA	FPO	Confirmation of cooperation	
4		BSP confirmation	BSP confirms cooperation	Send	BSP	FPO	Confirmation of cooperation	
5	Enough resources	BSP changes the status of SU	BSP closes the status of SU in case if have enough resources ready to provide balancing services	Send	BSP	FPO	Closing of acquisition to the SU	
6		Registration	FPO registers in FR resources assigned to the new SU		BSP			

Initiative of FSP or FSPA

Diagram



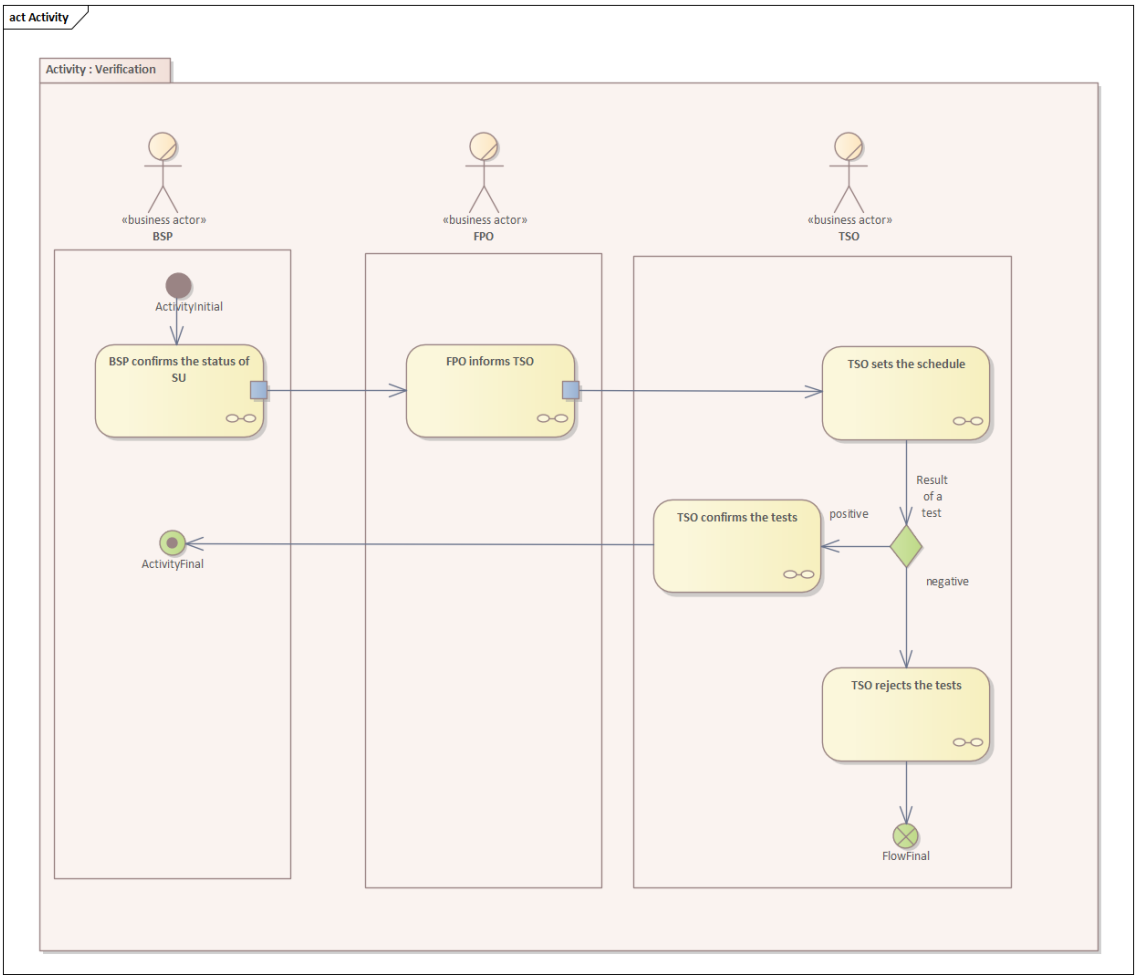
Scenario								
Scenario Name :		**No. 3.2 - Assignment of resources** – initiative of FSP or FSPA						
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***

1		FSP or FSPA offers its resources	FSP o FSPA offers to the chosen BSP its resources ready to provide balancing services	Send	FSP or FSPA	FPO	Declaration of cooperation with list of PoC	
2		FPO propagates the invitation	FPO resend the invitation to the BSP	Send the message	FPO	BSP	The message with invitation with list of PoC	
3		BSP confirmation	BSP confirms cooperation	Send	BSP	FPO	Confirmation of cooperation	
4		FSP or FSPA confirmation	FSP or FSPA confirms cooperation	Send	FSP or FSPA	FPO	Confirmation of cooperation	
5	Enough resources	BSP changes the status of SU	BSP closes the status of SU in case if have enough resources ready to provide balancing services	Send	BSP	FPO	Closing of acquisition to the SU	
6		Registration	FPO registers in FR resources assigned to the new SU		BSP			

Verification

Verification and test of scheduling unit.

Diagram



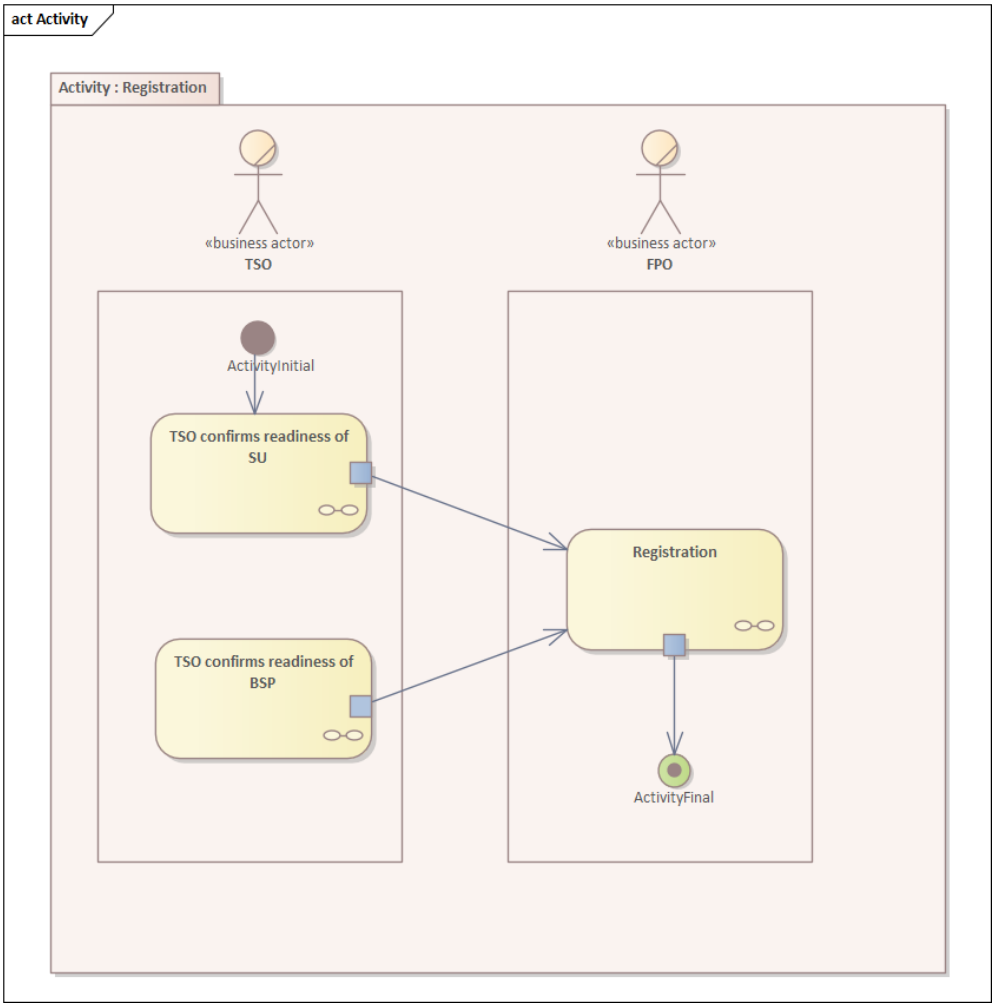
Scenario								
Scenario Name:		**No. 4 - Verification**						
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		BSP confirms the status of SU	BSP confirms the status of SU as ready for testing and compliance with the requirements for a given SU specified in Terms and Condition Related to Balancing	Send	BSP	FPO	SU status as tests-ready	
2		FPO informs	The FPO informs the TSO about	Send	FPO	TSO	The request	

		TSO	the readiness to test the new SU				for testing	
3		TSO sets the schedule	The TSO sets the date and procedure for testing new SU	Send	TSO	FPO, BSP	The test schedule for SU	
4	Negative results of tests	TSO rejects the new SU	The TSO rejects the new SU	Send	TSO	FPO, BSP	Rejection message	
5	Positive results of tests	TSO confirms the tests	The TSO confirms positive tests results and	Send	TSO	FPO, BSP	Acceptance message	

Registration

Registration of the scheduling unit by TSO.

Diagram



Scenario								
Scenario Name:		**No. 5 - Registration**						
Step No.	***Event***	***Name of Process / Activity***	***Description of Process/ Activity***	***Service***	***Information Producer (Actor)***	***Information Receiver (Actor)***	***Information Exchanged***	***Requirements, R-ID***
1		TSO confirms readiness of SU	TSO confirms the readiness of SU to provide balancing services	Send	TSO	FPO	SU readiness message	
2		TSO confirms readiness of BSP	TSO confirms the readiness of BSP to provide balancing services based on new SU	Send	TSO	FPO	BSP readiness message	
3		Registration	The FPO registers in FR a new SU as certified by the TSO and assigned to the BSP		FPO			

9.2.4.2 Slovenian demo

Congestion management in distribution grids under market conditions

Based on IEC 62559-2 edition 1
Generated from UML Use Case Repository with Modsarus® (EDF R&D Tool)

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-SL-01	Energy market	Congestion management in distribution grids under market conditions

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	2021-02-17	Rok Lacko (GEN-I)	draft-concept	
2	2021-04-28	Nermin Suljanović (EIMV)	Domain, Roles, BUC description, SUC list without detailed description	
3	2021-09-1	Luka Nagode (GEN-I)	Updated scenarios	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process in which managing flexibility in the distribution grid (e.g., switching off heat pumps) can prevent that distribution grid overreaches it's physical limits (e.g. transformer overheating, line congestion). It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions.
Objective(s)	Deferral of grid reinforcement investments (defer or avoid secondary substation replacement). Improve security of supply. Validate demand response mechanism to prevent congestion in the distribution grid. Test flexibility products to prevent congestion in the distribution grid under market conditions.
Related business case(s)	Operational planning activities Provide energy flexibility services

1.4. Narrative of Use Case

Narrative of use case
Short description
Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. In regard how DSO procure this flexibility service, two scenarios are considered. In the first scenario, service provider (e.g., aggregator) enters into a contract with DSO for a long-term period. The second scenario assumes that local flexibility market exists and that DSO purchases flexibility service at the local flexibility market to resolve congestion problems in the distribution grid.
Complete description
In this BUC, DSO uses flexibility resources connected to the distribution grid to resolve congestion problem and postpone investment in the grid reinforcement. Depending on how local flexibility market is organised, two scenarios are considered. The first scenario corresponds to **over the counter (OTC) market** in which flexibility service provider (FSP) make a long-term (e.g., 6 months) bilateral contract with DSO related. This first scenario includes the following processes: · **Prequalification**: after DSO publishes a call for flexibility procurement, FSP sends a request for prequalification. Within this process, DSO evaluates technical info and optionally run tests (depending on the offered power and impact on the distribution grid) to confirm capability of FSP to deliver a service. · **Offering**: when DSO identifies a need for the flexibility, DSO sends requests for offers. FSP send an offer. DSO collects and ranks the offer. After selection of the best offer, contract is signed. · **Activation**: when congestion in the grid is predicted or occurred, DSO sends a request to FSP for contracted flexibility at a given location in the distribution grid. FSP acknowledges request and activates a service (e.g., reduces a consumption by switching off heat pumps). · **Settlement**: using calculated base line, volume of the delivered power is calculated. This is volume is confirmed by both sides (e.g., check of error in measurements) and invoice is sent. In the second scenario, DSO procures flexibility on the **organised local flexibility market**. This scenario includes the following processes: · **Grid prequalification:** at the start of this process, flexibility resources are registered at the flexibility register. Flexibility register (component located at the market operator) initiates prequalification of the registered resource run by DSO, to validate existence of the resource and its impact on the distribution grid. The complexity of this procedure depends on the volume/power and the impact on the grid of the flexibility resources. · **Product prequalification**: DSO defines the requirements that each local flexibility product should meet. Flexibility market operator (FMO) coordinates the prequalification process. Flexibility service provider sends the prequalification request with accompanying information to the FMO, who forwards this request to DSO. DSO runs predefined tests and calculation, after send the results and acknowledge FMO about the final decision. FMO stores this information to the flexibility register and acknowledges FSP. · **Bidding**: DSO expresses the need for the flexibility service to FMO (based on the load and distributed generation prediction and state of the distribution grid), which publishes request for bids. FMO collects the bids from flexibility service provides and selects the optimal bids. FMO sends information about selected bids to DSO, flexibility service provider, TSO and flexibility register. · **Activation**: For the selected bid, activation is initiated by DSO sending activation signal to the flexibility service provider. FSP internally activates flexibility resources and acknowledges DSO. DSO informs TSO about activated flexibility resources in the distribution grid in order to avoid collision and double activation on the balancing market. During the activation, flexibility register (component of the market operator) collects the measurements from DSO and FSP. **Settlement**: Flexibility register calculates the base line. After the activated product has been delivered, flexibility register calculates delivered volume and information to DSO and FSP. In the

process of volume validation, DSO and FSP should validate delivered volume. When volume can't be validated, alignment process is initiated. FMO monetizes the delivered flexibility product and send the bill to DSO and reimbursement to FSP.

Summary of use case

If flexibility market not organised:

- **Prequalification**
  Description: On OTC market, prequalification run by DSO only.
    - Publish call for flexibility services
      Description: DSO expresses a need for a flexibility services to prevent a congestion in the distribution grid and publishes a call to prequalificate products that meet DSO requirements.
    - Receive prequalification decision and acknowledge
      Description:
    - Receive prequalification information and acknowledge
      Description:
    - Receive request for prequalification
      Description:
    - Run prequalification tests
      Description:
    - Send a request for the flexibility service prequalification
      Description:
    - Send prequalification test results and acknowledgement
      Description:
- **Offering**
  Description: Flexibility service provider (FSP) makes a long-term (e.g., 6 months) contract with DSO. This corresponds to the OTC market.
    - Call for offers closed
      Description:
    - Flexibility service offer reception
      Description:
    - Ranking and selection of offers
      Description:
    - Receive information about selected offers
      Description:
    - Receive the request for an offer
      Description:

        - Send acceptance offer confirmation
          Description:
        - Send an offer for the flexibility service
          Description:
        - Send the need for the flexibility
          Description:

- **Activation-OTC**
  Description: DSO activates flexibility product to avoid congestion in the grid.
        - Activate flexibility resources
          Description:
        - Receive activation acknowledgment
          Description:
        - Receive activation request
          Description:
        - Receive activation status
          Description: Information about flexibility resource activation
        - Receive measurements
          Description:
        - Send acknowledgement
          Description: ACK is sent to confirm reception of a document.
        - Send activation request for contracted flexibility
          Description:
        - Send activation status
          Description:
        - Send activation status
          Description: Information when flexibility service ended.
        - Send measurements
          Description:

- **Settlement-OTC**
  Description: Settlement for the delivered flexibility service on the OTC market.
        - Calculate base line
          Description:
        - Calculate delivered volume
          Description:
        - Receive acknowledgement
          Description:

- Receive proposed volume
  Description:
- Receive the reimbursement
  Description:
- Request volume recalculation
  Description:
- Send acknowledgement
  Description:
- Send request to validate volume
  Description:
- Send the reimbursement
  Description:
- Volume recalculation
  Description:

If flexibility market is organised

- **Grid prequalification**
  Description: Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.
  - Initiate grid prequalification
    Description:
  - Receive grid prequalification report
    Description:
  - Receive grid prequalification request
    Description:
  - Register flexibility resource
    Description:
  - Request to register flexibility resource
    Description:
  - Run grid prequalification tests
    Description:
  - Send grid prequalification report
    Description:
  - Send grid prequalification result
    Description:

        - Validate and register flexibility resource
          Description:

- **Product prequalification**
  Description: Process is coordinated by the Flexibility Market Operator (FMO).

        - Evaluate prequalification test results
          Description:

        - Publish call for flexibility service
          Description:

        - Receive and acknowledge
          Description:

        - Receive and acknowledge
          Description:

        - Receive and acknowledge
          Description:

        - Receive and forward request for flexibility service prequalification
          Description:

        - Receive and validate request
          Description:

        - Receive prequalification test results
          Description:

        - Run prequalification tests
          Description:

        - Send prequalification test results
          Description:

        - Send product prequalification requirements
          Description:

        - Send request for flexibility service prequalification
          Description:

        - Send service prequalification information
          Description:

- **Bidding**
  Description: Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.

        - Activity1
          Description:

        - Market clearing
          Description:
        - Publish flexibility need
          Description:
        - Receive and acknowledge
          Description:
        - Receive and acknowledge
          Description:
        - Receive call for bid
          Description:
        - Receive flexibility service bid
          Description:
        - Send flexibility need
          Description:
        - Send flexibility service bid
          Description:
        - Send trading results
          Description:

- **Activation**
  Description: Activation of flexibility service procured on the flexibility market.
        - Activate flexibility resource
          Description:
        - Receive acknowledgement
          Description:
        - Receive activation info
          Description:
        - Receive activation measurement
          Description:
        - Receive measurements
          Description:
        - Send acknowledgement
          Description:
        - Send activation info
          Description:
        - Send activation signal
          Description:

        - Send real-time measurements
          Description:

- **Settlement**
  Description: Monetisation of the delivered flexibility product, procured on the flexibility market.

        - Calculate baseline
          Description:

        - Monetize flexibility service
          Description:

        - Receive acknowledgement
          Description:

        - Receive proposed volume
          Description:

        - Receive proposed volume
          Description:

        - Receive the bill
          Description:

        - Receive the reimbursement
          Description:

        - Send acknowledgement
          Description:

        - Send acknowledgement
          Description:

        - Send the bill
          Description:

        - Send the reimbursement
          Description:

        - Start alignment process
          Description:

        - Start volume alignment process
          Description:

        - Validate delivered volume
          Description:

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1	A number of successfully avoided congestions during demonstration period		Deferral of grid reinforcement investments (defer or avoid secondary substation replacement)Improve security of supply
2	Volume of activated flexibility services		Validate demand response mechanism to prevent congestion in the distribution grid.
3	Success of local flexibility market platform test		Validate demand response mechanism to prevent congestion in the distribution grid. Test flexibility products to prevent congestion in the distribution grid under market conditions.

1.6. Use case conditions

Use case conditions	
Assumptions	
1	Local flexibility market
2	DSO procures congestion management services at the local flexibility market.
Prerequisites	
1	Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems
2	Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid.

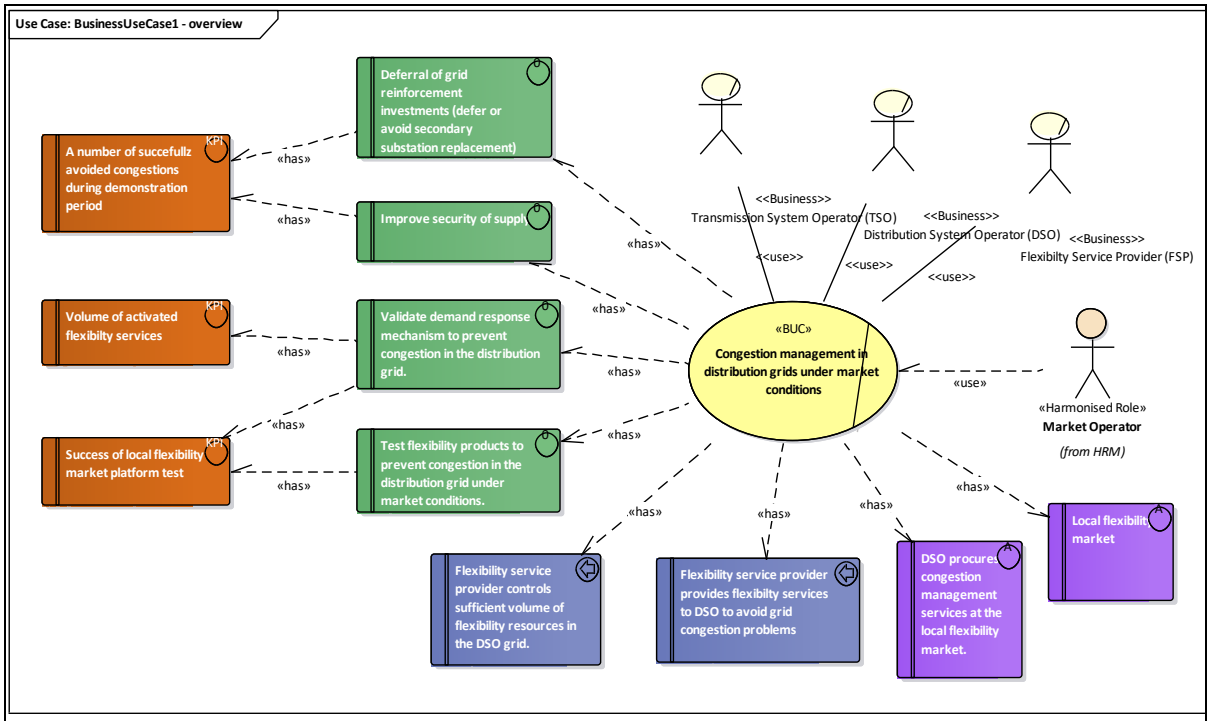
1.7. Further information to the use case for classification/mapping

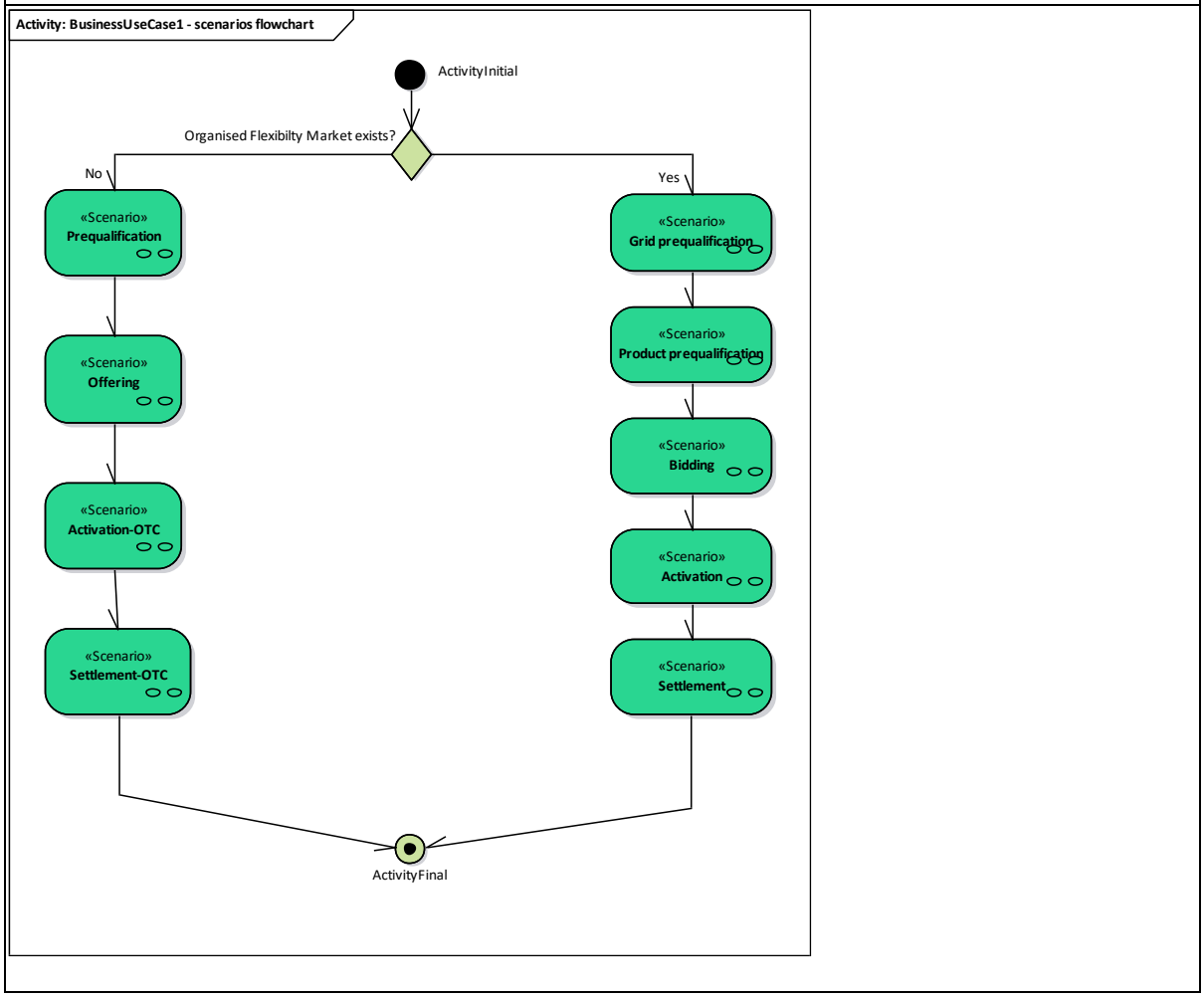
Classification information
Relation to other use cases
<<SUC>> Prequalification <<SUC>> Offering <<SUC>> Activation-OTC <<SUC>> Settlement-OTC <<SUC>> Grid prequalification <<SUC>> Product prequalification <<SUC>> Bidding <<SUC>> Activation - Flexibility market <<SUC>> Settlement-Flexibility market
Level of depth
High level
Prioritisation
Generic, regional or national relation
National relation
Nature of the use case
BUC
Further keywords for classification
Flexibility, Local flexibility market, Congestion management

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


Use Case: BusinessUseCase1 - overview
Deferral of grid reinforcement investments (defer or avoid secondary substation replacement)
A number of succefullz avoided congestions during demonstration period
KPI
Improve security of suppl
Volume of activated flexibilty services
KPI
Validate demand response mechanism to prevent congestion in the distribution grid.
Success of local flexibility market platform test
KPI
Test flexibility products to prevent congestion in the distribution grid under market conditions.
«has»
«BUC»
Congestion management in distribution grids under market conditions
<<Business>>
Transmission System Operator (TSO)
<<Business>>
Distribution System Operator (DSO)
<<Business>>
Flexibilty Service Provider (FSP)
<<use>>
«use»
«Harmonised Role»
Market Operator
(from HRM)
Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid.
Flexibility service provider provides flexibilty services to DSO to avoid grid congestion problems
DSO procures congestion management services at the local flexibility market.
Local flexibility market


Activity: BusinessUseCase1 - scenarios flowchart
ActivityInitial
Organised Flexibilty Market exists?
No
Yes
«Scenario»
Prequalification
«Scenario»
Offering
«Scenario»
Activation-OTC
«Scenario»
Settlement-OTC
«Scenario»
Grid prequalification
«Scenario»
Product prequalification
«Scenario»
Bidding
«Scenario»
Activation
«Scenario»
Settlement
ActivityFinal

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this business use case***
Transmission System Operator (TSO)	Business	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area. Source: EU Commission Task Force for Smart Grids, EG3	
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity. Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast),	
Flexibility Service Provider (FSP)	Business	Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties.	
Market Operator	Harmonised Role	A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity. **Additional Information**: This usually is an energy/power exchange or platform. The definition is based on Regulation on the internal market for electricity (EU) 2019/943.	

3.2. Systems

Actors			
Grouping (e.g. domains, zones)		***Group description***	
System name	***System owner***	***System description***	***Further information specific to this system use case***
DSO Scada system	Distribution System Operator (DSO)	System responsible for displaying grid measurements, which serve as input for DSO activation system	
TSO Scada system	Transmission System Operator (TSO)	System responsible for displaying grid measurements, which serve as input for ancillary services etc.	
DSO smartgrid activation system	Distribution System Operator (DSO)	Automatic system that according to the measurements decide where an activation is needed	
DSO smartgrid platform	Distribution System Operator (DSO)	Controls registers of all locations where flexibility is needed, communicates with bidding platform from market operator	
Virtual power plant technical channel	Flexibility Service Provider (FSP)	Takes care of real-time exchanged information for activations etc.	
Virtual power plant business channel	Flexibility Service Provider (FSP)	Takes care of business files exchange (bids, measurements etc)	
Virtual power plant	Flexibility Service Provider (FSP)	System responsible for units' activation, internal baseline calculations, monitoring of available locations	
Bidding platform	Market Operator	System collecting DSO offerings and FSP bids, organising them and publishing results	
Settlement system	Market Operator	System collecting DSO activations and FSP measurements, evaluating activation success and energy to be paid	
Unit controller	Flexibility Service Provider (FSP)	Controller that transmits activation demand to technical units	

3.3. References

4. Step by step analysis of use case

4.1. Overview of scenarios

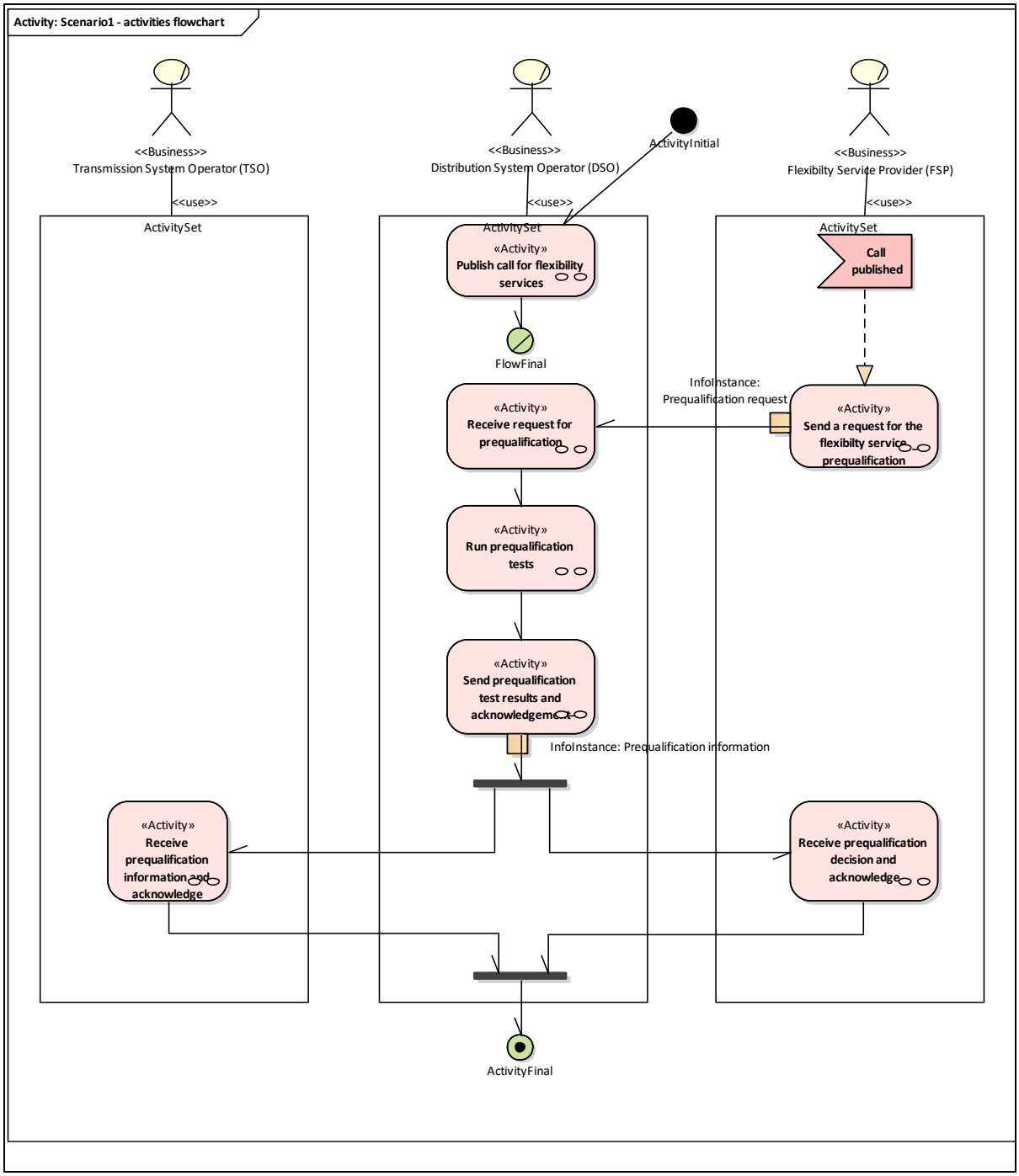
Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Prequalification	On OTC market, prequalification run by DSO only.	DSO			
2	Offering	Flexibility service provider (FSP) makes a long-term (e.g., 6 months) contract with DSO. This corresponds to the OTC market.	FSP			

3	Activation-OTC	DSO activates flexibility product to avoid congestion in the grid.	DSO			
4	Settlement-OTC	Settlement for the delivered flexibility service on the OTC market.	FSP?			
5	Grid prequalification	Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.	DSO			
6	Product prequalification	Process is coordinated by the Flexibility Market Operator (FMO).	FMO			
7	Bidding	Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.	FMO			
8	Activation	Activation of flexibility service procured on the flexibility market.	DSO			
9	Settlement	Monetisation of the delivered flexibility product, procured on the flexibility market.	FMO? DSO?			

4.2. Steps – Scenarios for flexibility market not organised

Prequalification BUC

On OTC market, prequalification run by DSO only.



Scenario step by step analysis

Scenario								
Scenario name	Prequalification							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**

1.1		Publish call for flexibility services	DSO expresses a need for a flexibility services to prevent a congestion in the distribution grid and publishes a call to prequalificate products that meet DSO requirements.		Distribution System Operator (DSO)	Flexibility Service Provider (FSP)		
1.2		Receive prequalification decision and acknowledge			Flexibility Service Provider (FSP)			
1.3		Receive prequalification information and acknowledge			Transmission System Operator (TSO)			
1.4		Receive request for prequalification			Distribution System Operator (DSO)			
1.5		Run prequalification tests			Distribution System Operator (DSO)			
1.6		Send a request for the flexibility service prequalification			Flexibility Service Provider (FSP)	Distribution System Operator (DSO),TSO?	Info15-Prequalification request	
1.7		Send prequalification test results and acknowledgement			Distribution System Operator (DSO)	Flexibility Service Provider (FSP)	Info16-Prequalification information	

- 1.6. Send a request for the flexibility service prequalification

  Business section: Prequalification/Send a request for the flexibility service prequalification

  Information sent:

Business object	***Instance name***	***Instance description***
Prequalification request		

- 1.7. Send prequalification test results and acknowledgement

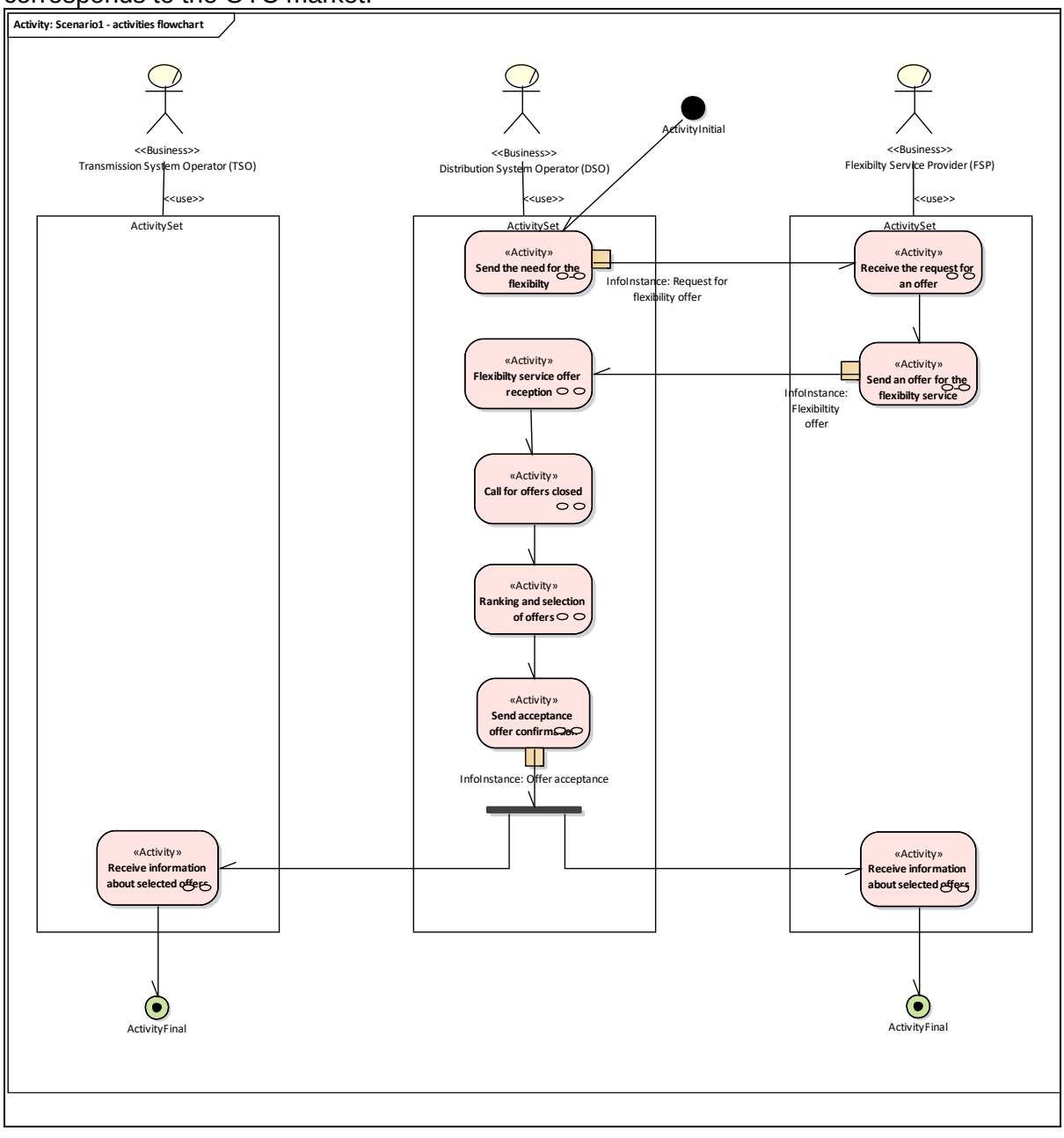
Business section: Prequalification/Send prequalification test results and acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Prequalification information	InfoInstance	

Offering BUC

Flexibility service provider (FSP) makes a long-term (e.g., 6 months) contract with DSO. This corresponds to the OTC market.



Scenario step by step analysis

Scenario								
Scenario name		Offering						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		Call for offers closed			Distribution System Operator (DSO)	FSP		
2.2		Flexibility service offer reception			Distribution System Operator (DSO)	FSP		
2.3		Ranking and selection of offers			Distribution System Operator (DSO)			
2.4		Receive information about selected offers			DSO	Transmission System Operator (TSO)		
2.5		Receive information about selected offers			DSO	Flexibility Service Provider (FSP)		
2.6		Receive the request for an offer			DSO	Flexibility Service Provider (FSP)		
2.7		Send acceptance offer confirmation			Distribution System Operator (DSO)		Info12-Offer acceptance	
2.8		Send an offer for the flexibility service			Flexibility Service Provider (FSP)		Info13-Flexibiltity offer	
2.9		Send the need for the flexibility			Distribution System Operator (DSO)		Info14-Request for flexibility offer	

- 2.7. Send acceptance offer confirmation

  Business section: Offering/Send acceptance offer confirmation

  Information sent:

Business object	Instance name	Instance description
Offer acceptance	InfoInstance	

- 2.8. Send an offer for the flexibility service

Business section: Offering/Send an offer for the flexibility service

Information sent:

Business object	Instance name	Instance description
Flexibiltity offer	InfoInstance	

- 2.9. Send the need for the flexibility

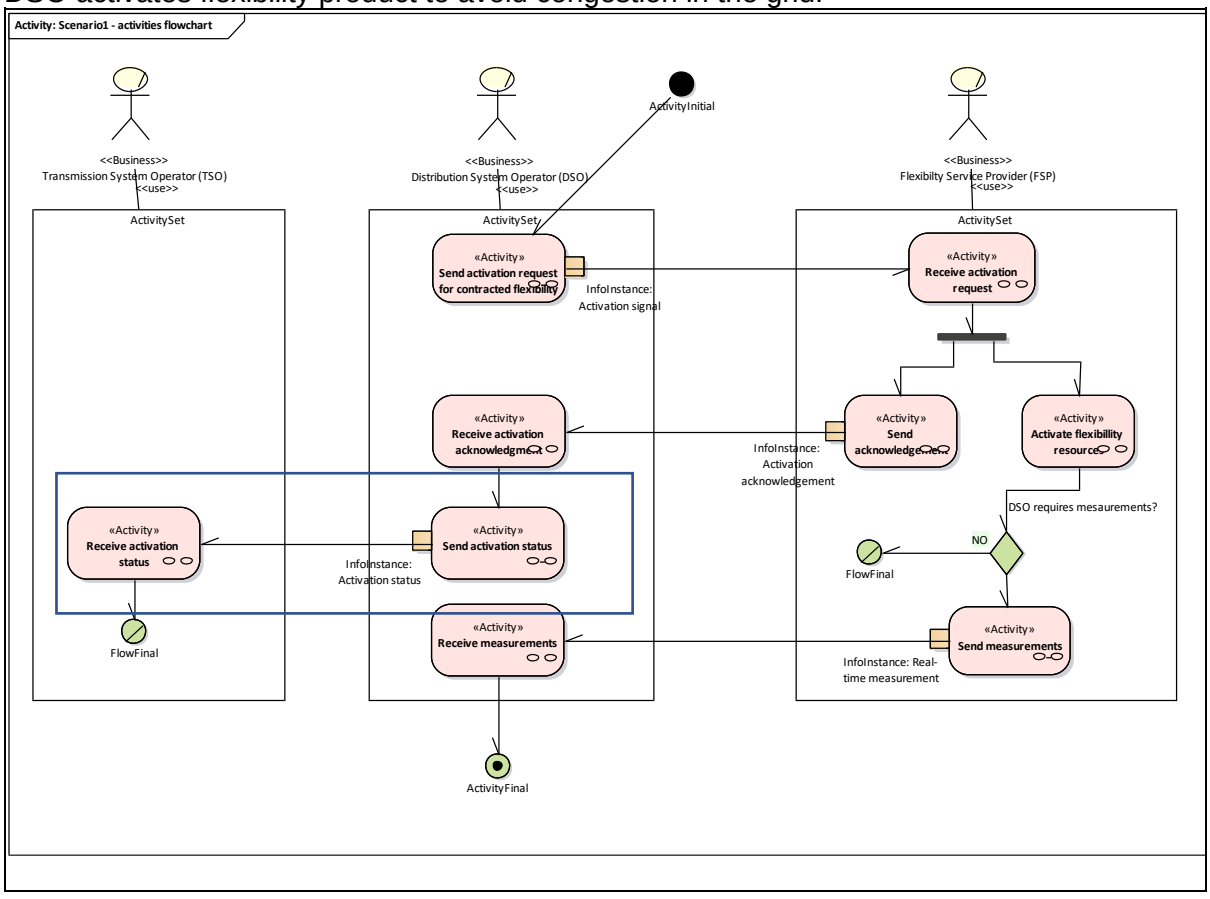
Business section: Offering/Send the need for the flexibility

Information sent:

Business object	Instance name	Instance description
Request for flexibility offer	InfoInstance	

Activation-OTC BUC

DSO activates flexibility product to avoid congestion in the grid.



Scenario step by step analysis

Scenario								
Scenario name		Activation-OTC						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
3.1		Activate flexibility resources			Flexibility Service Provider (FSP)			
3.2		Receive activation acknowledgment			FSP	Distribution System Operator (DSO)		
3.3		Receive activation request			Flexibility Service Provider (FSP)			
3.4		Receive activation status	Information about flexibility resource activation		Distribution System Operator (DSO)	Transmission System Operator (TSO)		
3.5		Receive measurements			Distribution System Operator (DSO)			
3.6		Send acknowledgement	ACK is sent to confirm reception of a document.		Flexibility Service Provider (FSP)		Info1-Activation acknowledgement	
3.7		Send activation request for contracted flexibility			Distribution System Operator (DSO)		Info3-Activation signal	
3.8		Send activation status			Distribution System Operator (DSO)		Info2-Activation status	
3.9		Send activation status	Information when flexibility service ended.					
3.10		Send measurements			Flexibility Service Provider (FSP)		Info4-Real-time measurement	

- 3.6. Send acknowledgement

Business section: Activation-OTC/Send acknowledgement
ACK is sent to confirm reception of a document.
Information sent:

Business object	*Instance name*	*Instance description*
Activation acknowledgement	InfoInstance	

- 3.7. Send activation request for contracted flexibility

Business section: Activation-OTC/Send activation request for contracted flexibility

Information sent:

Business object	*Instance name*	*Instance description*
Activation signal	InfoInstance	

- 3.8. Send activation status

Business section: Activation-OTC/Send activation status

Information sent:

Business object	*Instance name*	*Instance description*
Activation status	InfoInstance	

- 3.10. Send measurements

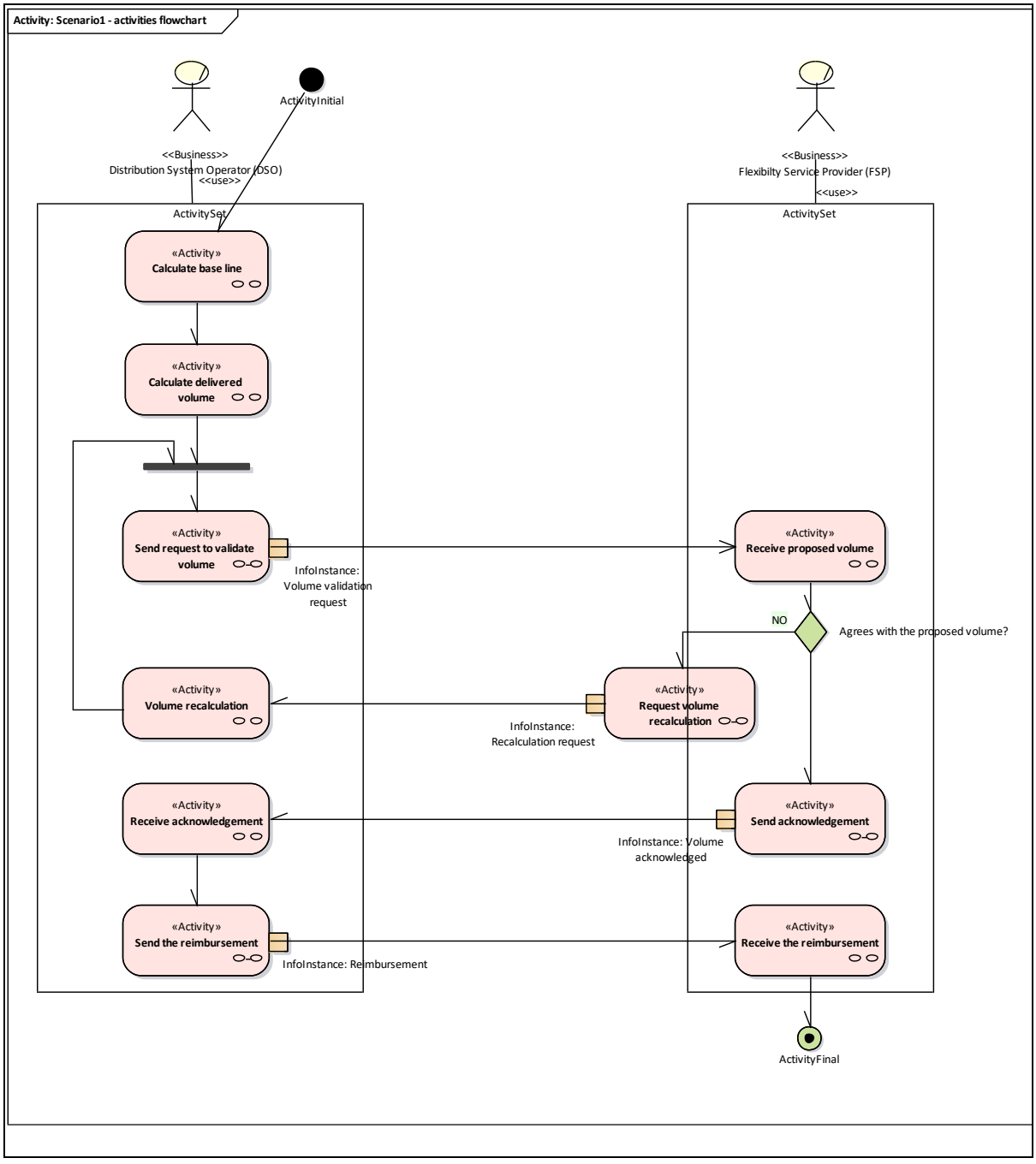
Business section: Activation-OTC/Send measurements

Information sent:

Business object	*Instance name*	*Instance description*
Real-time measurement	InfoInstance	

Settlement-OTC BUC

Settlement for the delivered flexibility service on the OTC market.



Scenario step by step analysis

Scenario								
Scenario name	Settlement-OTC							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***

4.1		Calculate base line			Distribution System Operator (DSO)			
4.2		Calculate delivered volume			Distribution System Operator (DSO)			
4.3		Receive acknowledgement			Distribution System Operator (DSO)			
4.4		Receive proposed volume			Distribution System Operator (DSO)	Flexibility Service Provider (FSP)		
4.5		Receive the reimbursement			Flexibility Service Provider (FSP)			
4.6		Request volume recalculation					Info25-Recalculation request	
4.7		Send acknowledgement			Flexibility Service Provider (FSP)	Distribution System Operator (DSO)	Info21-Volume acknowledged	
4.8		Send request to validate volume			Distribution System Operator (DSO)	Flexibility Service Provider (FSP)	Info26-Volume validation request	
4.9		Send the reimbursement			Distribution System Operator (DSO)	Flexibility Service Provider (FSP	Info23-Reimbursement	
4.10		Volume recalculation			Distribution System Operator (DSO)			

- 4.6. Request volume recalculation

  Business section: Settlement-OTC/Request volume recalculation

  Information sent:

Business object	***Instance name***	***Instance description***
Recalculation request	InfoInstance	

- 4.7. Send acknowledgement

Business section: Settlement-OTC/Send acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Volume acknowledged	InfoInstance	

- 4.8. Send request to validate volume

Business section: Settlement-OTC/Send request to validate volume

Information sent:

Business object	*Instance name*	*Instance description*
Volume validation request	InfoInstance	

- 4.9. Send the reimbursement

Business section: Settlement-OTC/Send the reimbursement

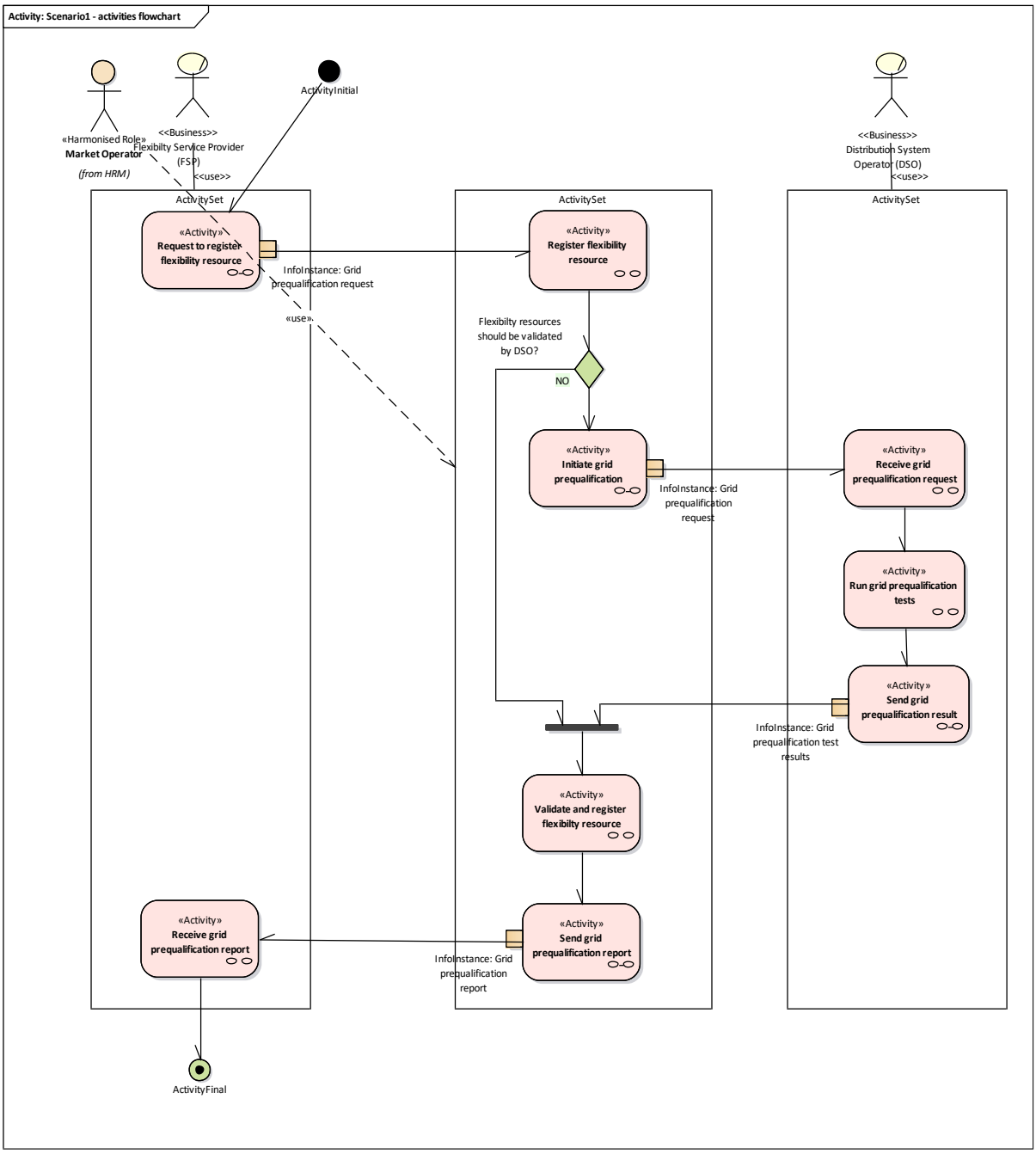
Information sent:

Business object	*Instance name*	*Instance description*
Reimbursement	InfoInstance	

4.3. Steps – Scenarios for organised flexibility market

Grid prequalification BUC

Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.



Scenario step by step analysis

Scenario								
Scenario name	Grid prequalification							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**

5.1		Initiate grid prequalification			Market Operator		Info9-Grid prequalification request	
5.2		Receive grid prequalification report			Flexibility Service Provider (FSP)			
5.3		Receive grid prequalification request			Distribution System Operator (DSO)			
5.4		Register flexibility resource			Market Operator			
5.5		Request to register flexibility resource			Flexibility Service Provider (FSP)		Info9-Grid prequalification request	
5.6		Run grid prequalification tests			Distribution System Operator (DSO)			
5.7		Send grid prequalification report			Market Operator		Info10-Grid prequalification report	
5.8		Send grid prequalification result			Distribution System Operator (DSO)		Info11-Grid prequalification test results	
5.9		Validate and register flexibility resource			Market Operator			

- 5.1. Initiate grid prequalification

  Business section: Grid prequalification/Initiate grid prequalification

  Information sent:

Business object	***Instance name***	***Instance description***
Grid prequalification request	InfoInstance	

- 5.5. Request to register flexibility resource

  Business section: Grid prequalification/Request to register flexibility resource

  Information sent:

Business object	***Instance name***	***Instance description***
Grid prequalification request	InfoInstance	

- 5.7. Send grid prequalification report

  Business section: Grid prequalification/Send grid prequalification report

  Information sent:

Business object	***Instance name***	***Instance description***
Grid prequalification report	InfoInstance	

- 5.8. Send grid prequalification result

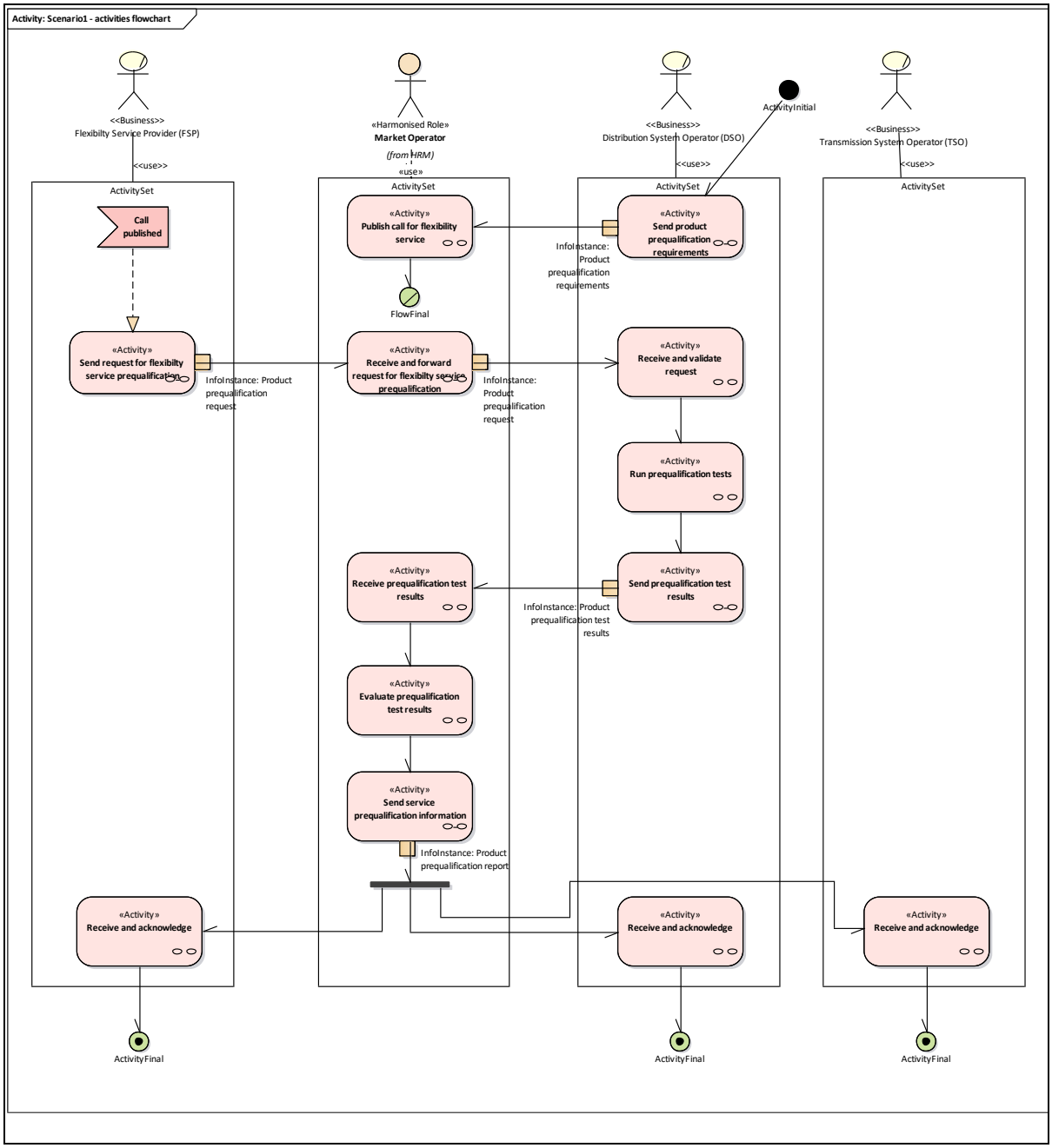
  Business section: Grid prequalification/Send grid prequalification result

  Information sent:

Business object	***Instance name***	***Instance description***
Grid prequalification test results	InfoInstance	

Product prequalification BUC

Process is coordinated by the Flexibility Market Operator (FMO).



Scenario step by step analysis

Scenario								
Scenario name	Product prequalification							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
6.1		Evaluate prequalification test results			Market Operator			

6.2		Publish call for flexibility service			Market Operator			
6.3		Receive and acknowledge			Flexibility Service Provider (FSP)			
6.4		Receive and acknowledge			Distribution System Operator (DSO)			
6.5		Receive and acknowledge			Transmission System Operator (TSO)			
6.6		Receive and forward request for flexibility service prequalification			Market Operator		Info17-Product prequalification request	
6.7		Receive and validate request			Distribution System Operator (DSO)			
6.8		Receive prequalification test results			Market Operator			
6.9		Run prequalification tests			Distribution System Operator (DSO)			
6.10		Send prequalification test results			Distribution System Operator (DSO)		Info18-Product prequalification test results	
6.11		Send product prequalification requirements			Distribution System Operator (DSO)		Info19-Product prequalification requirements	
6.12		Send request for flexibility service prequalification			Flexibility Service Provider (FSP)		Info17-Product prequalification request	
6.13		Send service prequalification information			Market Operator		Info20-Product prequalification report	

- 6.6. Receive and forward request for flexibility service prequalification

Business section: Product prequalification/Receive and forward request for flexibility service prequalification

Information sent:

Business object	*Instance name*	*Instance description*
Product prequalification request	InfoInstance	

- 6.10. Send prequalification test results

Business section: Product prequalification/Send prequalification test results

Information sent:

Business object	*Instance name*	*Instance description*
Product prequalification test results	InfoInstance	

- 6.11. Send product prequalification requirements

Business section: Product prequalification/Send product prequalification requirements

Information sent:

Business object	*Instance name*	*Instance description*
Product prequalification requirements	InfoInstance	

- 6.12. Send request for flexibility service prequalification

Business section: Product prequalification/Send request for flexibility service prequalification

Information sent:

Business object	*Instance name*	*Instance description*
Product prequalification request	InfoInstance	

- 6.13. Send service prequalification information

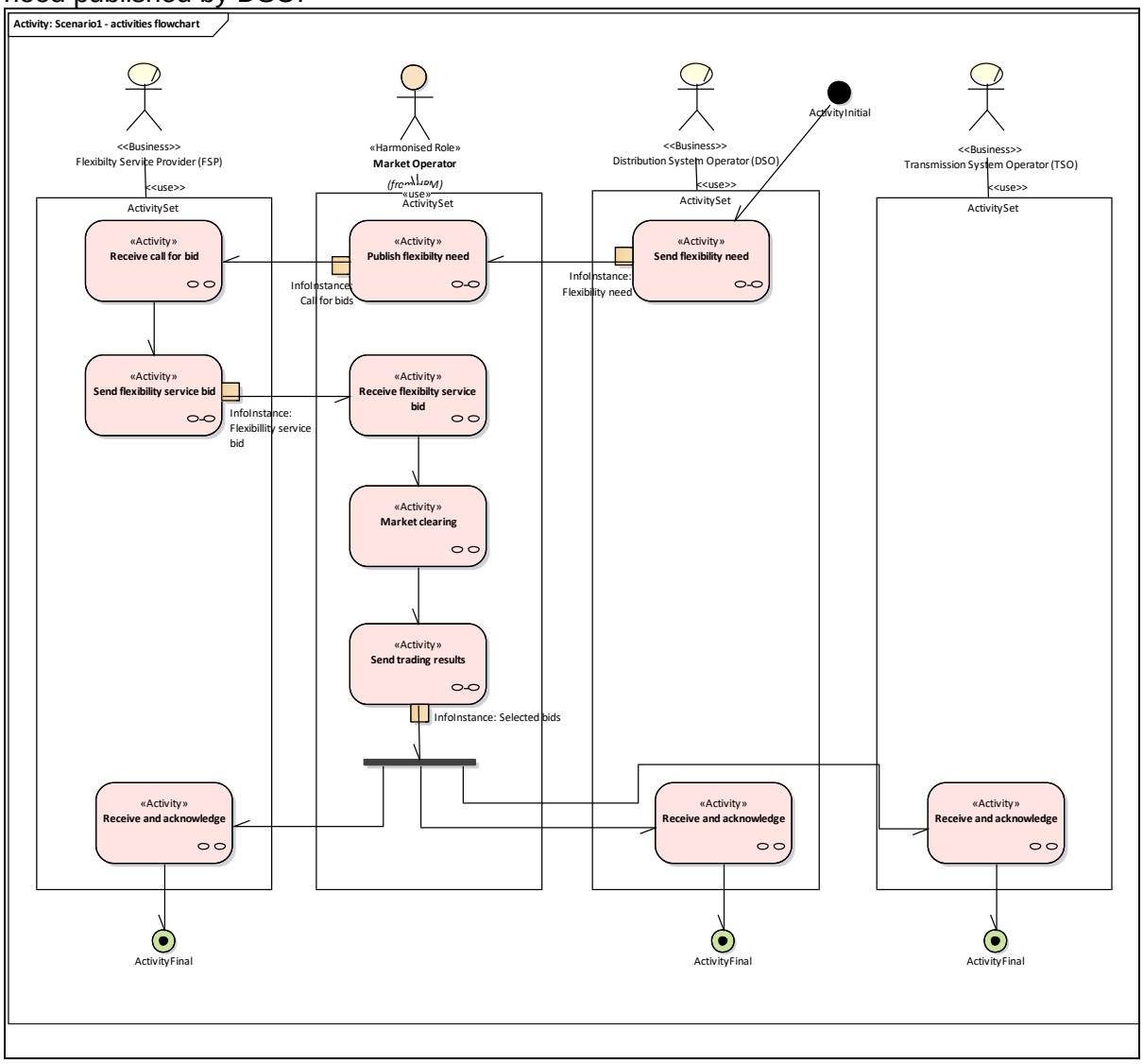
Business section: Product prequalification/Send service prequalification information

Information sent:

Business object	*Instance name*	*Instance description*
Product prequalification report	InfoInstance	

Bidding BUC

Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.



Scenario step by step analysis

Scenario								
Scenario name		Bidding						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
7.1		Send flexibility need			Distribution System Operator (DSO)		Info6-Flexibility need 1.Location	

							2.Timeframe (dates & hours), 3. Power needed, 4. Max energy price, 5. Max availability price.	
7.2		Publish flexibility need			Market Operator		Info5-Call for bids	
7.3		Receive call for bid			Flexibility Service Provider (FSP)			
7.4		Send flexibility service bid			Flexibility Service Provider (FSP)		Info7-Flexibillity service bid Location Timeframe Energy price Availability price Availability volume	
7.5		Receive flexibility service bid			Market Operator			
7.6		Market clearing			Market Operator			
7.7		Send trading results			Market Operator		Info8-Selected bids Location ContractID Accepted availability volume	
7.8		Receive and acknowledge			Flexibility Service Provider (FSP)			
7.9		Receive and acknowledge			Distribution System Operator (DSO)			
7.10		Receive and acknowledge			Transmission System Operator (TSO)			

- 7.3. Publish flexibility need

  Business section: Bidding/Publish flexibility need

  Information sent:

Business object	***Instance name***	***Instance description***
Call for bids	InfoInstance	

- 7.9. Send flexibility need

  Business section: Bidding/Send flexibility need

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility need	InfoInstance	

- 7.10. Send flexibility service bid

  Business section: Bidding/Send flexibility service bid

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibillity service bid	InfoInstance	

- 7.11. Send trading results

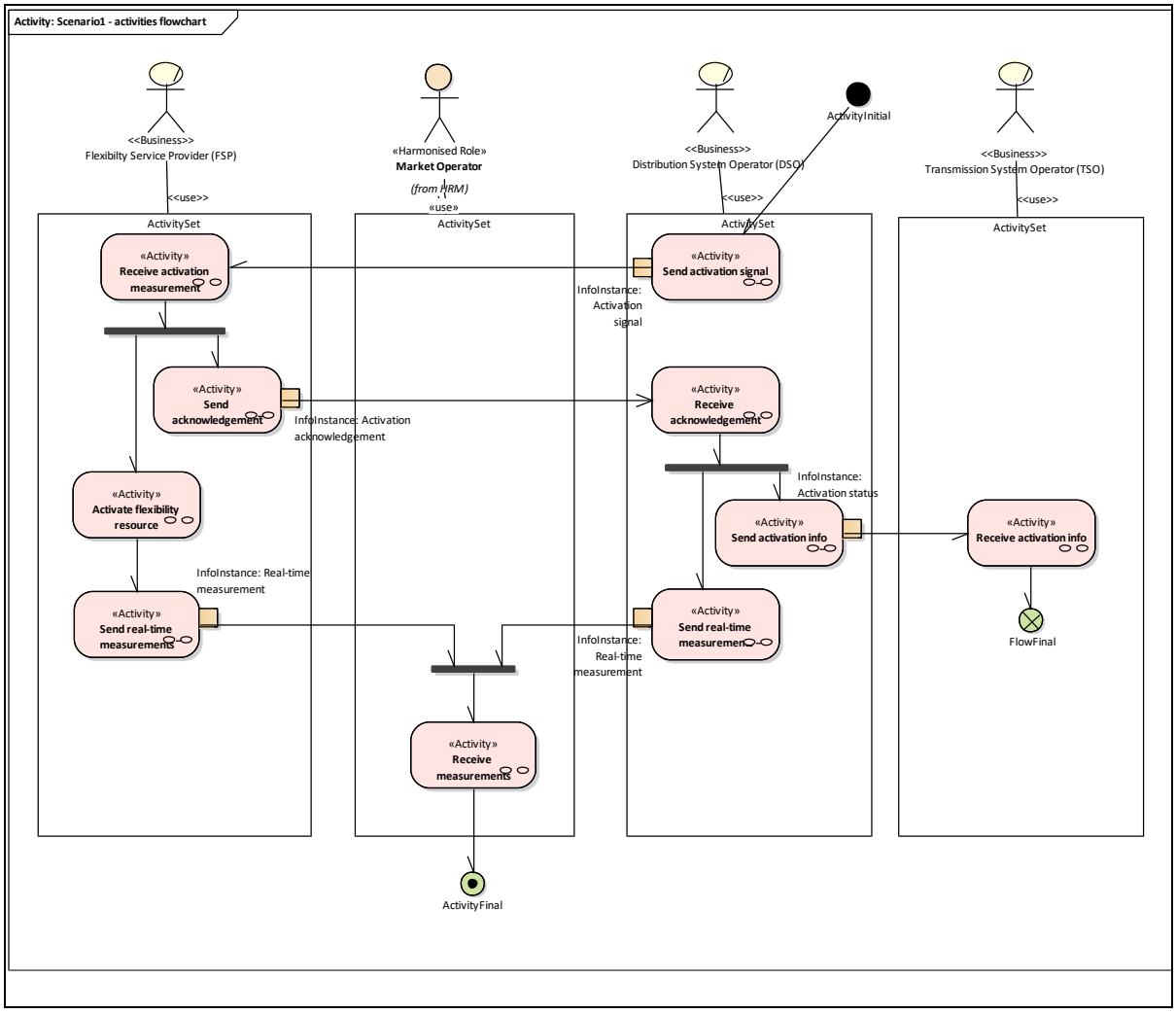
  Business section: Bidding/Send trading results

  Information sent:

Business object	***Instance name***	***Instance description***
Selected bids	InfoInstance	

Activation BUC

Activation of flexibility service procured on the flexibility market.



Scenario step by step analysis

Scenario								
Scenario name	Activation							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
8.1		Activate flexibility resource			Flexibility Service Provider (FSP)		Contract ID Start of activation End of activation Volume of power	
8.2		Receive acknowledgement			Distribution System Operator (DSO)		Contract ID Start of activation	

							End of activation Volume of power	
8.3		Receive activation info			Transmission System Operator (TSO)		Location Start of activation End of activation Volume of power	
8.4		Receive activation measurement			Flexibility Service Provider (FSP)		Timestamp Power	
8.5		Receive measurements			Market Operator		Timestamp Measurements for all technical units in minute resolution	
8.6		Send acknowledgement			Flexibility Service Provider (FSP)		Info1-Activation acknowledgement	
8.7		Send activation info			Distribution System Operator (DSO)		Info2-Activation status	
8.8		Send activation signal			Distribution System Operator (DSO)		Info3-Activation signal	
8.9		Send real-time measurements			Flexibility Service Provider (FSP)		Info4-Real-time measurement	
8.10		Send real-time measurements			Distribution System Operator (DSO)		Info4-Real-time measurement	

- 8.6. Send acknowledgement

  Business section: Activation/Send acknowledgement

  Information sent:

Business object	***Instance name***	***Instance description***
Activation acknowledgement	InfoInstance	

- 8.7. Send activation info

Business section: Activation/Send activation info

Information sent:

Business object	*Instance name*	*Instance description*
Activation status	InfoInstance	

- 8.8. Send activation signal

Business section: Activation/Send activation signal

Information sent:

Business object	*Instance name*	*Instance description*
Activation signal		

- 8.9. Send real-time measurements

Business section: Activation/Send real-time measurements

Information sent:

Business object	*Instance name*	*Instance description*
Real-time measurement	InfoInstance	

- 8.10. Send real-time measurements

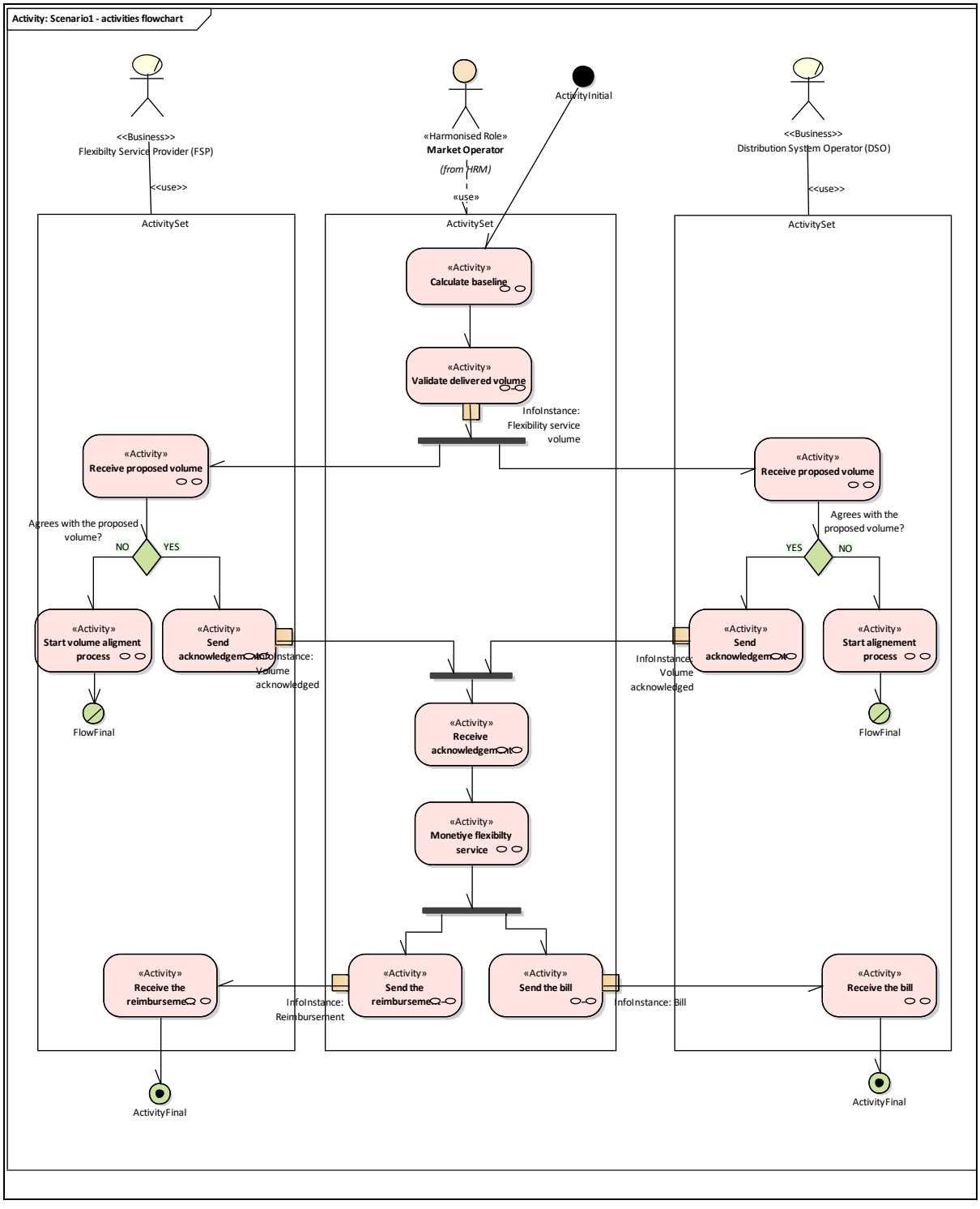
Business section: Activation/Send real-time measurements

Information sent:

Business object	*Instance name*	*Instance description*
Real-time measurement	InfoInstance	

Settlement BUC

Monetisation of the delivered flexibility product, procured on the flexibility market.



Scenario step by step analysis

Scenario	
Scenario name	Settlement

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
9.1		Calculate baseline			Market Operator			
9.2		Monetize flexibility service			Market Operator			
9.3		Receive acknowledgement			Market Operator			
9.4		Receive proposed volume			Flexibility Service Provider (FSP)			
9.5		Receive proposed volume			Distribution System Operator (DSO)			
9.6		Receive the bill			Distribution System Operator (DSO)			
9.7		Receive the reimbursement			Flexibility Service Provider (FSP)			
9.8		Send acknowledgement			Flexibility Service Provider (FSP)		Info21-Volume acknowledged	
9.9		Send acknowledgement			Distribution System Operator (DSO)		Info21-Volume acknowledged	
9.10		Send the bill			Market Operator		Info22-Bill	
9.11		Send the reimbursement			Market Operator		Info23-Reimbursement	
9.12		Start alignment process			Distribution System Operator (DSO)			
9.13		Start volume alignment process						
9.14		Validate delivered volume			Market Operator		Info24-Flexibility service volume	

- 9.8. Send acknowledgement

Business section: Settlement/Send acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Volume acknowledged	InfoInstance	

- 9.9. Send acknowledgement

Business section: Settlement/Send acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Volume acknowledged	InfoInstance	

- 9.10. Send the bill

Business section: Settlement/Send the bill

Information sent:

Business object	*Instance name*	*Instance description*
Bill	InfoInstance	

- 9.11. Send the reimbursement

Business section: Settlement/Send the reimbursement

Information sent:

Business object	*Instance name*	*Instance description*
Reimbursement	InfoInstance	

- 9.14. Validate delivered volume

Business section: Settlement/Validate delivered volume

Information sent:

Business object	*Instance name*	*Instance description*
Flexibility service volume	InfoInstance	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Activation acknowledgement	To confirm that activation has been executed.	
Info2	Activation status	DSO informs TSO about successful activation of the flexibility service in the distribution grid.	
Info3	Activation signal	This a request for activation of the contracted flexibility resource.	
Info4	Real-time measurement	Measured active power delivered by the flexibility resource. This is time series, delivered in real-time.	
Info5	Call for bids	Request to prequalified FSP to place a bid for the flexibility service.	
Info6	Flexibility need	Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids. This request contains information about the needed flexibility service, location/area, volume, date and time interval.	
Info7	Flexibility service bid		
Info8	Selected bids		
Info9	Grid prequalification request	Request for grid prequalification sent by FSP or flexibility resource owner. The request contains all technical data such as: 1. Flexibility resource type 2. Connectivity (voltage level, transformer substation, DSO) 3. Location (GPS coordinates) 4. Active power 5. .... Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO.	
Info10	Grid prequalification report	This is information to FSP about the grid prequalification and it is in the form of a document.	
Info11	Grid prequalification test results	This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered and used later without negative impact on the distribution grid.	
Info12	Offer acceptance	Information about accepted offers.	
Info13	Flexibility offer	Offer for the flexibility service on OTC market.	
Info14	Request for flexibility offer		

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info15	Prequalification request	Request document with all the information necessary to run prequalification tests. These documents include: 1. Type of the DER 2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location) 3. Installed power	
Info16	Prequalification information	Document with the prequalification results.	
Info17	Product prequalification request	Request for product prequalification with accompanying documents.	
Info18	Product prequalification test results	Results of tests run by DSO.	
Info19	Product prequalification requirements	Detailed description of the flexibility service product and requirements. This is a document.	
Info20	Product prequalification report		
Info21	Volume acknowledged	FSP agrees with the calculated volume related to the delivered flexibility service.	
Info22	Bill	Document, not modelled in CIM.	
Info23	Reimbursement	This information is related to the sending the invoice and payment. It will not be modelled with CIM.	
Info24	Flexibility service volume	Information about calculated delivered volume, from the baseline and measurements.	
Info25	Recalculation request	FSP determinates the deviation in the calculated volume and requests a check of the calculation.	
Info26	Volume validation request	After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement.	

Voltage control in distribution grids under market conditions

Based on IEC 62559-2 edition 1
Generated from UML Use Case Repository with Modsarus® (EDF R&D Tool)

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-SL-02	Energy market	Voltage control in distribution grids under market conditions

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	2021-02-17	Rok Lacko (GEN-I)	draft-concept	
2	2021-04-28	Nermin Suljanović (EIMV)	Domain, Roles, BUC description, SUC list without detailed description	
3	2021-08-16	Luka Nagode (GEN-I)	Roles, SUC description	
4	2021-08-25	Matej Malenšek (GEN-I)	BUC description	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	An increased number of household solar power plants causes voltage increase on LV voltage substations. Integrated smart inverters have advanced power controlling functions and with adjusting the output of active power, they may be used as voltage reduction devices. Using Volt-Watt method we would properly design the control parameters in the PV inverters. With this control method voltage violation would be mitigated and the power curtailment would be evenly distributed among the PV power plants. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process in which managing flexibility in the distribution grid (e.g., mitigating active power of the PV plants and charging household battery systems with excess energy) can prevent that distribution grid overreaches its physical limits (e.g. voltage increase, transformer overheating, line congestion). It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions.
Objective(s)	Deferral of grid reinforcement investments (defer or avoid secondary substation replacement). Improve security of supply. Validate demand response mechanism to prevent voltage increase in the distribution grid. Test flexibility products to prevent voltage increase in the distribution grid under market conditions.

Related business case(s)	EACL-SL-01 (Congestion management)

1.4. Narrative of Use Case

Narrative of use case
Short description
Due to increase of variable renewable energy sources (RES), such as household PV power plants (PV PP), we are facing with the increase of voltage in the MV/LV distribution systems, when demand does not meet production. Adjustments could be made on the transformers, so the delivered power is within the regulatory requirements, but this method is limited. Another way to reduce the voltage could be putting an export limit on solar systems, but in this case the investors/owners of the PV plants would suffer losses when net-metering calculation is made at the end of the year. To avoid these losses, batteries could be installed into their households, connected directly to the inverter. When voltage control is needed, active power curtailment would be activated via an inverter, and the excess energy, that would usually be directed into the LV system, would be used to charge the battery systems. The voltage in the MV/LV system would drop, and the stored energy could be used later in the day (for charging EVs, or for other demand response services). Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In regard how DSO procure this flexibility service, two scenarios are considered. In the first scenario, service provider (e.g., aggregator) enters into a contract with DSO for a long-term period. The second scenario assumes that local flexibility market exists and that DSO purchases flexibility service at the local flexibility market to resolve voltage increase problems in the distribution grid.
Complete description
In this BUC, battery systems (charged by the excess energy from the PV PP production), connected to the distribution grid, are used as flexibility resources to lower the voltage level. Voltage reduction would be Using PV inverters as smart control devices, which are already installed in the system, DSO could postpone investments in the grid reinforcement. Depending on how local flexibility market is organised, two scenarios are considered. The first scenario corresponds to **over the counter (OTC) market** in which flexibility service provider (FSP) make a long-term (e.g., 12 months) bilateral contract with DSO related. This first scenario includes the following processes: · **Prequalification**: after DSO publishes a call for flexibility procurement, FSP would list the aggregated units (Battery systems). Battery systems are installed within the DSO requirements. The FSP will control the active power on the inverter by the API, which would later be redirected into charging the battery. DSO evaluates the units and confirm capability of the FSP to deliver a service. · **Offering**: when DSO identifies a need for the flexibility, DSO sends requests for offers. FSP sends an offer. DSO collects and ranks the offer. After selection of the best offer, contract is signed. · **Activation**: when voltage increase n in the grid is predicted or occurred, DSO sends a request to FSP for contracted flexibility at a given location in the distribution grid. FSP acknowledges request and activates a service (e.g., reduces a consumption by switching off heat pumps). · **Settlement**: using calculated base line, volume of the delivered power is calculated. This is volume is confirmed by both sides (e.g., check of error in measurements) and invoice is sent. In the second scenario, DSO procures flexibility on the **organised local flexibility market**. This scenario includes the following processes: · **Grid prequalification:** at the start of this process, flexibility resources are registered at the flexibility register. Flexibility register (component located at the market operator) initiates prequalification of the registered resource run by DSO, to validate existence of the resource and its impact on the distribution grid. The complexity of this procedure depends on the volume/power and the impact on the grid of the flexibility resources.

· **Product prequalification**: DSO defines the requirements that each local flexibility product should meet. Flexibility market operator (FMO) coordinates the prequalification process. Flexibility service provider sends the prequalification request with accompanying information to the FMO, who forwards this request to DSO. DSO runs predefined tests and calculation, after send the results and acknowledge FMO about the final decision. FMO stores this information to the flexibility register and acknowledges FSP.
· **Bidding**: DSO expresses the need for the flexibility service to FMO (based on the load and distributed generation prediction and state of the distribution grid), which publishes request for bids. FMO collects the bids from flexibility service provides and selects the optimal bids. FMO sends information about selected bids to DSO, flexibility service provider, TSO and flexibility register.
· **Activation**: For the selected bid, activation is initiated by DSO sending activation signal to the flexibility service provider. FSP internally activates flexibility resources and acknowledges DSO. DSO informs TSO about activated flexibility resources in the distribution grid in order to avoid collision and double activation on the balancing market. During the activation, flexibility register (component of the market operator) collects the measurements from DSO and FSP.
Settlement: Flexibility register calculates the base line. After the activated product has been delivered, flexibility register calculates delivered volume and information to DSO and FSP. In the process of volume validation, DSO and FSP should validate delivered volume. When volume can't be validated, alignment process is initiated. FMO monetizes the delivered flexibility product and send the bill to DSO and reimbursement to FSP.

Summary of use case

If flexibility market not organised:

- **Prequalification**
  Description: On OTC market, prequalification run by DSO only.
    - Publish call for flexibility services
      Description: DSO expresses a need for a flexibility services to prevent voltage increase in the distribution grid and publishes a call to prequalificate products that meet DSO requirements.
    - Receive prequalification decision and acknowledge
      Description:
    - Receive prequalification information and acknowledge
      Description:
    - Receive request for prequalification
      Description:
    - Run prequalification tests
      Description:
    - Send a request for the flexibility service prequalification
      Description:
    - Send prequalification test results and acknowledgement
      Description:
- **Offering**
  Description: Flexibility service provider (FSP) makes a long-term (e.g., 12 months) contract with DSO. This corresponds to the OTC market.

- Call for offers closed
  Description:
- Flexibility service offer reception
  Description:
- Ranking and selection of offers
  Description:
- Receive information about selected offers
  Description:
- Receive the request for an offer
  Description:
- Send acceptance offer confirmation
  Description:
- Send an offer for the flexibility service
  Description:
- Send the need for the flexibility
  Description:

- **Activation-OTC**
  Description: DSO activates flexibility product to avoid voltage increase in the grid.
  - Activate flexibility resources
    Description:
  - Receive activation acknowledgment
    Description:
  - Receive activation request
    Description:
  - Receive activation status
    Description: Information about flexibility resource activation
  - Receive measurements
    Description:
  - Send acknowledgement
    Description: ACK is sent to confirm reception of a document.
  - Send activation request for contracted flexibility
    Description:
  - Send activation status
    Description:
  - Send activation status
    Description: Information when flexibility service ended.

- Send measurements
  Description:

- **Settlement-OTC**
  Description: Settlement for the delivered flexibility service on the OTC market.

    - Calculate base line
      Description:

    - Calculate delivered volume
      Description:

    - Receive acknowledgement
      Description:

    - Receive proposed volume
      Description:

    - Receive the reimbursement
      Description:

    - Request volume recalculation
      Description:

    - Send acknowledgement
      Description:

    - Send request to validate volume
      Description:

    - Send the reimbursement
      Description:

    - Volume recalculation
      Description:

If flexibility market is organised

- **Grid prequalification**
  Description: Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.

    - Initiate grid prequalification
      Description:

    - Receive grid prequalification report
      Description:

    - Receive grid prequalification request
      Description:

- Register flexibility resource
  Description:
- Request to register flexibility resource
  Description:
- Run grid prequalification tests
  Description:
- Send grid prequalification report
  Description:
- Send grid prequalification result
  Description:
- Validate and register flexibility resource
  Description:

- **Product prequalification**
  Description: Process is coordinated by the Flexibility Market Operator (FMO).
  - Evaluate prequalification test results
    Description:
  - Publish call for flexibility service
    Description:
  - Receive and acknowledge
    Description:
  - Receive and acknowledge
    Description:
  - Receive and acknowledge
    Description:
  - Receive and forward request for flexibility service prequalification
    Description:
  - Receive and validate request
    Description:
  - Receive prequalification test results
    Description:
  - Run prequalification tests
    Description:
  - Send prequalification test results
    Description:
  - Send product prequalification requirements
    Description:

        - Send request for flexibility service prequalification
          Description:
        - Send service prequalification information
          Description:

- **Bidding**
  Description: Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.
        - Activity1
          Description:
        - Market clearing
          Description:
        - Publish flexibility need
          Description:
        - Receive and acknowledge
          Description:
        - Receive and acknowledge
          Description:
        - Receive call for bid
          Description:
        - Receive flexibility service bid
          Description:
        - Send flexibility need
          Description:
        - Send flexibility service bid
          Description:
        - Send trading results
          Description:

- **Activation**
  Description: Activation of flexibility service procured on the flexibility market.
        - Activate flexibility resource
          Description:
        - Receive acknowledgement
          Description:
        - Receive activation info
          Description:

- Receive activation measurement
  Description:
- Receive measurements
  Description:
- Send acknowledgement
  Description:
- Send activation info
  Description:
- Send activation signal
  Description:
- Send real-time measurements
  Description:
-

- **Settlement**
  Description: Monetisation of the delivered flexibility product, procured on the flexibility market.
  - Calculate baseline
    Description:
  - Monetiye flexibility service
    Description:
  - Receive acknowledgement
    Description:
  - Receive proposed volume
    Description:
  - Receive proposed volume
    Description:
  - Receive the bill
    Description:
  - Receive the reimbursement
    Description:
  - Send acknowledgement
    Description:
  - Send acknowledgement
    Description:
  - Send the bill
    Description:

- Send the reimbursement
  Description:
- Start alignment process
  Description:
- Start volume alignment process
  Description:
- Validate delivered volume
  Description:
-

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	A number of succefully avoided events of voltage increase during demonstration period		Deferral of grid reinforcement investments (defer or avoid secondary substation replacement) Improve security of supply
2	Volume of activated flexibility services		Validate demand response mechanism to prevent voltage increase in the distribution grid.
3	Success of local flexibility market platform test		Validate demand response mechanism to prevent voltage increase in the distribution grid. Test flexibility products to prevent voltage increase in the distribution grid under market conditions.

1.6. Use case conditions

Use case conditions	
Assumptions	
1	Local flexibility market
2	DSO procures voltage control services at the local flexibility market.
Prerequisites	
1	Flexibility service provider provides flexibility services to DSO to avoid problems with voltage increase in the grid.
2	Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid.

1.7. Further information to the use case for classification/mapping

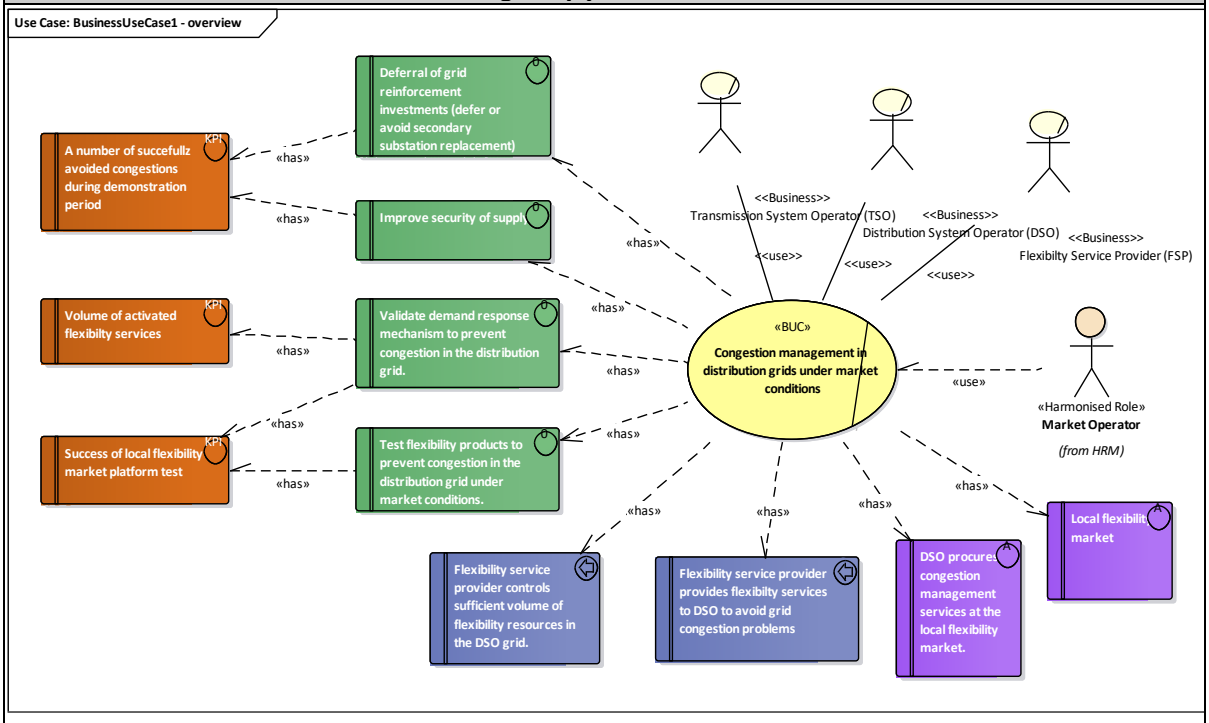
Classification information
Relation to other use cases
<<SUC>> Prequalification <<SUC>> Offering <<SUC>> Activation-OTC <<SUC>> Settlement-OTC <<SUC>> Grid prequalification <<SUC>> Product prequalification <<SUC>> Bidding <<SUC>> Activation - Flexibility market <<SUC>> Settlement-Flexibility market

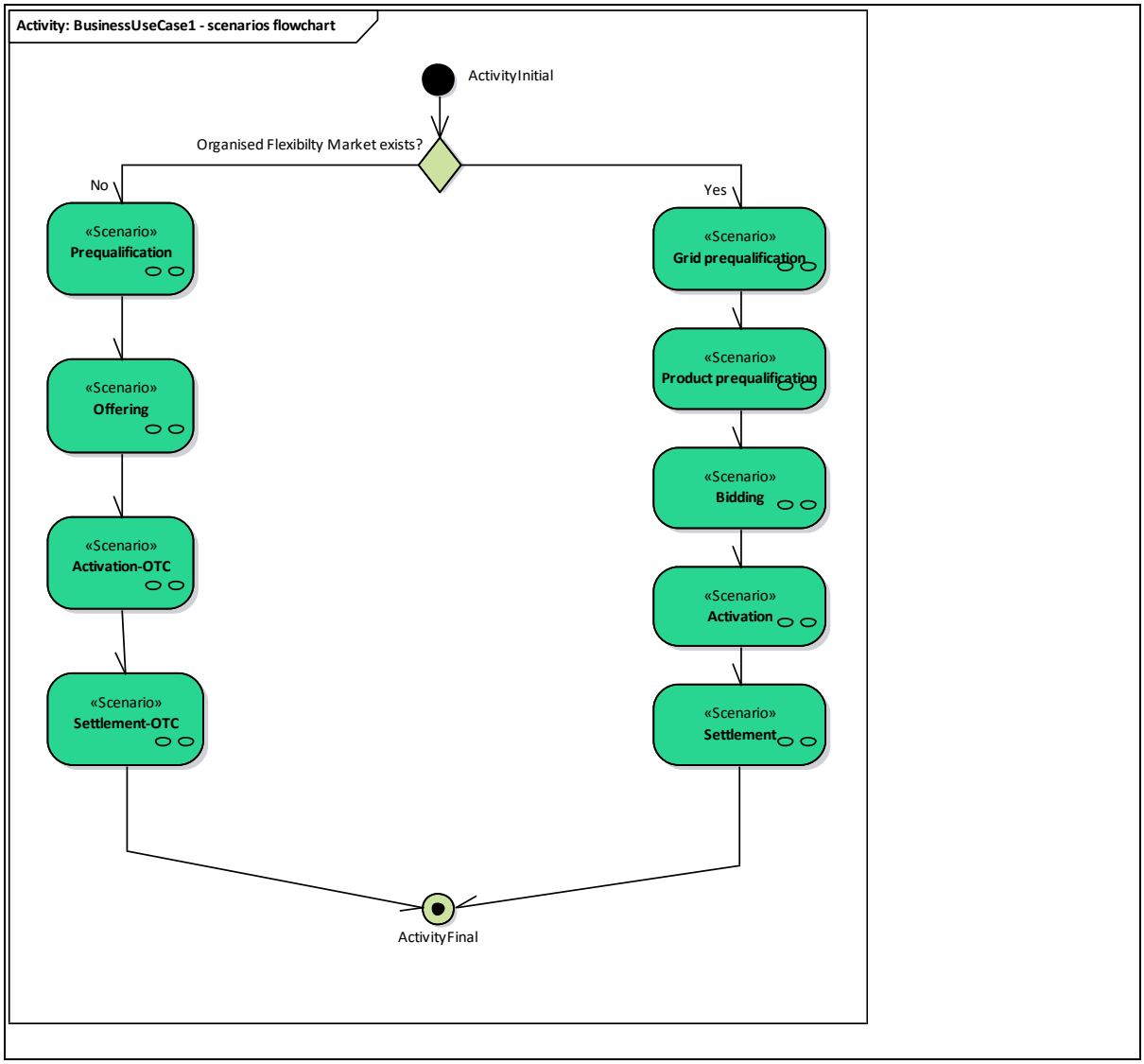
Level of depth
High level
Prioritisation
Generic, regional or national relation
National relation
Nature of the use case
BUC
Further keywords for classification
Flexibility, Local flexibility market, Voltage control

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case





3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this business use case***
Transmission System Operator (TSO)	Business	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring	

		the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area. Source: EU Commission Task Force for Smart Grids, EG3	
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity. Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast),	
Flexibility Service Provider (FSP)	Business	Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties.	
Market Operator	Harmonised Role	A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity. **Additional Information**: This usually is an energy/power exchange or platform. The definition is based on Regulation on the internal market for electricity (EU) 2019/943.	

3.2. Systems

Actors			
Grouping (e.g. domains, zones)		***Group description***	
System name	***System owner***	***System description***	***Further information specific to this system use case***
DSO Scada system	Distribution System Operator (DSO)	System responsible for displaying grid measurements, which serve as input for DSO activation system	
TSO Scada system	Transmission System Operator (TSO)	System responsible for displaying grid measurements, which serve as input for ancillary services etc.	
DSO smartgrid activation system	Distribution System Operator (DSO)	Automatic system that according to the measurements decide where an activation is needed	
DSO smartgrid platform	Distribution System Operator (DSO)	Controls registers of all location where flexibility is needed, communicates with bidding platform from market operator	

Virtual power plant technical channel	Flexibility Service Provider (FSP)	Takes care of real-time exchanged information for activations etc.	
Virtual power plant business channel	Flexibility Service Provider (FSP)	Takes care of business files exchange (bids, measurements etc)	
Virtual power plant	Flexibility Service Provider (FSP)	System responsible for units activation, internal baseline calculations, monitoring of available locations	
Bidding platform	Market Operator	System collecting DSO offerings and FSP bids, organising them and publishing results	
Settlement system	Market Operator	System collecting DSO activations and FSP measurements, evaluating activation success and energy to be paid	
Unit controller	Flexibility Service Provider (FSP)	Controller that transmits activation demand to technical units	

3.3. References

4. Step by step analysis of use case

4.1. Overview of scenarios

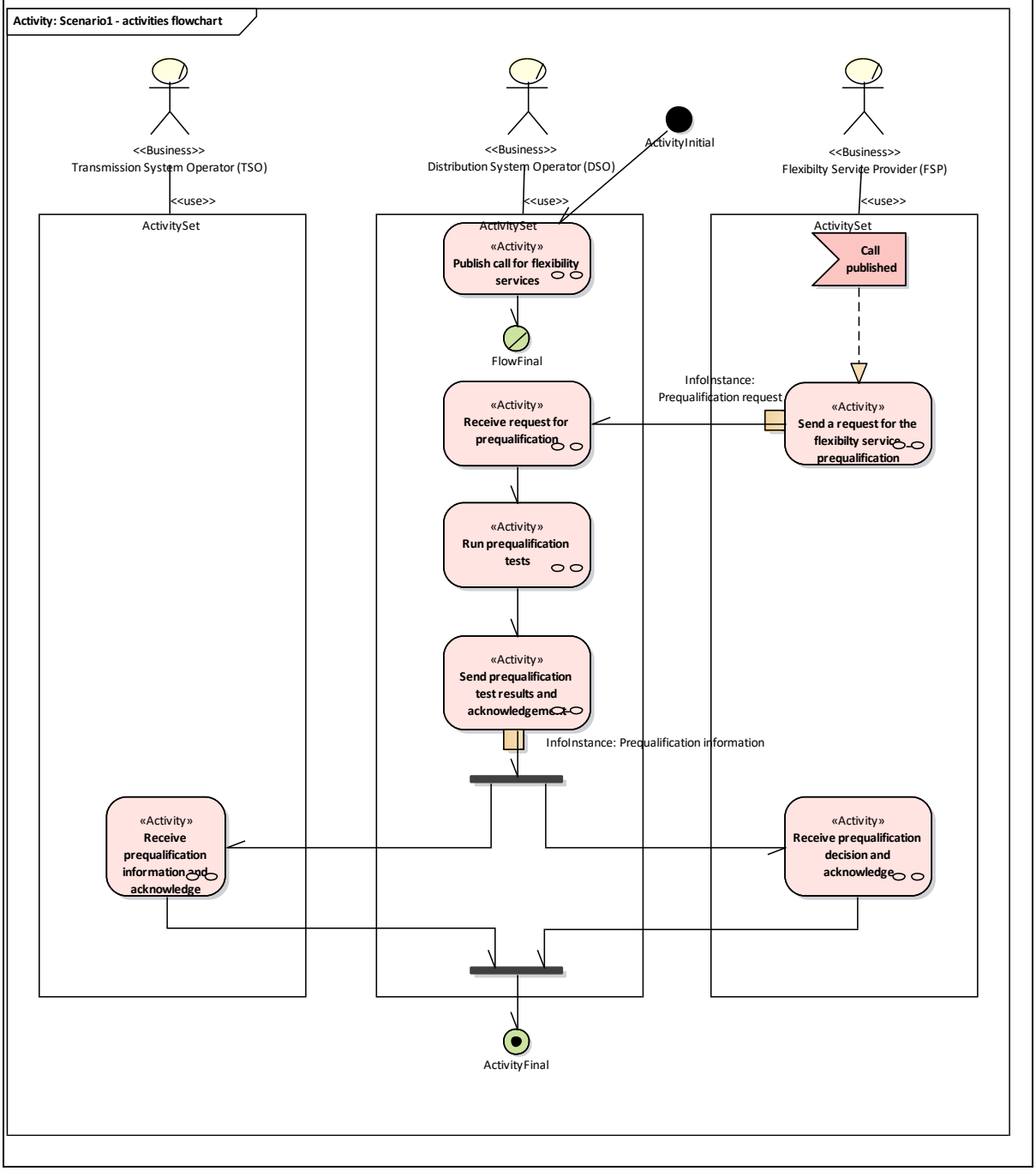
Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Prequalification	On OTC market, prequalification run by DSO only.	DSO			
2	Offering	Flexibility service provider (FSP) makes a long-term (e.g.12 months) contract with DSO. This corresponds to the OTC market.	FSP			
3	Activation-OTC	DSO activates flexibility product to avoid voltage increase in the grid.	DSO			
4	Settlement-OTC	Settlement for the delivered flexibility service on the OTC market.	FSP?			
5	Grid prequalification	Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.	DSO			
6	Product prequalification	Process is coordinated by the Flexibility Market Operator (FMO).	FMO			
7	Bidding	Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.	FMO			
8	Activation	Activation of flexibility service procured on the flexibility market.	DSO			

9	Settlement	Monetisation of the delivered flexibility product, procured on the flexibility market.	FMO? DSO?			

4.2. Steps – Scenarios for flexibility market not organised

Prequalification BUC

On OTC market, prequalification run by DSO only.



Scenario step by step analysis

Scenario								
Scenario name		Prequalification						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
1.1		Publish call for flexibility services	DSO expresses a need for a flexibility services to prevent a voltage increase in the distribution grid and publishes a call to prequalificate products that meet DSO requirements.		Distribution System Operator (DSO)	Flexibility Service Provider (FSP)		
1.2		Receive prequalification decision and acknowledge			Flexibility Service Provider (FSP)			
1.3		Receive prequalification information and acknowledge			Transmission System Operator (TSO)			
1.4		Receive request for prequalification			Distribution System Operator (DSO)			
1.5		Run prequalification tests			Distribution System Operator (DSO)			
1.6		Send a request for the flexibility service prequalification			Flexibility Service Provider (FSP)	Distribution System Operator (DSO),TSO?	Info15-Prequalification request	
1.7		Send prequalification test results and acknowledgement			Distribution System Operator (DSO)	Flexibility Service Provider (FSP)	Info16-Prequalification information	

- 1.6. Send a request for the flexibility service prequalification

Business section: Prequalification/Send a request for the flexibility service prequalification

Information sent:

Business object	*Instance name*	*Instance description*
Prequalification request		

- 1.7. Send prequalification test results and acknowledgement

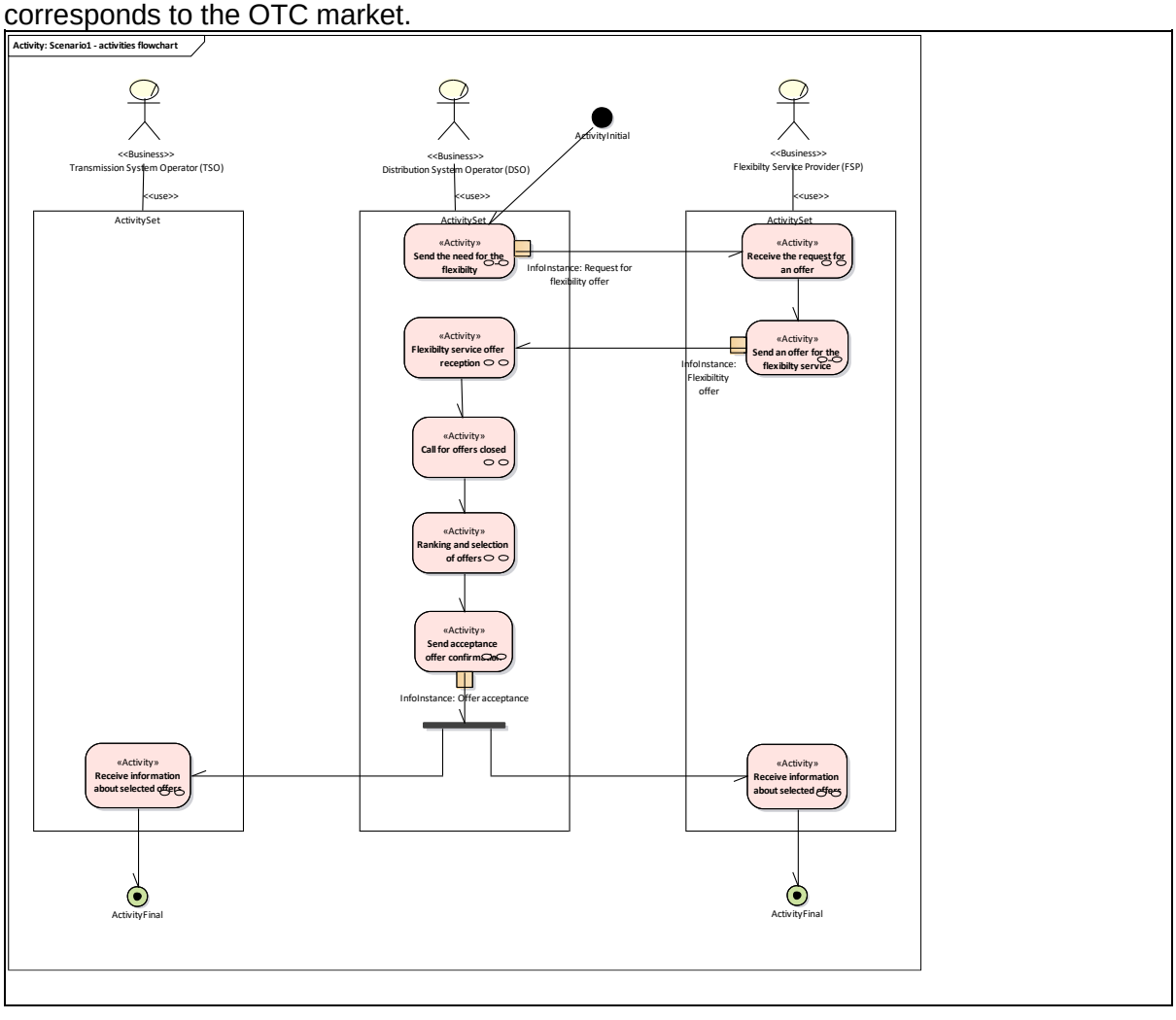
Business section: Prequalification/Send prequalification test results and acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Prequalification information	InfoInstance	

Offering BUC

Flexibility service provider (FSP) makes a long-term (e.g., 6 months) contract with DSO. This corresponds to the OTC market.



Scenario step by step analysis

Scenario								
Scenario name		Offering						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		Call for offers closed			Distribution System Operator (DSO)	FSP		
2.2		Flexibility service offer reception			Distribution System Operator (DSO)	FSP		
2.3		Ranking and selection of offers			Distribution System Operator (DSO)			
2.4		Receive information about selected offers			DSO	Transmission System Operator (TSO)		
2.5		Receive information about selected offers			DSO	Flexibility Service Provider (FSP)		
2.6		Receive the request for an offer			DSO	Flexibility Service Provider (FSP)		
2.7		Send acceptance offer confirmation			Distribution System Operator (DSO)		Info12-Offer acceptance	
2.8		Send an offer for the flexibility service			Flexibility Service Provider (FSP)		Info13-Flexibiltity offer	
2.9		Send the need for the flexibility			Distribution System Operator (DSO)		Info14-Request for flexibility offer	

- 2.7. Send acceptance offer confirmation

Business section: Offering/Send acceptance offer confirmation

Information sent:

Business object	*Instance name*	*Instance description*
Offer acceptance	InfoInstance	

- 2.8. Send an offer for the flexibility service

Business section: Offering/Send an offer for the flexibility service

Information sent:

Business object	*Instance name*	*Instance description*
Flexibiltity offer	InfoInstance	

- 2.9. Send the need for the flexibility

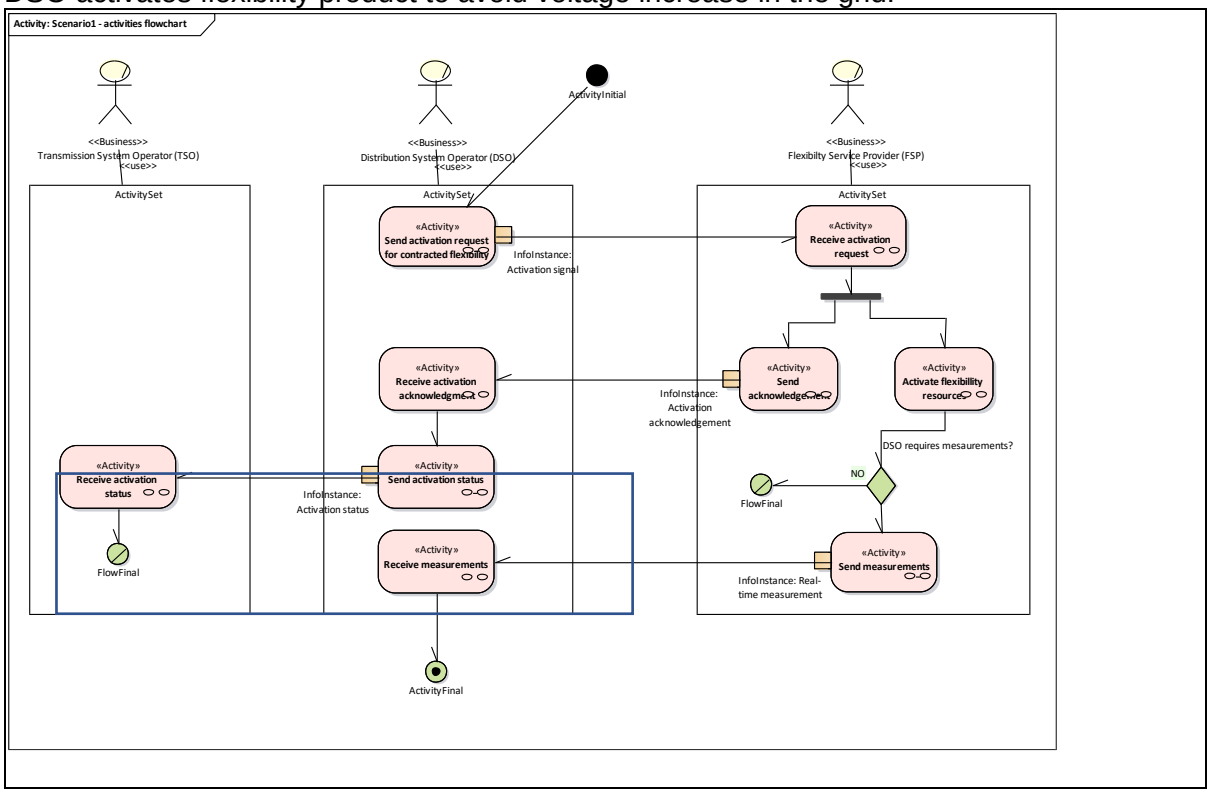
Business section: Offering/Send the need for the flexibility

Information sent:

Business object	*Instance name*	*Instance description*
Request for flexibility offer	InfoInstance	

Activation-OTC BUC

DSO activates flexibility product to avoid voltage increase in the grid.



Scenario step by step analysis

Scenario								
Scenario name		Activation-OTC						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
3.1		Activate flexibility resources			Flexibility Service Provider (FSP)			
3.2		Receive activation acknowledgment			FSP	Distribution System Operator (DSO)		
3.3		Receive activation request			Flexibility Service Provider (FSP)			
3.4		Receive activation status	Information about flexibility resource activation		Distribution System Operator (DSO)	Transmission System Operator (TSO)		
3.5		Receive measurements			Distribution System Operator (DSO)			
3.6		Send acknowledgement	ACK is sent to confirm reception of a document.		Flexibility Service Provider (FSP)		Info1-Activation acknowledgement	
3.7		Send activation request for contracted flexibility			Distribution System Operator (DSO)		Info3-Activation signal	
3.8		Send activation status			Distribution System Operator (DSO)		Info2-Activation status	
3.9		Send activation status	Information when flexibility service ended.					
3.10		Send measurements			Flexibility Service Provider (FSP)		Info4-Real-time measurement	

- 3.6. Send acknowledgement

Business section: Activation-OTC/Send acknowledgement
ACK is sent to confirm reception of a document.
Information sent:

Business object	*Instance name*	*Instance description*
Activation acknowledgement	InfoInstance	

- 3.7. Send activation request for contracted flexibility

Business section: Activation-OTC/Send activation request for contracted flexibility

Information sent:

Business object	*Instance name*	*Instance description*
Activation signal	InfoInstance	

- 3.8. Send activation status

Business section: Activation-OTC/Send activation status

Information sent:

Business object	*Instance name*	*Instance description*
Activation status	InfoInstance	

- 3.10. Send measurements

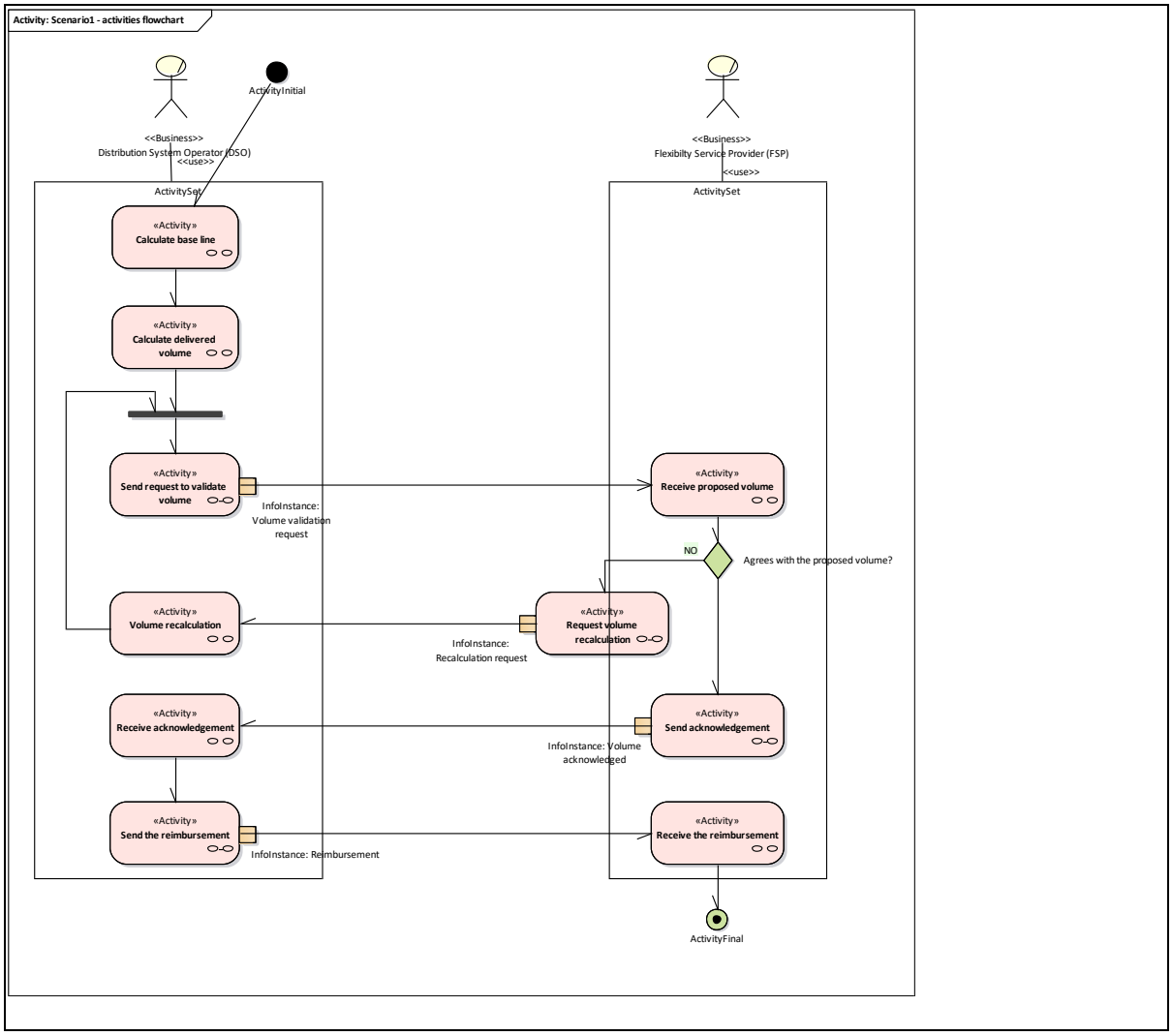
Business section: Activation-OTC/Send measurements

Information sent:

Business object	*Instance name*	*Instance description*
Real-time measurement	InfoInstance	

Settlement-OTC BUC

Settlement for the delivered flexibility service on the OTC market.



Scenario step by step analysis

Scenario								
Scenario name		Settlement-OTC						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
4.1		Calculate base line			Distribution System Operator (DSO)			
4.2		Calculate delivered volume			Distribution System Operator (DSO)			

4.3		Receive acknowledgement			Distribution System Operator (DSO)			
4.4		Receive proposed volume			Distribution System Operator (DSO)	Flexibility Service Provider (FSP)		
4.5		Receive the reimbursement			Flexibility Service Provider (FSP)			
4.6		Request volume recalculation					Info25-Recalculation request	
4.7		Send acknowledgement			Flexibility Service Provider (FSP)	Distribution System Operator (DSO)	Info21-Volume acknowledged	
4.8		Send request to validate volume			Distribution System Operator (DSO)	Flexibility Service Provider (FSP)	Info26-Volume validation request	
4.9		Send the reimbursement			Distribution System Operator (DSO)	Flexibility Service Provider (FSP	Info23-Reimbursement	
4.10		Volume recalculation			Distribution System Operator (DSO)			

- 4.6. Request volume recalculation

  Business section: Settlement-OTC/Request volume recalculation

  Information sent:

Business object	***Instance name***	***Instance description***
Recalculation request	InfoInstance	

- 4.7. Send acknowledgement

  Business section: Settlement-OTC/Send acknowledgement

  Information sent:

Business object	***Instance name***	***Instance description***
Volume acknowledged	InfoInstance	

- 4.8. Send request to validate volume

Business section: Settlement-OTC/Send request to validate volume

Information sent:

Business object	*Instance name*	*Instance description*
Volume validation request	InfoInstance	

- 4.9. Send the reimbursement

Business section: Settlement-OTC/Send the reimbursement

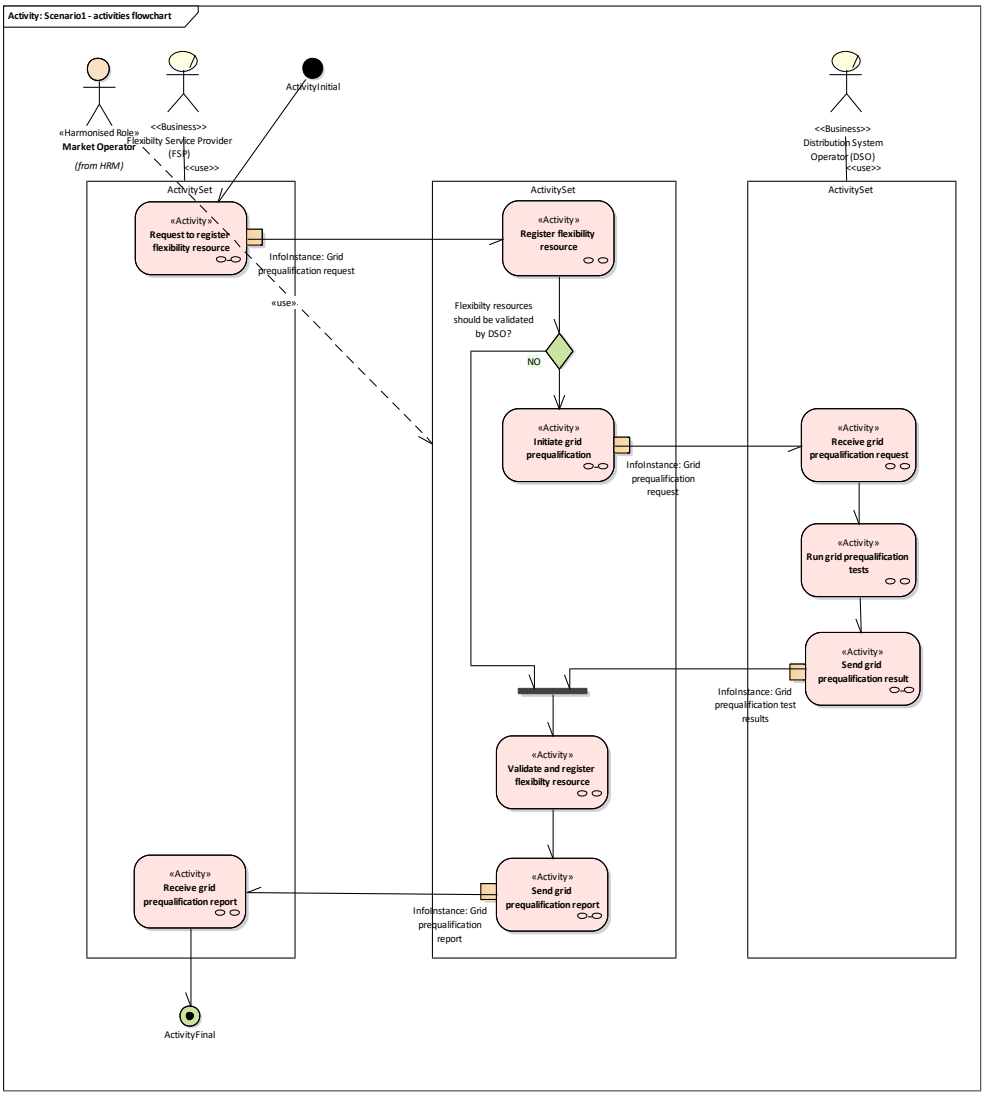
Information sent:

Business object	*Instance name*	*Instance description*
Reimbursement	InfoInstance	

4.3. Steps – Scenarios for organised flexibility market

Grid prequalification BUC

Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.



Scenario step by step analysis

Scenario								
Scenario name		Grid prequalification						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
5.1		Initiate grid prequalification			Market Operator		Info9-Grid prequalification request	
5.2		Receive grid prequalification report			Flexibility Service Provider (FSP)			

5.3		Receive grid prequalification request			Distribution System Operator (DSO)			
5.4		Register flexibility resource			Market Operator			
5.5		Request to register flexibility resource			Flexibility Service Provider (FSP)		Info9-Grid prequalification request	
5.6		Run grid prequalification tests			Distribution System Operator (DSO)			
5.7		Send grid prequalification report			Market Operator		Info10-Grid prequalification report	
5.8		Send grid prequalification result			Distribution System Operator (DSO)		Info11-Grid prequalification test results	
5.9		Validate and register flexibility resource			Market Operator			

- 5.1. Initiate grid prequalification

  Business section: Grid prequalification/Initiate grid prequalification

  Information sent:

Business object	***Instance name***	***Instance description***
Grid prequalification request	InfoInstance	

- 5.5. Request to register flexibility resource

  Business section: Grid prequalification/Request to register flexibility resource

  Information sent:

Business object	***Instance name***	***Instance description***
Grid prequalification request	InfoInstance	

- 5.7. Send grid prequalification report

  Business section: Grid prequalification/Send grid prequalification report

  Information sent:

Business object	Instance name	Instance description
Grid prequalification report	InfoInstance	

- 5.8. Send grid prequalification result

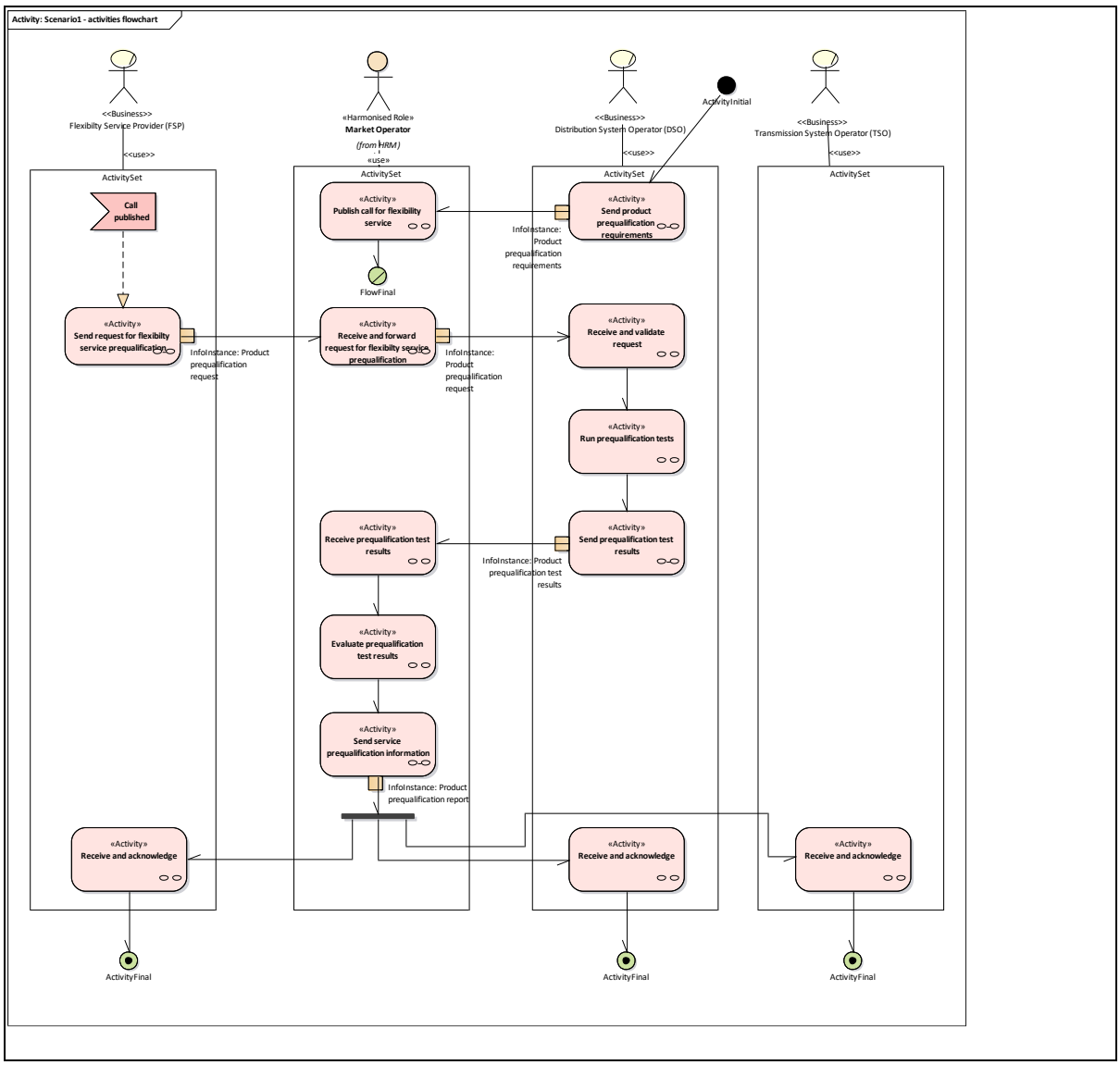
Business section: Grid prequalification/Send grid prequalification result

Information sent:

Business object	Instance name	Instance description
Grid prequalification test results	InfoInstance	

Product prequalification BUC

Process is coordinated by the Flexibility Market Operator (FMO).



Scenario step by step analysis

Scenario								
Scenario name	Product prequalification							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
6.1		Evaluate prequalification test results			Market Operator			
6.2		Publish call for flexibility service			Market Operator			
6.3		Receive and acknowledge			Flexibility Service Provider (FSP)			
6.4		Receive and acknowledge			Distribution System Operator (DSO)			
6.5		Receive and acknowledge			Transmission System Operator (TSO)			
6.6		Receive and forward request for flexibility service prequalification			Market Operator		Info17-Product prequalification request	
6.7		Receive and validate request			Distribution System Operator (DSO)			
6.8		Receive prequalification test results			Market Operator			
6.9		Run prequalification tests			Distribution System Operator (DSO)			
6.10		Send prequalification test results			Distribution System Operator (DSO)		Info18-Product prequalification test results	
6.11		Send product prequalification requirements			Distribution System Operator (DSO)		Info19-Product prequalification requirements	

6.12		Send request for flexibility service prequalification			Flexibility Service Provider (FSP)		Info17- Product prequalification request	
6.13		Send service prequalification information			Market Operator		Info20- Product prequalification report	

- 6.6. Receive and forward request for flexibility service prequalification

  Business section: Product prequalification/Receive and forward request for flexibility service prequalification

  Information sent:

Business object	***Instance name***	***Instance description***
Product prequalification request	InfoInstance	

- 6.10. Send prequalification test results

  Business section: Product prequalification/Send prequalification test results

  Information sent:

Business object	***Instance name***	***Instance description***
Product prequalification test results	InfoInstance	

- 6.11. Send product prequalification requirements

  Business section: Product prequalification/Send product prequalification requirements

  Information sent:

Business object	***Instance name***	***Instance description***
Product prequalification requirements	InfoInstance	

- 6.12. Send request for flexibility service prequalification

  Business section: Product prequalification/Send request for flexibility service prequalification

  Information sent:

Business object	***Instance name***	***Instance description***
Product prequalification request	InfoInstance	

- 6.13. Send service prequalification information

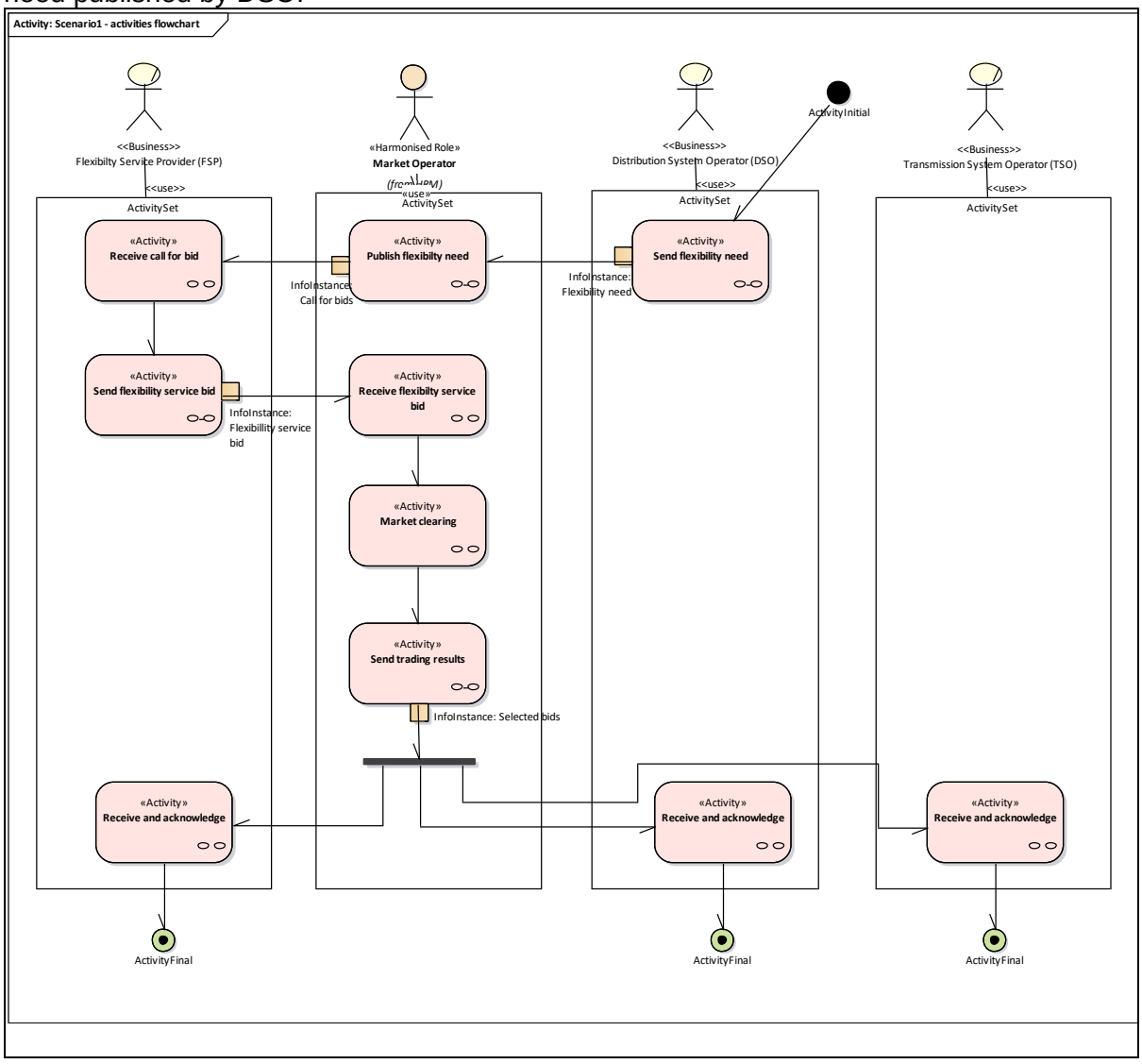
Business section: Product prequalification/Send service prequalification information

Information sent:

Business object	*Instance name*	*Instance description*
Product prequalification report	InfoInstance	

Bidding BUC

Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.



Scenario step by step analysis

Scenario	
Scenario name	Bidding

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
7.1		Send flexibility need			Distribution System Operator (DSO)		Info6-Flexibility need	
7.2		Publish flexibility need			Market Operator		Info5-Call for bids	
7.3		Receive call for bid			Flexibility Service Provider (FSP)			
7.4		Send flexibility service bid			Flexibility Service Provider (FSP)		Info7-Flexibillity service bid	
7.5		Receive flexibility service bid			Market Operator			
7.6		Market clearing			Market Operator			
7.7		Send trading results			Market Operator		Info8-Selected bids	
7.8		Receive and acknowledge			Flexibility Service Provider (FSP)			
7.9		Receive and acknowledge			Distribution System Operator (DSO)			
7.10		Receive and acknowledge			Transmission System Operator (TSO)			

- 7.3. Publish flexibility need

  Business section: Bidding/Publish flexibility need

  Information sent:

Business object	Instance name	Instance description
Call for bids	InfoInstance	

- 7.9. Send flexibility need

Business section: Bidding/Send flexibility need

Information sent:

Business object	*Instance name*	*Instance description*
Flexibility need	InfoInstance	

- 7.10. Send flexibility service bid

Business section: Bidding/Send flexibility service bid

Information sent:

Business object	*Instance name*	*Instance description*
Flexibillity service bid	InfoInstance	

- 7.11. Send trading results

Business section: Bidding/Send trading results

Information sent:

Business object	*Instance name*	*Instance description*
Selected bids	InfoInstance	

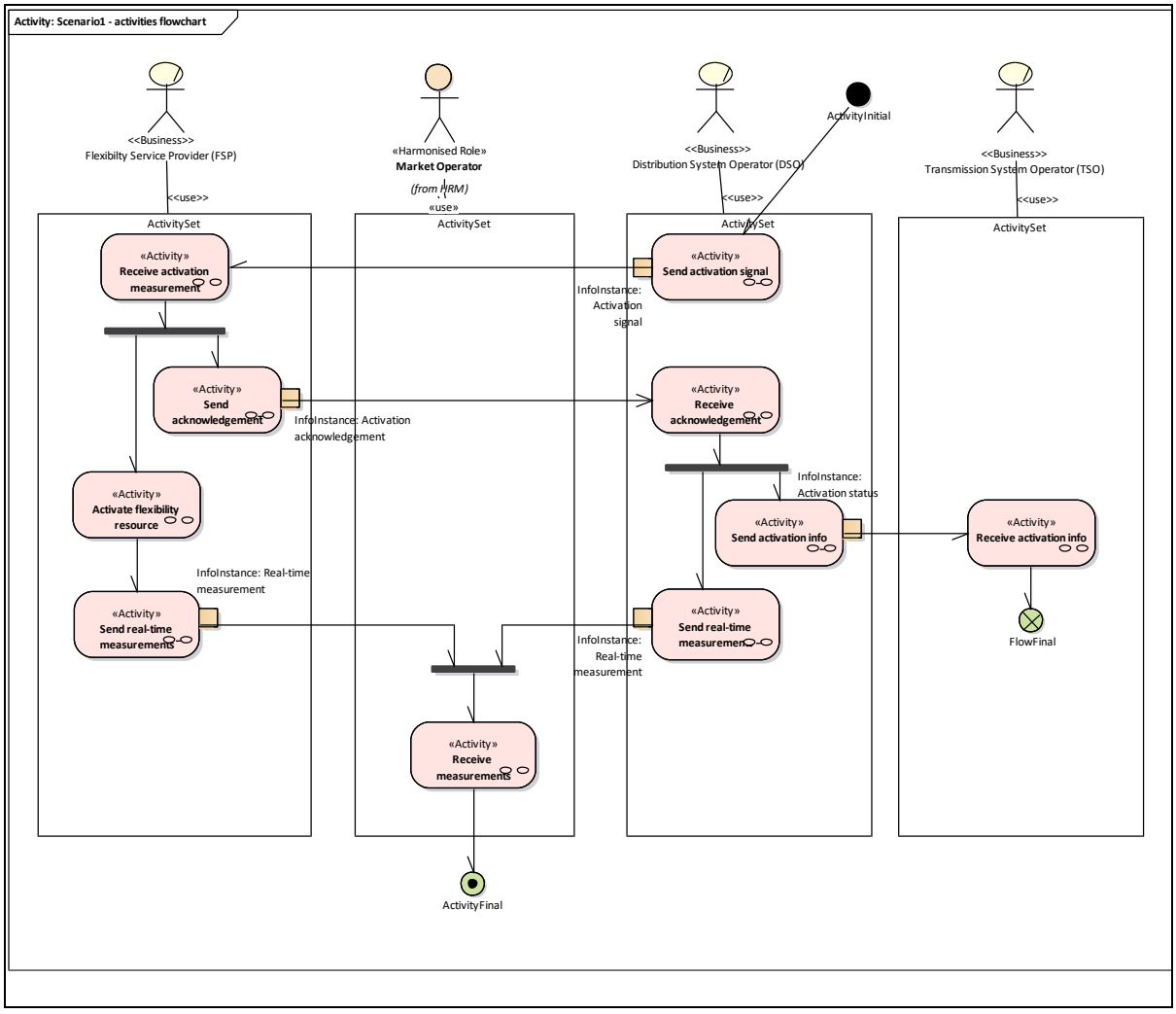
Bidding SUC

Scenario								
Scenario name		Bidding						
Step No	*Event*	*Name of process/activity*	*Description of process/activity*	*Service*	*Information producer (system)*	*Information receiver (system)*	*Information exchanged (IDs)*	*Requirement, R-IDs*
7.1		Send flexibility need			DSO smartgrid platform		Info6-Flexibility need 1.Location 2.Timeframe (dates & hours), 3. Power needed, 4.Max energy price, 5.Max availability price.	

7.2		Publish flexibility need			Bidding platform		Info5-Call for bids	
7.3		Receive call for bid			Virtual power plant business channel			
7.4		Send flexibility service bid			Virtual power plant business channel		Info7-Flexibillity service bid Location Timeframe Energy price Availability price Availability volume	
7.5		Receive flexibility service bid			Bidding platform			
7.6		Market clearing			Bidding platform			
7.7		Send trading results			Bidding platform		Info8-Selected bids Location ContractID Accepted availability volume	
7.8		Receive and acknowledge			Virtual power plant business channel			
7.9		Receive and acknowledge			DSO smartgrid platform			
7.10		Receive and acknowledge			Transmission System Operator (TSO)			

Activation BUC

Activation of flexibility service procured on the flexibility market.



Scenario step by step analysis

Scenario								
Scenario name	Activation							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
8.1		Activate flexibility resource			Flexibility Service Provider (FSP)			
8.2		Receive acknowledgement			Distribution System Operator (DSO)			
8.3		Receive activation info			Transmission System			

					Operator (TSO)			
8.4		Receive activation measurement			Flexibility Service Provider (FSP)			
8.5		Receive measurements			Market Operator			
8.6		Send acknowledgement			Flexibility Service Provider (FSP)		Info1-Activation acknowledgement	
8.7		Send activation info			Distribution System Operator (DSO)		Info2-Activation status	
8.8		Send activation signal			Distribution System Operator (DSO)		Info3-Activation signal	
8.9		Send real-time measurements			Flexibility Service Provider (FSP)		Info4-Real-time measurement	
8.10		Send real-time measurements			Distribution System Operator (DSO)		Info4-Real-time measurement	

- 8.6. Send acknowledgement

  Business section: Activation/Send acknowledgement

  Information sent:

Business object	***Instance name***	***Instance description***
Activation acknowledgement	InfoInstance	

- 8.7. Send activation info

  Business section: Activation/Send activation info

  Information sent:

Business object	***Instance name***	***Instance description***
Activation status	InfoInstance	

- 8.8. Send activation signal

  Business section: Activation/Send activation signal

  Information sent:

Business object	Instance name	Instance description
Activation signal		

- 8.9. Send real-time measurements

  Business section: Activation/Send real-time measurements

  Information sent:

Business object	Instance name	Instance description
Real-time measurement	InfoInstance	

- 8.10. Send real-time measurements

  Business section: Activation/Send real-time measurements

  Information sent:

Business object	Instance name	Instance description
Real-time measurement	InfoInstance	

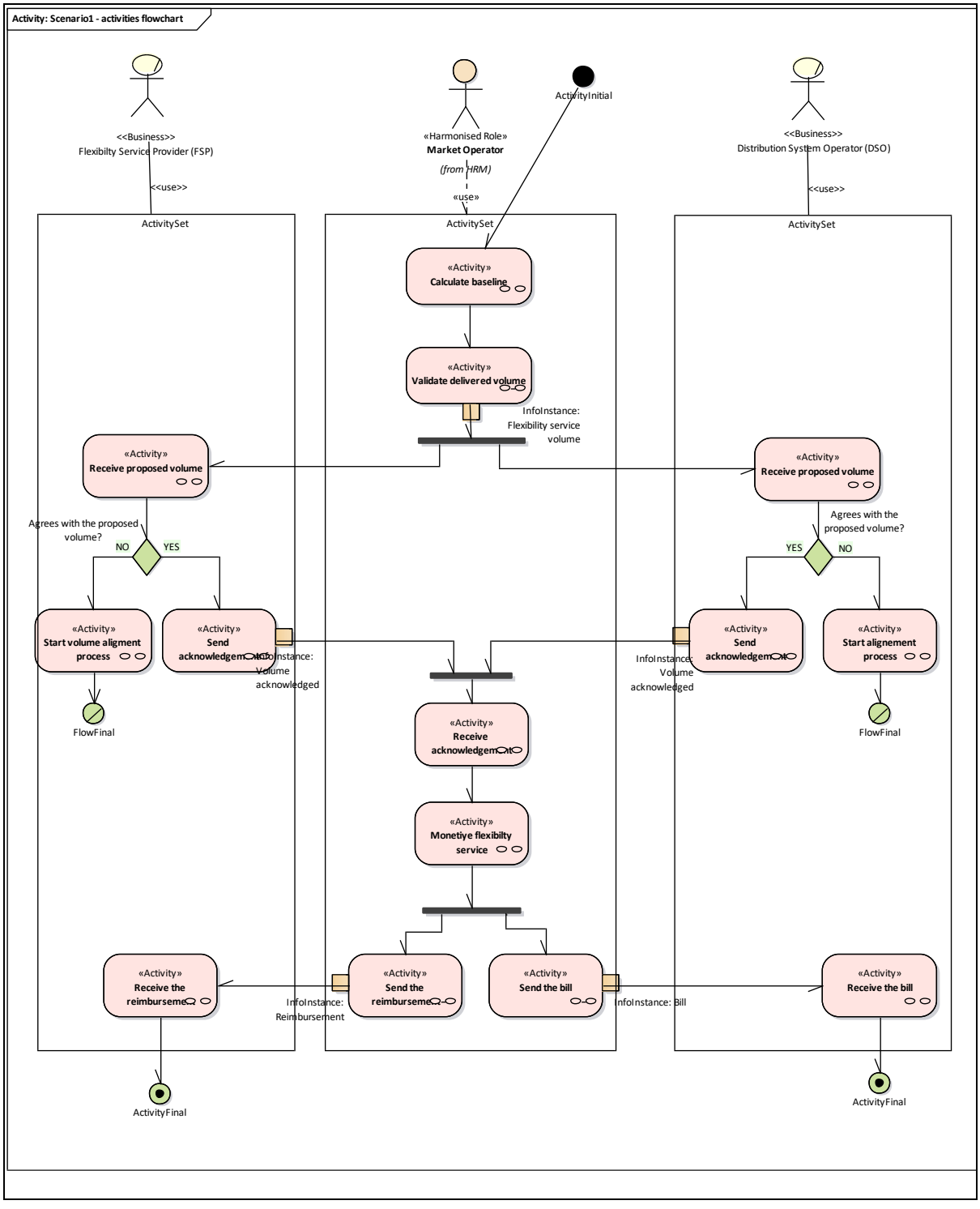
Activation SUC

Scenario								
Scenario name		Activation						
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
8.1		Activate flexibility resource			DSO smartgrid activation system	Virtual power plant technical channel	Contract ID Start of activation End of activation Volume of power	
8.2		Receive acknowledgement			Virtual power plant technical channel	DSO smartgrid activation system	Contract ID Start of activation End of activation Volume of power	
8.3		Receive activation info			DSO smartgrid activation system	TSO Scada system	Location Start of activation End of activation Volume of power	

8.4		Receive activation measurement			Flexibility Service Provider (FSP)	DSO Scada system	Timestamp Power	
8.5		Receive measurements			Virtual power plant business channel	Market Operator	Timestamp Measurements for all technical units in minute resolution	
8.6		Send acknowledgement			Flexibility Service Provider (FSP)	DSO smartgrid activation system	Info1-Activation acknowledgement	
8.7		Send activation info			Distribution System Operator (DSO)	DSO smartgrid activation system	Info2-Activation status	
8.8		Send activation signal			Virtual power plant	Unit controller	Info3-Activation signal	
8.9		Send real-time measurements			Virtual power plant technical channel	DSO Scada system	Info4-Real-time measurement	
8.10		Send real-time measurements			DSO Scada system	TSO Scada system	Info4-Real-time measurement	

Settlement BUC

Monetisation of the delivered flexibility product, procured on the flexibility market.



Scenario step by step analysis

Scenario	
Scenario name	Settlement

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
9.1		Calculate baseline			Market Operator			
9.2		Monetize flexibility service			Market Operator			
9.3		Receive acknowledgement			Market Operator			
9.4		Receive proposed volume			Flexibility Service Provider (FSP)			
9.5		Receive proposed volume			Distribution System Operator (DSO)			
9.6		Receive the bill			Distribution System Operator (DSO)			
9.7		Receive the reimbursement			Flexibility Service Provider (FSP)			
9.8		Send acknowledgement			Flexibility Service Provider (FSP)		Info21-Volume acknowledged	
9.9		Send acknowledgement			Distribution System Operator (DSO)		Info21-Volume acknowledged	
9.10		Send the bill			Market Operator		Info22-Bill	
9.11		Send the reimbursement			Market Operator		Info23-Reimbursement	
9.12		Start alignement process			Distribution System Operator (DSO)			
9.13		Start volume aligment process						
9.14		Validate delivered volume			Market Operator		Info24-Flexibility service volume	

- 9.8. Send acknowledgement

Business section: Settlement/Send acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Volume acknowledged	InfoInstance	

- 9.9. Send acknowledgement

Business section: Settlement/Send acknowledgement

Information sent:

Business object	*Instance name*	*Instance description*
Volume acknowledged	InfoInstance	

- 9.10. Send the bill

Business section: Settlement/Send the bill

Information sent:

Business object	*Instance name*	*Instance description*
Bill	InfoInstance	

- 9.11. Send the reimbursement

Business section: Settlement/Send the reimbursement

Information sent:

Business object	*Instance name*	*Instance description*
Reimbursement	InfoInstance	

- 9.14. Validate delivered volume

Business section: Settlement/Validate delivered volume

Information sent:

Business object	*Instance name*	*Instance description*
Flexibility service volume	InfoInstance	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Activation acknowledgement	To confirm that activation has been executed.	
Info2	Activation status	DSO informs TSO about successful activation of the flexibility service in the distribution grid.	
Info3	Activation signal	This a request for activation of the contracted flexibility resource.	
Info4	Real-time measurement	Measured active power delivered by the flexibility resource. This is time series, delivered in real-time.	
Info5	Call for bids	Request to prequalified FSP to place a bid for the flexibility service.	
Info6	Flexibility need	Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids. This request contains information about the needed flexibility service, location/area, volume, date and time interval.	
Info7	Flexibility service bid		
Info8	Selected bids		
Info9	Grid prequalification request	Request for grid prequalification sent by FSP or flexibility resource owner. The request contains all technical data such as: 1. Flexibility resource type 2. Connectivity (voltage level, transformer substation, DSO) 3. Location (GPS coordinates) 4. Active power 5. .... Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO.	
Info10	Grid prequalification report	This is information to FSP about the grid prequalification and it is in the form of a document.	
Info11	Grid prequalification test results	This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered and used later without negative impact on the distribution grid.	
Info12	Offer acceptance	Information about accepted offers.	
Info13	Flexibility offer	Offer for the flexibility service on OTC market.	
Info14	Request for flexibility offer		

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info15	Prequalification request	Request document with all the information necessary to run prequalification tests. These documents include: 1. Type of the DER 2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location) 3. Installed power 4.	
Info16	Prequalification information	Document with the prequalification results.	
Info17	Product prequalification request	Request for product prequalification with accompanying documents.	
Info18	Product prequalification test results	Results of tests run by DSO.	
Info19	Product prequalification requirements	Detailed description of the flexibility service product and requirements. This is a document.	
Info20	Product prequalification report		
Info21	Volume acknowledged	FSP agrees with the calculated volume related to the delivered flexibility service.	
Info22	Bill	Document, not modelled in CIM.	
Info23	Reimbursement	This information is related to the sending the invoice and payment. It will not be modelled with CIM.	
Info24	Flexibility service volume	Information about calculated delivered volume, from the baseline and measurements.	
Info25	Recalculation request	FSP determinates the deviation in the calculated volume and requests a check of the calculation.	
Info26	Volume validation request	After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement.	

9.2.4.3 Hungarian demo

MV feeder voltage control

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-HU-01	Hungary	MV feeder voltage control

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	07/05 2021	Bálint Hartmann	1.1-1.4 added	
2	24/05 2021	Bálint Hartmann, Péter Sőrés, Bálint Sinkovics	1.5-3.2 added	
3	31/08 2021	Bálint Hartmann, Péter Sőrés, Bálint Sinkovics	Completion	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Increasing renewable penetration causes violation of standard voltage bands on MV lines. The main scope of EACL-HU-01 is to mitigate voltage variations of MV feeders by activating flexibility services.
Objective(s)	The objective of the use case is to keep actual voltage values of MV feeders within the standard bands.
Related business case(s)	EACL-HU-02 “HV/MV transformer overload”

1.4. Narrative of Use Case

Narrative of use case
Short description
Need: Due to the proliferation of PV plants, connected to DSO MV lines or directly to the MV side of HV/MV substations, violation of standard voltage bands on MV lines is a forecoming issue in Hungary. This technical issue can be mitigated by P and/or Q on MV level. Service: Voltage issues of MV feeders can be mitigated by P and/or Q injection/consumption.
Complete description
The BUC operates on two-time horizons, each related to the specified grid service: • capacity auction • and energy activation (scheduled), respectively. Capacity auctions will be driven by technical needs of the DSOs, which are determined on a weekly basis based on weekly maintenance plans. Gate opens at W-1 Monday 0:00 and closes at W-1

Friday 14:00, thus enabling bidders a fairly long time to place bids, but the market can be cleared during working hours on W-1. Results of the auction are to be published by W-1 Friday 15:00.

Energy bids can be submitted between W-1 Monday 0:00 and D-1 6:00. The early gate opening supports the procurement of services that are expected to be necessary with probability. The gate closure on D-1 allows SOs to procure services based on day-ahead predictions and network calculations. Results of the clearing are to be published by D-1 7:00, which is 60 minutes ahead of local daily balancing capacity market gate closure, and well before the active period of DAM market bidding. This allows market players to participate on flexibility and day-ahead markets separately, and also supports that uncleared flexibility bids are submitted to shorter horizon markets (DAM, BAM).

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Number of flexibility service provider assets involved in the service	There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the number of assets involved.	
2	Ratio of flexibility service provider assets involved in the service	There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the ratio of involved and total number of assets involved.	
3	Avoided operational limit violations	The aim of using flexibility services is to mitigate voltage variations of the MV feeders and to avoid possible violations of voltage limits. The KPI reflects on the number and duration of violations avoided.	
4	Bid success	The ratio of accepted (successful) and submitted (total) flexibility bids.	
5	Market success	Flexibility services are one of many possible means to reach the aims of the BUC. The KPI reflects on the ratio of violations avoided by the provision of flexibility services and the violations avoided by other means (redispatch, curtailment, load shedding, etc.).	
6	Successful market optimization runs	The ratio of converging auctions of the market of flexibility services.	
7	Cost of service	Minimal, maximal and average prices of capacity auctions and energy activations are reflective on the liquidity of the market.	
8	Accuracy of DSO flexibility demand prediction	The DSOs prepare for possible operational issues through the energy activations. As energy bids have to be submitted before D-1 6:00, the accuracy of grid forecasts largely affects the performance of the DSO in using flexibility services. The KPI reflects on the accuracy of DSO flexibility demand predictions by calculating the ratio and volume of expected and actual flexibility service needs.	

1.6. Use case conditions

Use case conditions
Assumptions

Prerequisites	
1	DSO requires P and/or Q to keep actual voltage values of MV feeders within the standard bands.
2	FSP capable of providing P and/or Q is located at the bidding zone

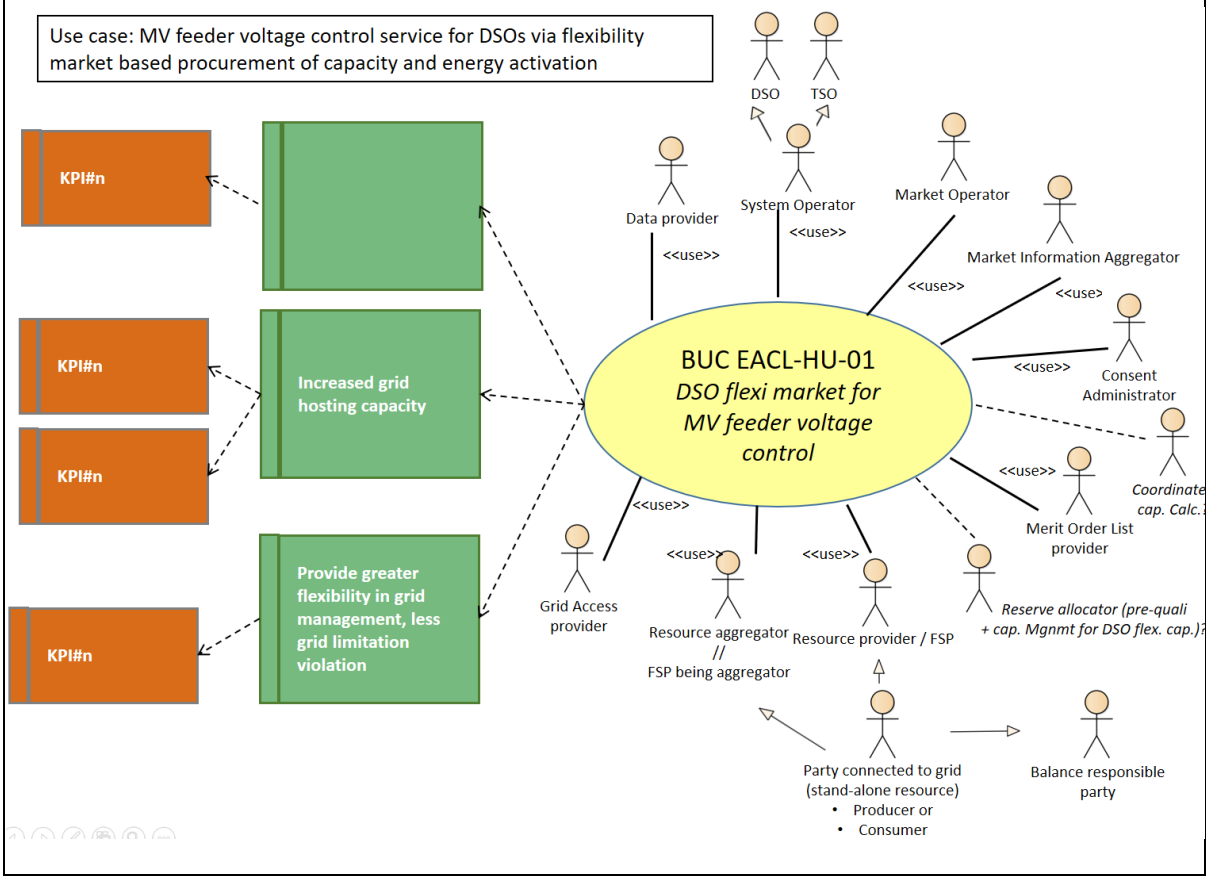
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
BUC will use the same products and market design as EACL-HU-02
Level of depth
Generic use case
Prioritisation
High level of priority
Generic, regional or national relation
National use case for Hungary
Nature of the use case
BUC
Further keywords for classification
MV line, DSO voltage control

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



Not connected to BUC, only indirectly affected:

- *Billing agent*
- *Metered data administ.*
- *Energy supplier*
- *Imbalance settlement responsible*

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Bidding zone ***Metering point***		The actors are grouped by the two layers of the market structure: the operation area of each participating DSO, and the location of metering points (i.e., HV/MV transformer supply area)	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
DSO	• Grid Access Provider • Data Provider • System operator	Active actor Responsible for maintaining service quality (e.g., EN 50160) and quantifying flexibility service needs Participates in energy auctions and energy activations	In the present BUC, the DSO is responsible for the operation of the distribution network and all related technical matters.
TSO	• System Operator • Data Provider	Passive actor Receives information on capacity auctions and energy activations	In the present BUC, the TSO is informed on the results of the flexibility service market and the actions of DSOs and FSPs. The TSO considers this information in the operation of the transmission system and all related technical matters.
FSP	• Flexibility/Balancing Service Provider • Resource aggregator • Producer / Consumer • Party connected to the grid • Flexibility service provider being aggregator	Provides services for the DSO Provides information to the TSO in case of activations through schedules	In the present BUC, the FSP is technology-independent; potential assets include photovoltaic plants, energy storage, B2B demand-side response, etc.
Market operator	• Market operator • Data Provider • Merit Order List Responsible	Responsible for market clearing	In the present BUC, the market operator aggregates the supply bids in the order book and carry out market clearing process.
OneNet common platform	• Flexibility register provider // consent administrator • TSO-DSO coordinator platform provider // coordinated cap. calculator	Responsible for the necessary TSO-DSO coordination	In the present BUC, the common coordination platform carries out TSO-DSO and DSO-FSP coordination steps, including DSO demand finalization, flexibility registration and bid prequalification, and market result broadcasting.

	• Market interface provider / market information aggregator		

3.2. References

https://eepublicdownloads.entsoe.eu/clean-documents/EDI/Library/HRM/Harmonised_Role_Model_2020-01.pdf

4. Step by step analysis of use case

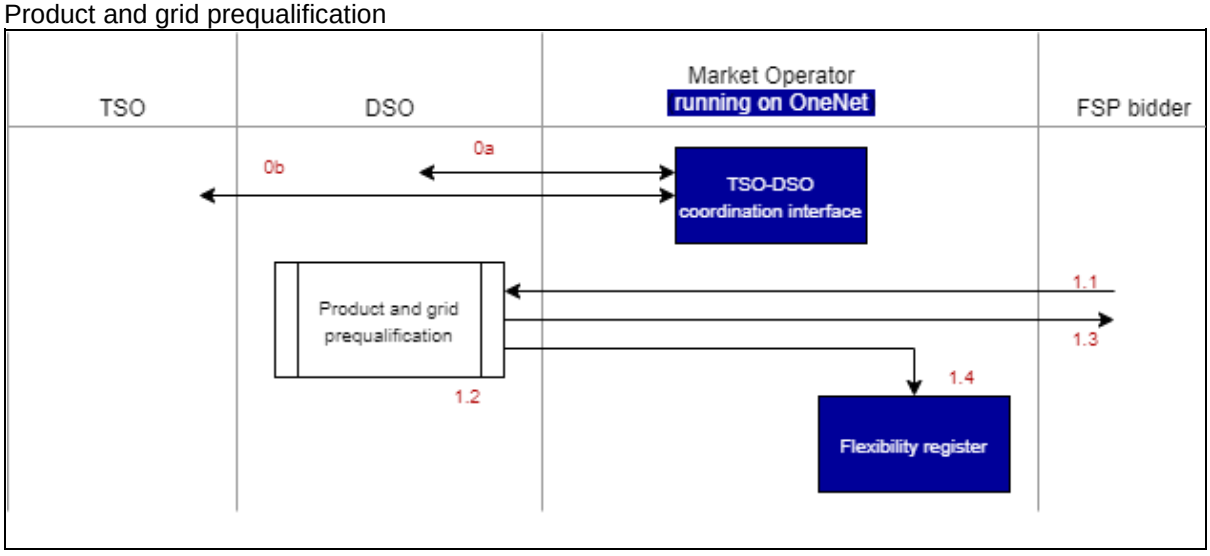
4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Scenario 1: Prequalification	Product and grid prequalification				
2	Scenario 2: Forecasting	DSO determines the volume and spatial-temporal location of flexibility needs	DSO			
3	Scenario 3: W-1 flexibility procurement W-1	Collection of supply bid in the order book, market clearing in W-1	Market operator	time, Gate Opening of W-1 capacity market		
4	Scenario 4: D-1 flexibility procurement	Collection of supply bid in the order book, market clearing in D-1	Market operator	time, Gate Opening of W-1 capacity market		

4.2. Steps - Scenarios

Scenario 1: Prequalification

Product and grid prequalification



Scenario step by step analysis

Scenario								
Scenario name		Scenario 1: Prequalification						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1		Prequalification request	FSP requests prequalification		FSP	DSO	I-01	
1.2		Product and grid prequalification	DSO executes prequalification		DSO,	DSO		
1.3		Approval of prequalification	DSO informs FSP of the prequalification result		DSO	FSP	I-02	
1.4		Prequalification results	Prequalification result is sent to the Market Operator (MO)		DSO	MO (Flexi register)	I-03	

- Step No 1.1 / Prequalification request

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP initialization data for prequalification	data transfer	FSP initializes prequalification

- Step No 1.3 / Approval of prequalification

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP qualification result	Data transfer	Status of FSP prequalification

- Step No 1.4 / Prequalification results

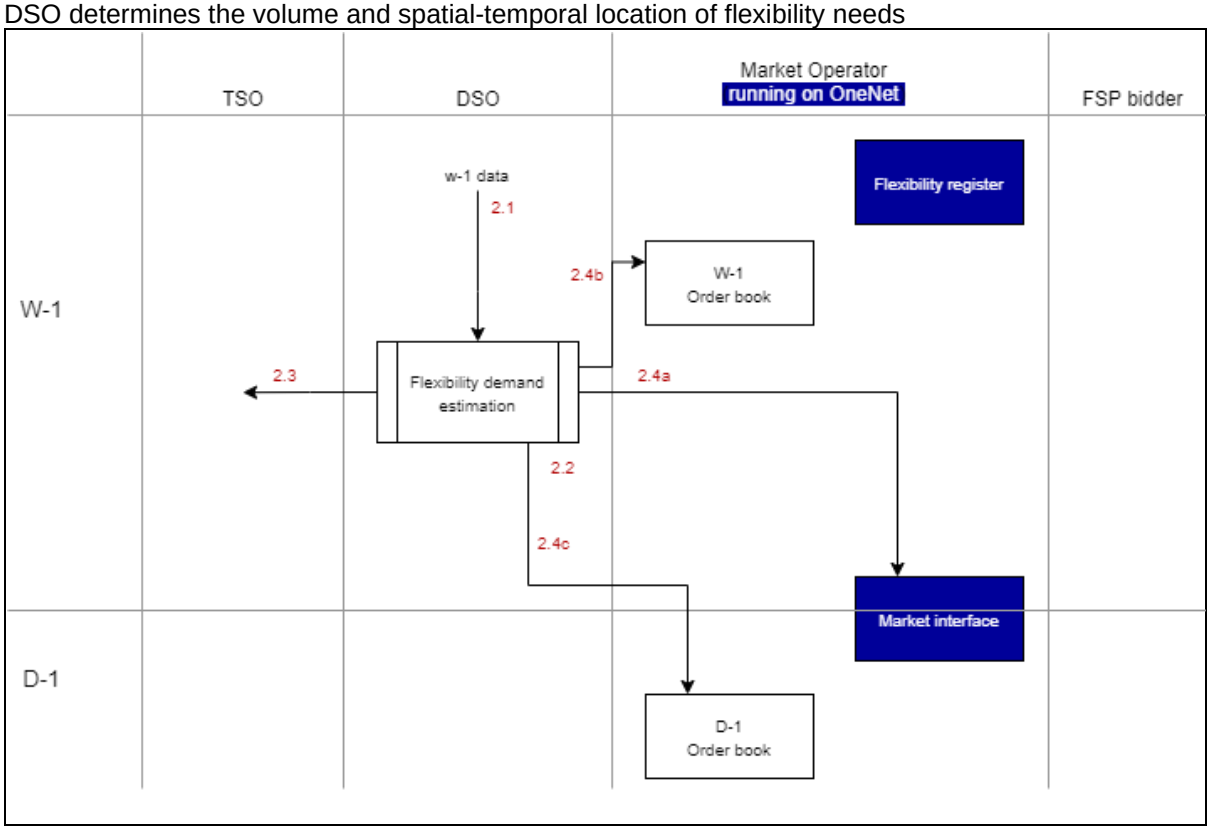
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP qualification result	Data transfer	Location identifier and product parameters, assignment of FSP to congested substation/MV feeder

Scenario 2: Forecasting

DSO determines the volume and spatial-temporal location of flexibility needs



Scenario step by step analysis

Scenario								
Scenario name		Scenario 2: Forecasting						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		DSO receives data for modelling flexibility needs	DSO collects past grid and external forecasting data		DSO	DSO	I-04	
2.2		DSO determines flexibility needs	DSO determines the amount and spatial-temporal location of service needs		DSO	DSO		
2.3		DSO informs TSO on flexibility needs	DSO-TSO data exchange		DSO	TSO	I-05	

2.4		DSO delivers flexibility needs	DSO informs MO of the flexibility needs		DSO	MO (W-1 & D-1 order book, market interface)	I-05	

- Step No 2.1 / Set database for modelling

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Historical grid operation dataset	Data transfer	Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting

- Step No 2.3 / DSO informs TSO on flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data exchange	Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept

- Step No 2.4 / DSO delivers flexibility needs

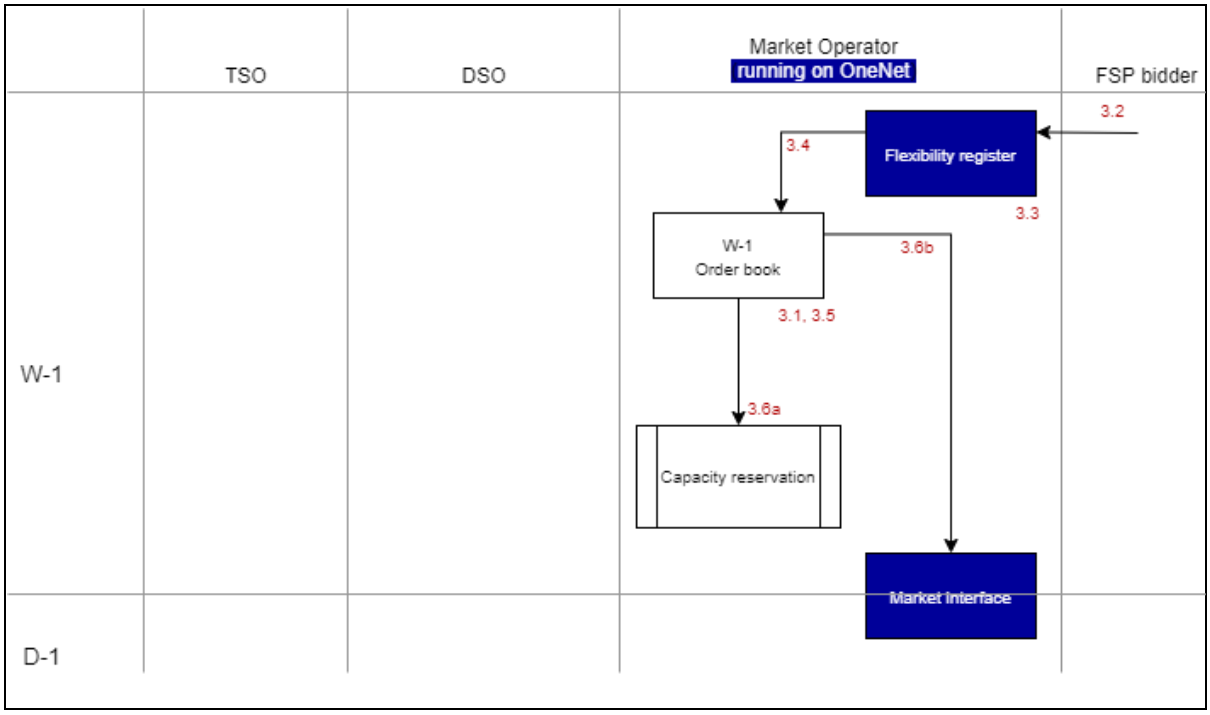
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data exchange	Quantity, type (capacity/activation), bid price, location, timing of demand

Scenario 3: Flexibility procurement W-1

Collection of supply bid in the order book, market clearing in W-1



Scenario step by step analysis

Scenario								
Scenario name	Scenario 3: W-1 flexibility procurement							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
3.1		Flexibility market opening, DSO needs announced	Market interface announces flexibility needs		1)Market Operator (MO) 2) MO (market interface)	1) MO (order book) 2) FSP	I-05	
3.2		FSPs submit bids	FSP submit bids to W-1 & D-1 order book		FSP	MO (flexi register)	I-06	
3.3		W-1 és D-1 FSP bid prequalification	FSP bid prequalification by MO		MO	MO		
3.4		FSP bids delivered	FSP bids are submitted to W-1 & D-1 order book		MO (flexi register)	MO (W-1 & D-1 order book)	I-06	
3.5		Clearing	Clearing is executed		MO	MO		
3.6		Results of the clearing are	Market operator shares clearing result with the		MO	MO (market interface)	I-07	

		transferred and announced	market interface					

- Step No 3.1 / Flexibility market opening, DSO needs announced

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand

- Step No 3.2 / FSPs submit bids

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data transfer	W-1/D-1 priced bid (+additional parameters)

- Step No 3.4 / FSP bids delivered

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data exchange	W-1/D-1 priced bid (+additional parameters)

- Step No 3.6 / Results of the clearing are transferred and announced

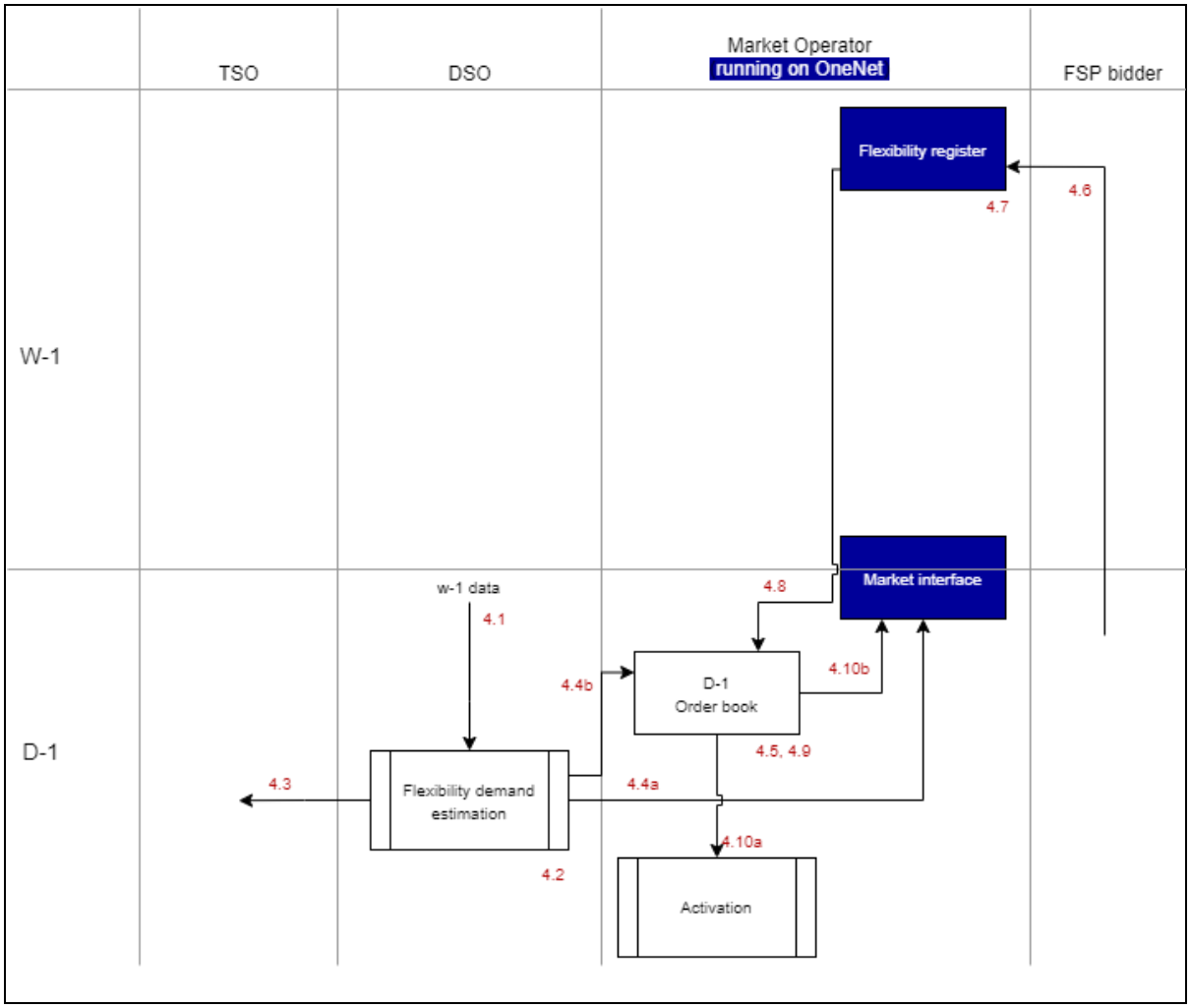
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Clearing result	promulgation (?)	General action (clearing) results; List of accepted bids

Scenario 4: D-1 flexibility procurement

Collection of supply bid in the order book, market clearing in D-1



Scenario step by step analysis

Scenario								
Scenario name		Scenario 4: D-1 flexibility procurement						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
4.1		DSO receives data for modelling flexibility needs	DSO collects past grid and external forecasting data		DSO	DSO	I-08	
4.2		DSO determines flexibility needs	DSO determines the amount and spatial-temporal location of service needs		DSO	DSO		

4.3		DSO informs TSO on flexibility needs	DSO-TSO data exchange		DSO	TSO	I-05	
4.4		DSO delivers flexibility needs	DSO informs MO of the flexibility needs		1) DSO 2) DSO	1) MO (W-1 & D-1 order book) 2) MO (market interface)	I-05	
4.5		Flexibility market opening, DSO needs announced	Market interface announces flexibility needs		1) MO (order book) 2) MO (market interface	1) MO (order book) 2) FSP	I-05	
4.6		FSPs submit bids	FSP submit bids to D-1 order book		FSP	MO (flexi register)	I-06	
4.7		D-1 FSP bid prequalification	FSP bid prequalification by MO		MO	MO		
4.8		FSP bids delivered	FSP bids are submitted to D-1 order book		MO (flexi register)	MO (D-1 order book)	I-06	
4.9		Clearing	Clearing is executed		MO	MO	I-07	
4.10		Announcement	Market operator shares clearing result with the market interface		MO (market interface)	MO (market interface)		

- Step No 4.1 / DSO receives data for modelling flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Weather forecast and historical grid operation dataset	Data transfer	Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/producer plans; Historical data for production forecasting

- Step No 4.3 / DSO informs TSO on flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept

- Step No 4.4 / DSO delivers flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand

- Step No 4.5 / Flexibility market opening, DSO needs announced

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand

- Step No 4.6 / FSPs submit bids

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)

- Step No 4.8 / FSP bids delivered

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)

- Step No 4.9 / Clearing

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Information on DSO needs	Data transfer	General action (clearing) results; List of accepted bids

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I-01	FSP initialization data for prequalification	Type of service unit identifier (name, location, technical parameters)	
I-02	FSP qualification result	Status of FSP prequalification (successful/ not successful);	
I-03	FSP qualification result	Location identifier and product parameters (ID, POD, P, Q, activation time, sensitivity factor), assignment of FSP to congested substation/MV feeder	
I-04	Historical grid operation dataset for flexibility service need modelling (W-1)	Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting (either profile or time series);	
I-05	Flexibility service need	Quantity, type (capacity/activation), bid price, location, timing of demand	
I-06	FSP supply bid	W-1/D-1 priced bid (+additional parameters)	
I-07	Clearing result	General action (clearing) results; List of accepted bids	
I-08	Weather forecast and historical grid operation dataset for flexibility service need modelling (D-1)	Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/ producer plans; Historical data for production forecasting (either profile or time series);	

HV/MV transformer overload

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-HU-02	Hungary	HV/MV transformer overload

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1	07/05 2021	Bálint Hartmann	1.1-1.4 added	
2	24/05 2021	Bálint Hartmann, Péter Sőrés, Bálint Sinkovics	1.5-3.2 added	
3	31/08 2021	Bálint Hartmann, Péter Sőrés, Bálint Sinkovics	Completion	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Increasing renewable penetration causes overloading of HV/MV transformers. The main scope of EACL-HU-02 is to mitigate overloading of HV/MV transformers by activating flexibility services.
Objective(s)	The objective of the use case is to avoid overloading of HV/MV transformers in all operational states of the power system.
Related business case(s)	EACL-HU-01 “MV feeder voltage control”

1.4. Narrative of Use Case

Narrative of use case
Short description
Need: Due to the proliferation of PV plants, connected to DSO MV lines or directly to the MV side of HV/MV substations, overloading of HV/MV transformers is a forecoming issue in Hungary. This technical issue can be mitigated by P and/or Q on MV level. Service: Overloading issues of HV/MV transformers can be mitigated by P and/or Q injection/consumption on MV level.
Complete description
The BUC operates on two-time horizons, each related to the specified grid service: • capacity auction • and energy activation (scheduled), respectively. Capacity auctions will be driven by technical needs of the DSOs, which are determined on a weekly basis based on weekly maintenance plans. Gate opens at W-1 Monday 0:00 and closes at W-1 Friday 14:00, thus enabling bidders a fairly long time to place bids, but the market can be cleared during working hours on W-1. Results of the auction are to be published by W-1 Friday 15:00.

Energy bids can be submitted between W-1 Monday 0:00 and D-1 6:00. The early gate opening supports the procurement of services that are expected to be necessary with probability. The gate closure on D-1 allows SOs to procure services based on day-ahead predictions and network calculations. Results of the clearing are to be published by D-1 7:00, which is 60 minutes ahead of local daily balancing capacity market gate closure, and well before the active period of DAM market bidding. This allows market players to participate on flexibility and day-ahead markets separately, and also supports that uncleared flexibility bids are submitted to shorter horizon markets (DAM, BAM).

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***
1	Number of flexibility service provider assets involved in the service	There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the number of assets involved.	
2	Ratio of flexibility service provider assets involved in the service	There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the ratio of involved and total number of assets involved.	
3	Avoided operational limit violations	The aim of using flexibility services is to mitigate overloading of HV/MV transformers and to avoid possible violations of loading limits. The KPI reflects on the number and duration of violations avoided.	
4	Bid success	The ratio of accepted (successful) and submitted (total) flexibility bids.	
5	Market success	Flexibility services are one of many possible means to reach the aims of the BUC. The KPI reflects on the ratio of violations avoided by the provision of flexibility services and the violations avoided by other means (redispatch, curtailment, load shedding, etc.).	
6	Successful market optimization runs	The ratio of converging auctions of the market of flexibility services.	
7	Cost of service	Minimal, maximal and average prices of capacity auctions and energy activations are reflective on the liquidity of the market.	
8	Accuracy of DSO flexibility demand prediction	The DSOs prepare for possible operational issues through the energy activations. As energy bids have to be submitted before D-1 6:00, the accuracy of grid forecasts largely affects the performance of the DSO in using flexibility services. The KPI reflects on the accuracy of DSO flexibility demand predictions by calculating the ratio and volume of expected and actual flexibility service needs.	

1.6. Use case conditions

Use case conditions	
Assumptions	
Prerequisites	
1	DSO requires P and/or Q to keep loading of HV/MV transformers below the permitted limits
2	FSP capable of providing P and/or Q is located at the bidding zone

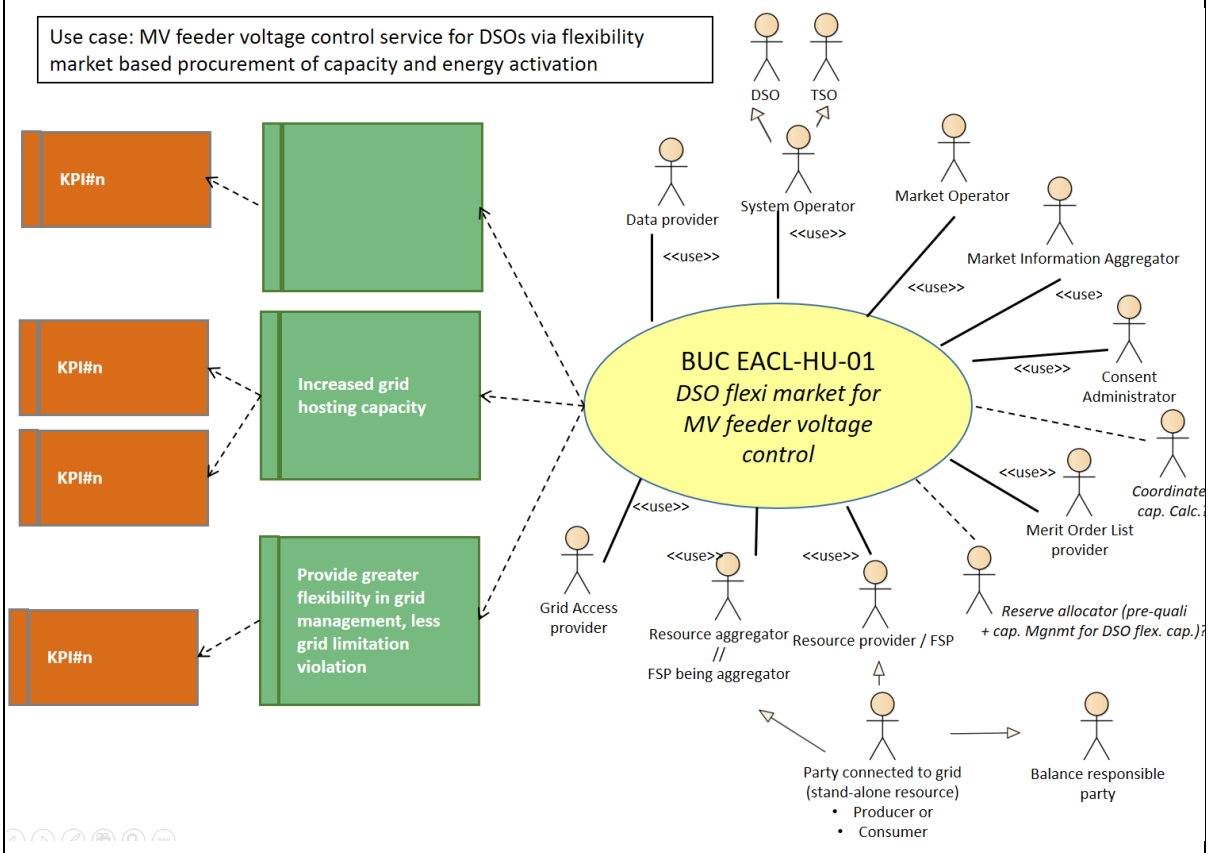
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
BUC will use the same products and market design as EACL-HU-01
Level of depth
Generic use case
Prioritisation
High level of priority
Generic, regional or national relation
National use case for Hungary
Nature of the use case
BUC
Further keywords for classification
HV/MV transformer, DSO congestion management

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



Not connected to BUC, only indirectly affected:

- *Billing agent*
- *Metered data administ.*
- *Energy supplier*
- *Imbalance settlement responsible*

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Bidding zone ***Metering point***		The actors are grouped by the two layers of the market structure: the operation area of each participating DSO, and the location of metering points (i.e., HV/MV transformer supply area)	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
DSO	• Grid Access Provider • Data Provider • System operator	Active actor Responsible for maintaining service quality (e.g., EN 50160) and quantifying flexibility service needs Participates in energy auctions and energy activations	In the present BUC, the DSO is responsible for the operation of the distribution network and all related technical matters.
TSO	• System Operator • Data Provider	Passive actor Receives information on capacity auctions and energy activations	In the present BUC, the TSO is informed on the results of the flexibility service market and the actions of DSOs and FSPs. The TSO considers this information in the operation of the transmission system and all related technical matters.
FSP	• Flexibility/Balancing Service Provider • Resource aggregator • Producer / Consumer • Party connected to the grid • Flexibility service provider being aggregator	Provides services for the DSO Provides information to the TSO in case of activations through schedules	In the present BUC, the FSP is technology-independent; potential assets include photovoltaic plants, energy storage, B2B demand-side response, etc.
Market operator	• Market operator • Data Provider • Merit Order List Responsible	Responsible for market clearing	In the present BUC, the market operator aggregates the supply bids in the order book and carry out market clearing process.
OneNet common platform	• Flexibility register provider // consent administrator • TSO-DSO coordinator platform provider // coordinated cap. calculator • Market interface provider / market information aggregator	Responsible for the necessary TSO-DSO coordination	In the present BUC, the common coordination platform carries out TSO-DSO and DSO-FSP coordination steps, including DSO demand finalization, flexibility registration and bid prequalification, and market result broadcasting.

3.2. References

https://eepublicdownloads.entsoe.eu/clean-documents/EDI/Library/HRM/Harmonised_Role_Model_2020-01.pdf

4. Step by step analysis of use case

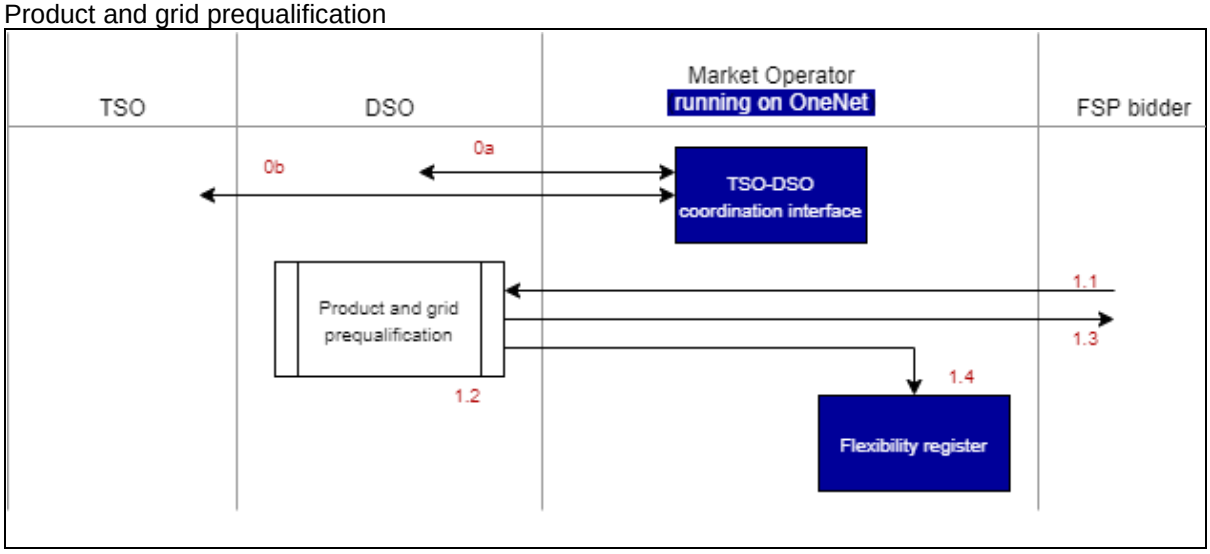
4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Scenario 1: Prequalification	Product and grid prequalification				
2	Scenario 2: Forecasting	DSO determines the volume and spatial-temporal location of flexibility needs	DSO			
3	Scenario 3: W-1 flexibility procurement W-1	Collection of supply bid in the order book, market clearing in W-1	Market operator	time, Gate Opening of W-1 capacity market		
4	Scenario 4: D-1 flexibility procurement	Collection of supply bid in the order book, market clearing in D-1	Market operator	time, Gate Opening of W-1 capacity market		

4.2. Steps - Scenarios

Scenario 1: Prequalification

Product and grid prequalification



Scenario step by step analysis

Scenario	
Scenario name	Scenario 1: Prequalification

Step No	*Event*	*Name of process/activity*	*Description of process/activity*	*Service*	*Information producer (actor)*	*Information receiver (actor)*	*Information exchanged (IDs)*	*Requirement, R-IDs*
1.1		Prequalification request	FSP requests prequalification		FSP	DSO	I-01	
1.2		Product and grid prequalification	DSO executes prequalification		DSO,	DSO		
1.3		Approval of prequalification	DSO informs FSP of the prequalification result		DSO	FSP	I-02	
1.4		Prequalification results	Prequalification result is sent to the Market Operator (MO)		DSO	MO (Flexi register)	I-03	

- Step No 1.1 / Prequalification request

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
FSP initialization data for prequalification	data transfer	FSP initializes prequalification

- Step No 1.3 / Approval of prequalification

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
FSP qualification result	Data transfer	Status of FSP prequalification

- Step No 1.4 / Prequalification results

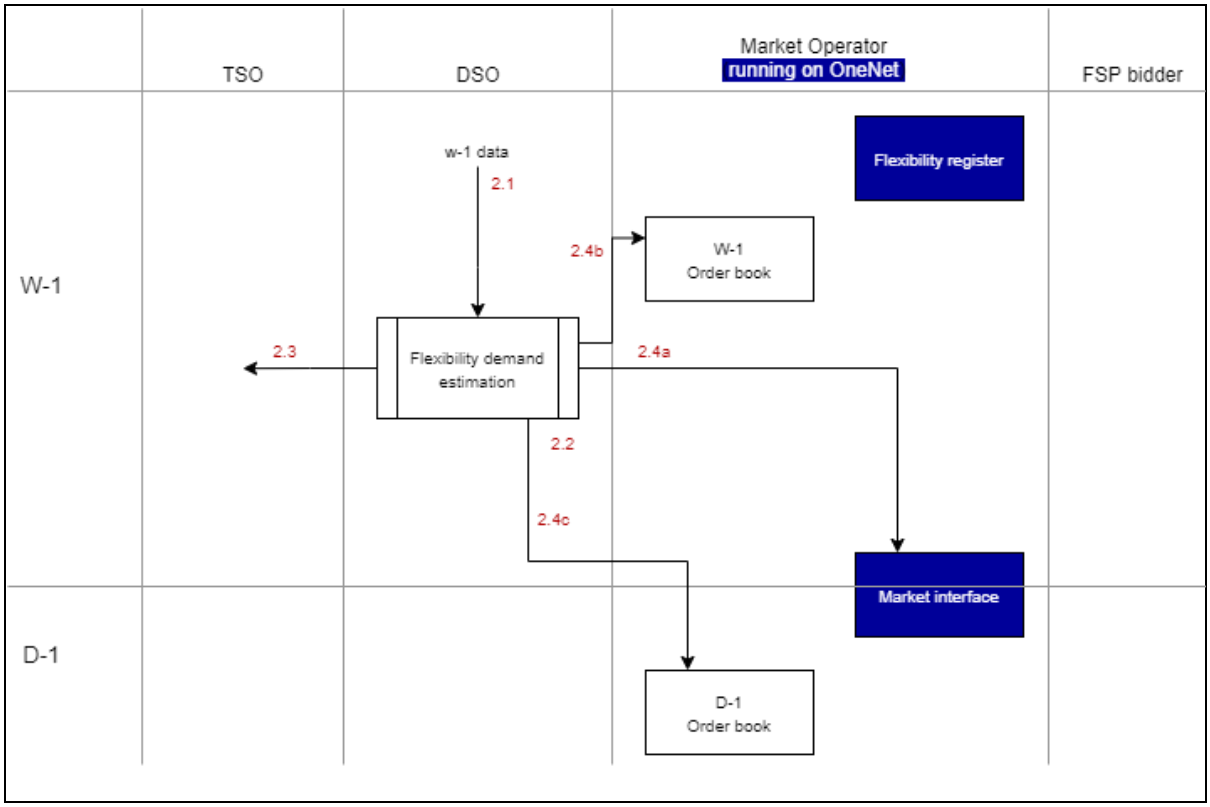
  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*
FSP qualification result	Data transfer	Location identifier and product parameters, assignment of FSP to congested substation/MV feeder

Scenario 2: Forecasting

DSO determines the volume and spatial-temporal location of flexibility needs



Scenario step by step analysis

Scenario								
Scenario name		Scenario 2: Forecasting						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1		DSO receives data for modelling flexibility needs	DSO collects past grid and external forecasting data		DSO	DSO	I-04	
2.2		DSO determines flexibility needs	DSO determines the amount and spatial-temporal location of service needs		DSO	DSO		
2.3		DSO informs TSO on flexibility needs	DSO-TSO data exchange		DSO	TSO	I-05	
2.4		DSO delivers flexibility needs	DSO informs MO of the flexibility needs		DSO	MO (W-1 & D-1 order book,	I-05	

						market interface)		

- Step No 2.1 / Set database for modelling

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Historical grid operation dataset	Data transfer	Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting

- Step No 2.3 / DSO informs TSO on flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data exchange	Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept

- Step No 2.4 / DSO delivers flexibility needs

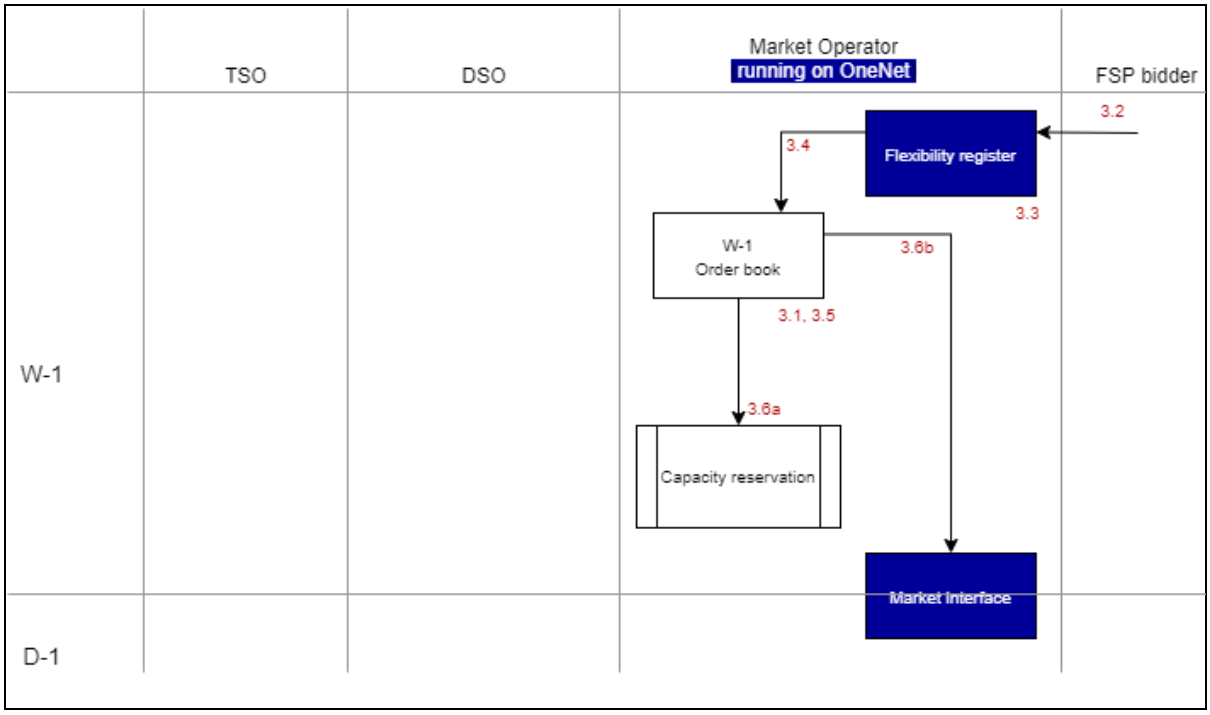
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data exchange	Quantity, type (capacity/activation), bid price, location, timing of demand

Scenario 3: Flexibility procurement W-1

Collection of supply bid in the order book, market clearing in W-1



Scenario step by step analysis

Scenario								
Scenario name	Scenario 3: W-1 flexibility procurement							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
3.1		Flexibility market opening, DSO needs announced	Market interface announces flexibility needs		1)Market Operator (MO) 2) MO (market interface)	1) MO (order book) 2) FSP	I-05	
3.2		FSPs submit bids	FSP submit bids to W-1 & D-1 order book		FSP	MO (flexi register)	I-06	
3.3		W-1 és D-1 FSP bid prequalification	FSP bid prequalification by MO		MO	MO		
3.4		FSP bids delivered	FSP bids are submitted to W-1 & D-1 order book		MO (flexi register)	MO (W-1 & D-1 order book)	I-06	
3.5		Clearing	Clearing is executed		MO	MO		
3.6		Results of the clearing are	Market operator shares clearing result with the		MO	MO (market interface)	I-07	

		transferred and announced	market interface					

- Step No 3.1 / Flexibility market opening, DSO needs announced

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand

- Step No 3.2 / FSPs submit bids

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data transfer	W-1/D-1 priced bid (+additional parameters)

- Step No 3.4 / FSP bids delivered

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data exchange	W-1/D-1 priced bid (+additional parameters)

- Step No 3.6 / Results of the clearing are transferred and announced

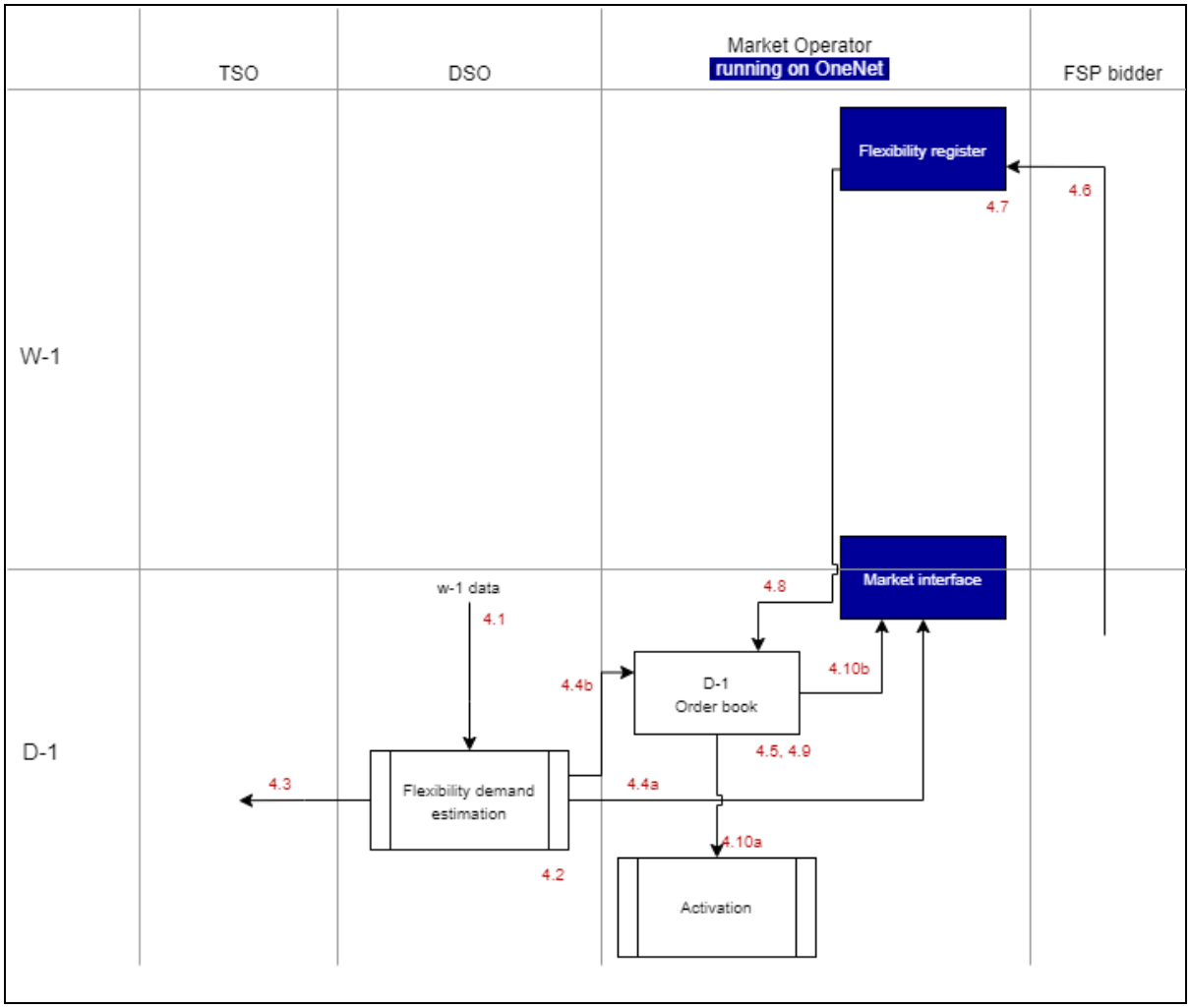
  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Clearing result	promulgation (?)	General action (clearing) results; List of accepted bids

Scenario 4: D-1 flexibility procurement

Collection of supply bid in the order book, market clearing in D-1



Scenario step by step analysis

Scenario								
Scenario name		Scenario 4: D-1 flexibility procurement						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
4.1		DSO receives data for modelling flexibility needs	DSO collects past grid and external forecasting data		DSO	DSO	I-08	
4.2		DSO determines flexibility needs	DSO determines the amount and spatial-temporal location of service needs		DSO	DSO		

4.3		DSO informs TSO on flexibility needs	DSO-TSO data exchange		DSO	TSO	I-05	
4.4		DSO delivers flexibility needs	DSO informs MO of the flexibility needs		1) DSO 2) DSO	1) MO (W-1 & D-1 order book) 2) MO (market interface)	I-05	
4.5		Flexibility market opening, DSO needs announced	Market interface announces flexibility needs		1) MO (order book) 2) MO (market interface	1) MO (order book) 2) FSP	I-05	
4.6		FSPs submit bids	FSP submit bids to D-1 order book		FSP	MO (flexi register)	I-06	
4.7		D-1 FSP bid prequalification	FSP bid prequalification by MO		MO	MO		
4.8		FSP bids delivered	FSP bids are submitted to D-1 order book		MO (flexi register)	MO (D-1 order book)	I-06	
4.9		Clearing	Clearing is executed		MO	MO	I-07	
4.10		Announcement	Market operator shares clearing result with the market interface		MO (market interface)	MO (market interface)		

- Step No 4.1 / DSO receives data for modelling flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Weather forecast and historical grid operation dataset	Data transfer	Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/producer plans; Historical data for production forecasting

- Step No 4.3 / DSO informs TSO on flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***

Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept

- Step No 4.4 / DSO delivers flexibility needs

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand

- Step No 4.5 / Flexibility market opening, DSO needs announced

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
Flexibility service need	Data transfer	Quantity, type (capacity/activation), bid price, location, timing of demand

- Step No 4.6 / FSPs submit bids

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)

- Step No 4.8 / FSP bids delivered

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)

- Step No 4.9 / Clearing

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***

Information on DSO needs	Data transfer	General action (clearing) results; List of accepted bids

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
I-01	FSP initialization data for prequalification	Type of service unit identifier (name, location, technical parameters)	
I-02	FSP qualification result	Status of FSP prequalification (successful/ not successful);	
I-03	FSP qualification result	Location identifier and product parameters (ID, POD, P, Q, activation time, sensitivity factor), assignment of FSP to congested substation/MV feeder	
I-04	Historical grid operation dataset for flexibility service need modelling (W-1)	Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting (either profile or time series);	
I-05	Flexibility service need	Quantity, type (capacity/activation), bid price, location, timing of demand	
I-06	FSP supply bid	W-1/D-1 priced bid (+additional parameters)	
I-07	Clearing result	General action (clearing) results; List of accepted bids	
I-08	Weather forecast and historical grid operation dataset for flexibility service need modelling (D-1)	Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/ producer plans; Historical data for production forecasting (either profile or time series);	

9.2.4.4 Czech demo

Nodal area congestion management

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-CZ-01	CZ DEMO – Access Net	Nodal area congestion management

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1		Václav Janoušek	Initial draft version	
2		Václav Janoušek, Martin Chytra	Added BUC diagram and corrections	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Nodal area congestion management)
Objective(s)	Identify relevant way of service procurement to address local congestion management in the distribution networks. The test is expected to deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment, activation of flexibility)
Related business case(s)	EACL-CZ-02

1.4. Narrative of Use Case

Narrative of use case
Short description
The UC will inquire into market-based procurement of non-frequency service (congestion management) for TSO/DSO. The local congestion is controlled through management of the active power provided through units (charging points) at the Low Voltage.
Complete description
1) Distribution System Operator procures the service (nodal area congestion management) at the dedicated platform. The bids include locality, reserved capacity (MW) and duration. 2) Provider of the service (Aggregator – enabling load management/charging poles) indicates his capacities simultaneously at the same environment. 3) The platform ensures all parties will receive the notification about bids. 4) Once relevant offer is accepted by the DSO (at least part of that), the given provider will receive confirmation through the platform. 5) After the service is accepted (by both parties), the relevant provider sends the list of units involved in the provision of the service. 6) This amount of flexibility is then reported to the dispatch control centre of the relevant DSO – to enable grid planning/scheduling.

7) Relevant units are directed by DSO through the Aggregator (which possess direct control of the flexibility resources) 8) The metering/billing is processed bilaterally between DSO and flexibility provider.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions		
Assumptions		
Prerequisites		

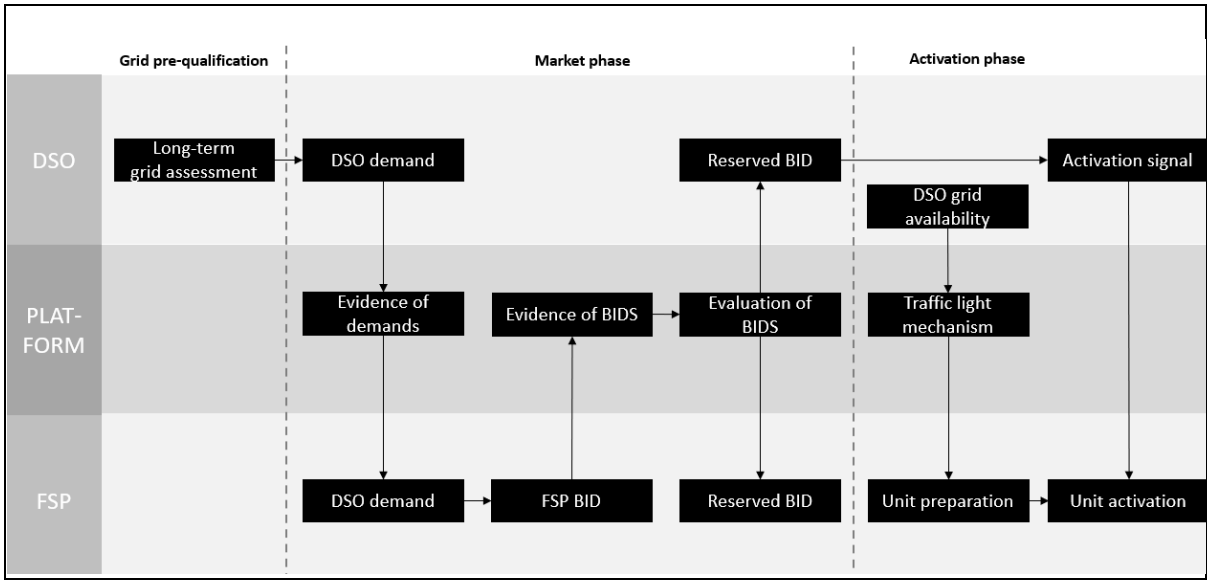
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
Reactive power overflow management, Voltage control
Level of depth
Generic
Prioritisation
Generic, regional or national relation
Nature of the use case
Business Use Cases
Further keywords for classification
Local congestion management, flexibility, DSO-FSP exchange of information

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	
Aggregator	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resource (DER).	
Platform	IT	IT environment allowing for market parties exchange of market-based flexibility products, providing necessary feedback on Aggregators/Units involved in flexibility provision. Moreover, in gives all participant relevant information on the grid availability through traffic light scheme.	
Unit/Flexibility provider	Business	Single units (part of the portfolio of the aggregator) proving flexibility to the distribution grid operator.	
LMS	IT	IT system allowing planning of charging patterns according to expected grid conditions and RES production	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Grid evaluation	Run by DSO to validate the grid in terms of load capacity and future load profile/grid users connected.	DSO			
2	Market phase	Communication on bids collection and selection,	Platform			
3	Activation phase	Flexibility bids activation to solve the forecasted congestion management	AGG			

4.2. Steps - Scenarios

Grid evaluation

Scenario #1 description

Run by DSO to validate the grid in terms of load capacity and future load profile/grid users connected.

Scenario step by step analysis

Scenario								
Scenario name		Grid evaluation						
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Congestion expected	Long-term grid assessment	Grid is evaluated in terms of load capacity and future load profile/grid users connected	Grid evaluation	DSO	DSO		

Market phase

Scenario #2 description

Bids collection and selection, communication of market results

Scenario step by step analysis

Scenario	
Scenario name	Market phase

Step No	Event	Name of process/ activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
2.1	Congestion occurs	Flexibility inquiry	DSO identifies relevant flexibility capacities to address congestion	Flexibility – demand	DSO	DSO		
2.2	Flexibility requirement	Flexibility demand	DSO sends flexibility demand to the platform – this includes location, capacity and duration	Announcement on flexibility demand	DSO	Platform	Info1	
2.3	Flexibility offer	Flexibility supply	AGG informs platform about available flexibility capacity	Announcement on flexibility supply	AGG	Platform	Info2	
2.4	Platform performs bids matching	Demand/supply match	Platform matches demand/supply and informs market parties on the results	Flexibility settlement	AGG	DSO	Info3	

- Step No 2.2 / Flexibility requirement

  Business section:

  Information sent:

Business object	Instance name	Instance description
Amount of flexibility needed	Flexibility demand	Data sent to IT platform – detailing (type of service – active power, duration of contract, nodal area)

- Step No 2.3 / Flexibility offer

  Business section:

  Information sent:

Business object	Instance name	Instance description
Amount of flexibility available	Flexibility bid	Data send to IT platform – containing amount of service available/number of units available, duration of bid available, nodal area

Activation

Scenario #3 description

Flexibility bids activation to solve the forecasted congestion management

Scenario step by step analysis

Scenario								
Scenario name	Activation							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
3.1	Prequalification	Assessment of the availability of the grid for the activation of flexibility	DSO based on faults/outage indicates for resources (providing flexibility) availability of the grid through traffic light scheme	Grid availability assessment	DSO	Platform	Info4	
3.2	Activation of flexibility through aggregator	Flexibility activation	AGG activates flexibility in given limits (capacity) – there is delivered set of parameters through AGG towards local management system (LMS) operating EV charging infrastructure	Flexibility activation	AGG	LMS	Info5	
3.3	DSOs	Flexibility assessment	DSO evaluates flexibility based on the metering data	Flexibility assessment	DSO	DSO		

- Step No 3.1 / Grid availability assessment

  Business section:

  Information sent:

Business object	***Instance name***	***Instance description***

Grid availability assessment information		

- Step No 3.2 / Flexibility activation

Business section:

Information sent:

Business object	***Instance name***	***Instance description***
Set of parameters		

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Announcement on flexibility demand	DSO sends flexibility demand to the platform – this includes location, capacity and duration.	
Info2	Announcement on flexibility supply	AGG informs platform about available flexibility capacity.	
Info3	Flexibility settlement	Platform matches demand/supply and informs market parties on the results.	
Info4	Grid availability assessment	DSO based on faults/outage indicates for resources (providing flexibility) availability of the grid through traffic light scheme.	
Info5	Flexibility activation	AGG activates flexibility in given limits (capacity) – there is delivered set of parameters through AGG towards local management system (LMS) operating EV charging infrastructure.	

Reactive power overflow management

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-CZ-02	CZ DEMO – Access Net	Reactive power overflow management

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1		Václav Janoušek	Initial draft version	
2		Václav Janoušek, Martin Chytra	Added BUC diagram and corrections	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Reactive power overflow management)
Objective(s)	Identify relevant way of service procurement to control flow of reactive power between TSO and DSO in order to keep reactive power flows in given limits. The test is expected to deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment)
Related business case(s)	EACL-CZ-01, EACL-CZ-03

1.4. Narrative of Use Case

Narrative of use case
Short description
The UC will inquire into market-based procurement of non-frequency service (reactive power flow) for DSO. Reactive power overflows from DSO to TSO are controlled through management of the reactive power provided through units (generators/units) at the Middle Voltage/High Voltage level. The product is meant to keep reactive power overflows within limits agreed between DSO and TSO.
Complete description
1) Distribution System Operator procures the service at the dedicated platform. The bids include locality, reserved capacity (MVAr) and duration. 2) Provider of the service (individual units/Aggregator) indicates his capacities simultaneously at the same environment. 3) The platform ensures all parties will receive the notification about bids. 4) Once relevant offer is accepted by the DSO (at least part of that) given provider will receive confirmation through the platform 5) After the service is accepted (by both parties) relevant provider sends the list of units/generators involved in the provision of the service 6) This list of units/generators is than delivered to the dispatch control center of the relevant DSO – to enable direct control of the relevant units/generators by the DSOs for grid service purposes 7) The metering/billing is processed bilaterally between DSO and flexibility provider.

1.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

1.6. Use case conditions

Use case conditions		
Assumptions		
Prerequisites		

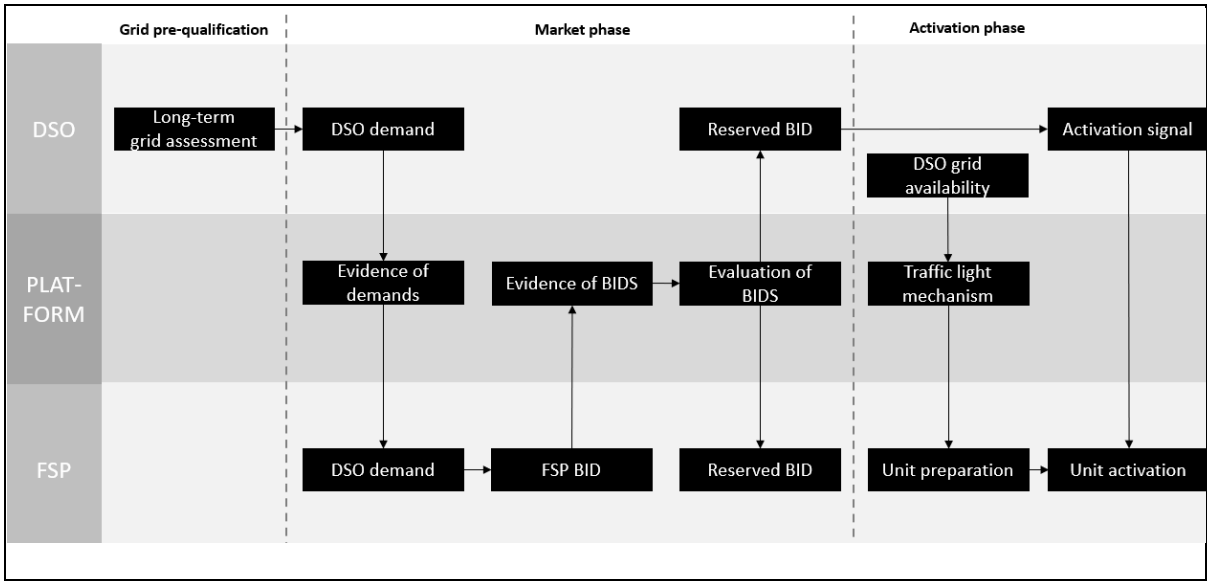
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
Nodal area congestion management, Voltage Control
Level of depth
Generic
Prioritisation
Generic, regional or national relation
Nature of the use case
Business Use Cases
Further keywords for classification
Local congestion management, flexibility, DSO-FSP exchange of information

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case



3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	
Aggregator	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resources (DER).	
Platform	IT	IT environment allowing for market parties exchange of market-based flexibility products, providing necessary feedback both on Aggregators/Units involved in flexibility provision. Moreover, in gives all participant relevant information on the grid availability through traffic light scheme.	
Unit/Flexibility provider	Business	Single units (part of the portfolio of the aggregator) proving flexibility to the distribution grid operator.	

3.2. References

4. Step by step analysis of use case

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Grid evaluation	Long term grid assessment concerning flows of reactive power between TSO and DSO	DSO			
2	Market phase	Communication on bids collection and selection	Platform	Overproduction of reactive power	Production of reactive power is beyond limits	Production of reactive power is within limits

4.2. Steps - Scenarios

Grid evaluation (reactive power flows)

Scenario #1 description

Run by DSO to evaluate the amount of reactive power exchanged between DSO and TSO

Scenario step by step analysis

Scenario								
Scenario name	Grid evaluation							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Overproduction of reactive power expected	Long-term grid assessment	Grid is evaluated in terms of production of reactive power in terms of exchange of reactive power in the TSO/DSO connection points	reactive power production evaluation	DSO	DSO		

Market phase

Scenario #2 description

Communication on bids collection and selection

Scenario step by step analysis

Scenario	
Scenario name	Market phase

Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
2.1	Overproduction of reactive power occurs	Flexibility inquiry	DSO identifies relevant flexibility capacities to address overproduction of reactive power	Flexibility – demand	DSO	DSO		
2.2	Flexibility requirement	Flexibility demand	DSO sends flexibility demand to the platform – this includes location, capacity and duration	Announcement on flexibility demand	DSO	Platform	Info1	
2.3	Flexibility offer	Flexibility supply	AGG informs platform about available flexibility capacity	Announcement on flexibility supply	AGG	DSO	Info2	
2.4	Platform performs bids matching	Demand/supply match	Platform matches demand/supply and informs market parties on the results	Flexibility settlement	DSO	Platform	Info3	
2.5	Prequalification	Assessment of the availability of the grid for the activation of flexibility	DSO based on faults/outage indicates for resources (providing flexibility) availability of the grid through traffic light scheme	Grid availability assessment	DSO	Platform	Info4	

- Step No 1.3 / Flexibility requirement

Business section:

Information sent: DSO informs on amount of reactive power energy needed

Business object	*Instance name*	*Instance description*
DSO	Reactive power flexibility needed	Data sent to IT platform – detailing (type of service – reactive power, duration of contract, nodal area)

- Step No 1.4 / Flexibility offer

  Business section:

  Information sent: FSP indicates amount of flexibility available

Business object	*Instance name*	*Instance description*
FSP	Flexibility bid	Data send to IT platform – containing amount of service available, duration of bid available, nodal area

5. Information exchanged

Information exchanged			
Information exchanged, ID	*Name of information*	*Description of information exchanged*	*Requirement, R-IDs*
Info1	Announcement on flexibility demand	DSO sends flexibility demand to the platform – this includes location, capacity and duration	
Info2	Announcement on flexibility supply	AGG informs platform about available flexibility capacity	
Info3	Flexibility settlement	Platform matches demand/supply and informs market parties on the results	
Info4	Grid availability assessment	DSO based on faults/outage indicates for resources (providing flexibility) availability of the grid through traffic light scheme	

Voltage Control

Based on IEC 62559-2 edition 1

6. Description of the use case

6.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
EACL-CZ-03	CZ DEMO – Access Net	Voltage control

6.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1		Václav Janoušek	Initial draft version	
2		Václav Janoušek, Martin Chytra	Added BUC diagram and corrections	

6.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Voltage control)
Objective(s)	Identify relevant way of service procurement to address voltage issues in the distribution networks through reactive power. The test is expected to deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment).
Related business case(s)	EACL-CZ-01, EACL-CZ-02

6.4. Narrative of Use Case

Narrative of use case
Short description
The UC will inquire into market-based procurement of non-frequency service (voltage control) for DSO. The voltage is controlled through management of the reactive power provided through units (generators/units) at the Middle Voltage/High Voltage level. The product is meant to keep voltage in given limits in terms of quality of supply.
Complete description
8) Distribution System Operator procures the service (voltage control) at the dedicated platform. The bids include locality, reserved capacity (MVAr) and duration. 9) Provider of the service (individual units/Aggregator) indicates his capacities simultaneously at the same environment. 10) The platform ensures all parties will receive the notification about bids. 11) Once relevant offer is accepted by the DSO (at least part of that) given provider will receive confirmation through the platform 12) After the service is accepted (by both parties) relevant provider sends the list of units/generators involved in the provision of the service 13) This list of units/generators is than delivered to the dispatch control center of the relevant DSO – to enable direct control of the relevant units/generators by the DSOs for grid service purposes 14) The metering/billing is processed bilaterally between DSO and flexibility provider.

6.5. Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

6.6. Use case conditions

Use case conditions		
Assumptions		
Prerequisites		

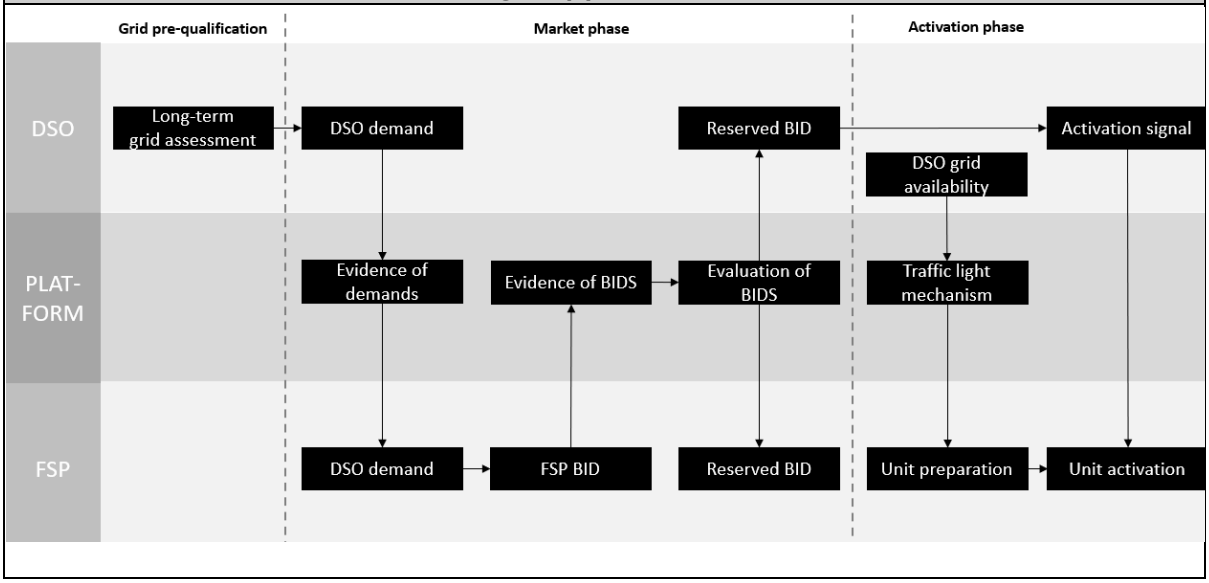
6.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
Nodal area congestion management, Reactive power overflow management
Level of depth
Generic
Prioritisation
Generic, regional or national relation
Nature of the use case
Business Use Cases
Further keywords for classification
Local congestion management, flexibility, DSO-FSP exchange of information

6.8. General remarks

7. Diagrams of use case

Diagram(s) of use case



8. Technical details

8.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.	
Aggregator	Business	A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resources (DER).	
Platform	IT	IT environment allowing for market parties exchange of market-based flexibility products, providing necessary feedback both on Aggregators/Units involved in flexibility provision. Moreover, in gives all participant relevant information on the grid availability through traffic light scheme.	
Unit/Flexibility provider	Business	Single units (part of the portfolio of the aggregator) proving flexibility to the distribution grid operator.	

8.2. References

9. Step by step analysis of use case

9.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Grid evaluation	Long term grid assessment concerning capacity of grid in terms of keeping voltage in given limits				
2	Market phase	Communication on bids collection and selection	DSO	Voltage issues	Voltage beyond limits	Voltage within the limit

9.2. Steps - Scenarios

Grid evaluation (voltage limits)

Scenario #1 description

Run by DSO to evaluate quality of supply concerning voltage limits

Scenario step by step analysis

Scenario								
Scenario name	Grid evaluation							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
1.1	Overproduction of reactive power expected	Long-term grid assessment	Grid is evaluated in terms of production of reactive power in terms of exchange of reactive power in the TSO/DSO connection points	reactive power production evaluation	DSO	DSO		

Market phase

Scenario #2 description

Communication on bids collection and selection

Scenario step by step analysis

Scenario								
Scenario name	Market phase							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
2.1	Voltage quality issues	Flexibility inquiry	DSO identifies relevant flexibility capacities to address voltage issues	Flexibility – demand	DSO	DSO		
2.2	Flexibility requirement	Flexibility demand	DSO sends flexibility demand to the platform – this includes	Announcement on flexibility demand	DSO	Platform	Info1	

			location, capacity and duration					
2.3	Flexibility offer	Flexibility supply	AGG informs platform about available flexibility capacity	Announcement on flexibility supply	AGG	DSO	Info2	
2.4	Platform performs bids matching	Demand/supply match	Platform matches demand/ supply and informs market parties on the results	Flexibility settlement	DSO	Platform	Info3	
2.5	Prequalification	Assessment of the availability of the grid for the activation of flexibility	DSO based on faults/ outage indicates for resources (providing flexibility) availability of the grid through traffic light scheme	Grid availability assessment	DSO	Platform	Info4	

10. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Announcement on flexibility demand	DSO sends flexibility demand to the platform – this includes location, capacity and duration	
Info2	Announcement on flexibility supply	AGG informs platform about available flexibility capacity	
Info3	Flexibility settlement	Platform matches demand/supply and informs market parties on the results	
Info4	Grid availability assessment	DSO based on faults/outage indicates for resources (providing flexibility) availability of the grid through traffic light scheme	

9.2.5 OneNet General BUC

Unlocking market-based flexibility provision to procure services to operators

Based on IEC 62559-2 edition 1

1. Description of the use case

1.1. Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
OneNet_GBUC	EU	Unlocking market-based flexibility provision to procure services to operators

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.1	25/6/2021	Katerina Drivakou Thanasis Bachoumis	Section 1.3 drafted	
0.2	25/08/2021	Katerina Drivakou Thanasis Bachoumis	Sections 1.4-1.8 drafted	

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	The scope of this BUC is to facilitate the unlocking of flexibility markets both on transmission and distribution system level and to address the network operators' needs, by providing flexibility for 'frequency' and 'non-frequency' ancillary services. In addition, the aim of this BUC is to strengthen the role of customer in the flexibility value chain and ensure the seamless coordination of the different actors. This BUC is the result of mapping the demo BUCs against the process described within the ASM report.
Objective(s)	• Definition of common market processes in different EU regions • Moving from system-centric to customer-centric approach. • Creating an integrated marketplace for system services.
Related business case(s)	NOCL-01, SOCL-GR-01, SOCL-GR-02, SOCL-CY-01, SOCL-CY-02, WECL-ES-01, WECL-ES-02, WECL-PT-01, WECL-PT-02, WECL-FR-01, WECL-FR-02, EACL-SL-01, EACL-PL-01, EACL-PL-02, EACL-PL-03, EACL-PL-04, EACL-CZ-01, EACL-CZ-02, EACL-CZ-03, EACL-HU-01, EACL-HU-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This business use case intends to describe the flexibility services procurement process through a market mechanism which aims to fulfil the need of system operators to secure power supplies in the context of ever-increasing RES penetration.

Complete description
The business use case describes seven scenarios, namely: 1. Customer process: This process deals with onboarding customer for providing flexibility. It starts from definition of some products, contract format, and information consents for customers, who want to provide flexibility. 2. Preparatory phase: This scenario focuses on prequalification of a) Flexibility Service Providers, b) product prequalification (the technical specification of product), and c) the grid assessment of the flexibility product ('grid prequalification'), for example if the flexibilities can cause congestions in the grid ('grid prequalification'). 3. Forecasting phase: This phase focuses on the planning of grid utilization and on identifying potential congestions. 4. Market phase: This scenario deals with the market opening, qualification, bids collection, market clearing and communication of results procedures. 5. Activation phase: This scenario describes the process of activation of the flexibility procured in the flexibility market, taking into account any grid limitations, and the needed data exchange. 6. Delivery and monitoring phase: This scenario focuses on monitoring the flexibility delivery. 7. Measurement and settlement phase: This scenario deals with the validation of service delivery and the financial settlement of the delivered flexibility product. The business use case can be applied in provision and procurement of balancing, network congestion management and voltage control services.