Specifications and guidelines for Western Demos

D9.1

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About OneNet

OneNet will provide a 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 a 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 EDSO, have activated their members to put together a unique consortium.

OneNet will see the participation of a consortium of over 70 partners[1].

The key elements of the project are:

1. Definition of a common market design for Europe: this means standardized 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.

[1] The OneNet project partners are listed at: https://onenet-project.eu/partners/

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List of Abbreviations and Acronyms

Acronym	Meaning
A	Availability
ASM	Active System Management
BUC	Business Use Case
CAPEX	Capital Expenditure
CEP	Clean Energy Package
DER	Distributed Energy Resource
DSO	Distribution System Operator
E	Energy
ECCo-SP	Energy Communication & Connectivity Service Platform
ECP	Energy Communication Platform
EDX	Energy Data eXchange
EHV	Extra-High Voltage
ENEDIS	ENEDIS S.A. (French DSO)
ENTSO-e	European Network of Transmission System Operators for Electricity
E-REDES	E-REDES - Energia S.A. (Portuguese DSO)
ES	Spain
EU	European Union
FR	France
FSP	Flexibility Service Providers
HV	High Voltage
ICT	Information and Communication Technology
i-DE	I-DE Redes Eléctricas Inteligentes, S.A.U. (Spanish DSO)
IMO	Independent Market Operator
KPI	Key Performance Indicator
kW	Kilowatt
kWh	Kilowatt-hour
LMP	Local Market Platform
LT	Long-term
LV	Low Voltage
mFRR	Manual Frequency Restoration Reserve
MOL	Merit Order List
MV	Medium Voltage
NEMO	Nominated Electricity Market Operator

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OMIE	Iberian Electricity Market Operator
OPEX	Operational Expenditure
P	Active Power
PT	Portugal
REN	Rede Elétrica Nacional (Portuguese TSO)
RR	Replacement Reserve
RT	Real Time
RTE	Réseau de Transport d'Électricité (French TSO)
SGAM	Smart Grid Architecture Model
SO	System Operators (referring to both DSOs and TSOs)
STAR	System of Traceability of Renewables Activations
SUC	System Use Case
TSO	Transmission System Operator
UFD	Union Fenosa Distribución (Spanish DSO)
WECL	Western Cluster

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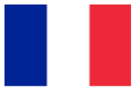
Executive Summary

The present deliverable addresses the work of the three Western Cluster demonstration countries, namely Portugal, Spain and France. The objective of the deliverable D9.1 is to foster coordination between the demonstrations in the three countries, provide guidance and steer exchange to make sure that the Western Cluster provides the highest level of aggregates value at the EU level and to the project as a whole.

The work conducted can be divided into different steps. Firstly, the initial set-up of the demonstrations in the three countries was discussed and documented. Initially, a simplified survey of potential use cases was conducted. Once the initial inputs were collected, the complete Business Use Cases (BUCs) and System Use Cases (SUCs) design was carried out. This work was done in close connection with Tasks 2.3 and 5.1, whose objective was to collect and analyze the Use Cases produced by the demos and clusters. In total, seven local BUCs, eleven SUCs and one Regional BUC were designed by the Western Cluster.

List of BUCs and SUCs in the Western Cluster

		
WECL-REGIONAL-01: *Cross-SO grid pre-qualification*		
WECL-PT-01*: Exchange of Information for Congestion Management – Short Term*	***WECL-ES-01****: Long-term congestion management*	***WECL-FR-01****: Improved monitoring of flexibility for congestion management*
WECL-PT-02*: Exchange of Information for Congestion Management – Long Term*	***WECL-ES-02****: Short-term congestion management*	***WECL-FR-02****: Improved TSO-DSO information exchange for DER activation*
WECL-PT-03*: Exchange of Information for Operational Planning*	***SUC-ES-01****: Local Market Platform*	***SUC-FR-01****: TSO automated activation*
SUC-PT-01*: Evaluation of the Product & Grid pre-qualification requirements*		***SUC-FR-02****: DSO manual activation*
SUC-PT-02*: Day-Ahead & Intraday Flexibility needs*		
SUC-PT-03*: Long-term Flexibility needs*		
SUC-PT-04*: Selection of Bids*		
SUC-PT-05*: Evaluate Grid Constraints*		
SUC-PT-06*: Maintenance plans information exchange*		
SUC-PT-07*: Consumption and gen. forecast info. exchange*		
SUC-PT-08*: Short-circuit levels information exchange*		

Legend:

Regional BUC
Local BUC
Local SUC

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Secondly, the practical demonstration characteristics were discussed with the demos, aiming at identifying where demonstrations would take place, which networks/voltage levels they would involve, and which flexibility providers would potentially participate in the demonstration activities. Therefore, Task 9.1 also aimed at starting the Flexibility Service Provider (FSP) identification and classification process. Besides these activities, Task 9.1 also monitored closely other tasks and work packages in which definitions affecting the western cluster demonstrations were taking place. For instance, Task 3.1 conducted a mapping and analysis of market models that will take while Task 2.2 provided a standardized understanding of products and services within the OneNet project. These activities served as important inputs for the following alignment analysis as well.

Besides promoting the initial set up of the Western Cluster demonstrations, an important outcome of Task 9.1 is to conduct an alignment analysis between demonstrations and between the Western Cluster and the most relevant European guidelines touching the aspects being demonstrating. For that purpose, the last chapters of this deliverable provide an analysis having as input the initial set-up of the demos and additional definitions made in other OneNet tasks. We focus particularly on the alignment between the demonstrations and the joint report written by ENTSO-e and the distribution associations on the TSO-DSO coordination in the context of balancing and congestion management [1]. Considering that the three demos focus on the procurement of local flexibility by the DSO, the TSO, or both and that other aspects of TSO-DSO coordination such as information exchange are also at the centre of the demonstrations, it is important to compare the solutions proposed by the Western Cluster in OneNet against what is considered now one of the main European guidelines for the enhancement of TSO-DSO coordination.

The comprehensive mapping of the three demonstrations presented in this report allows for an analysis of similarities, differences and overall alignment of the solutions being proposed. It is safe to say that the Western Cluster as a whole is aligned with the OneNet objectives as well as with the European view on the future of power systems, specifically on the urge for an enhanced TSO-DSO coordination, as expressed by the ASM report and recent regulatory packages such as the Clean Energy Package. Moreover, the solutions proposed aim at facilitating the integration of diverse FSPs connected at the distribution level. For the solutions testing direct involvement of customers (e.g., Spanish local market for congestion management or the French activations by TSO and DSO), the customer engagement will be key for the success of the demonstration, as they aim at facilitating the participation and integration of their resources into service markets. For that, the initial identification of FSP has already started, including the planning for the use of the Cascading Funds as a means to foster customer engagement[2]. In the case of indirect customer participation (e.g., the Portuguese BUCs focused on the exchange of information), the customer is still in the centre of demonstration, as solutions also try to reduce barriers for flexibility provision. This alignment of the Western Cluster with the European view

[2] The Cascading Funds are being considered for the Spanish demonstration, in which a local market for flexibility will be tested.

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could be verified by analyzing the Western Cluster solutions in the face of the recommendations proposed by the ASM report. A high level of alignment was seen without any major deviations.

Assessment of the ASM report with respect to the Western Cluster setup

Topic	*Recommendation from the ASM Report*	*Status on the Western Cluster*
Congestion management process and information exchange	TSOs and DSOs should optimise their processes and actions in collaboration	Foreseen in the Western Cluster
	An incentive for market parties to provide good schedules	Not foreseen so far. Could be considered in the cluster activities
	System operators should properly communicate their needs in the different timeframes	Foreseen in the Western Cluster
	Information on FSP should be made available through the flexibility resources register	Foreseen in the Western Cluster
Products and bids	Products should comply with needs of SOs within different timeframes and consider possibilities for market parties	Foreseen in the Western Cluster
	Product definition should allow for aggregation as much as technically feasible	Not foreseen so far. Could be considered in the cluster activities
	Products should be designed in a dialogue with stakeholders	Foreseen in the Western Cluster
	Different products should be sufficiently aligned to allow an efficient market-based allocation of flexibility	Foreseen in the Western Cluster
Pre-qualification	Conditional and dynamic pre-qualification can increase pre-qualified volume on the market	Foreseen in the Western Cluster
	The pre-qualification process should be user friendly	Foreseen in the Western Cluster
	Pre-qualification could take place on an aggregated/portfolio level if technically acceptable	Foreseen in the Western Cluster
Marketplace	An EU conceptual framework should be used to discuss market models	Foreseen in the Western Cluster
	When assessing market model options, implementation through different platform options should be considered	Out of the scope of the WECL
	Timing for congestion management markets should be harmonized with EU markets	Foreseen in the Western Cluster
	System operators should always exchange all the relevant information from their grid and the relevant connected assets	Foreseen in the Western Cluster
	The activation of bids for congestion management creates an imbalance that shall be counteracted	Foreseen in the Western Cluster
Platforms	Access [to platforms] should be easy for the customer	Foreseen in the Western Cluster
	Interoperability with other platforms must be ensured	Ongoing process. It is being considered in the cluster activities
	Platforms must avoid harmful interference and conflicts beyond their associated grids	Foreseen in the Western Cluster

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	Any coordination and data exchange between TSOs and DSOs that is required to avoid harmful interference is the responsibility of TSOs and DSOs	Foreseen in the Western Cluster
	Platforms solutions should be technology agnostic	Ongoing process. It is being considered in the cluster activities
General recommendations	TSOs and DSOs should pursue an integrated system approach when developing new solutions	Foreseen in the Western Cluster
	TSOs and DSOs shall use those flexibility tools that are effective, cost-efficient and that suit their needs	Foreseen in the Western Cluster

Among the three demonstration countries, both similarities and differences can be observed. Firstly, all three demos are considering congestion management services and products. This may allow for the future exchange of experiences on activities with common objectives. For instance, the enhancement of information exchange in the context of congestion management is an important objective for both the French and the Portuguese demonstrations. Where differences among demonstrations exist, they also help to expand the reach of the solutions being tested in the Western Cluster. While the Spanish demonstration is focused on the customer-DSO-MO interactions in market-oriented demonstrations, the other demonstrations are more focused on the TSO-DSO interactions from a technical perspective, mostly on data exchange. In this context, the Western Cluster is expected to provide answers for a large number of questions in the TSO-DSO-Customer triad.

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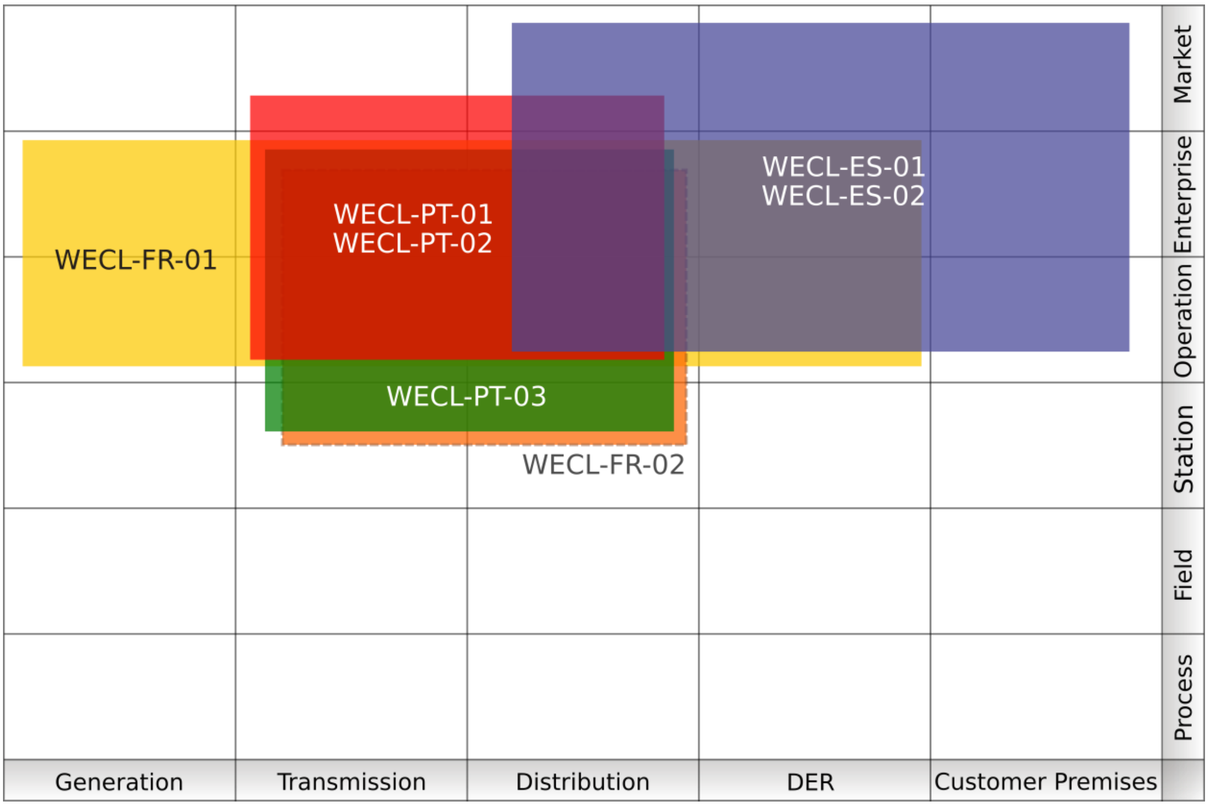

Western Cluster's business layer representation

The demonstration descriptions and setups are, however, a work in progress and are not finalized by this deliverable D9.1. Therefore, this ongoing process can benefit from the identified aspects in which demonstrations are complementary, in which exchange of experiences and further developments proposed by the ASM report are possible.

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1 Introduction

The way electricity is produced and consumed is changing fast. For several years now, power systems have been going through important changes, mostly aiming to reach what some authors describe as the three D's: decarbonization, decentralization and digitalization [2]. Firstly, the goal for decarbonization is clear, and the European Union (EU) has made targets progressively more ambitious throughout the years. From the original 20-20-20 goal[3] of reducing CO_2 emission by 20% by 2020[4], now the latest legislative package nicknamed "Fit for 55" raises the goal to 55% by 2030. Within this EU decarbonization goals, the power sector plays a key role, not only in promoting internal decarbonization of the sector but also contributing to the decarbonization of other sectors (e.g. transportation and parts of the industry). Secondly, decentralization is also among the guiding principles steering policy and decisions in the European energy sectors. The Clean Energy for all Europeans package (CEP)[5] states the need for "competitive, consumer-centred, flexible and non-discriminatory electricity markets" [3]. The decentralization goal means that consumers, prosumers, distributed generators and all other incumbent and new stakeholders should be included equally in energy markets. Finally, the third principle guiding changes in the power sector is digitalization, primarily characterized by the roll-out of smart meters. Digitalization is a fundamental enabler for the achievement of decentralization and is expected to unlock new business models and opportunities for stakeholders across the electricity system value chain.

The promotion of the three D's is leading to the creation of new types of agents and the growing number of Distributed Energy Resources (DERs). With such growth comes the need to properly integrating these new agents and resources, both technically and from a regulatory perspective. They have the potential to contribute to the system with services that will enhance its performance and reliability and potentially reduce operation costs. In this context, the OneNet project aims at creating the conditions for a new generation of system services able to fully exploit demand response, storage and distributed generation while creating fair, transparent and open conditions for the consumer. As a result, while creating one network for Europe, the project aims to build a customer-centric approach to grid operation. This ambitious view is achieved by proposing new markets, products and services and creating a unique ICT architecture.

The present deliverable is part of the Work Package 9, which addresses the work of the three Western Cluster demonstration countries, namely Portugal, Spain and France. This deliverable D9.1, specifically, is the product of Task 9.1, whose objective was to foster coordination between the demonstrations in the three countries,

[3] The 20-20-20 goal was a European plan on climate change adopted in 2008 that stated that Member States should reach 20% increase in energy efficiency, 20% reduction of CO2 emissions, and 20% renewables by 2020.

[4] When compared to levels in 1990.

[5] The CEP is a comprehensive update on the EU legislation on energy published in 2019. Together with the most recent updates brought by the "Fit for 55" package, the CEP is currently guiding the way Member States are adapting their electricity markets.

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provide guidance and steer exchange to make sure that the Western Cluster provides the highest level of aggregates value at the EU level and to the project as a whole.

The work conducted in Task 9.1 can be divided into different steps. Firstly, the initial set-up of the demonstrations in the three countries was discussed and documented. Initially, a simplified survey of potential use cases was conducted. Once the initial inputs were collected, the complete Business Use Cases (BUCs) and System Use Cases (SUCs) design was carried out. This work was done in close connection with Tasks 2.3 and 5.1, whose objective was to collect and analyze the Use Cases produced by the demos and clusters. Secondly, the practical demonstration characteristics were discussed with the demos, aiming at identifying where demonstrations would take place, which networks/voltage levels they would involve, and which flexibility providers would potentially participate in the demonstration activities. Therefore, Task 9.1 also aimed at starting the Flexibility Service Provider (FSP) identification and classification process. Besides these activities, Task 9.1 also monitored closely other tasks and work packages in which definitions affecting the western cluster demonstrations were taking place. For instance, Task 3.1 conducted a mapping and analysis of market models that will take while Task 2.2 provided a standardized understanding of products and services within the OneNet project. These activities served as important inputs for the following alignment analysis as well.

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Finally, the conclusions of this deliverable D9.1 provide recommendations based on the initial demo set-up and the alignment analysis conducted. At the time of writing, demonstrations are at a critical moment when final adjustments to the demo set-up are being discussed.

[6] TSO: Transmission System Operator; DSO: Distributions System Operator

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2 Methodology

The identification and description of the solutions to be demonstrated in the Western Cluster followed a methodology that consisted of several septs. First, a period of initial discussions on products, services and demonstration characteristics took place. This phase was conducted mostly by the demonstration partners at the national level. Following this initial identification, a simplified Use Case template was used to capture these ideas in a more formalized manner (see the simplified template in Appendix 1). In this manner, key aspects of the BUC, such as the objectives and narrative, could be described at an early stage of the task. The next step was the definition of the full BUC, following the standard template IEC 62559-2. The BUC writing process was also done in cooperation with Task 2.3. The completion of the BUC provided the Western Cluster with a comprehensive understanding of how solutions can be implemented within the demonstrations. The next step was the definition and writing of the SUCs, that detail processes of actual systems necessary to the BUCs. This process was done in cooperation with Task 5.1, responsible for the overall analysis of the OneNet SUCs. Finally, the last step with regards to the definition of Use Cases was the development of a Western Cluster Regional BUC. In the BUC, all three countries are expected to participate in a coordinated cross-border demonstration, namely a cross-SO harmonized pre-qualification process.

During the writing process for all use cases, the aspects discussed in the Active System Management report (ASM, [1]), written by ENTSO-e and the four DSO associations in Europe, were especially taken into account. More specifically, all BUCs in the Western Cluster used the five service phases as the scenarios for each BUC. The service phases defined in the ASM report are the (i) preparatory phase, (ii) the forecasting phase, (iii) market phase, (iv) monitoring & activation phase, and the (v) measurement. For a detailed description of each service phase, we refer the reader to the Appendix of this deliverable, produced during the BUC writing process to aid the scenario definition.

In parallel to the Use Case definitions, the demonstrations also worked on the overall demonstration set-up definitions. Aspects such as the geographical area where the demonstrations will take place, the potential FSP and the platforms to be developed were discussed and initiated. The combination of both the description of use cases and the initial description of the demonstration setup allowed for the initial definition of Key Performance Indicators (KPIs). Figure 2-1 illustrates the activities that took place in Task 9.1 and their sequence.

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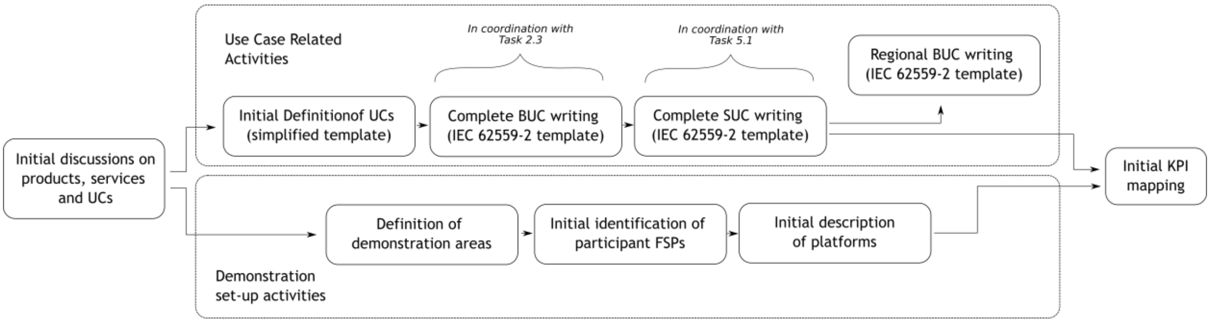

Figure 2-1: Timeline of Task 9.1

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3 Portuguese Demonstration

3.1 Overview of the Portuguese demonstration

The Portuguese demonstration, included in the OneNet Western Cluster, will be testing a data exchange information mechanism between the Portuguese DSO and TSO for flexibility and operational planning purposes.

An overview of the market architecture of the OneNet Portuguese demonstration is represented in Figure 3-1 and described in more detail in deliverable 3.1. The Portuguese market comprises a multi-level market model in which foster the direct interaction between DSO and TSO.

It is important to note that no flexibility market will be developed for the Portuguese demonstration. The main purpose of this demo is to test the direct communication between DSO and TSO, which is needed for any of the flexibility procurement process phases, such as pre-qualification, plan/forecast, market phase and monitoring & activation, and transversal to any market architecture. Nevertheless, the market architecture represented in Figure 3-1 is used only as a reference to organize the flow of information that will be exchanged and to have a reference timeframe for the exchange of information.

This market architecture considers three different timeframes, such as greater than annually for the long-term, day-ahead, and intraday. Therefore, in the Portuguese Demonstration, the exchange of information among the Portuguese DSO and TSO will consider the mentioned timeframes.

It is expected that coordination between the DSO and the TSO will optimize the system operation and optimally address the needs of both System Operators (SOs). This interaction will focus on two main topics, enable flexibility to solve the SO's needs and improve their operational processes.

For flexibility purposes, the demonstration will follow a multilevel coordination strategy, considering four main process phases of ASM report – prepare, plan/forecast, market phase, monitoring and activation. Each of these process phases implies the coordination between both SOs, which means direct communication between the TSO and DSO to evaluate each situation and obtain the solution that better fits the needs of both operators. For instance, if the TSO is expecting congestion in its grid, and no bids are available in the TSO Congestion Management submarket, the TSO can consult the DSO to obtain additional offers by forwarding bids from the DSO Congestion Management submarket to the TSO Congestion Management submarket, and vice-versa.

For operational planning purposes, the Portuguese demonstration will address some topics that can be relevant for better network planning and better preparation of daily operational actions, thus avoiding constraints in the transmission and distribution network.

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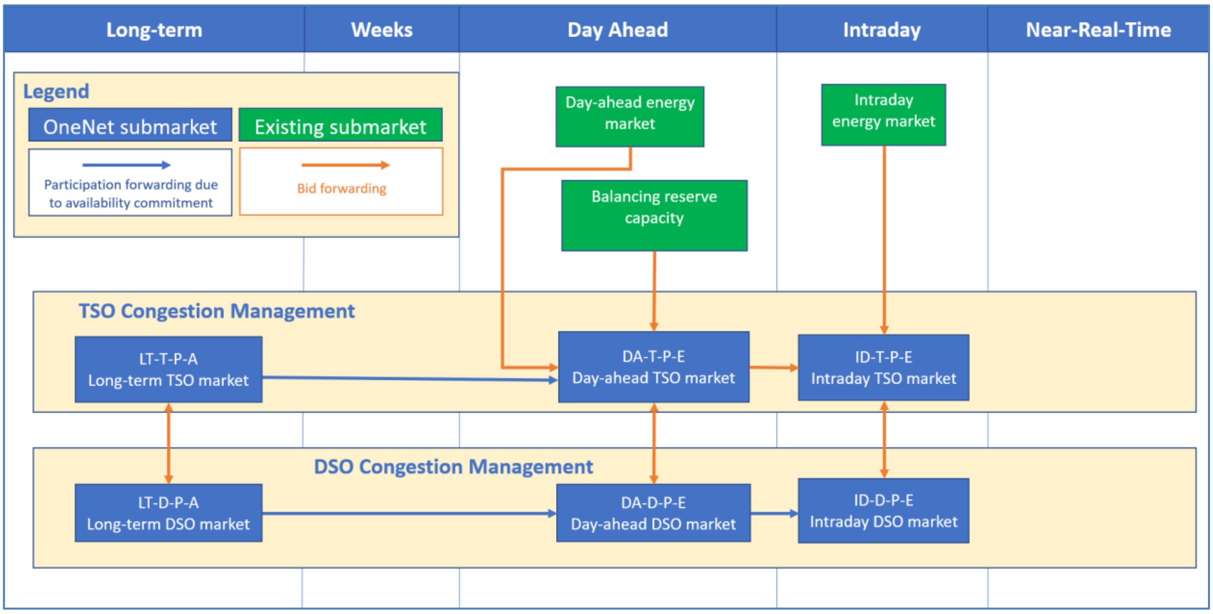

Figure 3-1: Overview of the Portuguese Market. Source: D3.1[7]

3.2 Portuguese Use Cases

The OneNet Portuguese demonstrator aims at specifying the exchanges of information between system operators to enable flexibility provision and to improve their operational planning. For the Business Use Cases related to flexibility, the ASM report stages were considered as the necessary steps in defining the process upon which coordination should be carried out between TSO and DSO. All stages were considered except for the settlement process since the goal is to focus on the information exchange. For the Business Use Case related to operational planning, the operational processes of the DSO and TSO that can be improved with the exchange of information between network operators are considered.

3.2.1 WECL-PT-01 - Exchange of Information for Congestion Management – Short Term

3.2.1.1 Scope and Objectives

The main objectives of the BUC WECL-PT-01[8] Exchange of Information for Congestion Management are the following:

[7] The acronyms on the picture are: Long-term (LT); Transmission (T); Distribution (D); Active Power (P); Availability (A); Energy (E); Day-ahead (DA); Intraday (ID); Real-time (RT).

[8] The BUC naming in the OneNet project follows a standard: cluster identification, country and sequential numbering for the country. Therefore, WECL stands for Western Cluster, while PT stands for Portugal (ISO 3166-1 alpha-2 code)

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1. Design and detail each process phase of the ASM report so that it can serve as a basis for future developments.

2. Coordinate 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.

3.2.1.2 Short Narrative and BUC overview

Flexible resources connected to the transmission and distribution systems can provide flexibility to system operators to eliminate congestions through a market mechanism. This BUC applies both transmission and/or distribution systems, and it aims 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. Two different time frame markets will be examined:

- Day Ahead
- Intraday

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

- Prepare/Pre-qualification: The process in which it is checked whether a unit can deliver the product it intends to sell, considering 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

As described in section 3.2, in this Business Use Case, the Measurement and Settlement phase will not be addressed.

3.2.1.3 Overview Diagram

Figure 3-2 presents the overview diagram of the BUC WECL-PT-01, including the actors, the objectives (marked "O"), the assumptions (marked "A), and the prerequisite (marked "P") and the scenarios that the Business Use Case will approach.

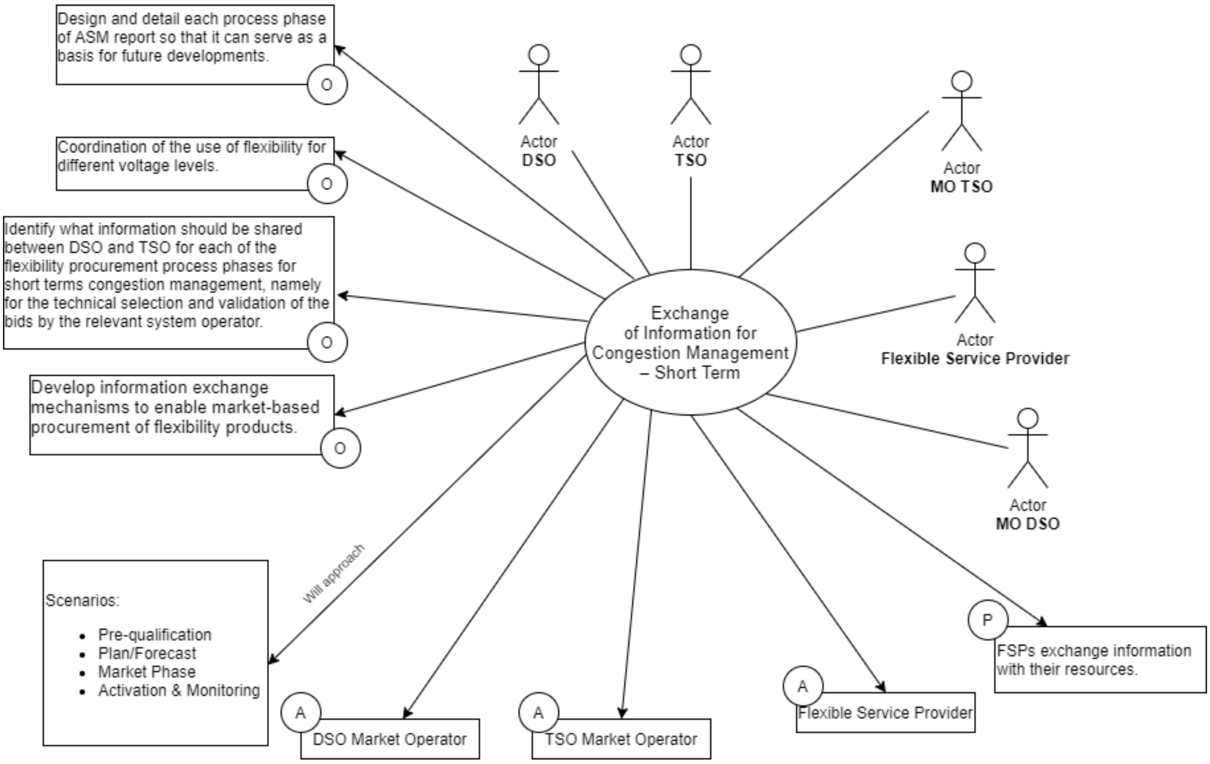

Figure 3-2: Overview diagram of Exchange of Information for Congestion Management – Short term Business Use Case

3.2.2 WECL-PT-02 - Exchange of Information for Congestion Management – Long Term

3.2.2.1 Scope and Objectives

The objectives of the WECL-PT-02 are the same as for the Business Use Case WECL-PT-01, since the main difference is the timeframe considered.

3.2.2.2 Short Narrative and BUC overview

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Flexible resources connected to the transmission and distribution systems 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/or distribution systems to keep power flows within the acceptable thermal limits. 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 longer than annually. For this timeframe, we will approach some of the process phases of the 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 WECL-PT-01, 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. As described in section 3.1, in this Business Use Case, the Measurement and Settlement phase will not be addressed.

3.2.2.3 Overview Diagram

Figure 3-3 presents the overview diagram of the BUC WECL-PT-02, including the actors, the objectives (marked "O"), the assumptions (marked "A), and the prerequisite (marked "P"). From an overview perspective, the diagram is equivalent to the one of WECL-PT-01. The differences between the short and long-term BUCs can be observed in sequence diagrams available in the Appendix of this deliverable. Since the sequence diagrams correspond to the scenarios that will be addressed, the differences between WECL-PT-01 and WECL-PT-02 are seen in the plan/forecast and market phase scenarios.

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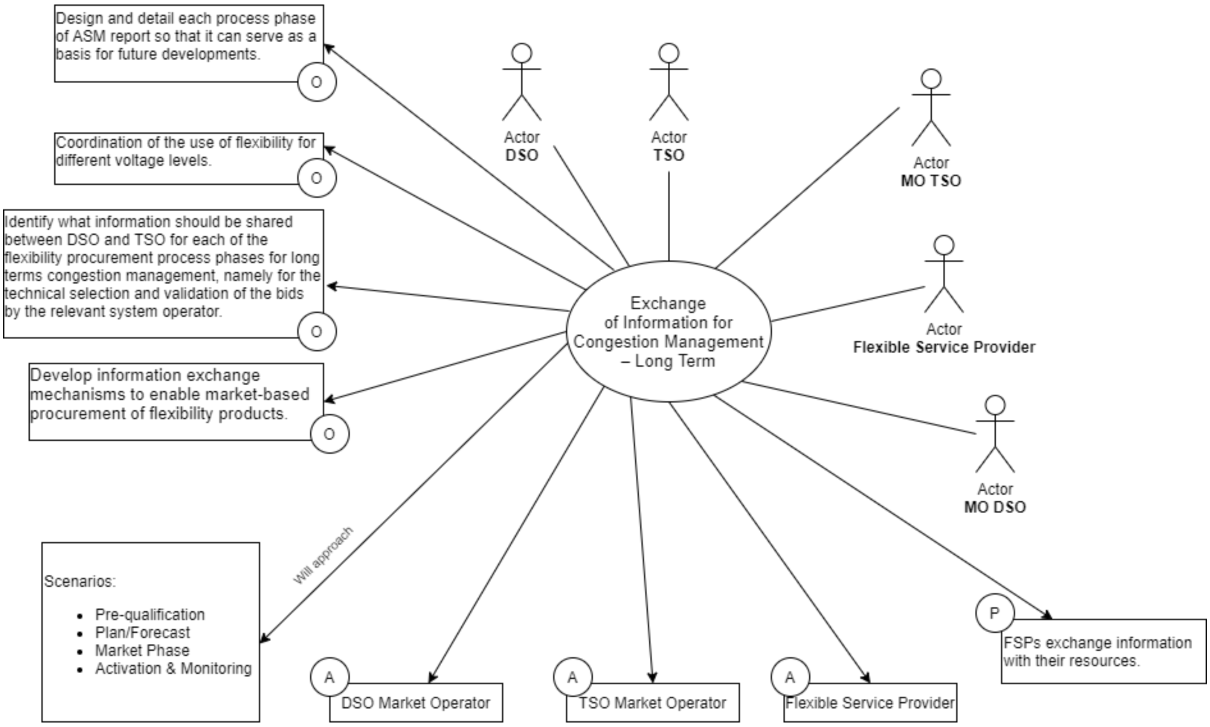

Figure 3-3: Overview diagram of Exchange of Information for Congestion Management – Long term Business Use Case

3.2.3 WECL-PT-03 - Exchange of Information for Operational Planning

3.2.3.1 Scope and Objectives

The main objectives of the BUC WECL-PT-03 Exchange of Information for Operational Planning are the following:

1. Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve the programming of DSO operation.
2. Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve the 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.

3.2.3.2 Short Narrative and BUC overview

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This BUC focuses on the enhancement of information exchange that enables better operational planning for DSOs and TSOs.

The increase in generation from renewable resources, with their associated uncertainty, and the increase in the use of electricity (due to EVs, for example) means that system operators must improve their grid management strategies 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 use case is related to WECL-PT-01, and WECL-PT-02 since some of the information covered in this use case can be used in both.

This BUC explores and intends to define the information exchange principles between TSO and DSO to improve the operation of both networks in multiple domains and timeframes. For the long-term, the information that needs to be exchanged bidirectionally regarding the expected evolution of the transmission and distribution grids and their associated supply, consumption, generation and flexibility services configuration will be defined.

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[9] substation, as well as the information regarding the load transfer availability between EHV/HV interconnecting points, providing 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 type and amount of 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 on the definition of the information to exchange:

- 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 can actively contribute to the increase of the short-circuit levels. The short-circuit levels should be tracked to ensure that they are kept

[9] EHV: extra-high voltage; HV: high voltage.

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bellow the rated short circuit current of the power equipment in the TSO/DSO interface. This information should be computed and exchanged after the gate-closure time of the day-ahead market to use the market results to robustly forecast the short-circuit levels at the nodal level in the observability area.

Due to the impact that distribution network loops close to the TSO-DSO interface can have on 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 substations with some impact in the distribution grids power flows near the interconnection point.

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 its 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. An accurate estimation of the energetic mix (generation and consumption) is extremely valuable in order to predict better the planning operation activities of the operators. The aggregation of these forecasts to the TSO/DSO interface (EHV/HV substations) allows both operators to have an expected more accurate forecast in what concerns the generation and consumption from the other operator. Additionally, these forecasts can help in the improvement of state estimator; however, this topic will not be handled in the use case.

The final goal of this use case is to set 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.

3.2.3.3 Overview Diagram

Figure 3-4 presents the overview diagram of the BUC WECL-PT-03, including the actors, the objectives (marked “O”), the assumptions (marked “A), and the prerequisite (marked “P”).

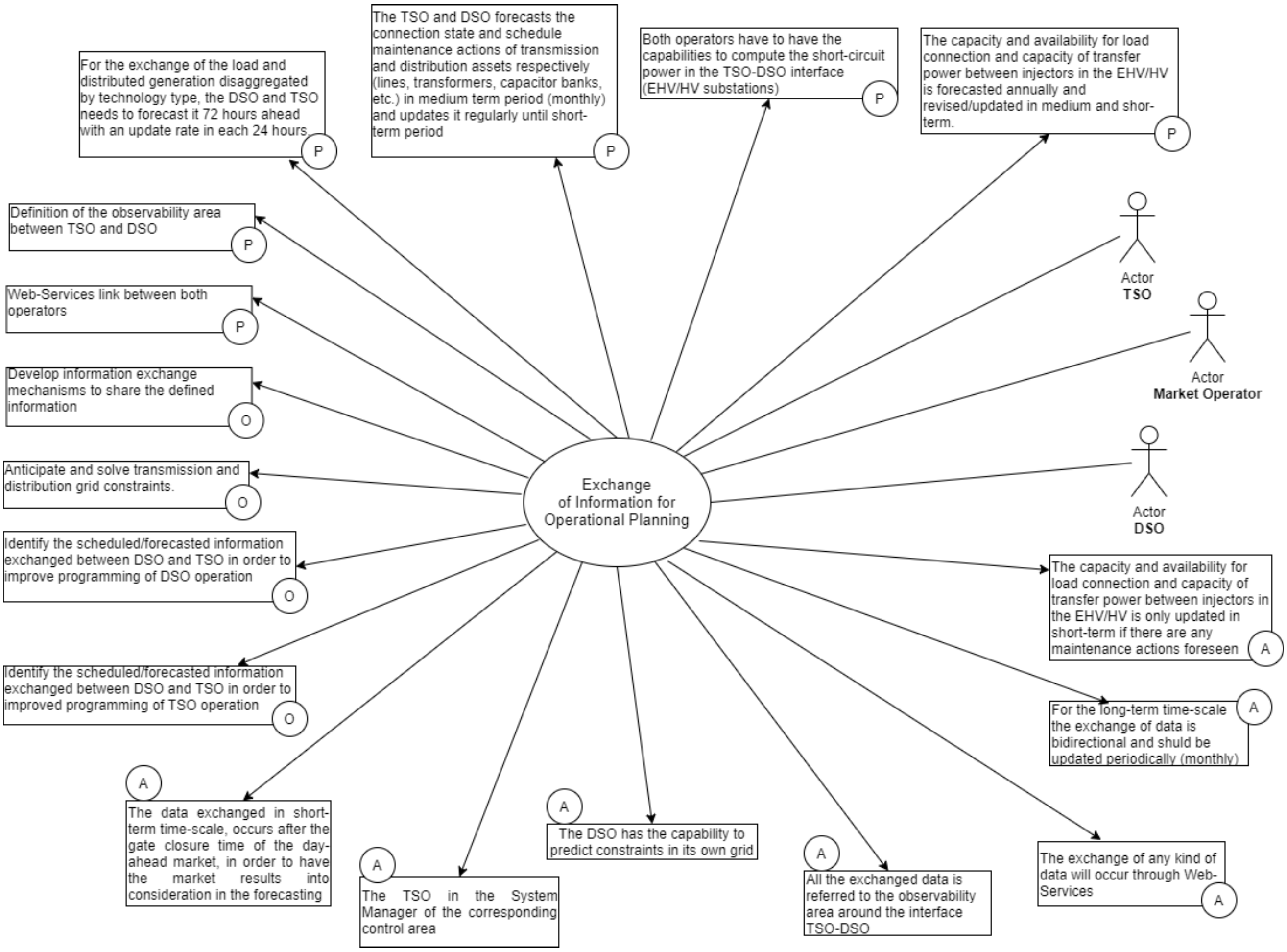

Figure 3-4: Overview diagram for Exchange of Information for Operational Planning Business Use Case

3.2.4 Portuguese System Use Cases

The use cases were approached from a business intent but considering a time horizon perspective since different tools and needs are required when a long or short-term analysis is being carried out. In this sense, a group of eight system use cases were defined, which distinguish different time horizons where needed and replicates as common SUCs the activities which are common to both WECL-PT-01 and WECL-PT-02. Moreover, three of those are dedicated to WECL-PT-03. The following table summarises the SUCs, the corresponding designation and BUCs.

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Table 3-1: Summary of System Use Cases and corresponding BUCs

SUCs Nbr.	SUC Designation	Ref. BUC
SUC-PT-01	Evaluation of the Product & Grid pre-qualification requirements	WECL-PT-01 and WECL-PT-02
SUC-PT-02	Day-Ahead & Intraday Flexibility needs	WECL-PT-01
SUC-PT-03	Long-term Flexibility needs	WECL-PT-02
SUC-PT-04	Selection of Bids	WECL-PT-01 and WECL-PT-02
SUC-PT-05	Evaluate Grid Constrains	WECL-PT-01 and WECL-PT-02
SUC-PT-06	Maintenance plans information exchange	WECL-PT-03
SUC-PT-07	Consumption and generation forecast information exchange	WECL-PT-03
SUC-PT-08	Short-circuit levels information exchange	WECL-PT-03

SUC01 - Evaluation of the Product & Grid pre-qualification requirements

This SUC is common to WECL-PT-01 and WECL-PT-02. This particular SUC is divided into two different processes, the product and the grid evaluation process. For each process, the Portuguese demo will describe each step, in which a given set of requirements are categorized as mandatory or informative to prequalify an FSP. The development of the SUC separates the processes for DSO and TSO when necessary. Similarly, for product evaluation, it identifies which mandatory and informative requirements exist, such as mode of activation, minimum quantity to deliver, locational information, etc., are required to evaluate whether the unit can (technically) deliver the product it wants to sell/deliver. For grid evaluation, in the pre-qualification phase, a grid impact assessment is evaluated. To do this evaluation, it is defined what kind of grid data is the most appropriate.

SUC02 - Day-Ahead & Intraday Flexibility needs

This SUC focuses on a short time frame, hence under the WECL-PT-01 scope. It supports the coordination between DSO and TSO so that they can determine how much flexibility they will need to acquire for a short-term timeframe. Coordination is needed to prevent congestions in the distribution and transmission grids due

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to activation of active power flexibilities for the needs of DSO and TSO. This coordination process starts day-ahead and ends intraday, after the opening of the intraday flexibility market. In one of the scenarios described in this SUC, it is proposed that the information exchanges between the DSO and the TSO are done through the OneNet System.**SUC03 - Long-term Flexibility needs**

As a complement to the previous SUC and looking at the longer time frame, this SUC refers to the WECL-PT-02. Likewise, this SUC supports the coordination between DSO and TSO so that they can determine how much flexibility they will need to acquire for a long-term timeframe. Coordination is needed to anticipate technical problems, improve network operation security and avoid investments in the distribution and transmission grids with the activation of active power flexibilities. In this SUC is described the steps, such as a probabilistic power flow checking and forecasting of possible congestion areas, that system operators should go through considering the possibility of reserving flexibility services for congestion management years in advance. Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about planning, forecast and the amount of flexibility needed is foreseen.

SUC04 - Selection of Bids

This system use case is yet another case of a common application to both WECL-PT-01 and WECL-PT-02. It describes the selection of bids process, which is included in the Market phase scenario in both BUCs. This SUC will focus on which bid parameters need to be described, such as flexibility direction, the possibility for aggregation, etc. These are crucial to select what bids can solve system operators' needs and constraints, taking into account the impact of each bid on both the operator's network and the neighbouring operator's network. In addition to the parameters of the bids, another aspect to consider when selecting bids is the coordination between DSO and TSO markets, namely the coordination in forwarding bids from the DSO market to the TSO market and vice versa. Furthermore, it is described which parameters are addressed to select which bids can and cannot be acquired and the merit order list (MOL) of the previously acquired bids. After the selection of the bids, based on the requirements described above, the MOL of the acquired bids is defined.

SUC05 - Evaluate Grid Constraints

This process is included in the Market and Activation scenarios described in the Business Use Cases Template WECL-PT-01 and WECL-PT-02. This SUC supports the coordination between DSO and TSO in the market and activation phase. To avoid the acceptance and the activation of bids results in new constraints, the system operator to which the resource is connected should make a check of the state of its network to be sure that the activation does not cause any future problem. In this SUC, it is described which parameters are addressed and analysed to validate the activation of the accepted bids in the market phase. To do this, the grid data used by system operators should be as up to date as possible to ensure that the bids that will be activated will not bring consequences. The dynamic grid constraints evaluation is a continuous process during the market and activation

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phases. This stage resembles the grid pre-qualification stage; however, it is more dynamic and includes up to date information, hence possibly requiring different tools, justifying a SUC of its own.

SUC06 - Maintenance plans information exchange

This SUC will define the information exchange related to the maintenance plans in multiple time horizons referring to the WECL-PT-03. This SUC is supported by the idea that an accurate definition of the maintenance plans is crucial for the operational activities of different stakeholders, such as consumers and grid operators. The maintenance work plans should be defined between distribution and transmission operators on an annual basis (long-term). This SUC has the objective to keep tracking the schedule of the maintenance works and update them when needed by exchanging more detailed information during different timeframes (medium-term until close to real-time).

SUC07 - Consumption and generation forecast information exchange

This SUC will describe the processes and the information exchange related to the forecast of consumption and generation aggregated in the interface TSO/DSO nodes under the scope of the WECL-PT-03. This SUC explores the exchange of this information between operators to improve their planning activities in the short term. The generation forecast should be disaggregated by technology type (Solar, Wind, Hydro, CHP, among others). The load forecast can also be exchanged in a disaggregated way by distinguishing different types of consumers (residential, industrial, etc.). The disaggregation by technology allows the operators to have forecast by generation type and make dedicated improvements to the respective forecast methods of each one, and also to have a distinguishment between feed-in-tariff and market generation. This information should be exchanged day-ahead between operators, taking into consideration the market clearance results. This data exchange is to be exchanged every 24 hours. The data shall include the forecast for the next 72 hours with a granularity of 15 minutes.

SUC08 - Short-circuit levels information exchange

Always referring to the interface points between the DSO and TSO, this SUC will describe the short-circuit levels forecast information exchange between TSO and DSO for the EHV/HV substations, which is under the scope of the WECL-PT-03. This SUC establishes the process to compute and exchange the complete short-circuit power in the interface nodes (EHV/HV substations) that could be used for operational planning purposes. The active contributions from transmission and distribution assets are specific and taken into consideration for the short-circuit power in different stages. The fault type under this SUC will focus only on the three-phase symmetrical short-circuit (transient timeframe). Independently of the different topological arrangements of each country, the calculation of the short-circuit powers should follow a similar approach that is proposed in this BUC, which fits well as a potential OneNet Use Case.

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It is important to note the extensive list of SUCs that have been described. However, for demonstration purposes, the Portuguese demonstration effort in this project only allows the development of the following SUCs: SUC01, SUC02, SUC06, SUC07 and SUC08.

3.3 Demo site characteristics

3.3.1 Demo site

Since the Portuguese Demo is focused on the exchange of information between DSO and TSO, it is not considered a physical site for the demonstration. Nevertheless, for the exchange of information will be considered different areas and different voltage levels have been selected to try the most relevant situations.

3.3.1.1 Network characteristics

Regarding the network areas used for the Portuguese Demo, they were selected to include substations where the transition from the transmission network to the distribution network is made at 60 kV. The focus of the demonstration is the exchange of information between DSO and TSO, and for this purpose, at this stage, two areas will be considered since, for these areas, the exchange of operational planning information can be relevant.

- Trás-os-Montes area, which is a network in the northeast of Portugal, to which Bragança and Vila Real belong.
- Batalha area, which is a network located in the seaside centre of Portugal near Leiria.

It is important to note that during the development of the project, other relevant areas could be added to the Demonstration.

The two following figures show the above-mentioned areas of the Portuguese grid, detailed from the EHV levels (red for 400 kV and green for the 220 kV) to the 60 kV level (black). The 60 kV lines are part of the DSO network.

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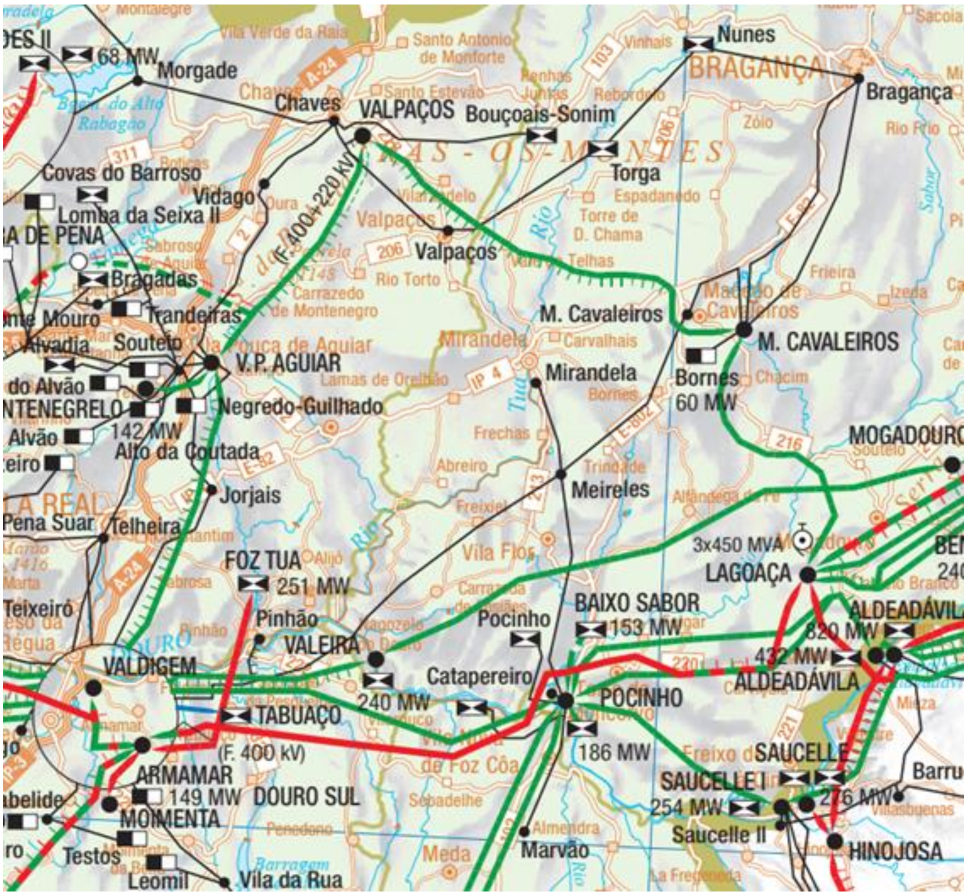

Figure 3-5: Trás-os-Montes area network. Source: [4]

Figure 3-6: Batalha area network. Source: [4]

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3.3.1.2 Resources characteristics

For the Portuguese demonstration, the resources will participate indirectly since the focus is on the information exchanges between DSO and TSO. A sample of FSPs connected to different voltage levels will be considered to define which product attributes should be required by SOs, the structures (terminology) of the information exchanged between them and also so that the implementation of these information exchanges can be tested using real or synthetic data as content. For this sample of FSPs, it is planned to have the characterization of each FSP, such as the name of FSP, resource, mode of activation, quantity, locational information, and SO connected, etc.

3.4 Key Performance Indicators

The KPIs for the Portuguese demonstration were defined from an exchange of information point of view[10]. The main indicators are described below and comprises one economic indicator and seven technical indicators. The economic indicator refers to the cost per year of the necessary infrastructure to support the information exchange, including maintenance aspects.

- 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.

In general, technical KPIs can be assessed directly from the UC outcome. However, if it cannot, it can be drawn from the positive or negative externalities exchange of information between parties. An example of this is the KPI "Requested Flexibility", which even though the BUC may not focus on flexibility provision, will be impacted by the exchange of information to allow it. This will result in higher success rates of flexibility requests and provision. On the other hand, direct assessments can be done, as in the case of forecast activities. This is because the activity is a forecast being done solely with one SO information, and there is a subsequent forecast after the exchange of information, which should have an impact on the forecast (KPI "Forecast Quality").

- Forecast Quality – It assesses standard metrics of a forecasting exercise such as MAE – mean absolute error of the forecast (kW) and the NMAE – normalized mean absolute error of forecast (%)
- Share of correctly forecasted congestions - The ratio of the correctly forecasted congestions versus all congestions that occurred or would have occurred without curative DSO action.

[10] The KPIs described in this section are preliminary and may be altered. The final list of KPIs will be presented in the Deliverable D2.4.

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- Share of correctly forecasted congestion - The ratio of the correctly forecasted congestions versus all congestions that occurred or would have occurred without curative DSO and TSO action.
- Share of false-positive congestion forecasts - The ratio of the incorrectly forecasted congestions versus the total number of congestions forecasted.
- Requested flexibility - This indicator measures the amount of flexibility requested by the DSO or TSO for ancillary services from all the flexible resources of the portfolio.
- Technical Avoided Restrictions - Ratio of technical restrictions (voltage and congestion problems) solved through the use of flexibility services. Technical assessment and not economical.
- Curtailed RES (MWh/day) - RES accumulated energy curtailed in transmission or distribution grid before and after BUC implementation.

Further KPIs related to the information exchange itself will be considered, such as related to the timing of such transactions, the volume transacted, sender and recipient status. However, no functional units were defined at this stage of the project.

3.5 Portuguese Platforms and Architecture Approach

It is important to make an initial remark about the Portuguese platforms and architecture approach here described, that this description is not definitive since it is being stated in a very early phase of the project, and for that reason, can suffer some changes in the future. The data exchange and communication infrastructure that will be structured and implemented within this project has the final objective of integrating the functional and production environment of both Portuguese system operators without harming the grid operational stability and introducing cyber-security risks. The web services will go through dedicated machines to isolate physically and logically from grid operators' production environment. Furthermore, in order to be aligned with the main concept of the project, for one of the system use cases described above, the exchange of information between the Portuguese DSO and TSO will be done through the OneNet System.

In the Portuguese demonstration phase, the partners envision the exchange of the operational planning data and respective forecast by using REST Architecture based Web-Services [5]. The exchange of information between the transmission and distribution system operators (REN[11] and E-REDES[12]) will have dedicated APIs that are responsible for gathering the specific information from the dedicated databases of each of the operators. Both operators have dedicated machines to host the web service.

[11] Redes Energéticas Nacionais (Portuguese TSO).
[12] E-REDES - Energia S.A. (Portuguese DSO)

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In Figure 3-7 below is presented the schematic representation of the envisioned information and communication technology (ICT) between the TSO and DSO to be implemented and tested in Portuguese demonstration.

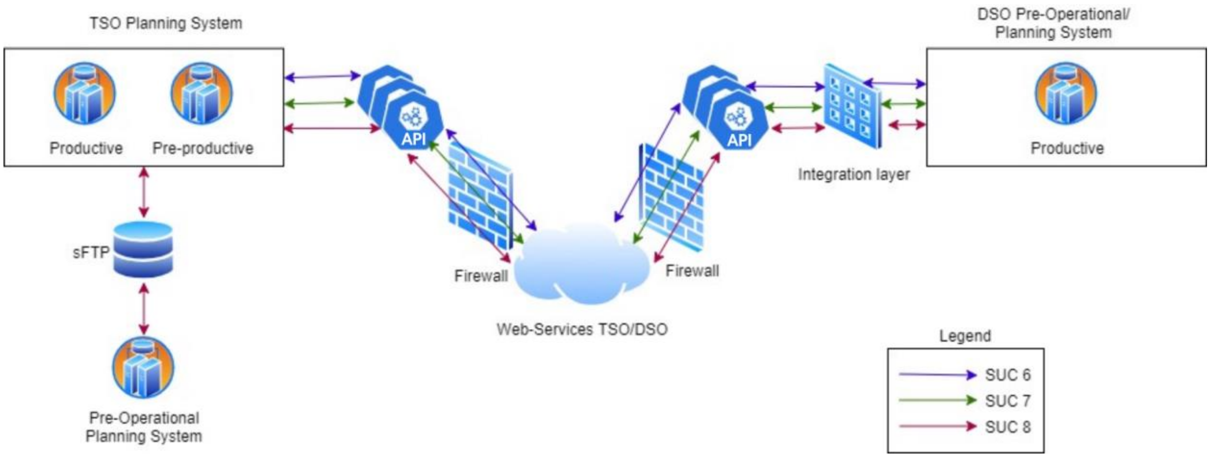

Figure 3-7: Portuguese architecture overview

The ICT will need to take into consideration the multiple security measures to protect the integrity of the production environments (isolation, segregation, endpoint protection, monitoring and control).

The REST Web-Services communication will follow the protocol standard IEC 62325-504, and the files will be exchanged in XML format. Each of the operators will have their databases from which they can read data to send to the other operator having into consideration a pre-defined XML template for each of the system UC. The writing process is also possible in the same way through the Web-services respecting the IEC standard guidelines and the agreed formats. Each operational planning SUC will have a dedicated file with specific fields that are not fully identified yet.

The integration layer represented has the purpose of making all the routing of information and guarantee the safe exchange from and to the DSO ICT domain. On this scope, this layer is very important since most of the information will be coming or going to the operational planning system of the DSO domain, which is very critical, given that this infrastructure is where core operational applications are hosted. As such, very high cybersecurity and resilience standards need to be present.

The sFTP (secure File Transfer Protocol) communication between the TSO planning system and the Pre-Operational Planning system is related to the SUC 8 in which the Pre-Operational Planning system is responsible for the computation of the forecasted short-circuit power in the interface. This link is, in fact, a dedicated TSO internal link created just for this purpose.

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For flexibility purposes, namely SUC01 and SUC 02, at this stage, there are still some possibilities open. On the one hand, for the communication between the transmission and distribution system operators (REN[13] and E-REDES[14]), a possibility to be tested is the UMEI concept that is being developed currently in the H2020 EUniversal project,[15] an innovative, universal, adaptable and modular approach to interlink active system management with electricity markets for the provision of flexibility services, allowing distributed communication without the need of a central hub. It aims to overcome limitations that system operators experience in the use of flexibility. And it's currently being materialized into publicly available APIs, allowing for any stakeholder to adopt them or to develop new APIs concerning new services while adopting the UMEI interface specification. On the other hand, Energy Communication & Connectivity Service Platform (ECCo-SP) is also a platform that can be considered to demonstrate the exchange of market and flexibility information between the different stakeholders [6]. The ECCo-SP can be used as a common platform for reliable and secure communications between REN, E-REDES and eventually market operators or flexibility aggregators. It currently comprises two main functional blocks: Energy Communication Platform (ECP) acting in the communication layer and Energy Data eXchange (EDX), responsible for the service layer. The ECP/EDX supports the following different interfaces for information exchange: FSSF, AMQP and IEC 62325-504 Web Services.

[13] Redes Energéticas Nacionais (Portuguese TSO).
[14] E-REDES - Energia S.A. (Portuguese DSO).
[15] https://euniversal.eu/

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4 Spanish Demonstration

4.1 Overview of the Spanish Demonstration

The OneNet Spanish demonstrator aims at unlocking the flexibility of the resources connected to the distribution system to contribute to congestion management at the distribution level. Local markets in which the DSO is the only buyer of the flexibility services, and the FSPs are the sellers, are tested.

The Spanish demonstration will involve two DSOs, namely i-DE[16] and UFD[17], as well as OMIE[18], the nominated electricity market operator (NEMO) for managing the Iberian Peninsula's day-ahead and intraday electricity markets. Different FSPs will also participate in the provision of flexibility services, as discussed in the following sections. The TSO-DSO coordination is also being considered in the Spanish demonstration, despite the Spanish TSO not being a partner in the OneNet project and that the powers involved in the pilot have almost no effect on the transmission grid. The coordination is done through OMIE who coordinates energy market results and responsibilities with the SOs. This function is already performed by the Spanish NEMO for the energy markets and will be extended, in the context of the demonstration, to include the local markets being developed in OneNet.

To enable the trading of flexibility products, a local market platform (LMP) will be developed by OMIE and used by DSOs and FSPs. OMIE will act as the Independent Market Operator (IMO) for the LMP, which will trade several different products in different submarkets. As presented in the OneNet deliverable D3.1, two main submarkets are proposed:

- Long-term market (availability product and agreed activation submarket, and an availability product submarket);
- Short-term market (day-ahead product availability-optional and activation submarket, and real-time product activation submarket).

The existing submarkets that are relevant for the scope of the demonstrator are:

- Day-ahead energy market
- Intraday energy market
- Common congestion management market
- Balancing energy market

Figure 4-1 provides an overview of the market architecture of the OneNet Spain demonstration. All the new submarkets are decentralized markets and event-based. In the case of a need for system services, the DSO asks

[16] I-DE Redes Eléctricas Inteligentes, S.A.U. (Spanish DSO).
[17] Union Fenosa DIstribución (Spanish DSO)
[18] Iberian Electricity Market Operator

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the IMO to open a call in a specific grid area to procure flexibility. The system service procured is active power flexibility. It is procured active power availability, activation, or both depending on the submarket considered.

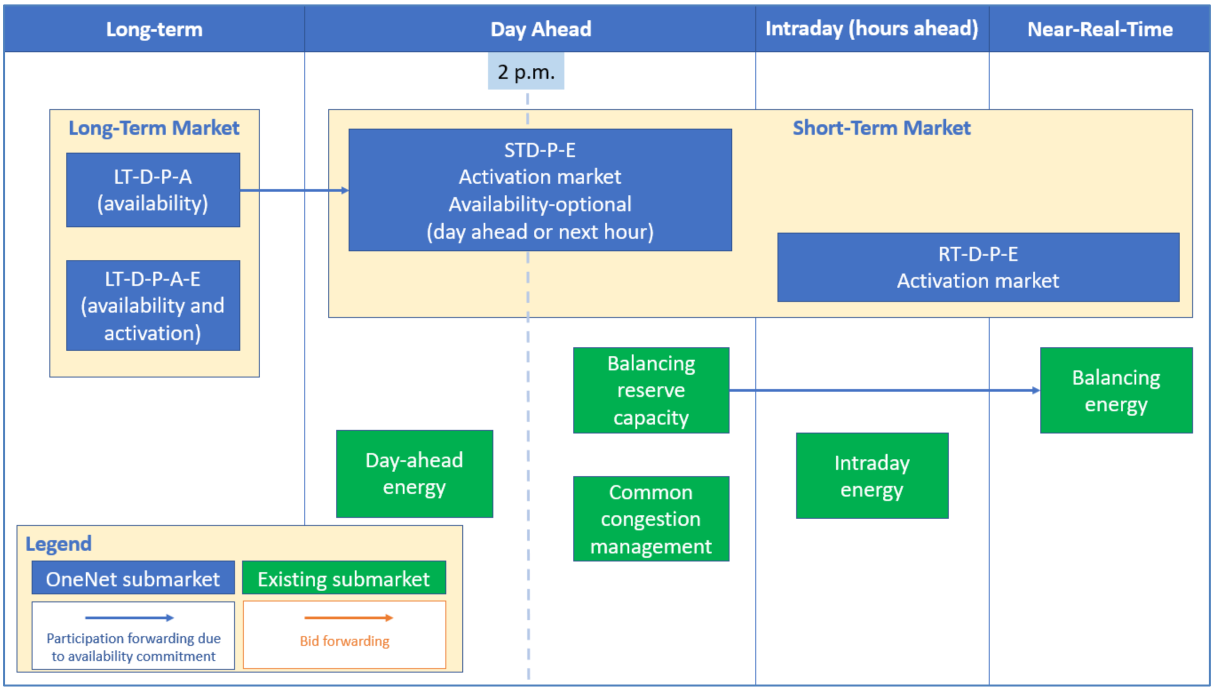

Figure 4-1: Overview of the Spanish Demonstrator Market Architecture[19]. LT-P: Long-term active power, ST-P: short-term active power.

In the long-term submarket developed by the OneNet Spanish demonstrator, are included:

a. "Availability Product": Long-Term active power availability submarket (LT-P-A, in Figure 4-1);
b. "Agreed Activation product": Long-Term active power availability and activation submarket (LT-P-A-E, in Figure 4-1).

4.1.1 Overview of the Long-Term submarkets

On the one hand, the "Availability Product" (LT-P-A) is part of the long-term submarkets for flexibility procurement. It represents a local mechanism in which the DSO procures active power flexibility in terms of availability from FSPs connected at the distribution system level. The FSPs belonging to the procurement area

[19] The acronyms on the picture are: Long-term (LT); Transmission (T); Distribution (D); Active Power (P); Availability (A); Energy (E); Day-ahead (DA); Intraday (ID); Real-time (RT).

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compete by submitting activation and availability bids to the local auction marketplace. In this case, the FSPs get the compromise to be available, but the activation is not granted (it could be renegotiated closer to Delivery Time).

On the other hand, the "Agreed Activation product" (LT-P-A-E) has a similar structure. However, in this market, both availability and activation terms are settled and will not be renegotiated anymore. This market is designed for procuring flexibility services in all those cases in which the need for flexibility can be forecasted long in advance; hence, the activation of the FSPs can be scheduled long in advance with high reliability.

For both long-term submarkets, market sections are requested by the respective DSOs through the LMP. As exemplified in Figure 4-2, the DSO should select a zone, delivery period, flexibility being procured among other parameters necessary for a market session to be created.

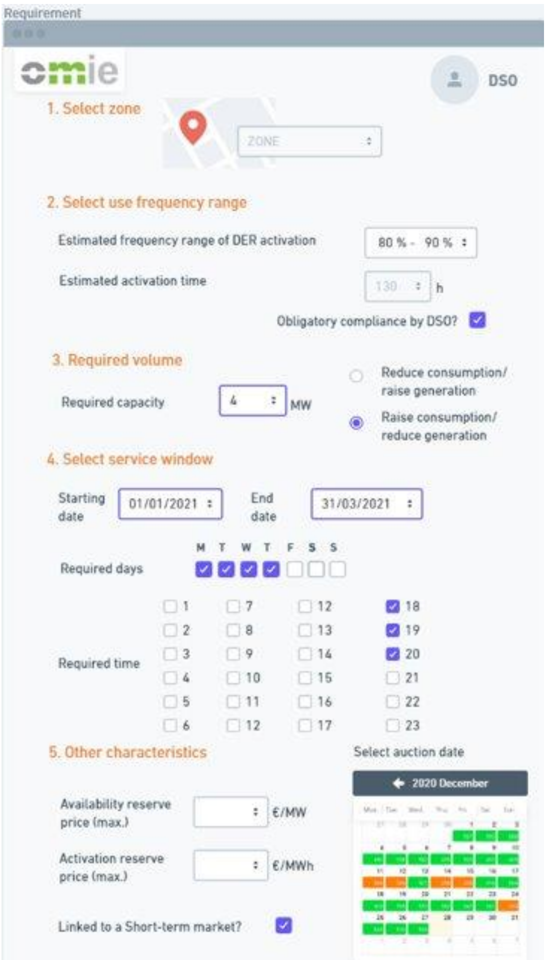

Figure 4-2: Preliminary screen for the market session request

Once the market session is open, market participants are notified, and the qualification and pre-qualification processes take place, as shown in Figure 4-3. Once the pre-qualification and the qualification processes are concluded, resources able to participate in the market session are notified, and the bidding takes place, followed by the market-clearing and the communication of results.

In the Spanish demonstration, several steps are taken in order to ensure that flexibility product can be delivered once (or if) the activation takes place. These steps are divided into pre-qualification and qualification processes, both market and technical. The pre-qualification process takes place when an FSP requests to have resources pre-qualified. The pre-qualification is then conducted by both DSO and IMO. The former conducts a technical pre-qualification, while the latter conducts a market pre-qualification. The qualification process, on the other hand, takes place for a specific market session. Among the pre-qualified FSPs, DSO and IMO conducts a final check to verify that resource/FSP can participate in that market session. It is also important to notice that the pre-qualification process can still take place and be finalized even after a market session is requested by the DSO. This overlap of processes is only possible in the long-term markets, given the fact that the market session may be open for participation for a long period of time.

The "service window" is defined as the period in which the flexibility product is being delivered. The service window, however, should not be confused with the activation window. The service window can comprise the time of the availability procured by the DSO from a certain FSP. Within the service window, activation may or may not occur.

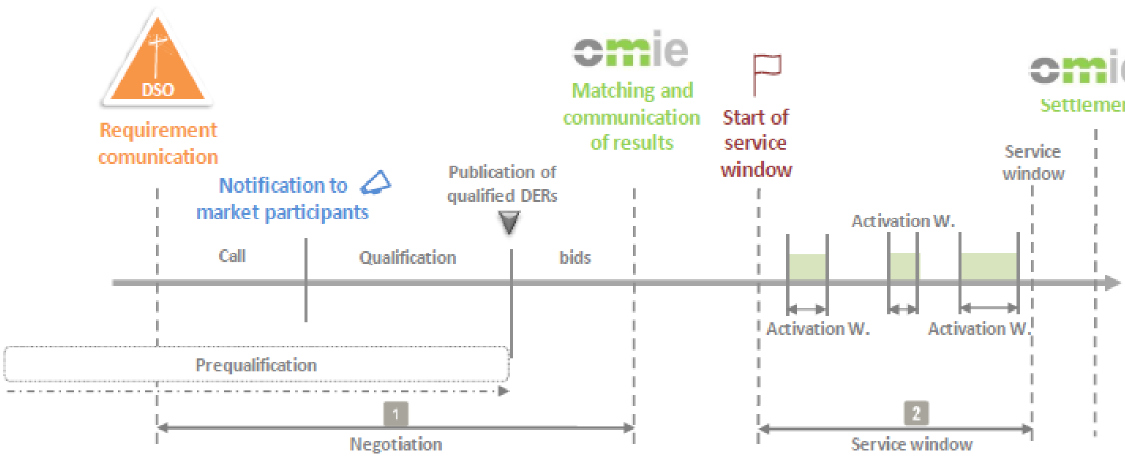

Figure 4-3: Market session steps for long-term products

After the service window is over, the IMO proceeds with the settlement of the service. Based on the metering data gathered by the DSO, the IMO will compare the flexibility provided by the FSP with the previously agreed

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baseline. In case of partial delivery by the FSP, the IMO can apply a correction factor to the final payment received by the FSP, as shown below.

$$Correction\ Factor\ (CF) = \frac{Real\ delivered\ energy(MWh)}{Capacity\ notification\ (MW)\ \ x\ Estimated\ required\ time(h)}$$

CF	Payment for term of activation	Accions
>100%	No additional payment above the agreed	None
100%-65%	Proportional payment for the service provided	The service will be monitored below 90%. More than 3 activation services below 90% will be considered as failed service.
<65%	Failed service. No payment corresponds	Potential end of the contract

Figure 4-4: Correction factor for product non-delivery

The long-term submarket functioning is fully described in the BUC WECL-ES-01[20], while the functioning of the LMP is formally described in the SUC-ES-01.

4.1.2 Overview of the Short-Term submarkets

In the short-term submarket developed by the OneNet Spanish demonstrator, two are included:

a. Short-Term P activation (availability optional) submarket (ST-P-E);
b. Real-Time P activation submarket (RT-P-E).

The Short-Term P activation submarket (ST-P-E) is part of the short-term submarkets for flexibility procurement. It represents a day-ahead local mechanism in which the DSO can procure active power flexibility from the FSPs connected at the distribution system level. In this market, active power activation is procured and remunerated; however, the submarket structure leaves open the possibility to remunerate also availability in some cases. The peculiarity of this submarket relies on the fact that it is composed of two different time procedures. If the market operator receives the request for flexibility before 2 p.m., the auction opens at 2 pm; otherwise, the auction opens at the next hour. Although all the FSPs in the relevant procurement area can participate in the related auction, if there are FSPs that have been cleared in the Long-Term active power availability submarket (LT-P-A), its participation is mandatory. These FSPs can bid a different amount and price in the short-term submarket. However, in that case, the ST-P-E auction is characterised by a reserve price

[20] ES: Spain (ISO 3166-1 alpha-2 code)

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established by DSO (maximum price accepted by the algorithm in the auction process) that cannot be exceeded and is related to the long-term matching price.

The Real-Time P activation submarket (RT-P-E) is part of the short-term submarkets for flexibility procurement. It represents a local mechanism that occurs on the same day of the delivery in which the DSO procures active power flexibility from FSPs connected at the distribution system level. In this market, active power activation is procured and remunerated. Participation in the RT-P-E submarket is open to all qualified FSPs, and there is no link with the long-term submarkets (LT-P-A and LT-P-A-E).

In the Spanish demonstrator, only the Long-Term P availability submarket (LT-P-A) and Short-Term P activation submarket (ST-P-E) directly interact. This interaction is based on the fact that the FSPs cleared in the long-term availability market are obliged to participate in the short-term market. In any case, the FSPs can submit new bids and update the implicit activation bid.

The market processes for the short-term submarkets are very similar to the ones for long-term submarkets, as illustrated in the proposed timeline of Figure 4-5. The market sessions are also called by the DSO in a similar way to the long-term markets, and FSPs/resources have to be pre-qualified to be able to participate. One difference with regards to long-term markets is that the pre-qualification for a potential participant has to be concluded before the market session is requested by DSO, given the short-term nature of the market process.

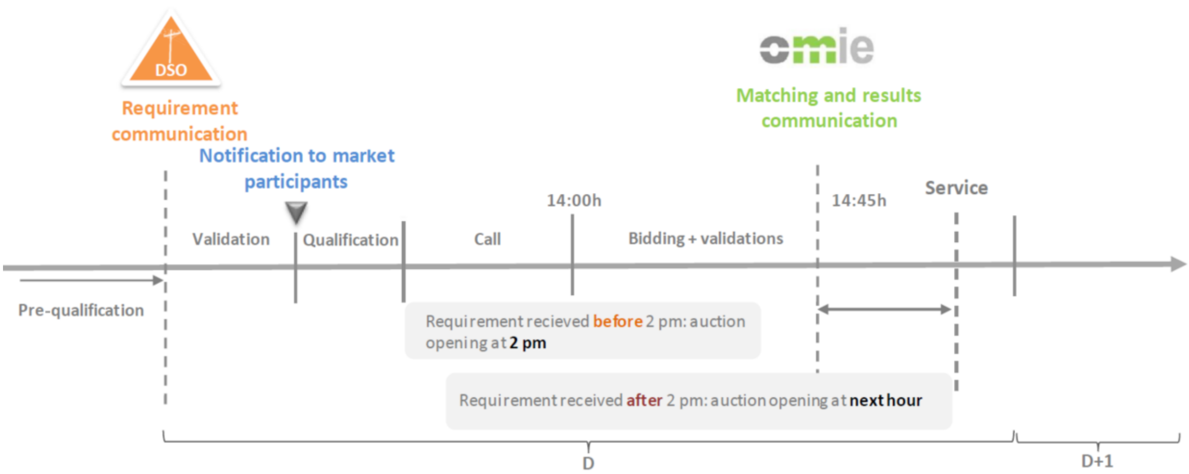

Figure 4-5: Short-term submarkets processes

The short-term submarket functioning is fully described in the BUC WECL-ES-02, while the functioning of the LMP is formally described in the SUC-ES-01.

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4.2 Spanish Use Cases

4.2.1 BUC WECL-ES-01: Long-term congestion management

This BUC WECL-ES-01 describes the functioning of the long-term submarkets within the Spanish demonstration.

4.2.1.1 Scope and Objectives

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.

The objectives of this BUC are:

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.

4.2.1.2 Short Narrative and BUC overview

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 of delivery, and is aimed towards MV/LV[21] flexibility providers.

The DSO procures the product in the long term (years to weeks ahead of 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 in 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 in the contract.

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[21] MV: Medium Voltage; LV: Low Voltage.

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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 coordinated, 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 allows it 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**:

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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 for the DSO to procure activation in the long-term, defining weeks/months in advance of 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 more than year-ahead to weeks ahead. The gate closure time takes place a week ahead of delivery or before. FSPs participating should have resources connected to medium or low voltage levels or commit to having them in service at the requested time.

During this phase, there is a qualification process to check if the flexibility provider is able to provide (or will be able to provide) the demanded service in terms of quality and cost. The results of the auction will be published.

It is worth noting that the Spanish demonstration counts on both the pre-qualification and the qualification processes to assess whether an FSP is able to provide the product being procured. The pre-qualification process is a one-time procedure aiming to evaluate the overall characteristics of both the participant and the resources. The qualification procedure takes place for every market session and consists of a final check of conditions for participation (e.g. enough financial warranties to operate in the long-term market).

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**:

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In this final service phase, the MO and/or DSO will verify if the flexibility was provided in accordance with the product procured in the market phase. This service phase can take place in 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.

Figure 4-7 presents the overview diagram for this BUC WECL-ES-01. It is worth mentioning that this BUC makes use of the SUC designed in the Spanish demonstration. In this SUC, the Market Platform is described.

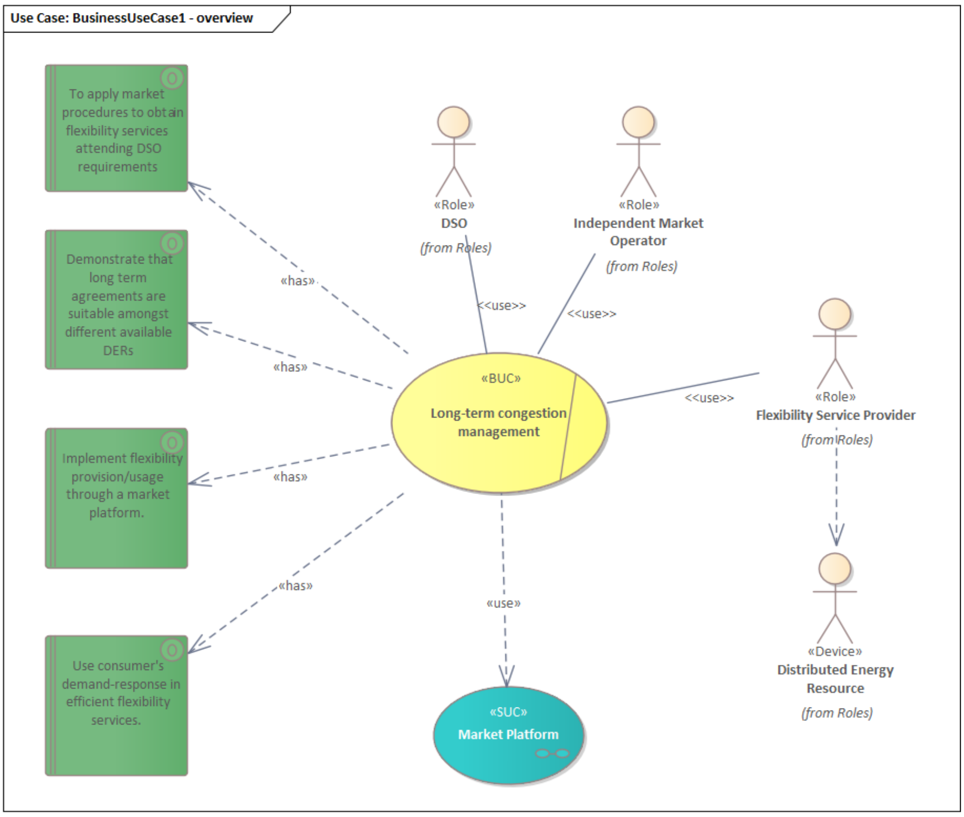

Figure 4-6: WECL-ES-01 Overview Diagram

4.2.2 BUC WECL-ES-02: Short-term congestion management

This BUC WECL-ES-02 describes the functioning of the short-term submarkets within the Spanish demonstration.

4.2.2.1 Scope and Objectives

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.

The objectives of this BUC are:

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.

4.2.2.2 Short Narrative and BUC overview

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

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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:

1. 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 perspectives, 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 FSPs 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 of coping 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 coordinated, 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 allows it to.

2. 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.

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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 needed.

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. 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 the 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 the notification sent to the TSO.

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 situations in which the procured flexibility activations cannot be concluded are outside the scope of this BUC WECL-ES-02.

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.

5. Measurement phase:

In this final service phase, the MO and/or DSO will verify if the flexibility was provided in accordance with the product procured in the market phase. This service phase can take place in 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

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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.

Figure 4-7 presents the overview diagram for this BUC WECL-ES-02, which is very similar to the previous BUCs. It is worth mentioning that this BUC makes use of the SUC designed in the Spanish demonstration. In this SUC, the Market Platform is described.

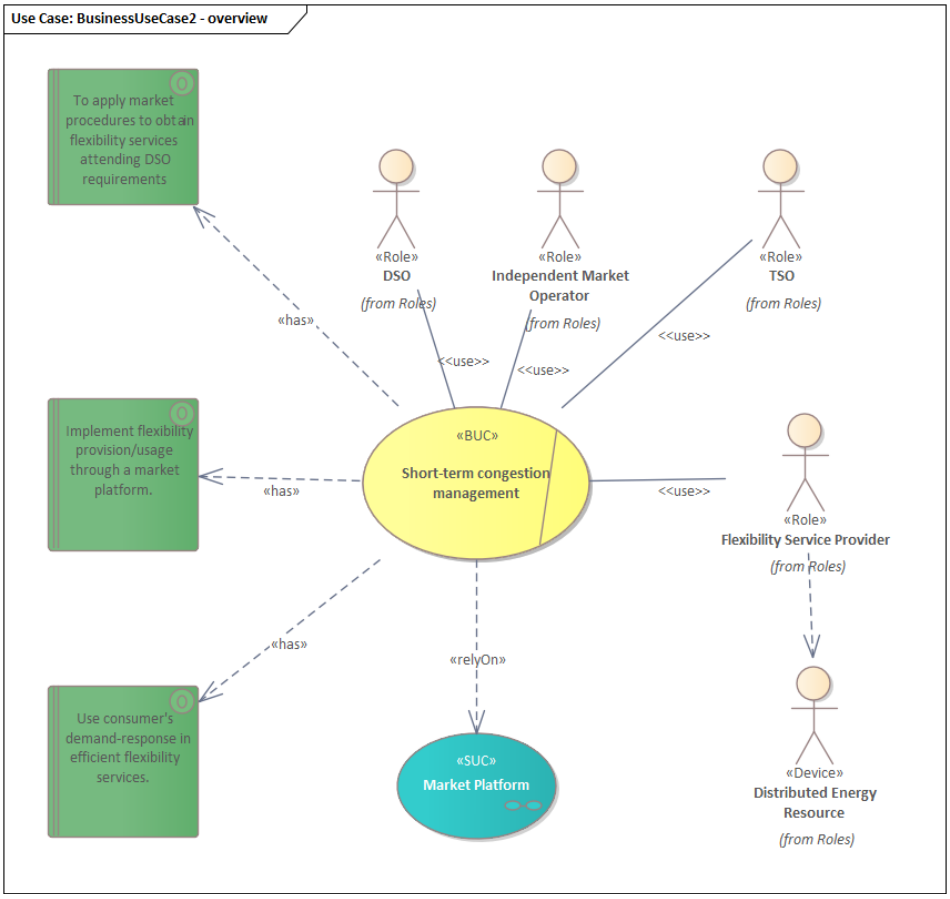

Figure 4-7: WECL-ES-02 Overview Diagram

4.2.3 SUC ES-01: Local Market Platform

Besides the two BUCs described above, the Spanish demonstration has also designed one SUC, namely the Local Market Platform. This SUC serves both WECL-ES-01 and WECL-ES-02 BUCs and describes the platform that

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will be developed in order to enable the procurement of local flexibility by the Spanish DSOs, the communications among the different actors in the demonstration, the storage of information with regards to FSP pre-qualification and qualification, as well as the market-clearing for the different markets and products to be tested. In addition, the Local Market Platform will also be the interface of the Spanish demonstrator and the OneNet System, currently under definition. This interaction will occur with the publication of results from the Spanish local market into the OneNet System or the exchange of pre-qualification information for the Regional BUC described below[22]. The SUC is divided into three scenarios, according to the functionality being offered by the Local Market Platform. The scenarios are:

- Flexibility Resource Register

In this scenario, the FSP applicants will be able to request to be allowed to participate in market sessions, follow up the pre-qualification process, and update their information whenever needed. This scenario will also serve as a global register of flexibility resources to DSOs and to the IMO. These registers will provide information for the following scenarios (e.g., location, type of DER, etc.) and will be used in the process, such as the qualification and the settlement.

- Market Request

This scenario describes how the market platform will enable and handle a market session request by the DSO. It involves the interface in which the DSO may request a market session, the notification to the IMO, the validation process, the registration and the final notification to market participants. Within this scenario, differences may exist depending on the products that will be traded (e.g., long or short-term, availability or activation), which are highlighted in the step-by-step analysis.

- Market Session

The market session scenario describes the activities comprised between the notification of an open market session to the publication of market results. Therefore, it can be divided into three macro processes, namely the (i) qualification, (ii) the negotiation period, and (iii) the market-clearing and results.

[22] At the time of writing, the definitions on the scope of the OneNet System and the possibilities for interaction with the different demonstrations are still under discussions. Therefore, the Spanish demonstration has planned those interactions from the demo's perspective and in the context of the Regional BUC. Nevertheless, these interaction may be modified according to future definitions on the scope and capabilities of the OneNet System.

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In this scenario, the Local Market Platform also interacts with the OneNet System by publishing the market results on a certain periodicity. Market results are collected and published into the OneNet System every hour or daily. The objective of this interaction is to make other SOs aware of activations in case those activations can impact their operations (e.g. activations of units near the border between two SOs).

4.3 Spanish demo site characteristics

The Spanish demonstration will have sites in the areas managed by the two Spanish DSOs participating in the OneNet project, namely i-DE and UFD.

4.3.1 i-DE demos

Different areas and different voltage levels have been selected with the purpose of trying the most varied situations. In principle, the demonstrations will take place in the cities of Madrid and Murcia. Other areas could be selected in the future.

4.3.1.1 Demo sites

- Murcia: A city in the south-eastern of Spain, the capital and most populous city of the Region of Murcia and the seventh-largest city in the country.
- Madrid: A city in the centre of Spain. It is the capital and most populous city of Spain.
- Other areas could be selected depending on future FSP engagement

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Figure 4-8: Location of the i-DE demonstration areas

4.3.1.2 Network characteristics

- Murcia: Urban area electrically fed by a mesh medium voltage system at the level of 20kV. The network is operated radially, but the high level of connections allows to move load between lines and even between High Voltage/Medium Voltage substations. There are monitored secondary substations, Medium Voltage/Low Voltage in the area, which will allow measuring the impact of demand response and other resources from the low voltage to the medium voltage system.
- Madrid: It is an area with a high density of customers by km², principally residential and commercial. It is fed by a mesh system at 20 kV and 15 kV levels with several connected substations operated radially. All lines are underground. The low voltage system is radial and generally with high demand.

4.3.1.3 Resources characteristics

Demand response will be tested in the demos. Two universities have shown interest in participating at this moment:

- Murcia: The University of Murcia (UMU) is one of the biggest Universities in Spain. UMU has a population of 40,000 people: students, services personal, etc. UMU has three main campuses and several facilities deployed throughout different cities in the Region of Murcia. Among them, the Espinardo Campus, which has shown interest, is the biggest one which a number of buildings greater than 30.
- Madrid: Universidad Pontificia Comillas, located in Catoblanco, in the north of Madrid, Alcobendas.

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4.3.2 UFD demos

Different areas, voltage levels and types of clients have been selected, with the purpose of trying the most varied situations.

4.3.2.1 Demo sites

- Madrid[23]: A city in the centre of Spain. It is the capital and most populous city of Spain. It has a population of 3,3 million inhabitants and an area of 604 km².
- Alcalá de Henares: It is a Spanish city belonging to the Community of Madrid. It has a population of 197,562 inhabitants and an area of 88 km². It is a city that has a marked tourist and university character.
- Other areas could be selected depending on future flexible provider engagement. In particular, we are working on a network that is located in the Cuenca region but in an eminently rural area. It is a high voltage network that has both industrial clients and small urban centres. It also has hydraulic and photovoltaic generation.

4.3.2.2 Network characteristics

Use cases will be used at multiple voltage levels, as the proposed locations present quite a few possibilities. In particular, medium voltage networks (mainly 15 kV) will be used and in industrial and commercial areas, as well as on university campuses. A case of two medium voltage networks connected to each other and fed from two high voltage substations (66-132 kV) will also be analyzed.

Finally, the possibility of analyzing a high voltage ring (66 kV) in which customers could provide flexibility services at said voltage level is being studied.

4.3.2.3 Resources characteristics

Demand response and small generation will be tested in the demos.

We are reaching agreements with different types of clients that can provide flexibility services from the demand side and the small generation:

- A university campus in which it could work as a closed network and which could include a small photovoltaic plant.
- Various commercial and industrial consumers:

[23] Both i-DE and UFD are responsible for the distribution in the city of Madrid, each one covering part of the city.

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    - Sports centre with swimming pool
    - Pumping consumption (with/or without a generation group)
    - Wastewater treatment plant, with cogeneration and the possibility of storage.
    - Hypermarket
    - Food Factory
- Electric vehicle charging points.

Due to the pending development of specific legislation for these solutions, voluntary agreements without remuneration are being proposed to the different clients.

4.4 Key Performance Indicators

The preliminary set of KPIs selected by the Spanish demonstration is presented below. Besides the name and description of the KPI, the domain and the category are also identified. All KPIs are applicable to both Spanish BUCs. This final and complete list (including the formulas for each KPI) will be presented in the deliverable D2.4.

- **Cost value** (dom.: Economic; cat.: OPEX & CAPEX[24]): Compare flexibility cost with avoided cost otherwise, if flexibility was not used, e.g. cost (deferral or avoidance) of network reinforcement.
- **ICT costs** (dom.: Economic; cat.: ICT cost): 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.
- **Available flexibility** (dom.: Technical; cat.: Flexibility indicators): 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 is in relation to the total amount of power in the specific grid segment in the same period.
- **Accuracy of load forecast** (dom.: Technical; cat.: Forecast indicator): This indicator measures the error of the load forecast in the distribution system.
- **Power deviation** (dom.: Technical; cat.: Flexibility indicators): Tracking error between a set-point requested by the SO and the measure.
- **Congestion reduction** (dom.: Technical; cat.: Flexibility indicators): This indicator measures the percentage decrease of load demand in the requested asset by a flexibility provider resource.

[24] OPEX: Operational Expenditure; CAPEX: Capital Expenditure

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- **Volume of transactions** (dom.: Economic; cat.: Market indicators): This indicator measures the number of transactions. This indicator will be used to measure the number of offered and cleared bids for each service.
- **Number of transactions** (dom.: Economic; cat.: Market indicators): This indicator measures the percentage of products tested in the demos with respect to the number of products initially targeted by the demos.
- **Number of products** (dom.: Technical; cat.: Market indicators): This indicator measures the percentage of products tested in the demos with respect to the number of products initially targeted by the demos.
- **Active participation** (dom.: Social; cat.: Customer indicator): 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 customers' engagement plans.

4.5 Spanish Platforms and Architecture Approach

OMIE, as the Spanish IMO, is developing a platform to provide a user-friendly interface for the development of Local Flexibility Markets.

The platform will have different interfaces according to the type of product to be negotiated: Short-Term Flexibility Product or Long-Term Flexibility Product, but both function similarly.

The platform would be configured to carry out all the necessary processes before, during and after every period of negotiation of any Local Flexibility Market. This is the reason why it cannot be considered as a market platform only, but also a communication and information environment between the different parties (FSPs-IMO- DSOs-TSO) where all the data can be shared.

DSOs, through the new platform, would be able to send flexibility requirements to the IMO. After a validation process, the IMO would trigger a local auction. Additionally, DSOs will manage the energy resources of their area, checking if they have passed the pre-qualification and qualification processes.

FSPs would be able to register their flexibility resources to participate in Local Flexibility Markets, and once the local auction is on trading mode, they will be allowed to send their bids. After the auction, the results and other relevant information would be published and shared through the platform too.

The IMO would manage and control all the processes using this platform, from the registration of new FSPs and resources to the settlement of the local auctions.

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Long-Term and Short-term platforms would be based on web systems accessible from different devices. The main way of communication between the platform and the different parties is expected to be through the web interface, but other communication protocols are studied to be developed and included (e.g., APIs[25]).

The whole new system developed would be prepared for the integration with the production environment that is running the negotiation of the day-ahead and intraday energy markets. For the project, dedicated machines will be used to isolate this new environment from the production systems to avoid any risk in the current energy markets.

Finally, it is worth noting that the Market Platform under development will also interact with the OneNet System. Two points of interaction are currently planned. First, market results will be made available through the OneNet System[26], as described in the SUC-ES-01 (see appendix for details). Second, the Spanish market platform will also interact with the OneNet System in the context of the Regional BUC, described in chapter 6.

[25] API: Application Programming Interface

[26] Interaction under evaluation. Details on this information exchange are yet to be defined.

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5 French Demonstration

5.1 Overview of the French demonstration

The OneNet French Demonstration is divided into two parts: the implementation of STAR (System of Traceability of Renewables Activations) and the study on innovative ways for TSO-DSO information exchange for DER activation.

5.1.1 Overview of the STAR system

The STAR system is a monitoring platform that allows sharing relevant information for the settlement but not directly undertaking it. The use case STAR aims to build a shared ledger to simplify and optimise the management of renewable production curtailments by covering the entire life cycle of a flexibility offer, from the formulation of offers to the monitoring of their activation 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. The generation curtailment monitored by the STAR platform is considered by the French rules and the contract between the system operators and generators. Therefore, the active power generation curtailment is similar to the activation of flexibility for congestion management purposes.

The flexibility services tracked by STAR are mainly focused on Congestion Management. The STAR platform only registers to track information regarding resource activations and does not activate any resource. The core of the STAR demonstrator is proving the technical feasibility of the platform. Those aspects related to the flexibility procurement are secondary. The STAR use case does not define new products or markets; the platform to be built in the STAR use case only tracks the producers' production forecasts, offers, and flexibility activations.

The analysis of the implementation of the STAR system, which tracks the active power generation curtailment of renewable generators, is linked to the mechanisms used to define the network access agreements that specify the producers' curtailment obligations and compensation. Moreover, the STAR platform also tracks the active power generation curtailment resulting from the intraday energy market. The STAR demo uses existing mechanisms; therefore, no new markets or flexibility procurement mechanisms are developed within this OneNet demonstrator. As mentioned in the deliverable D3.1, the mechanisms in which the STAR system will be used are the connection agreements contract (both for TSO and DSO) and the short-term congestion management market.

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5.1.2 Overview of the Improved TSO-DSO information exchange for DER activation

The French demonstration will study innovative ways of TSO-DSO information exchange in the context of DER activation. 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 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 agree in advance on a set of flexibilities activations that are safe for each other and can be used without further prior approval. The so-called "shared information TSO-DSO congestion management in case of activation of distributed flexibility" aims to study 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.

This test will still consider and design which information exchange methodologies are suitable for the French DER activation context. For this reason, the BUC description is done partially at this stage, considering that the final product of this demonstration is the completion of the BUC.

5.2 French Use Cases

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

5.2.1.1 Scope and Objectives

Faced with the challenges of the energy transition, ENEDIS[27] and RTE[28] are experimenting with new technological solutions to integrate new flexibility mechanisms to manage congestions on their networks. Among the necessary developments is the improvement of monitoring of flexibility for congestion management purposes, the focus of this BUC.

This use case is based on blockchain technology. It aims to simplify and optimize renewable production curtailments by providing enhanced monitoring during the entire life cycle of a flexibility offer, from the

[27] French DSO.
[28] Reseau de Transport d'Electricite (French TSO).

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formulation of offers to control 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.

5.2.1.2 Short Narrative and BUC overview

Using allowed blockchain technologies, a shared ledger will be implemented to establish a decentralized trust framework among renewable energy generators, market participants, the DSO and the TSO. All participants will have access to the previously mentioned shared platform to provide more transparency and visibility while preserving business confidentiality. 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 access 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 manual flexibilities activations 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.

Figure 5-1 shows the overview diagram BUC WECL-FR-01[29]. It is worth mentioning that this BUC makes use of the two SUCs designed in the French demonstration, as described below:

- SUC-FR-01 - TSO automated activation: To simplify and optimize the management of renewable production curtailments building the STAR platform, we have to define the information exchanges and processes needed to perform the related BUC's traceability objectives in the case of TSO automated activations.
- SUC-FR-02 – DSO manual activation: This SUC provides requirements for data exchanges and processes between TSO, DSO, FSPs and producers for the STAR platform to handle the related BUC's traceability objectives in the case of DSO manual flexibility activations.

[29] FR: France (ISO 3166-1 alpha-2 code)

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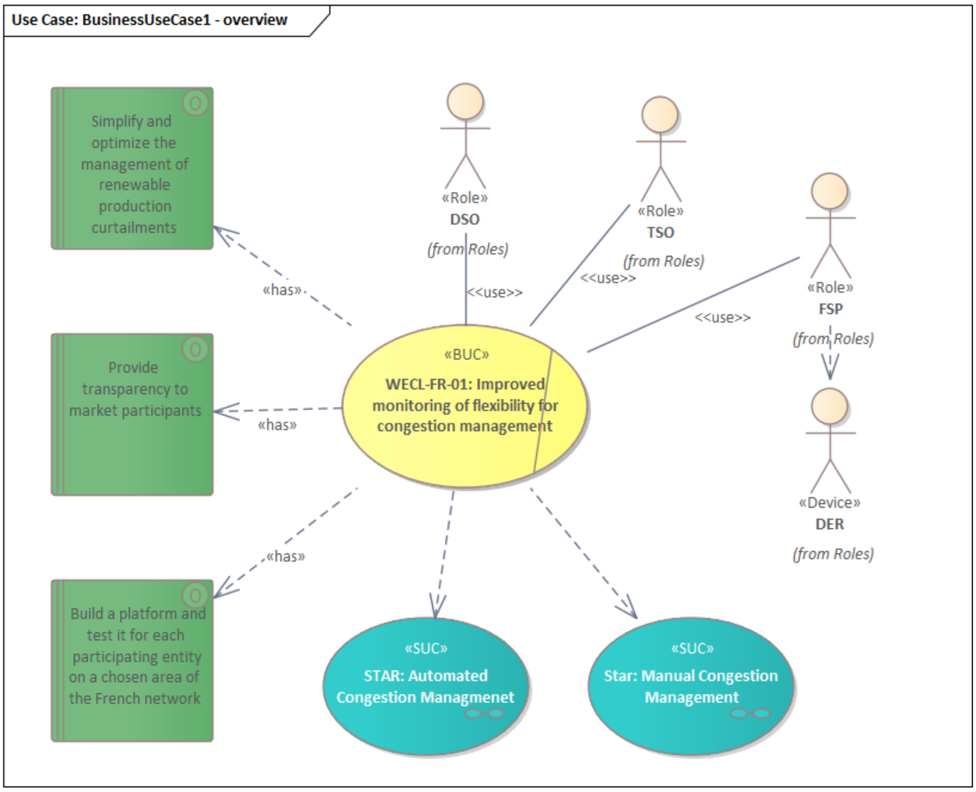

Figure 5-1: WECL-FR-01 overview diagram

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

5.2.2.1 Scope and Objectives

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 won't have the possibility to perform ad hoc security analysis for every flexibility activation demand. Therefore, TSO and DSO have to agree in advance on a set of flexibility activations that are safe for each other and can be used without further prior approval, so-called “shared information TSO-DSO congestion management in case of activation of distributed flexibility”.

This BUC aims 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.

5.2.2.2 Short Narrative and BUC overview

RTE and ENEDIS will work on a common methodology to determine the "shared information TSO/DSO congestion management in case of activation of distributed flexibility" as described in the section above and first determine the sub-tasks of such a work.

5.3 Demo site characteristics

5.3.1 Network characteristics

Figure 5-2: Network for the French demonstration

The experiment will take place in the southwest part of France, in the area of Melle-Longchamp. It encompasses 30 power lines ranging up to 400 kV, which sometimes face congestions due to a strong power generation west of the area and a high demand at the other side of the network. Curtailment automata are already under experimentation on this network that uses renewable generation to manage these congestions,

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with around a dozen executed flexibility activation orders last year. It will be one of the demo's objectives to track these orders in this area.

5.3.2 Resources characteristics

The Melle-Longchamps area has five substations that are connected to NAZA *automata*. On the DSO network, twelve wind power (from 2,3 MW to 12 MW) and two solar panels (from 2,3 MW to 4,4 MW) are involved in the demo., but only wind power is concerned by the SUC 1 (Trackability by automating activation). Workshops will be scheduled with considered resources in order to determine their level of implication in providing the relevant data and implementing the designed processes.

5.4 Key Performance Indicators

French demo proposes two KPIs for BUC-FR-01 "system of trackability of renewal Activations for automating and annual congestion management" as described below:

- The number of flexibility service provider assets involved in the service.
- The percentage of actually tracked flexibility activations with respect to the total of flexibility activations is supposed to be tracked.

5.5 French Platforms and Architecture Approach

The demo's architecture is still under study, but as the first approach, the architecture is presented in Figure 5-3.

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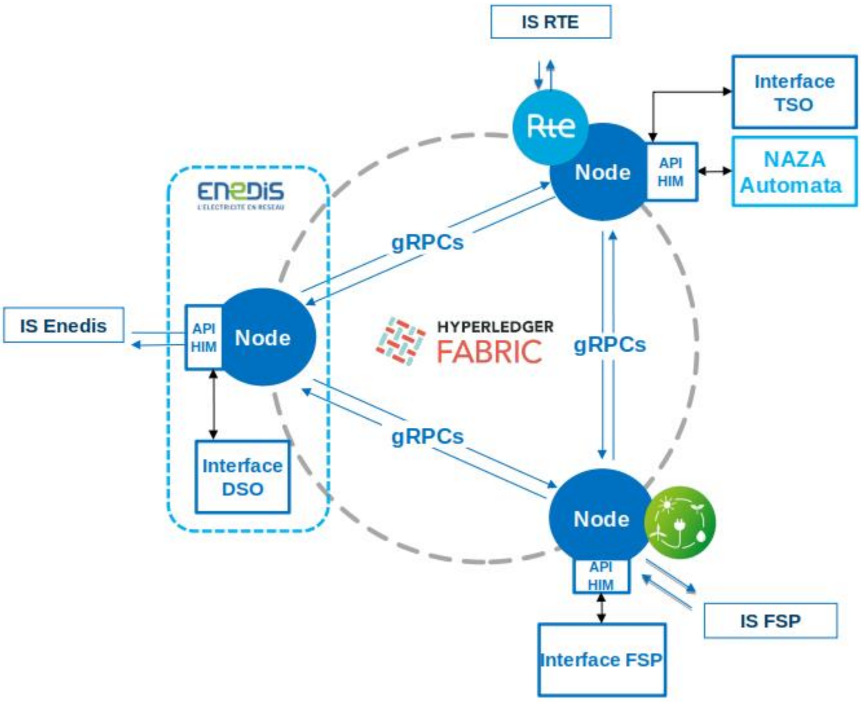

Figure 5-3: Preliminary architecture of platforms in the French demonstration[30]

The platform will consist of a decentralized, shared register that will enable to track of flexibility activations related data. It relies on allowed blockchain technology using the Hyperledger Fabric framework. It should be hosted in three different nodes: one managed by the TSO, another by the DSO and the last one for the producers.

The platform is planned to build REST API and IHM for the different actors to store either manually or automatically relevant information such as activation order, execution logs, metering data, etc... For instance, flexibility orders formulated by RTE's NAZA automata should be automatically transmitted thanks to a link to the blockchain. The access to these APIs will be subject to restrictions according to the posting and reading rights defined for each actor.

[30] The French architecture will also communicate with the OneNet System, Nevertheless, as the definitions are not completed, interactions are not yet depicted.

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6 Regional BUC

In addition to the definition of the countries BUCs, a Regional BUC was also identified. The objective behind the definition of a Regional BUC is to promote the interaction and exchange of information among all demo countries in the Western Cluster while contributing to the development of cross-border solutions in line with the OneNet project objectives.

The Regional BUC defined by the Western Cluster is named "Cluster Preparatory Phase: Cross-SO grid pre-qualification". This BUC describes how an FSP can be pre-qualified to provide the service not only to the SO they are connected to but also to another SO. In this context, this BUC aims to go beyond the TSO-DSO coordination scope, allowing that an FSP connected to one SO can be pre-qualified to a neighbouring SO if this type of flexibility provision is physically possible. This type of cross-SO pre-qualification could be useful, for instance, in the places where two DSOs are directly connected (e.g. i-DE and UFD in Madrid, Spain) or possibly close to the border of two countries (given that the interconnection characteristics allow for flexibility provision).

More than actually pre-qualifying resources for the cross-SO or cross-border flexibility provision, this Regional BUC aims to allow the necessary information exchange between SOs so that the pre-qualifications occur. For this purpose, firstly, a harmonization of minimum data for pre-qualification will be done[31]. This is important to ensure that all SOs agree on the most relevant data when pre-qualifying an FSP connected to another network. Secondly, the necessary data exchange processes have to be in place so SOs can conclude the pre-qualification in an efficient and timely manner. For that, the demonstration of this BUC will count on the OneNet System, a pan-European network of platforms being developed to integrate the local platforms being developed in the project.

Figure 6-1 displays the preliminary overview of the Regional BUC. Although this BUC was not completely developed at the time of writing, the preliminary BUC template can be consulted in the Appendix of this deliverable.

[31] Additional data, however, can always be requested by the pre-qualifying SO.

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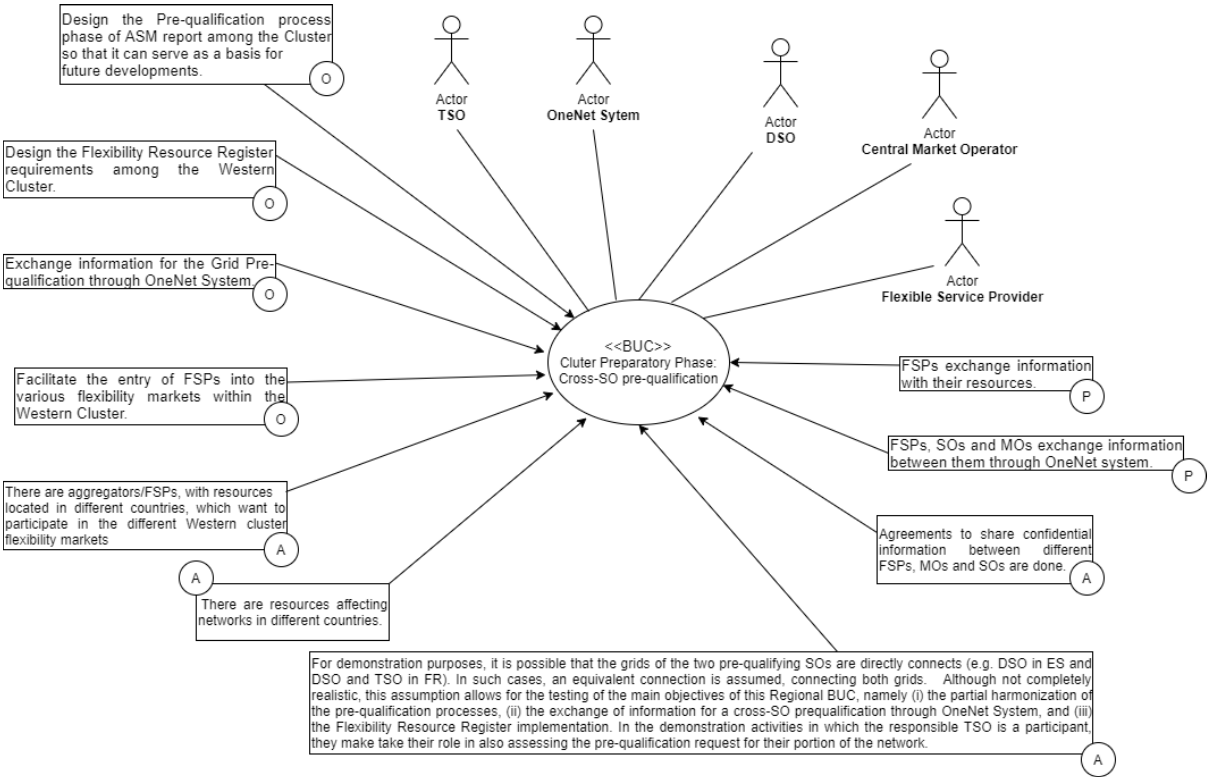

Figure 6-1: Regional BUC preliminary overview diagram

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7 Alignment Analysis

In this section, an initial evaluation of the proposed demonstrations is conducted, aiming to identify how the demos in the Western Cluster converge and those which are individual to each demo country. Moreover, this section also assesses the alignment of the demonstrations with the Active System Management report (hereafter ASM, [1])[32].

The objective of this analysis is twofold:

- Firstly, it aims at providing the demonstrations with a mapping of aspects that could be compared among the different countries. In the case of similar solutions being tested, demonstrations could exchange experiences and compare results, contributing to assessing the replication potential of these solutions. On the other hand, however, solutions being tested individually by the one demo country could also benefit the others, as those may serve as a reference for future implementations.
- Secondly, this chapter aims to assess how the solutions being proposed by the demonstrations fit into the context of the ASM report. This publication has recently become a guideline for the aspects related to the coordination among TSOs and DSOs in flexibility procurement. It is also one of the main references for the OneNet project. The alignment of the demonstrations with the ASM report is important for establishing pan-European solutions that could be replicated and exploited in the other Member States.

7.1 Alignment among the demos in the Western Cluster

For the alignment analysis among the three demonstration countries, the main inputs are the BUCs, and SUCs developed within T9.1, in coordination with T2.3 and T5.1. Additionally, the description of the demonstrations and the technical architecture defined so far are also considered.

7.1.1 Demonstration set-up

The three demonstration countries have adopted different approaches concerning the market models and products being considered. The OneNet deliverable D3.1 has provided a theoretical framework for the

[32] This section considers only the alignment among the national BUCs, SUCs, and other demonstration aspects, and therefore does not include the Regional BUC.

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evaluation and comparison of market models. The same deliverable also conducted an analysis of the demonstrations in the OneNet project based on this framework. The report concludes that the Spanish demonstration is a "Market-based DSO-FSP coordination". In contrast, both the Portuguese and the French demonstration are classified as "Technical TSO-DSO coordination", as illustrated in Figure 7-1.

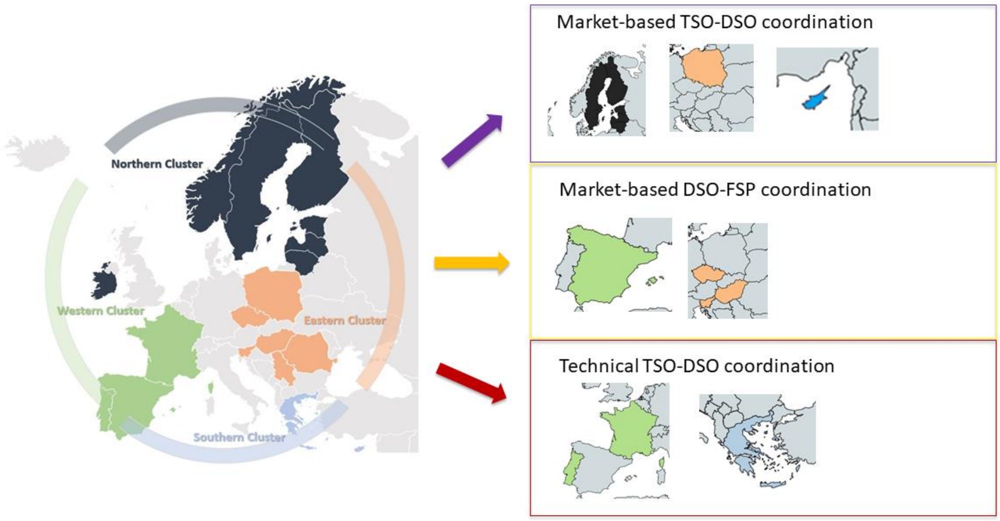

Figure 7-1: From geographical clustering to market design demonstrators' clustering. Source: D3.1

The BUCs and SUCs developed by the demonstrations and the demo set-up descriptions corroborate this assessment. The Spanish use cases focus on developing a market platform (SUC-ES-01) and enabling the DSO to procure flexibility in both short and long terms. The Spanish BUCs are also characterized by the close coordination between the DSO and FSP, helped by the IMO that facilitates the flexibility trading process. The TSO is not directly involved in the demonstration. Therefore, it is only mentioned in the short-term BUC as an actor that is communicated of the final scheduling of units (considering the flexibility markets and the aggregated results of all markets)[33].

The Portuguese and the French demonstrations, on the other hand, address the coordination between TSO and DSO with a particular focus on the technical aspects of the coordination, specifically the information exchange that should take place between system operators during procurement and activation of flexibility. On the Portuguese demonstration, three BUCs are being tested. The first two BUCs describe the information exchange that would take place during the procurement of flexibility by both the TSO and the DSO in long-term

[33] The IMO in the Spanish demonstration is also the NEMO for the Iberian Peninsula. Therefore, it regularly communicates the final nomination of markets agents to the TSO. The results from the flexibility markets could also be included in the final communication to the TSO.

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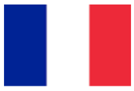
and short-term products. These BUCs follow a similar structure to the ones designed by the Spanish demonstration. Both demonstration countries describe the interaction of actors in the five service phases (except the measurement phase for the Portuguese demonstration) for both long and short-term flexibility procurement. However, the Spanish demonstration focuses on flexibility procurement at medium or low voltage levels, and therefore the TSO is not included as a central actor in the demonstration, and it also aims at the practical interaction with FSPs. On the other hand, the Portuguese demonstration does include the TSO as a central actor in their use cases. From a practical perspective, the demonstration will focus on the evaluation of the TSO-DSO interaction rather than with FSPs. In the demonstration, FSPs will be participating indirectly.

7.1.2 Use Cases in the Western Cluster Demonstrations

In total, seven local BUCs, eleven SUCs and one Regional BUC were designed by the Western Cluster. Table 7-1 lists all BUCs and SUCs designed in the Western Cluster.

Table 7-1: List of BUCs and SUCs in the Western Cluster

		
WECL-REGIONAL-01: *Cross-SO grid pre-qualification*		
WECL-PT-01*: Exchange of Information for Congestion Management – Short Term*	***WECL-ES-01****: Long-term congestion management*	***WECL-FR-01****: Improved monitoring of flexibility for congestion management*
WECL-PT-02*: Exchange of Information for Congestion Management – Long Term*	***WECL-ES-02****: Short-term congestion management*	***WECL-FR-02****: Improved TSO-DSO information exchange for DER activation*
WECL-PT-03*: Exchange of Information for Operational Planning*	***SUC-ES-01****: Local Market Platform*	***SUC-FR-01****: TSO automated activation*
SUC-PT-01*: Evaluation of the Product & Grid pre-qualification requirements*		***SUC-FR-02****: DSO manual activation*
SUC-PT-02*: Day-Ahead & Intraday Flexibility needs*		
SUC-PT-03*: Long-term Flexibility needs*		
SUC-PT-04*: Selection of Bids*		
SUC-PT-05*: Evaluate Grid Constraints*		
SUC-PT-06*: Maintenance plans information exchange*		
SUC-PT-07*: Consumption and gen. forecast info. exchange*		
SUC-PT-08*: Short-circuit levels information exchange*		

Legend:

Regional BUC
Local BUC
Local SUC

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When considering the local BUCs designed by each demonstration, important similarities exist. Firstly, it is worth noticing that all BUCs in the Western Cluster have as scenarios the phases of the service introduced by the ASM report [1]. This approach was commonly agreed upon within the Western Cluster to facilitate later comparison and exchange of experiences within the cluster. Beyond that, demonstration countries defined their BUCs internally, choosing which problem to address and which solutions to propose.

To visualize possible overlaps among the different BUCs, the Smart Grid Architecture Model (SGAM) framework is used. Figure 7-2 provides a stylized illustration of the range of each BUC on the business layer, both in terms of domains (e.g. generation, transmission etc.) and the hierarchical zones (e.g. process, field etc.).

The Spanish BUCs (WECL-ES-01 and 02, in blue) mostly focus on the distribution, DER and customer premises[34] domains, considering that the TSO is not directly involved in the demonstration. On the other hand, the Spanish demo will directly interact with the different DER and customers taking part in the demonstration activities. From a hierarchical zones' perspective, the Spanish BUCs mostly focus on operation, enterprise, and market zones. This means that most of the demonstration will focus on the market design and interaction with stakeholders (e.g. DSO, IMO, FSPs), but without testing new hardware or advance communication implementations. In principle, market communications will be done by web-service systems. However, it is worth mentioning that future hardware developments may be tested within the Spanish demonstration. The mapping in Figure 7-2 is stylized; hence the demonstration may explore aspects in the station, field or process zones.

The Portuguese BUCs can be divided into those linked to short and long-term markets (WECL-PT-01 and 02, respectively), and the one solely focuses on enhanced information exchange for the TSO and the DSO. Regarding the former two, they show an important parallel with the two BUC designed by the Spanish demonstration. The main differences are that (i) the TSO is directly involved in the Portuguese demonstration and (ii) that the BUC is mostly focused on the information exchange in the context of the short and long-term market than on designing new local flexibility markets. Therefore, WECL-PT-01 and 02 can be placed on the transmission and distribution domains while focusing on the operation and enterprise zones, considering market aspects. The WECL-PT-03 is focused entirely on the information exchange between TSO and DSO. In principle, this BUC should occur mostly in operation and enterprise zones, as all information exchange will occur through web services.

[34] It is important to clarify the concepts used in SGAM for both "DER" and "Customer Premises", as those might not be completely in line with other interpretation. According to [7], DER "represent small power plants which are directly connected to the public distribution grid, with a small-scale power generation technologies (in the range of 3 to 10.000 kW)", while Customer Premises "include normal consumers as well as producers in form of photovoltaic generation, electric vehicle storage, or micro turbines which are hosted to the distribution grid. The premises contain industrial, commercial and home facilities as consumers." Therefore, both can be seen as DER, the SGAM-DER concept more related to DG while the Customer Premise is closer to demand response or DR+DG/Storage, in the context of this deliverable.

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The French demonstration has defined two different BUCs. The WECL-FR-01 aims to provide better trackability for the flexibility activated. In this BUC, no new markets are considered. It aims primarily on providing enhanced visibility for the activations defined in existing markets. The increased trackability spans from generators to DER on the domain axis of the SGAM framework, as the information should be made available to TSOs and DSOs and the FSPs being activated. The WECL-FR-02, on the other hand, will investigate innovative ways of exchanging information between the TSO and the DSO for operational planning and real-time operation purposes. In its objectives, this BUC is close to WECL-PT-03 being developed by the Portuguese demonstration.

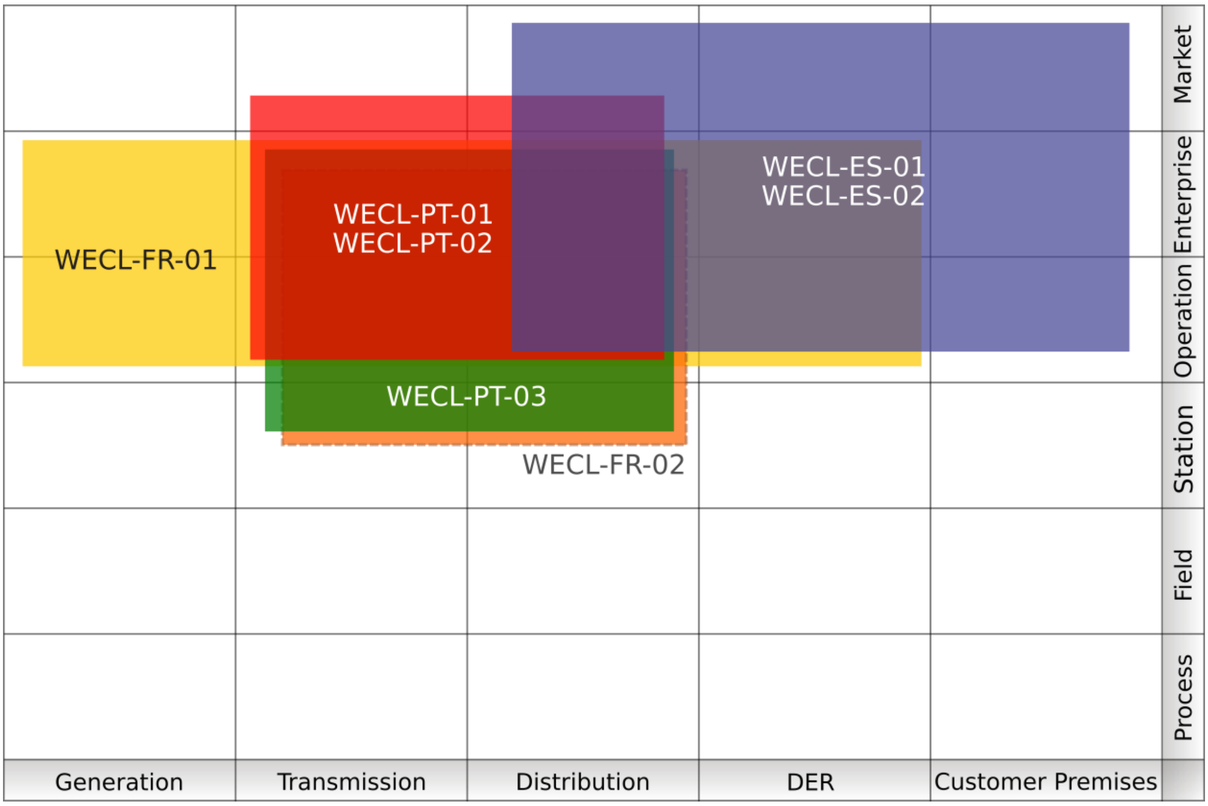

Figure 7-2: Western Cluster's business layer representation

The overlapping of BUCs on the SGAM framework shows a strong convergence of use cases towards enhancing information exchange between TSO and DSOs in the context of local flexibility procurement. For four out of seven BUCs, this information exchange is among the main objectives to be demonstrated. Nevertheless, the Western Cluster will also demonstrate the practical implementation of local flexibility markets, particularly in Spain.

Considering the important overlap among use cases, it is also possible to identify how demonstrations complement each other. Hence, aspects not completely modelled by one demonstration can eventually be found on another, offering a resource for future exchange of experiences among the demonstrations. The two most comparable BUCs are the Portuguese WECL-PT-01 and 02 and the Spanish WECL-ES-01 and 02. On the one

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hand, the Spanish demonstration can benefit from several definitions done by the Portuguese demonstration already. For instance, the plan/forecast service phases are considered internal activities of the DSO in the Spanish BUCs, and therefore not described in detail. At the same time, the Portuguese counterparts completely model them. For the Portuguese demo, the need for the TSO/DSO interaction makes it necessary to complete the modelling of the service phase.

Nevertheless, the DSO-specific planning and forecasting activities modelled in the SUCs, such as SUC-PT-02 (short-term and day-ahead flexibility needs) and SUC-PT-03 (long term flexibility needs), could be of interest for the Spanish demonstration. On the other hand, the Spanish demonstration provides a detailed description of a Local Market Platform in their SUC-ES-01. This SUC could provide other demonstrations on how such a platform can interact with the other actors and systems (e.g. OneNet System).

The French and Portuguese demonstration could benefit from a close exchange of experience between BUCs WECL-PT-03 and WECL-FR-02 throughout the project. Both BUCs have similar objectives and lay on a similar region of domains and zones of the SGAM framework, as shown in Figure 7-2. Their methodological approaches could also be complementary, considering that the Portuguese demonstration is predefined BUC to be tested. In contrast, the French demonstration will test multiple approaches, which are still under discussion. Additionally, both Spanish and Portuguese demonstrations could benefit from the monitoring of results from WECL-FR-01. This French BUC is market-agnostic, and its replication to both Spanish and Portuguese contexts could be considered.

7.1.3 Products and Services in the Western Cluster

Similarly to the definition of markets, which were classified and clustered by the OneNet deliverable D3.1, products and services also went through a definition and harmonisation process, detailed in the deliverable D2.2. In this deliverable, firstly, a theoretical framework is proposed, in which services and products for TSOs and DSOs are defined and their attributes described. Secondly, the deliverable looks at the different products and services proposed by each demonstration and frames them into the harmonized set of products and services derived from the theoretical framework.

A system service can be defined as a specific need from SOs to ensure the security of supply and system adequacy. These needs can take place in different timeframes, including the long term (month or years ahead), short term (day-ahead to a month ahead) and the operational timeframe (intraday to real-time). The theoretical framework also identifies the different systems services according to the need and the timeframe. For instance, for system adequacy need, a system service in the long-term timeframe may be needed, namely capacity remuneration. For the congestion management need, several services are suitable, from the long-term to the

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operational timeframes. They include correction and predictive active power management and grid reconfiguration.

Once system services are identified, products can be designed. Products are defined as tradable units procured by the SO to fulfil the demand for a system service. Therefore, a product is an objective tradable unit that contains all the necessary attributes (e.g. timing - preparation, ramping, activation - pricing, quantity, divisibility, granularity etc.) that can later translate into a binding commitment. Thus, it is possible that different SOs demand the same system service (e.g. manually activated frequency control) but using different products (e.g. mFRR or RR[35]).

The system services being considered in the three demonstration countries fall under the congestion management need, taking place in all three timeframes. The other three types of needs, namely adequacy, frequency control, black start and voltage control, are not directly considered in the Western Cluster. According to the clustering presented in D2.2, the products being considered in the Western Cluster can be translated into three of the harmonized products defined by that research. They are the (i) predictive long-term local active, (ii) predictive short-term local active, and (iii) corrective local active, as compared in Table 7-2 below.

[35] mFRR: manual Frequency Restoration Reserve; RR: Replacement Reserve

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Table 7-2: Products in the Western Cluster: harmonization, similarities and differences

Harmonized Product	Country	Local Product	Description	Differences / Similarities
Predictive long-term local active		Sustain	It is a flexibility product that provides a scheduled service purchased in advance of the need to ensure the network remains secure and does not go beyond its firm capacity at times of peak demand. The requirement windows for the provision of this product will be scheduled and fixed at the point of contract.	The products being considered are very similar. Portugal and Spain have foreseen two local products each to cover the need for Predictive long-term local active power. In one product, the only capacity is remunerated, while in the other, it considers both capacity and energy.
		Secure	It is a flexible product that provides a scheduled service purchased in advance of ensuring the network remains secure during certain network conditions close to real-time. Energy itself is only activated when needed. Payments consist of an Arming fee credited when the service is scheduled and a further utilization payment awarded on delivery.	
		Agreed Activation Product	It is a flexibility product that provides a scheduled service purchased in advance of the need to ensure the network remains secure and does not go beyond its firm capacity at times of peak demand. The requirement windows for the provision of this product will be scheduled and fixed at the point of contract.	
		Availability Product	It is a flexibility product that provides a scheduled service purchased in advance of the need to ensure the network remains secure during certain network conditions close to real-time. Energy itself is only activated when needed. Payments consist of an Arming fee credited when the service is scheduled and a further utilization payment awarded on delivery.	

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Predictive short-term local active		Products for Intraday Congestion Management for DSO/TSO	For a situation where forecasted power flows violate the thermal limits of the elements of the grid and voltage stability or the angle stability limits of the power system. For congestions caused by failures (e.g. switching state changes, ad-hoc active power intervention such as load shedding) and grid- or market-related measures can also be procured. (intraday)	Similar products are also designed for predictive short-term local active power. Both Portugal and Spain consider a procurement taking place in the day-ahead for the case in which network events are expected or programmed. The difference arises with the products closer to real-time. The Portuguese demo foresees an intraday product, which would be demanded due to forecasted events. The Spanish demonstration, however, considers a "post-fault" product instead (next harmonized product).
		Products for Day-Ahead Congestion Management for DSO/TSO	For a situation where forecasted power flows violate the thermal limits of the elements of the grid and voltage stability or the angle stability limits of the power system. [Predictive] For congestions that are forecastable (e.g. redispatch, counter trading, as well as the use of active power flexibility), grid or market-related measures can be procured. (day ahead)	
		Day-ahead	To support the network in the event of expected/programmed fault conditions as to maintenance work. As the service is required before a network fault, it consists of an Availability and Utilization fee. By accepting an Availability fee, participants are expected to be ready to respond to a flexibility need by the DSO.	
Corrective local active		Real-Time	It is used post fault. It is intended to help with restoration following an unexpected failure of equipment. Under such circumstances, the response can be used to reduce the stress on the network. As the requirement is inherently unpredictable, it is based on a premium 'utilization only' service. This will reward a response that aids network restoration but will pay no	Both products considered by France[36] and Spain take place in the near or at real-time and serve the purpose to help manage congestions in the grid. However, several differences in the attributes exist. Firstly, the French product is a TSO and DSO product, while the Spanish one is a DSO product. Moreover, the Spanish product

[36] The French demonstration is not testing a new product, but rather increasing the trackability of already existing products.

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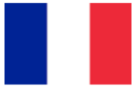
			arming or availability fees. Participants declared available for the Restore service will be expected to respond to any utilization calls within 15 minutes and will receive an associated utilization fee.	pays per utilization (energy), while the French product derives from the non-firm capacity arrangement, as shown in section 5.1.
		Near real-time corrective local active energy	A flexibility product that can be activated in real-time as a corrective action to eliminate network congestions. The activation of this product could be done either by the DSO or the TSO, manually or via an order sent by automation.	

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For each of the harmonized products, the Deliverable D2.2 offers a set of attributes when designing the final demonstration products. This guideline aims to provide demonstrations across the OneNet project with a common understanding of how suitable products could be implemented. To assess the suitability of the products considered, the work presented in D2.2 considers the needs and coordination between TSOs and DSOs and the perspective of the service providers, the FSPs (including aggregators and, more broadly, investors in new sources of flexibility). Workshops were organized to collect feedback on the products proposed.

However, it is important to notice that the harmonized products proposed by D2.2 should not be confused with standardized products. Within the OneNet understanding, the harmonization of products aims at reducing the variations between products, while standardization is the process in which variations are completely eliminated. Therefore, the theoretical framework advocates for only harmonised products, especially for products involving distributed flexibility provision for DSOs. In this case, the harmonization provides the benefit of barriers to FSPs by reducing the variations in requirements while maintaining the capability of DSOs to consider local characteristics and needs in the designed products.

7.1.4 KPIs considered in the Western Cluster

As part of the BUC writing process and the demonstration setup discussions, the three demonstration countries provided a preliminary identification of the KPIs that could be used to measure the results of the demonstrations. The KPIs identified for Portugal, Spain, and France can be consulted in sections 3.4, 4.4 and 5.4, respectively. It is important to note that this is a preliminary definition. The OneNet project has a specific task in which KPIs will be fully defined and described, namely Task 2.4. For this reason, the KPIs presented in this deliverable D9.1 only contain a brief description, without presenting the formulation and other aspects that would be necessary for their implementation and calculation, which will be presented in deliverable D2.4.

The Spanish, Portuguese and French demonstrators have proposed 10, 8 and 2 KPIs, respectively. Among those, certain similarities can be observed. For instance, both Portuguese and Spanish demonstrations will calculate the ICT costs to develop their solutions. Additionally, they will look at the accuracy of the forecasts and the effect of flexibility activation in reducing congestions. The French and the Spanish demonstration also share one KPI with a common objective: the participation of FSPs. The Spanish demonstration will calculate the number of active customers, while the French demonstration will compute the number of FSPs involved in their services.

Therefore, eight out of the twenty KPIs identified within the Western Cluster are aligned to some extent. The remaining KPIs are focused on specific aspects being explored by each demonstration. The Portuguese

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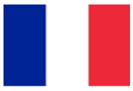
demonstration, for example, includes several KPIs on the data quality, as the demonstration is focused on information exchange. The Spanish demonstration foresees the calculation of KPIs to evaluate the local market that will be implemented (e.g. volume and number of transactions, number of products) and other economic aspects of the flexibility usage by DSOs, including a comparison of the procurement costs incurred by the DSOs against the potentially avoided or deferred costs otherwise necessary (e.g. network reinforcement). The French KPIs are focused on the trackability of activation, in line with the objectives of the STAR system.

Table 7-3 lists all KPIs proposed by the three demonstration countries, including a colour matching those KPIs containing similarities.

Table 7-3: List of KPIs per demonstration country

		
ICT costs	*ICT costs*	*Tracked flexibility activations*
Share of correctly forecasted congestions	*Active participation*	*Number of flexibility service*
Forecast Quality	*Accuracy of load forecast*	
Share of correctly forecasted congestion	*Available Flexibility*	
Share of false-positive congestion forecasts	*Cost Value*	
Requested flexibility	*Power Deviation*	
Technical Avoided Restrictions	*Congestion reduction*	
Curtailed RES (MWh/day)	*Volume of transactions*	
	Number of transactions	
	Number of products	

Legend: coloured KPIs indicate similarities

7.2 Alignment of the Western Cluster with the ASM report

This subsection assesses the alignment of the Western Cluster use cases and demonstration set-ups with the proposals brought by the ASM report. It identifies how the solutions proposed by the cluster promote the development of the concepts initially proposed by the ASM and how the ASM could guide future developments of the demonstration. This assessment aims to ensure that the solutions being proposed are aligned with the European view on TSO-DSO coordination and that the demonstrations are adopting clear rules and interfaces, enhancing the possibility for replicability to the other Member States.

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This section is organized following the structure of the topics of the ASM report. For each topic, the ASM provides an analysis and recommendations for policy and implementation by TSOs and DSOs. Therefore, this subsection considers each of the 23 recommendations and assesses to which extent the Western Cluster is (i) providing solutions and contributing to the development of the recommendations, (ii) not directly considering the recommendations (but future consideration during the demonstration is possible), or (iii) if the Western Cluster is moving away from the recommendations.

Considering that each demonstration country addresses different aspects mainly in a complementary way, this assessment is done for the Western Cluster as a whole and not for each country, only highlighting countries and solutions when necessary.

7.2.1 Congestion management process and information exchange

The ASM report focuses on the TSO-DSO interactions for a particular market setting, namely the procurement of balancing (a TSO's responsibility) and congestion management for local and central needs. The recommendations and assessment of the Western Cluster follow below.

- Recommendation 1: *TSOs and DSOs should optimise their processes and actions in collaboration.*

The Western Cluster is contributing to the development of this recommendation. In particular, the Portuguese and the French demonstrations (in which the TSO is participating) propose optimizing their processes for congestion management in a coordinated manner.

- Recommendation 2: *There should be an incentive for market parties to provide good schedules with relevant locational information to the system operators, which is crucial to get a proper forecast for congestion management.*

Market participants in the Western Cluster receive some incentive to provide good schedules to a certain extent and provide locational information. Also, the Spanish demonstration already defined a "correction factor" (see section 4.1), which could incentivise the FSP to provide an accurate estimate and deliver the procured service when activated. However, baseline methods are yet not defined, which could impact these incentives.

- Recommendation 3: *System operators should properly communicate their needs in the different timeframes.*

Demonstrations in the Western Cluster have planned different BUCs for long and short-term timeframes. Different products may account for an even finer granularity (e.g. day-ahead and intraday congestion management products).

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- Recommendation 4: *Information on flexibility resources that are pre-qualified or are seeking participation in congestion management and balancing should be shared and available (typically nationally) for both TSOs and DSOs, through a flexibility resources register. TSOs and DSOs jointly recommend that the concept of flexibility resources register should be acknowledged at the European level and the implementation should be decided on a national level.*

One of the main objectives of the Western Cluster is to contribute to the information exchange among market participants and system operators. The Spanish SUC-ES-01 will specifically demonstrate an implementation of the flexibility resources register concept.

7.2.2 Products and bids

- Recommendation 5: *Products for congestion management should comply with the needs of system operators within the different timeframes (from long-term to real-time) and take into account the possibilities of the market parties, including retail. Existing tools and services should be considered.*

As mentioned for Recommendation 3, different timeframes are considered. In addition, the needs of system operators are also taken into account when designing the products. For instance, for the Spanish demonstration, it was identified that a long-term activation product would be desirable for the DSOs. Also, products and markets are designed to provide a level playing field for participant FSPs, and they take into consideration the already existing markets, as demonstrated in deliverable D3.1.

- Recommendation 6: *Product definition should allow for aggregation as much as technically feasible.*

In principle, aggregators will not participate in the demonstration activities directly. However, the possibility for aggregation might be considered in the Portuguese BUC in the DSO-TSO information exchange. The Portuguese demonstration could therefore explore the aggregation concept.

- Recommendation 7: *Products should be designed in a dialogue with stakeholders to assess possibilities and needs, at least at a national level. Special attention should be given to avoiding too numerous and diverse products, while considering local specificities.*

The design of products within the Western Cluster was done in a two-step approach. Firstly, demonstrations freely designed the products that best suited their needs. Secondly, these products went through a harmonization process in the scope of Task 2.2. The definition of harmonized products included the participation of several types of stakeholders in different workshops.

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- Recommendation 8: *A general EU harmonisation of the products for congestion management is not required, as long as this does not lead to a distortion of the level playing field. However, different products for portfolio optimisation, balancing and congestion management should be sufficiently aligned to allow an efficient market-based allocation of flexibility. This implies standard national requirements of the congestion management product.*

In the spirit of this recommendation, harmonized products were defined in Task 2.2. Harmonization is understood as a sufficient reduction of differences to reduce barriers for FSPs while retaining the capabilities for SOs to consider their needs. Considering that the Western Cluster is focused on congestion management products only, harmonization, as opposed to standardization, is desirable.

7.2.3 Pre-qualification

- Recommendation 9: *In addition to regular pre-qualification commitments from the connecting system operator, there are two ways of enabling more flexibility service providers being qualified: a. conditional grid pre-qualification, where the pre-qualification is dependent on certain conditions being met, or b. dynamic grid pre-qualification, where the pre-qualification can change over time. The aim of both concepts is to increase the pre-qualified volume on the market.*

The Spanish demonstration defines that “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)”, which encompasses the concepts of dynamic and conditional pre-qualification.

- Recommendation 10: *The pre-qualification process should be user friendly, striving to minimise the different steps and standardize them when possible.*

Both Portuguese and Spanish demonstrations have planned the pre-qualification in ways to minimize steps for potential FSPs. For example, the Spanish demonstration defines both a “grid pre-qualification” and a “market pre-qualification”, carried out by the DSO and IMO, respectively. Although these two pre-qualification processes must be completed, the FSP only interacts with the Local Market Platform.

- Recommendation 11: *Pre-qualification could take place on an aggregated/portfolio level if technically acceptable.*

The Portuguese demonstration considers the possibility of aggregated/portfolio in both their long and short-term BUCs in what affects the DSO-TSO information exchange.

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7.2.4 Marketplace

- Recommendation 12: *A conceptual framework is a useful tool for structuring the discussion around market interaction on congestion management: a clear definition of roles and responsibilities, market model options, coordination options and platform options. It is recommended that TSOs and DSOs agree on the usage of this conceptual framework on the EU level, without impairing national specificities and allowing the selection of options on a national level.*

From the perspective of the Western Cluster development, this recommendation lays outside of its scope. However, it is worth noticing that the OneNet has developed a common framework for market models applied to the Western Cluster (see OneNet deliverable D3.1).

- Recommendation 13: *When assessing market model options, implementation through different platform options should be considered, as both issues are linked. This would allow assessing more concretely the consequences of the market design selected: making the right choices may lead to very effective solutions, whereas making nonaligned choices may lead to very complex and costly solutions. It is recommended that TSOs and DSOs at a national level jointly discuss these options in dialogue with stakeholders, taking into account national specificities.*

The interaction between platforms and market models is not considered extensively in the Western Cluster, considering that the interaction of TSO and DSO with market implementation is limited. In the Portuguese demonstration, TSOs and DSOs interact extensively, but no particular market is created, as the focus of this demonstration is to test the data exchange. In the Spanish demonstration, in which market development is a priority, the TSO is not part of the demonstration. Therefore, the option for an independent local market platform was chosen.

- Recommendation 14: *Timings of most market processes (day-ahead, intraday, balancing) are evolving towards an alignment on a European target model. However, the timing for congestion management can differ at a national level, depending on local specificities. It is recommended that these markets are compatible with the markets at the EU level, but that the corresponding timeframes are defined on a national level. This would ease the effort of TSO – DSO coordination.*

In principle, the timing of markets (in particular for the Spanish demonstration) was chosen based on the system operator's needs. Moreover, it also considered the interaction with existing markets, considering that the Spanish NEMO is also part of the demonstration.

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- Recommendation 15: *The different options for market models, coordination and platforms give a European framework, which is recommended to be the basis for the Member States to discuss, and after taking into account their national specificities, agree on Member State level on implementation. Irrespective of the options chosen, system operators should always exchange all the relevant information from their grid and the relevant connected assets, from structural data (potential flexibility services and their characteristics) to more dynamic data (forecast and activation of bids): this is needed to allow efficient flexibility procurement without creating issues on the grid.*

The Western Cluster is specially focused on the development of solutions to foster the adoption of this recommendation. On the one hand, the Portuguese and the French demonstrations will test enhanced information exchange for operation planning. The sharing of activation of bids is present in all three demonstrations. Moreover, the French BUC WECL-FR-01 will demonstrate innovative ways for the trackability of activations. Structural data will also be shared. The Spanish demonstration will test the concept of the Flexibility Registry, and the Portuguese demonstration has planned a comprehensive sharing of information from long to short term, as exemplified in Figure 7-3.

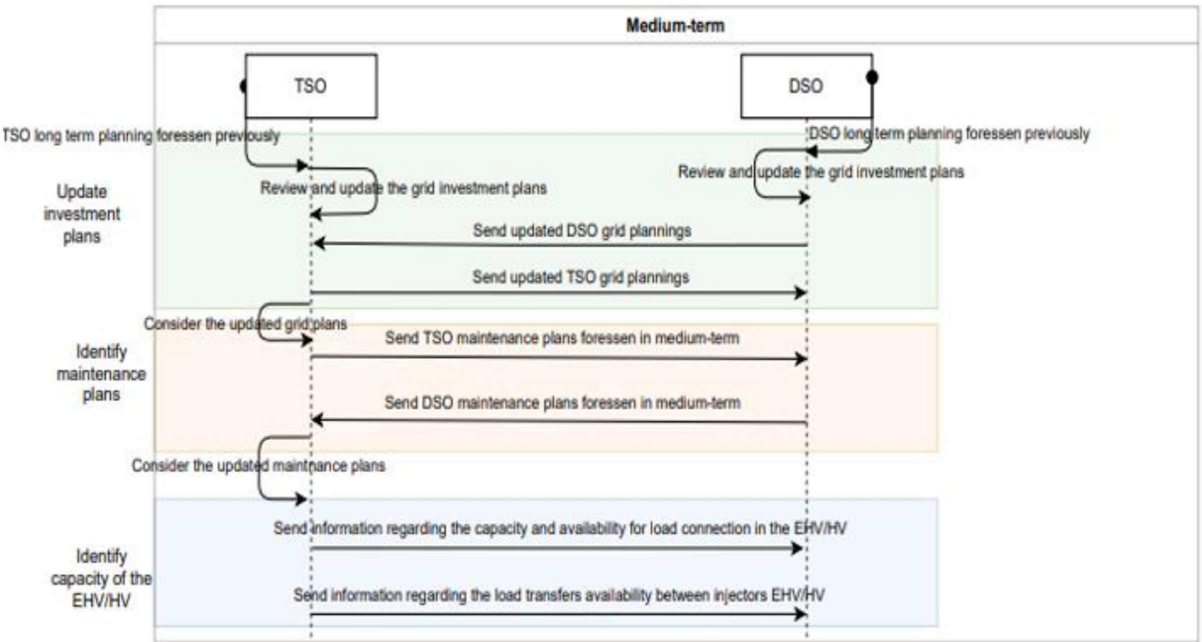

Figure 7-3: Medium-term information exchange in the BUC WECL-PT-03

- Recommendation 16: *The activation of bids for congestion management creates an imbalance that shall be counteracted to maintain system balance. This can be done by: a. the service provider, who delivers the bid and takes responsibility for the imbalance created, b. the system operator performing the congestion management action, meaning a redispatch, or c. the TSO, who combines this with its balancing task.*

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The design of balancing markets and balancing actions lies outside the scope defined by the demonstrations. Therefore, this recommendation is not addressed yet by the Western Cluster. This effect will be considered in a later stage in the Spanish demonstrator.

7.2.5 Platform options

- Recommendation 17: *Access should be easy for the customer: For both end consumers as well as market parties offering flexibility to system operators, easy access should be facilitated irrespective of the platform arrangement (e.g. whether separate or joint platforms are created).*

This aspect is being considered for the design of the Local Market Platform in Spain. In the market platform, the FSP will interact directly with the platform. The French BUC WECL-FR-1 also foresees facilitated access by flexibility providers to the STAR system.

- Recommendation 18: *Interoperability with other platforms must be ensured: Platforms developed by TSOs, DSOs or jointly should always respect and ensure a level playing field for the market. This will require coordination and (an) agreed interface(s) between the regulated and commercial domains.*

At the time of writing, the architecture of platforms is still under discussion, as mentioned in the above chapters. Nevertheless, this aspect is already being taken into account. Additionally, each demonstration will promote interactions of the national demonstration with the OneNet System, which will also contribute to demonstrating the interoperability of the national solutions.

- Recommendation 19: *Platforms must avoid harmful interference and conflicts beyond their associated grids: Platforms should contain a functionality to ensure that any TSO or DSO interaction does not create any harmful impact on their respective grids or on the system as a whole. This requires correct and timely data exchange between platforms and a set of well-designed algorithms.*

These functionalities are being particularly considered by Portuguese and French demonstration in their BUCs WECL-PT-03 and WECL-FR-02, respectively. These BUCs focus on avoid such types of problems by sharing data at the operational planning phase. The French demonstration will also experiment with tools such as the “tunnel of warranty”, which ensures that activations by one system operator do not cause problems to the adjacent grid.

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- Recommendation 20: *TSO – DSO coordination and mutual data exchange are an activity in the regulated domain: As both TSOs and DSOs carry system responsibility to ensure the security of supply and system stability, any coordination and data exchange between TSOs and DSOs that is required to avoid harmful interference is the responsibility of TSOs and DSOs. This will also ensure that the whole system is operated as efficiently as possible, and the value to the customer is maximised.*

This aspect is embedded in the design of those use cases that foresee the TSO-DSO data exchange.

- Recommendation 21: *Platforms solutions should be technology agnostic: In defining platforms and solutions, TSOs and DSOs should be technology and hardware agnostic.*

As mentioned for recommendation 18, this too is an aspect that should be fully addressed by the demonstration when defining the final architecture of their respective platforms.

7.2.6 General recommendations

- Recommendation 22: *TSOs and DSOs should pursue an integrated system approach when developing new solutions and should avoid any isolated solution.*

To those demonstrations in which TSO-DSO interactions are being tested extensively (namely France and Portugal), an integrated approach was considered throughout the solution development process.

- Recommendation 23: *TSOs and DSOs shall use those flexibility tools that are effective, cost-efficient and that suit their needs.*

Specific KPIs will measure, for each demonstration, the effectiveness and suitability of solutions, as well as their cost-efficiency.

7.2.7 Summary

Table 7-4 provides a summary of the alignment analysis and the Western Cluster demonstrations. In total, from the 23 original recommendations, we conclude that for 18 the Western Cluster will test solutions and provide results that contribute to the understanding and further development of these recommendations. For two recommendations, we conclude that the demonstrations do not consider them yet and that they could or

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will be considered in future activities of the demonstrations if they fit the scope and purpose of the demos. Two recommendations are currently being defined by the demonstrations, and therefore being taken into account, while one recommendation was considered outside of the scope of the Western Cluster activities.

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Table 7-4: Summary of the alignment analysis between the WECL demons and the ASM report

Topic	*Id*	*Description*	*Status on the Western Cluster*	*Considerations for the Western Cluster*
Congestion management process and information exchange	1	TSOs and DSOs should optimise their processes and actions in collaboration	Foreseen in the Western Cluster	
	2	An incentive for market parties to provide good schedules	Not foreseen so far. Could be considered in the cluster activities	Definition of baseline methods and other forecasting requirements by FSPs could be considered.
	3	System operators should properly communicate their needs in the different timeframes	Foreseen in the Western Cluster	
	4	Information on FSP should be made available through the flexibility resources register	Foreseen in the Western Cluster	
Products and bids	5	Products should comply with needs of SOs within different timeframes and consider possibilities for market parties	Foreseen in the Western Cluster	
	6	Product definition should allow for aggregation as much as technically feasible	Not foreseen so far. Could be considered in the cluster activities	The inclusion of aggregation in the WECL is limited.
	7	Products should be designed in a dialogue with stakeholders	Foreseen in the Western Cluster	
	8	Different products should be sufficiently aligned to allow an efficient market-based allocation of flexibility	Foreseen in the Western Cluster	
Pre-qualification	9	Conditional and dynamic pre-qualification can increase pre-qualified volume on the market	Foreseen in the Western Cluster	

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	10	The pre-qualification process should be user friendly	Foreseen in the Western Cluster	
	11	Pre-qualification could take place on an aggregated/portfolio level if technically acceptable	Foreseen in the Western Cluster	
Marketplace	12	An EU conceptual framework should be used to discuss market models	Foreseen in the Western Cluster	The OneNet market model framework was used in analyzing and defining the WECL
	13	When assessing market model options, implementation through different platform options should be considered	Out of the scope of the WECL	The WECL does not focus on the market interaction of TSO and DSO
	14	Timing for congestion management markets should be harmonized with EU markets	Foreseen in the Western Cluster	
	15	System operators should always exchange all the relevant information from their grid and the relevant connected assets	Foreseen in the Western Cluster	
	16	The activation of bids for congestion management creates an imbalance that shall be counteracted	Foreseen in the Western Cluster	Considered in the Spanish demonstrator in the energy schedules shared with the TSO
Platforms	17	Access [to platforms] should be easy for the customer	Foreseen in the Western Cluster	
	18	Interoperability with other platforms must be ensured	Ongoing process. It is being considered in the cluster activities	The design of platforms' architecture is still ongoing. This aspect will be considered.
	19	Platforms must avoid harmful interference and conflicts beyond their associated grids	Foreseen in the Western Cluster	
	20	Any coordination and data exchange between TSOs and DSOs that is required to avoid harmful interference is the responsibility of TSOs and DSOs	Foreseen in the Western Cluster	

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	21	Platforms solutions should be technology agnostic	Ongoing process. It is being considered in the cluster activities	The design of platforms' architecture is still ongoing. This aspect will be considered.
General recommendations	22	TSOs and DSOs should pursue an integrated system approach when developing new solutions	Foreseen in the Western Cluster	
	23	TSOs and DSOs shall use those flexibility tools that are effective, cost-efficient and that suit their needs	Foreseen in the Western Cluster	

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8 Conclusions

This deliverable characterizes the OneNet Western Cluster in the three demonstration countries, namely Portugal, Spain and France. The document presents all the use cases developed for each demonstration, including the BUCs, the SUCs, and the Regional BUCs. Moreover, it also describes the demonstration characteristics in terms of geographical scope, resources to be used, and the KPIs considered to measure the outcomes of the demonstration activities.

The comprehensive mapping of the three demonstrations presented in this report allows for an analysis of the proposed solutions' similarities, differences, and overall alignment. The Western Cluster as a whole is aligned with the OneNet objectives and the European view on the future of power systems, specifically on the urge for an enhanced TSO-DSO coordination, as expressed by the ASM report recent regulatory packages such as the Clean Energy Package. Moreover, the solutions proposed aim at facilitating the integration of diverse FSPs connected at the distribution level. For the testing of the solution, direct involvement of customers will be involved (e.g. Spanish local market for congestion management or the French activations by TSO and DSO). Customer engagement will be key for the success of the demonstration, as they aim at facilitating the participation and integration of their resources into service markets. Initial identification of FSP has already started, including the planning for using the Cascading Funds to foster customer engagement[37]. In the case of indirect customer participation (e.g. the Portuguese BUCs focused on the exchange of information), the customer is still in the centre of the demonstration. Solutions also try to reduce barriers to flexibility provision. This alignment of the Western Cluster with the European view could be verified by analyzing the Western Cluster solutions in the face of the recommendations proposed by the ASM report. A high level of alignment was seen without any major deviations.

Among the three demonstration countries, both similarities and differences can be observed. Firstly, all three demos are considering congestion management services and products. This single service may allow for the future exchange of experiences on activities with common objectives. For instance, enhancing information exchange in congestion management is an important objective for both the French and the Portuguese demonstrations. Where differences among demonstrations exist, they also help to expand the reach of the solutions being tested in the Western Cluster. While the Spanish demonstration focuses on customer-DSO-MO interactions in market-oriented demonstrations, the other demonstrations focus more on the TSO-DSO

[37] The Cascading Funds are being considered for the Spanish demonstration, in which a local market for flexibility will be tested.

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interactions from a technical perspective, mostly on data exchange. In this context, the Western Cluster is expected to provide answers for a large number of questions in the TSO-DSO-Customer triad.

The demonstration descriptions and setups are a work in progress and are not finalized by this deliverable D9.1. Therefore, this ongoing process can benefit from the identified aspects in which demonstrations are complementary, in which exchange of experiences and further developments proposed by the ASM report are possible.

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10 Appendix

10.1 Service Phases in the Active System Management Report

The Active System Management report (ASM, [1]), written by ENTSO-e and the four DSO associations in Europe, establishes an important baseline for the discussion on distributed flexibility procurement for balancing and congestion management and the required coordination between TSO and DSO in order to achieve that goal. Given the importance of this joint stakeholder publication, the ASM is also a reference for the OneNet project, as stated in the DoA.

In this chapter, we provide a summary of key concepts and recommendations proposed the ASM report, as well as an assessment of the alignment of the BUCs under development in the Western Cluster with the ASM report.

Definitions of Service Phases

In order to inform the BUC writing process, the service phases defined in the ASM report serve as a guide for the definition of scenarios in each BUC. Services phases are split into five, as listed below:

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

Preparatory Phase

The ASM report advocates that "distributed flexibility resources should be used where they provide the most value to the whole electricity system, while guaranteeing quality of service and security of supply". In order to achieve this goal, TSO-DSO coordination, information exchange, product design and market platforms should be in place. On each one of these topics, the ASM report provides valuable reasoning and recommendation, that are also relevant in the context of the development on the OneNet BUCs.

10.1.1.1 Products and bids

The report is focused on congestion management and balancing products. The former includes not only congestions at the transmission grid, to which TSO may already have organized markets to deal with, but also future local congestion management markets, in which DSOs will be able to solve their congestion needs.

One important definition is on what "congestion" means. The ASM report reminds the reader that the Guideline on Capacity Allocation and Congestion Management defines three types of congestions, namely "market congestions", "physical congestions" and "structural congestions", and states the focus of analysis is on the first one:

> 'Physical congestion' means any network situation where forecasted or realised power flows violate the thermal limits of the elements of the grid and voltage stability, or the angle stability limits of the power system;

The standardization of congestion management products is not necessary at the European level (as per the Clean Energy Package), but is recommended at the Member State level. This degree of standardization is necessary to reduce costs of flexibility service providers participating in different markets (e.g. aggregators that have to comply with different product definitions). For that purpose, the ASM report provides a list of attributes that could be used not only to design flexibility products for congestion management, but also to evaluate possible the harmonization:

- Minimum/maximum bid size
- Direction of deviation (up/down)
- 'partial' or 'all or none' bid
- Minimum/maximum duration (e. g. 15 min/60 min)
- Definition of congestion point (identification of the congested area/locational information)
- Bidding period: time granted to the market parties to offer bids
- Selection period: time required by the system operator to select the bids which will be activated
- Activation period: time before activation signal and ramp up period (1 h, 15 min, 0 s)
- Maximum ramping period (15 min, 5 min, …)
- Minimum full activation period (15 min, 30 min, …)
- Mode of activation (automatic, manual)
- Availability window (per day, per week, per year)
- Frequency: Maximum number of activations (per day, per week, per year)
- Recovery time: Minimum time between activations
- Recovery conditions
- Baseline methodology
- Measurement requirements
- Unit-based or portfolio-based within a certain geographical area
- Penalty for non-delivery (fixed or dependent on the bid size and/or duration, …)
- Certificate of origin
- Level of availability of the bid (due to the uncertainty of RES)

10.1.1.2 Pre-qualification

The pre-qualification process definition is divided into two, namely the product pre-qualification and the grid pre-qualification.

The **product pre-qualification** is defined as checking whether the unit can (technically) deliver the product it wants to sell/deliver. For this type of pre-qualification, the ASM report argues that **the responsible** for the pre-qualification **should be the party buying the product**. With regards to this type of pre-qualification, the ASM report also recommends a "one-stop shop" approach in the case that there would be multiple buyers for the same unit. In this case, the FSP would only go through one product pre-qualification per product.

The **grid pre-qualification**, is defined as checking whether the grid can manage the delivery of the product that the unit wants to sell/deliver (both congestion management and balancing products), according to the

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agreement and applicable framework between the different system operators on pre-qualification. For this type of pre-qualification, the ASM report argues that **the responsible** for the pre-qualification **should be the grid in which the FSP is connected and intermediate DSO**[38]. For the grid pre-qualification, the ASM report recommends the use of flexible grid pre-qualifications, such as the dynamic and conditional grid pre-qualifications.

Forecasting Phase

The forecasting phase aims at evaluating the grid conditions and the need for flexibility procurement. According to the ASM report, this phase can include both the **grid expansion planning** and the **operational planning**. Therefore, "Some forecasts consist of long-term planning analysis made years in advance (before the preparatory phase) and some forecasts are updated and performed up until real time (for example using real-time weather data and remote monitoring devices on the grids)".

Market Phase

This market phase starts when congestions are expected. Bids are collected according to their product definition and timing. They can be either long or short term capacity bids, or short term energy bids. Within this market phase, the **choice for a market model** for balancing and congestion management enters into play. These are the coordination schemes defined in the ASM report. Three options are proposed by the report, as listed below:

1. Option 1: separated TSO and DSO congestion management
2. Option 2: combined TSO and DSO congestion management, with separated balancing
3. Option 3: combined balancing and congestion management for all system operators together

In the case of OneNet BUCs, market models are not limited to the three options proposed by the ASM report. Other WPs are currently designing market models in addition to the ones proposed not only in the ASM report, but also in other H2020 projects and academic literature.

Monitoring & activation phase

In this service phase, close coordination between SOs is also necessary. One system operator should not activate bids in already congested areas of another SO, for instance. The ASM report does not provide a comprehensive detailing for this market phase. However, it becomes clear that information exchange is a crucial component. With regards to information exchange, the ASM report proposes the creation of a "flexibility

[38] The "intermediate DSO" means the DSO in between the DSO in which the FSP is connected and the final buyer of the product. It is a common situation in countries with a two-DSO layer, in which a local DSO connects to a regional DSO that finally connects to the TSO (e.g. Sweden).

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register”, which be more related to the market phase, but also the “**traffic light system**”. The latter can be used as a real-time or close to real time tool to aid SOs at the monitoring and activation phase. In consists of a way to signal when congestions are not expected (green), when they are expected (yellow), or an emergency situation (red).

Measurement & settlement phase

The final service phase consists of the measurement and settlement of the flexibility procured and activated. The measurement consists of verifying if the FSP actually provided the service contracted. On one hand, it requires appropriate communication infrastructure. On the other hand, certain aspects of product definition are relevant, especially the baseline to which the actual measurement will be compared against.

On the settlement phase, the ASM report does not bring much details, but mentions that the settlement should also consider the allocation of the measured energy between FSP and Balance Responsible Party.

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10.2 Template – Simplified Description of the Use Case

*Please fill out one template for each identified use case. In case that different perspectives require separate documents please indicate **your viewpoint** for this use case:*

☐*DSO*

☐*TSO*

☐*MO*

☐*Aggregator*

☐*DER*

☐*Other*

Use Case Identification

Name of UC: *Enter a short name that refers to the activity of the UC itself.*

Name Author(s) or Committee: *Person or e.g. standardization committee like Smart Grid Technical Committees or Working Group, if applicable.*

Scope and Objectives

Scope: *Describe briefly the scope, objectives, and rationale of the UC. You can additionally use the tick boxes to specify the voltage level and markets that are subject to this use case.*
Describe briefly the scope, objectives, and rationale of the UC. **Network under Study (Specify the voltage level)** ☐EHV TSO ☐HV TSO ☐HV DSO ☐MV DSO ☐LV DSO ☐Other: **Market under Study**

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☐Day-ahead energy market

☐ Intraday energy market

☐ Day-ahead balancing market

☐ Intraday Balancing Market

☐ Long-term (from year-ahead to weeks) TSO procurement market

☐Long-term (from year-ahead to weeks) DSO procurement market

☐Day-ahead TSO congestion market

☐Day-ahead DSO congestion market

☐Intraday TSO congestion market

☐Intraday DSO congestion market

☐Other:

Objective: *Describe briefly the objective of the UC.*

Narrative of the Use Case

Short Description: *A short narrative focusing on the question « what ?« , not « why ?« .. Only intended to get a brief overview.*

10.3 Template – Complete Use Case Form

[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		

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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.

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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								
2.4								
2.5								
2.6								

- Step No 2.x / Name of process

Business section:

Information sent:

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

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- Step No 2.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

Scenario name #3

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*
3.1								
3.2								
3.3								
3.4								
3.5								
3.6								

- Step No 3.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

- Step No 3.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*

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6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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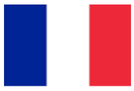
10.4 Complete Collection of BUCs and SUCs

The following subsection of the Appendix brings all the BUCs and SUCs developed by the Western Cluster within T9.1, in cooperation with T2.3 and T5.1. The table below can be used to help navigate the documents (links available):

		
WECL-REGIONAL-01: *Cross-SO grid pre-qualification*		
WECL-PT-01: *Exchange of Information for Congestion Management – Short Term*	***WECL-ES-01***: *Long-term congestion management*	***WECL-FR-01***: *Improved monitoring of flexibility for congestion management*
WECL-PT-02: *Exchange of Information for Congestion Management – Long Term*	***WECL-ES-02***: *Short-term congestion management*	***WECL-FR-02***: *Improved TSO-DSO information exchange for DER activation*
WECL-PT-03: *Exchange of Information for Operational Planning*	***SUC-ES-01***: *Local Market Platform*	***SUC-FR-01***: *TSO automated activation*
SUC-PT-01: *Evaluation of the Product & Grid pre-qualification requirements*		***SUC-FR-02***: *DSO manual activation*
SUC-PT-02: *Day-Ahead & Intraday Flexibility needs*		
SUC-PT-03: *Long-term Flexibility needs*		
SUC-PT-04: *Selection of Bids*		
SUC-PT-05: *Evaluate Grid Constraints*		
SUC-PT-06: *Maintenance plans information exchange*		
SUC-PT-07: *Consumption and gen. forecast info. exchange*		
SUC-PT-08: *Short-circuit levels information exchange*		

Legend:

Regional BUC
Local BUC
Local SUC

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10.5 WECL-REGIONAL-01: Cross-SO grid pre-qualification

Cluster Preparatory Phase: Cross-SO grid pre-qualification[39]

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***
		Cluster Preparatory Phase: Cross-SO grid pre-qualification

1.2. Version management

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

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Regional Use Case, enabling coordination among market and system operators of the Western Cluster, and be in line with the OneNet concept.
Objective(s)	- 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. - Facilitate the entry of FSPs into the various flexibility markets within the Western Cluster.
Related business case(s)	

1.4. Narrative of Use Case

Narrative of use case
Short description
This Cluster BUC is focused on exchange of information between the system/market operators of the Western Cluster to improve the pre-qualification process phase described in the ASM report and be in accordance with the OneNet System concept.
Complete description
The ASM report describes the Preparatory phase as a crucial stage to enable effective functioning of any flexibility markets as well, because it is a process which ensures that the flexibility offered by a particular flexibility service provider 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

[39] Preliminary version.

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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 challenge of this 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 described in the ASM Report, such as 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 Business Use Case, the OneNet system is essential to foster the interaction among system operators, market operators and the Flexible Service providers.

It is important to note that under the Spanish law, *Ley 24/2013, de 26 de diciembre, del Sector Eléctrico*, article 34, international connections belong to REE, the Spanish TSO. Due to this factor, TSOs must be notified and take action of the use of international tie-lines in the DSOs grid. Since the Spanish TSO is not participating in this project, only notifications to the Portuguese and French TSO will be tested in this BUC.

Narrative:

An aggregator with a portfolio (e.g. FSP1) located near the border of two countries requests to be prequalified in order to participate in one flexibility market, on the country to which they are located. The prequalification request goes through the Market Operator (MO), DSO and TSO (e.g. MO_1, DSO_1 and TSO_1 in country 1). During the initial prequalification process, FSP1 is presented with the option to be also prequalified to participate in the neighboring country (country 2), since it has affection in grid of country 2. If FSP1 accepts, the prequalification process is then forwarded by MO_1, DSO_1 and TSO_1 to MO_2, DSO_2 and TSO_2 through the OneNet System. As the processes are harmonized by this BUC, MO_2, DSO_2 and TSO_2 should receive all the information necessary to assess the prequalification viability. The MO_2, DSO_2 and TSO_2 proceed with the assessment of the prequalification. In the spirit of the Article 182.4 of the SO GL, they can (i) accept the full prequalification of FSP1, (ii) set a limit to the flexibility provision of FSP1 in country 2, or (iii) deny the participation of FSP1 in the country 2. This decision will be based on technical reasons such as the geographical location of the resource providing units and resource providing groups. Once country 2 concludes the cross-border prequalification process, this is information is added to the FSP1's entry in the Flexibility Register of each stakeholder (system and market operators involved). It is important to note that this pre-qualification process does not invalidate the remaining procedures for the following ASM process phases.

1.5. Key performance indicators (KPI)

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

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1.6. Use case conditions

Use case conditions	
Assumptions	
	• There are aggregators/FSPs, with resources located in different countries, which want to participate in the different Western cluster flexibility markets. • There are resources affecting networks in different countries. • Agreements to share confidential information between different FSPs, MOs and SOs are done. • For demonstration purposes, it is possible that the grids of the two pre-qualifying SOs are directly connects (e.g. DSO in ES and in FR). In such cases, an equivalent connection is assumed, connecting both grids. Although not completely realistic, this assumption allows for the testing of the main objectives of this Regional BUC, namely (i) the partial harmonization of the pre-qualification processes, (ii) the exchange of information for a cross-SO prequalification through OneNet System, and (iii) the Flexibility Resource Register implementation. In the demonstration activities in which the responsible TSO is a participant, they make take their role in also assessing the pre-qualification request for their portion of the network.
Prerequisites	
1	FSPs exchange information with their resources.
2	FSPs, SOs and MOs exchange information between them through OneNet System.

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

Classification information
Relation to other use cases
Level of depth
High Level
Prioritisation
High
Generic, regional or national relation
Regional
Nature of the use case
Business Use Case
Further keywords for classification
Prequalification, Flexibility Registration

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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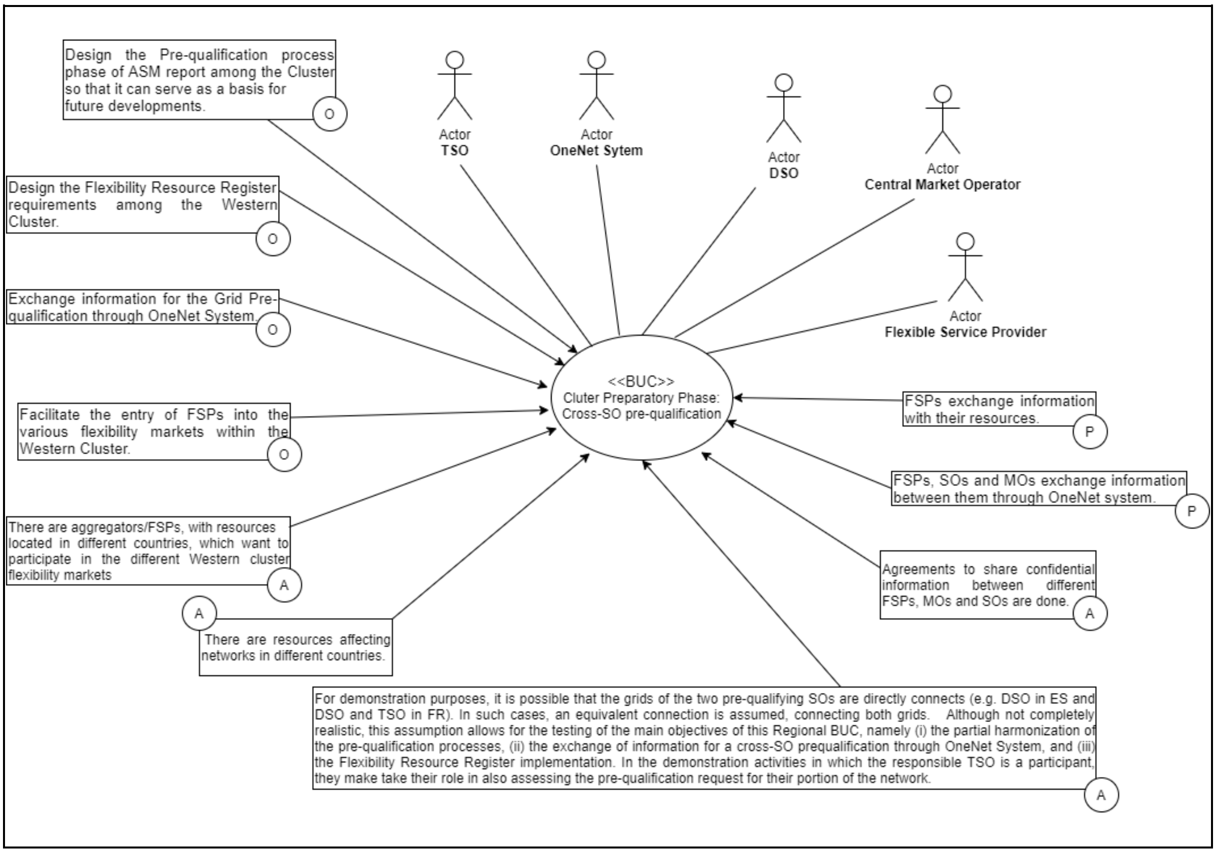

3. Technical details

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, HV)". Moreover, the DSO is responsible for connection of all grid users at the distribution level.	
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.	
MO	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	

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		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.	
OneNet System	Role	The OneNet System will allow the integration and connection among other systems in the OneNet Project.	

3.2. References

4. Step by step analysis of use case

(to be completed)

4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Prepare					
2	Plan/Forecast					
3	Market Phase					
4	Monitoring & Activation					
5	Measurement & Control of Activation & Settlement					

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name	Prepare							
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***

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- 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								
2.4								
2.5								
2.6								

- 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*

Scenario name #3

Scenario #3 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario	
Scenario name	

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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								
3.2								
3.3								
3.4								
3.5								
3.6								

- Step No 3.x / Name of process

Business section:

Information sent:

Business object	Instance name	Instance description

- Step No 3.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

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6. **Requirements (optional)**
7. **Common terms and definitions**
8. **Custom information (optional)**

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10.6 WECL-PT-01: Exchange of Information for Congestion Management – Short Term

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

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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 time-frame, 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***

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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.
3	
4	

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

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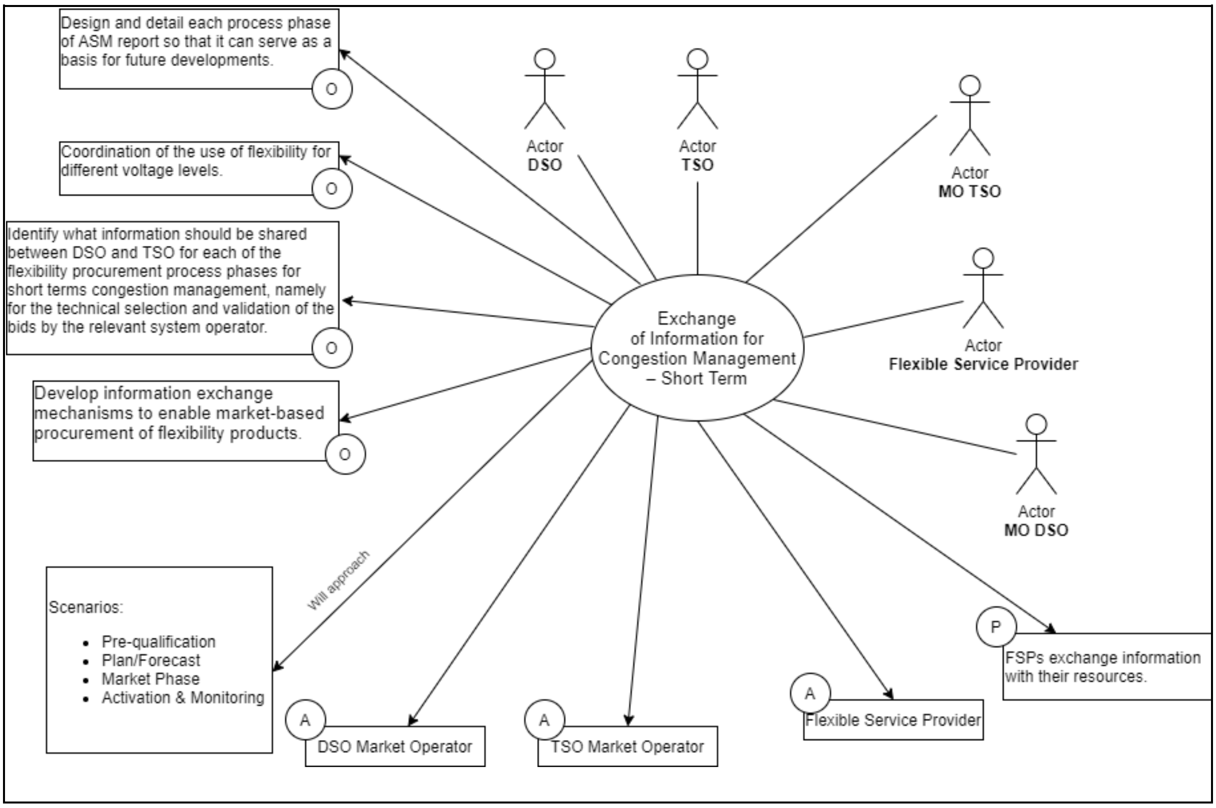

3. Technical details

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	

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		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

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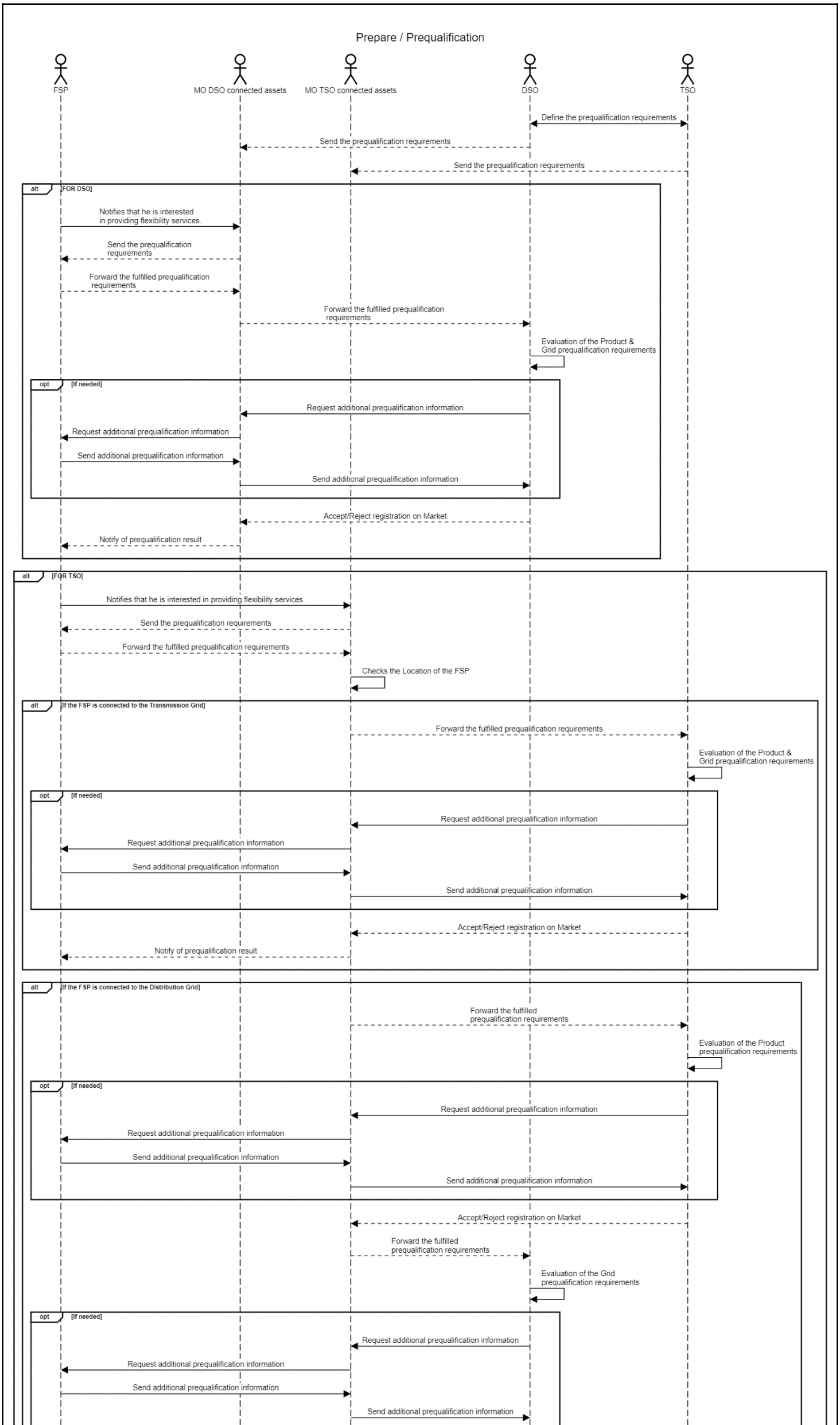
Prepare / Prequalification
FSP
MO DSO connected assets
MO TSO connected assets
DSO
TSO
Define the prequalification requirements
Send the prequalification requirements
Send the prequalification requirements
alt [FOR DSO]
Notifies that he is interested in providing flexibility services.
Send the prequalification 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

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		

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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 the		MO TSO	TSO		

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			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 the Distribution Grid.		MO TSO	DSO	Info6	
1.36		Evaluation of the Grid	FOR TSO.		DSO	DSO		

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		prequalification requirements	If the FSP is connected to the Distribution Grid.					
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

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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

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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

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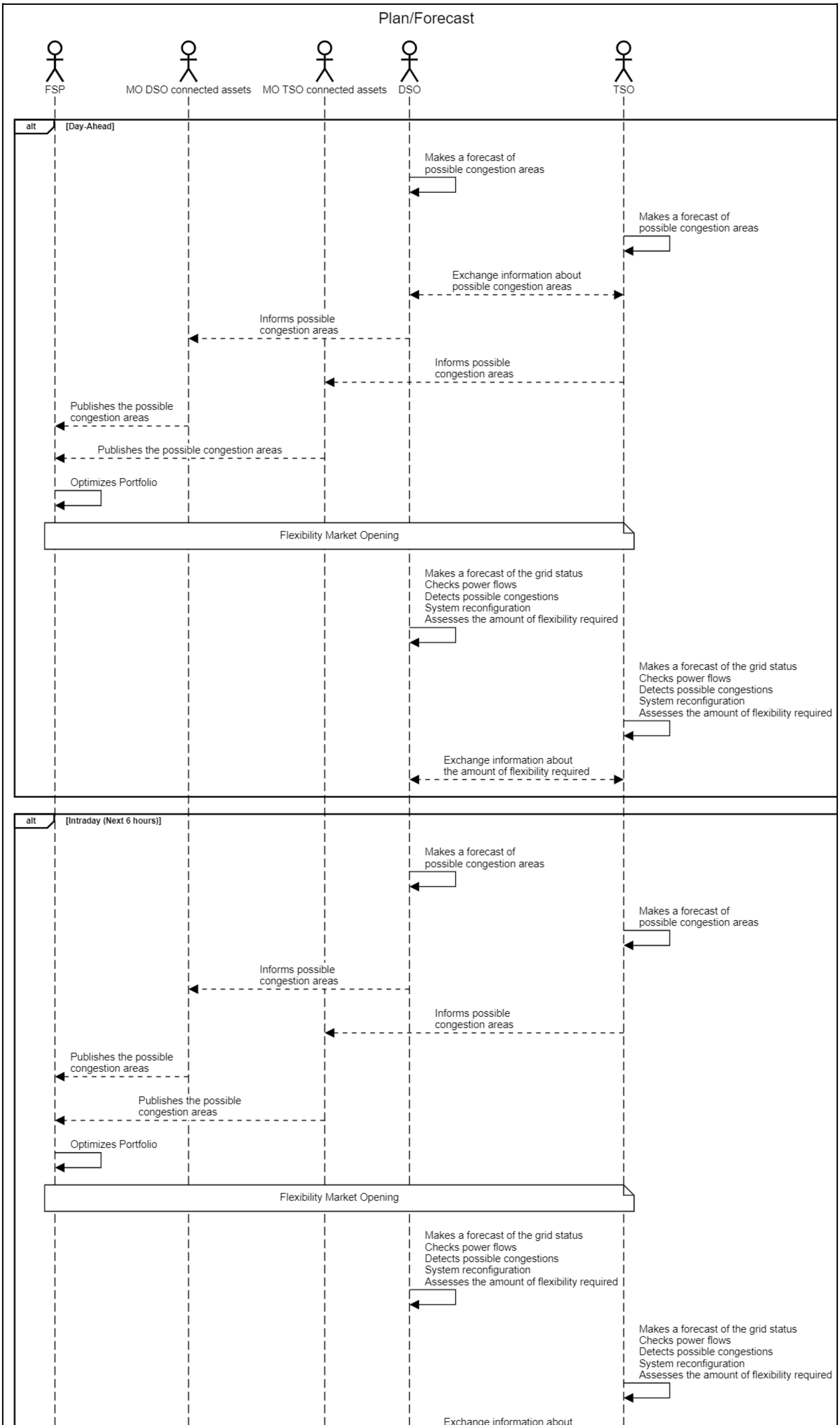

Plan/Forecast
FSP
MO DSO connected assets
MO TSO connected assets
DSO
TSO
alt
[Day-Ahead]
Makes a forecast of possible congestion areas
Makes a forecast of possible congestion areas
Exchange information about possible congestion areas
Informs possible congestion areas
Informs possible congestion areas
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

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. Before Flexibility Market Opening		FSP	FSP		
2.9		Makes a forecast of the grid status	Day-Ahead Market. Flexibility Market Opening		DSO	DSO		

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		Check power flows Detect possible congestions System reconfiguration Assesses the amount of flexibility required						
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	Intraday Market.		MO TSO	FSP		

		congestion areas	Before Flexibility Market Opening					
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 flexibility required	Intraday Market. Flexibility Market Opening		DSO/TSO	DSO/TSO	Info11	

- 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***

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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

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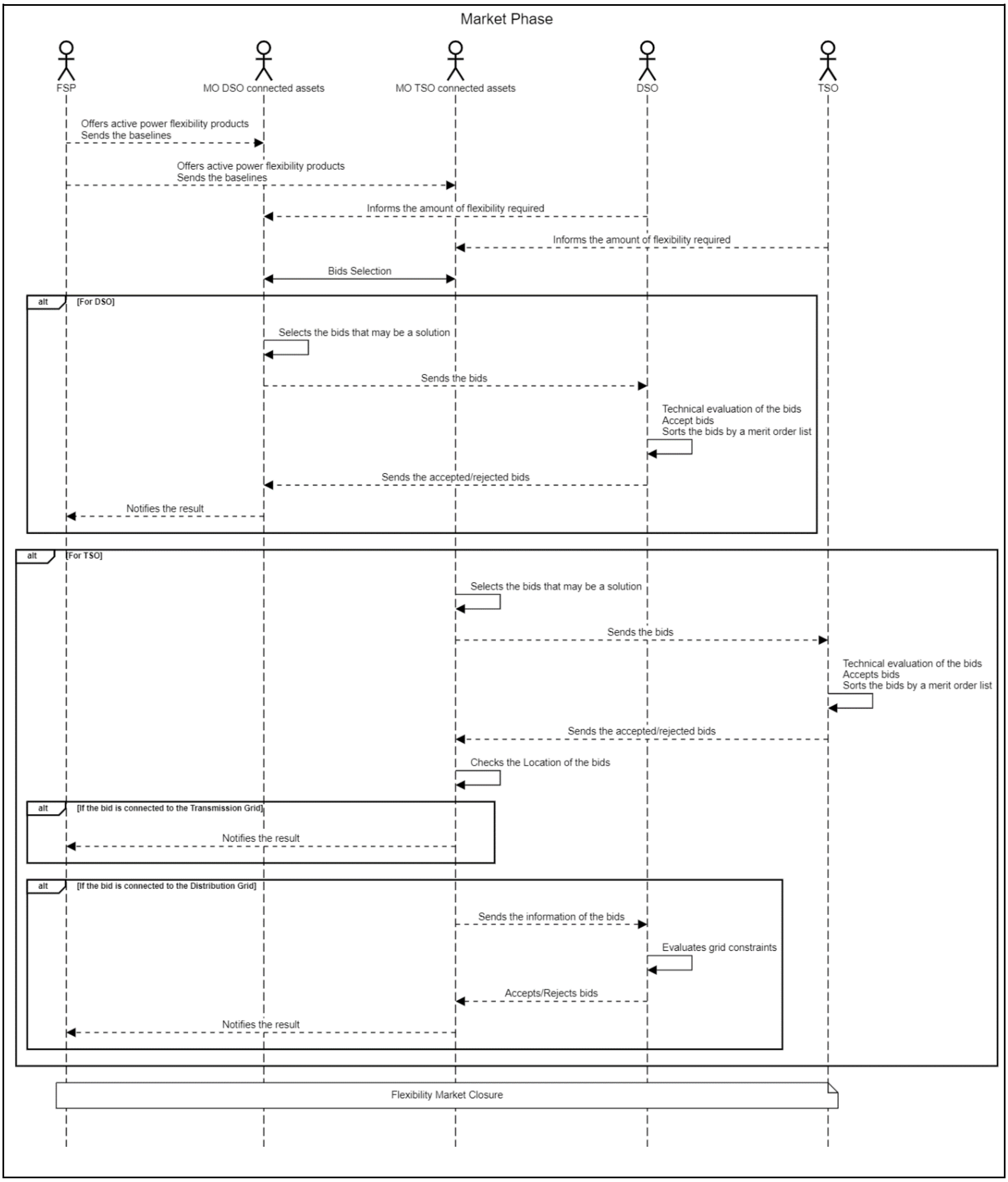

Scenario step by step analysis

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***

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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		MO TSO	FSP		

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			Transmission Grid					
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*

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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

Add activity or activity set diagram.

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***

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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	

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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 DSO. Flexibility quantity (MW)	Info11
Info13	Informs the amount of flexibility required	TSO->MO TSO. Flexibility quantity (MW)	Info11
Info14	Sends the bids	For DSO. MO DSO->DSO. Characterization of the Bid (information, parameters, eg. 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, eg. 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, eg. 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)	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.7 WECL-PT-02: Exchange of Information for Congestion Management – Long Term

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

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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.

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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.

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2	

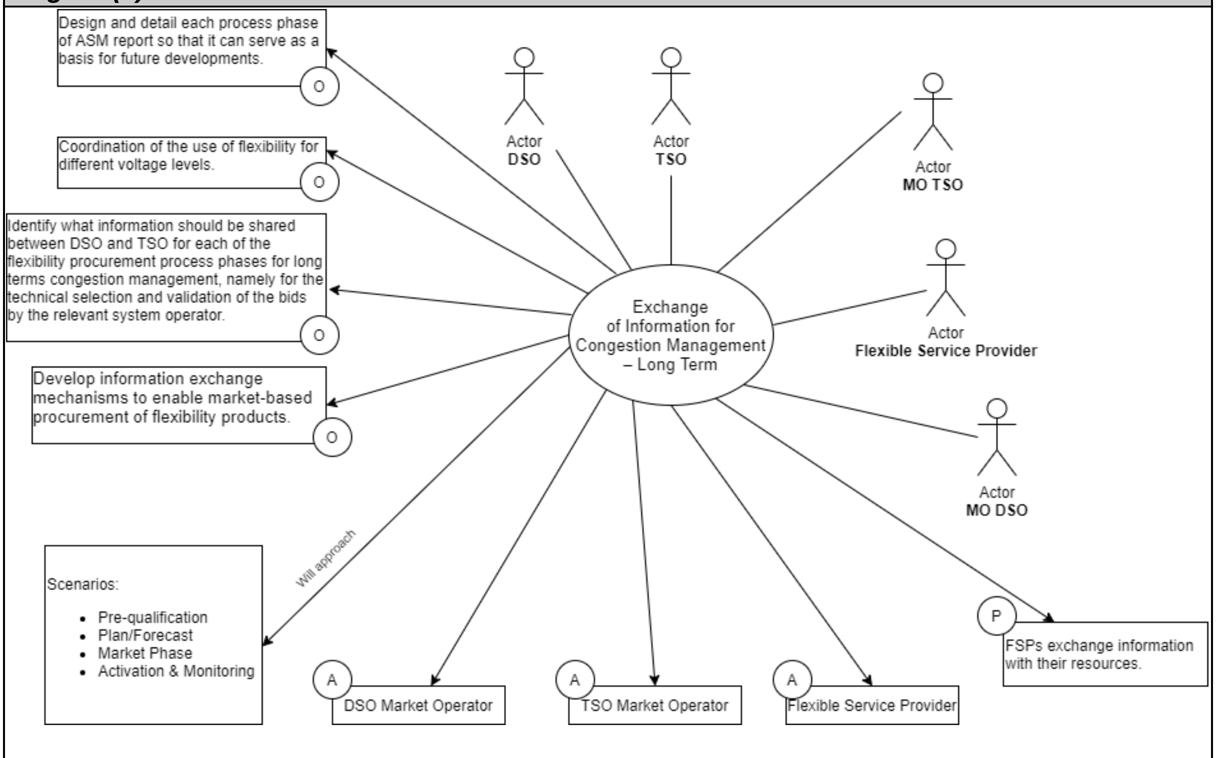
1.7. Further information to the use case for classification/mapping

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***

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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 forecasted	DSO/TSO			

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		congestion management.				

4.2. Steps - Scenarios

Prepare/Prequalification

Scenario #1 description

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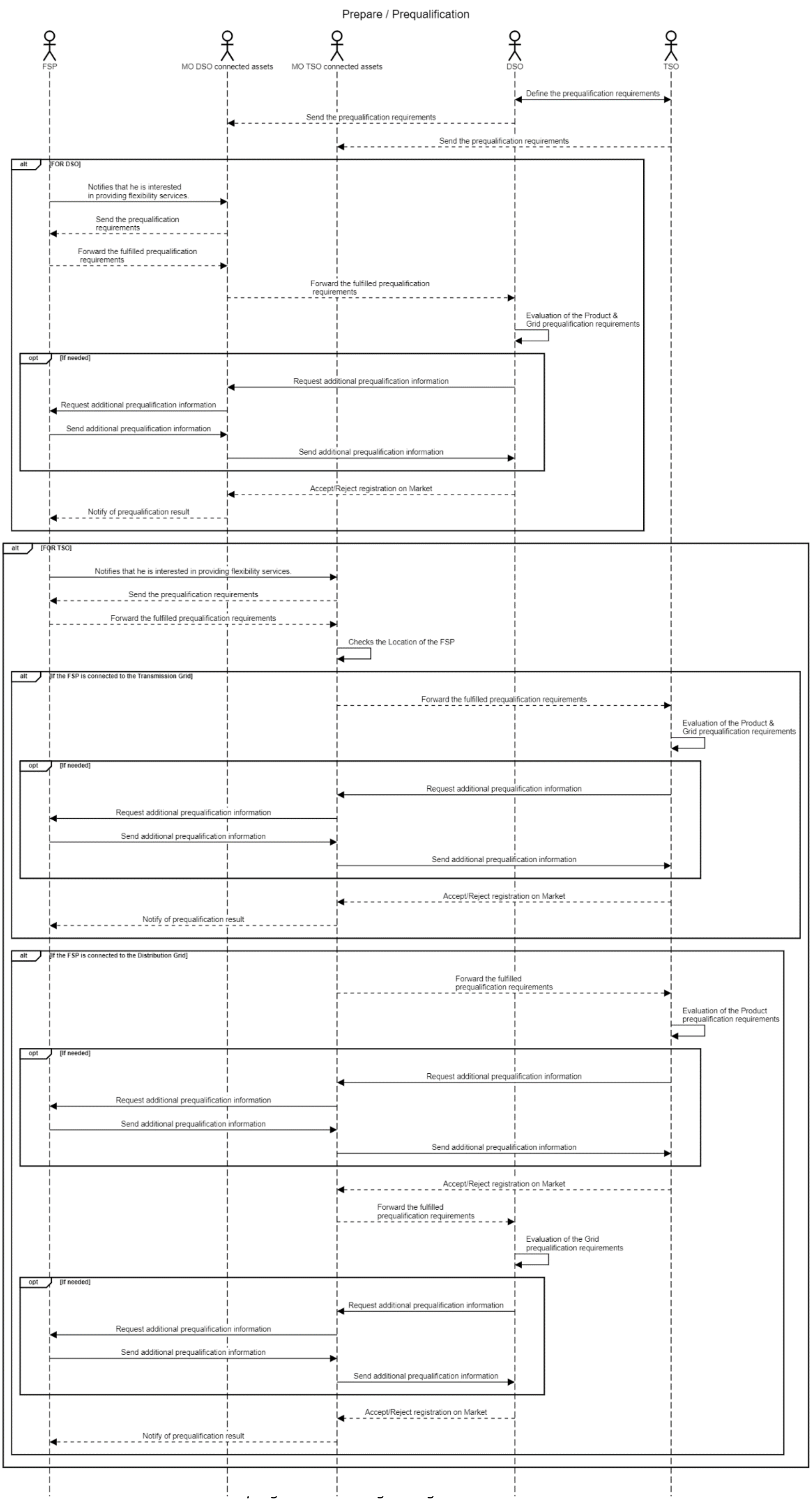
Prepare / Prequalification
FSP
MO DSO connected assets
MO TSO connected assets
DSO
TSO
Define the prequalification requirements
Send the prequalification requirements
Send the prequalification requirements
alt [FOR DSO]
Notifies that he is interested in providing flexibility services.
Send the prequalification 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		

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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 the		MO TSO	TSO		

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			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 the Distribution Grid.		MO TSO	DSO	Info6	
1.36		Evaluation of the Grid	FOR TSO.		DSO	DSO		

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		prequalification requirements	If the FSP is connected to the Distribution Grid.					
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***

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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		

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- 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

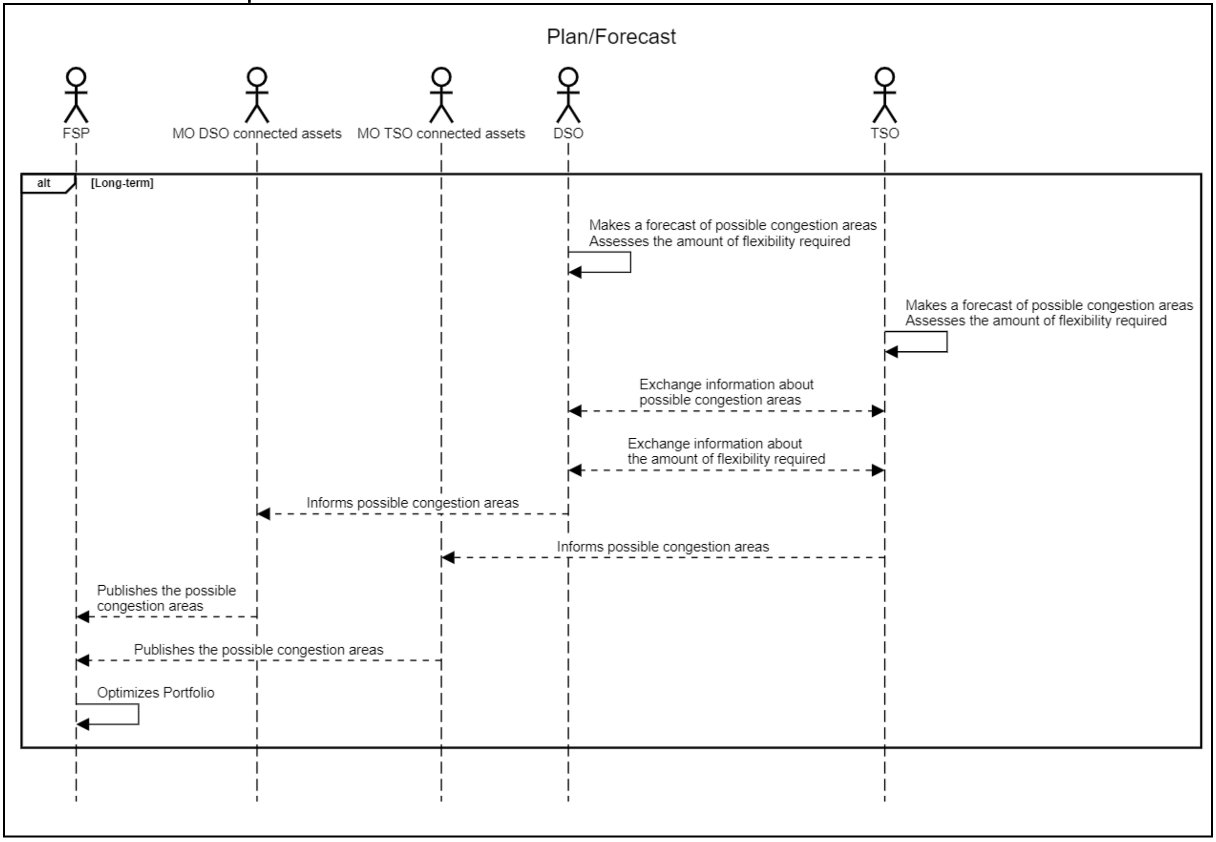
Business section:

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*

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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		

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- 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

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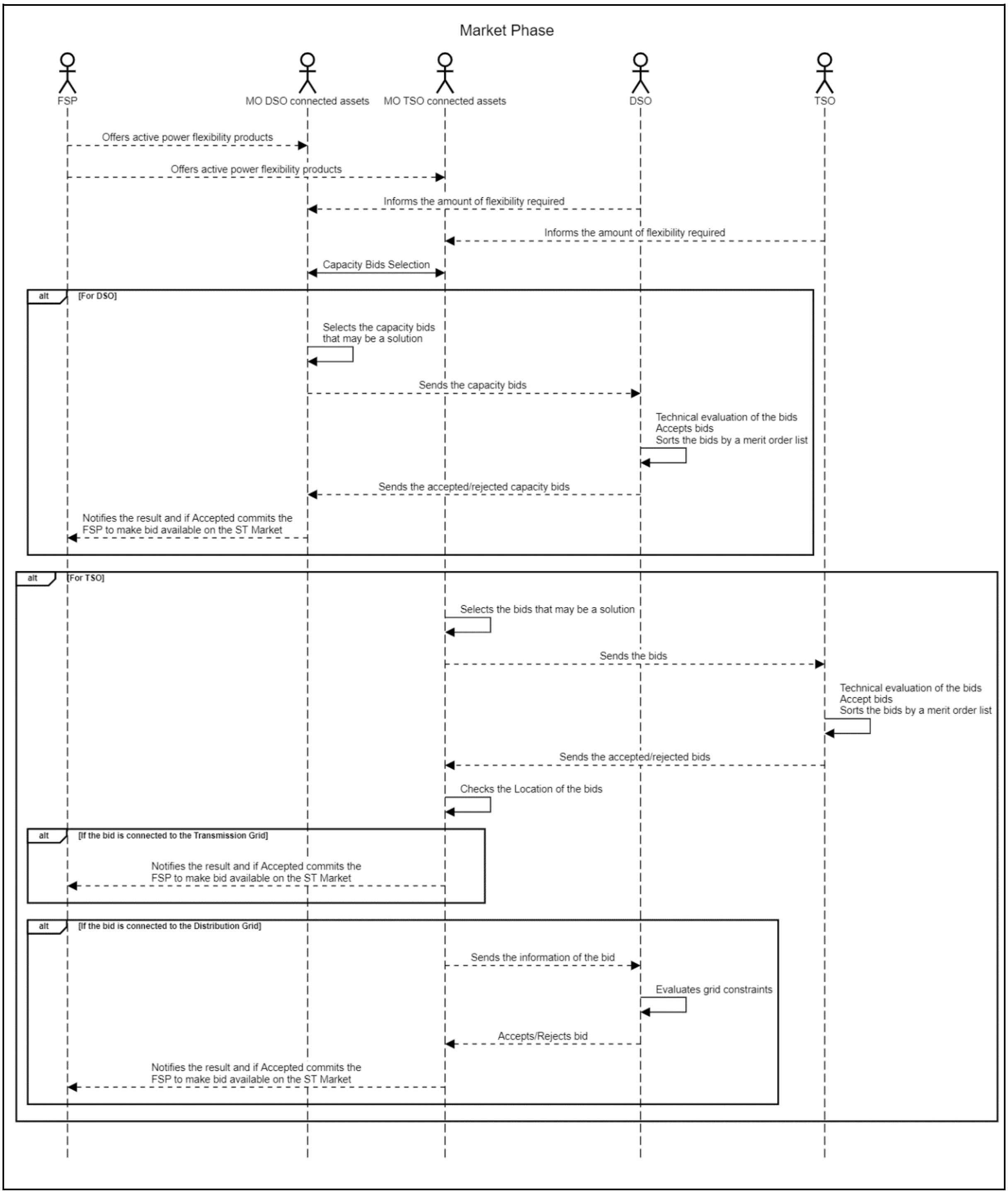

Scenario step by step analysis

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***

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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	For TSO		MO TSO	FSP		

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		Accepted commits the FSP to make bid available on the ST Market	If the bid is connected to the Transmission Grid					
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:

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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

Add activity or activity set diagram.

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	

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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

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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	

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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, eg. 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, eg. 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, 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, eg. 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)	

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6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.8 WECL-PT-03: Exchange of Information for Operational Planning

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.

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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 below 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***

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1.6. Use case conditions

Use case conditions	
Assumptions	
1- The data exchanged in short-term time-scale, 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 time-scale, 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

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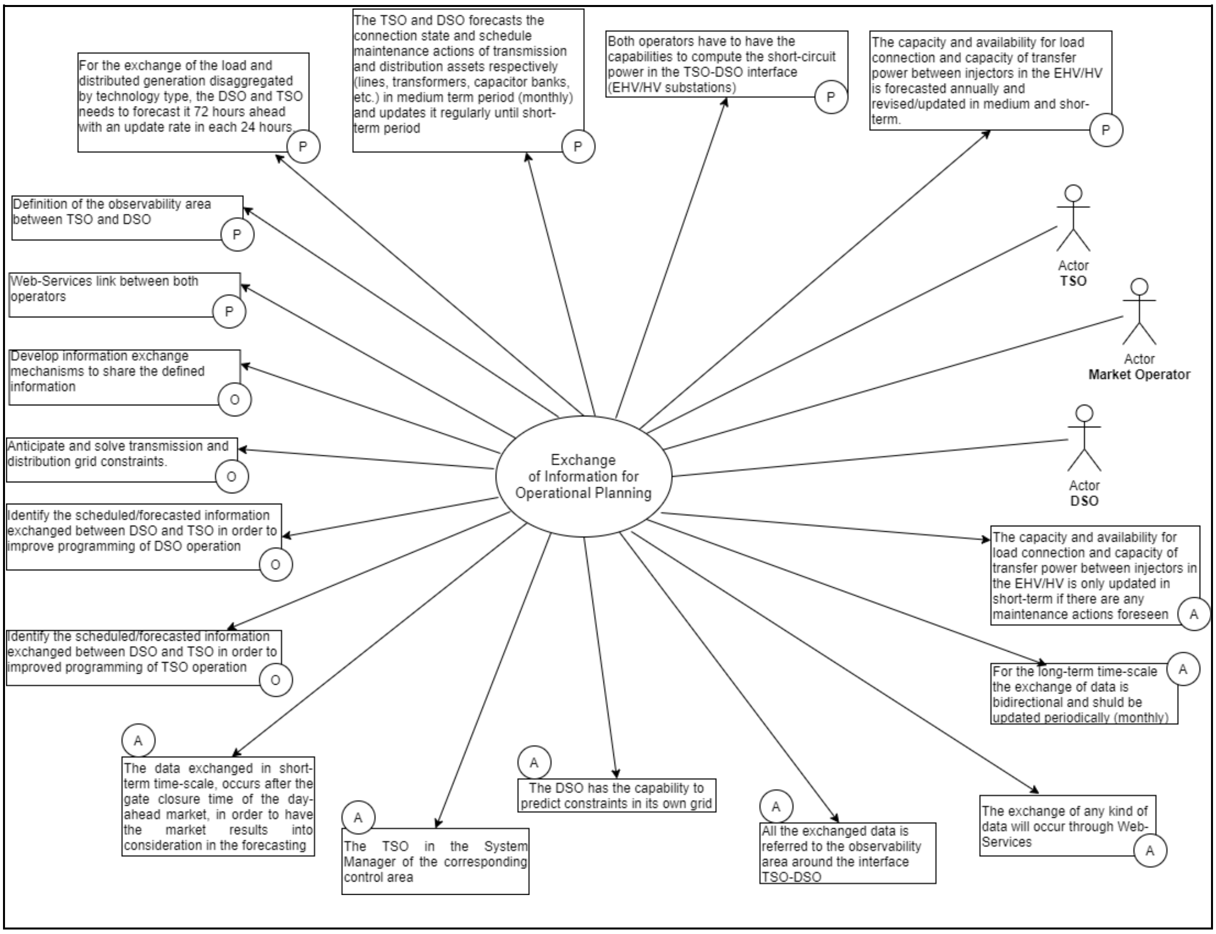

3. Technical details

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".	

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3.2. References

4. Step by step analysis of use case

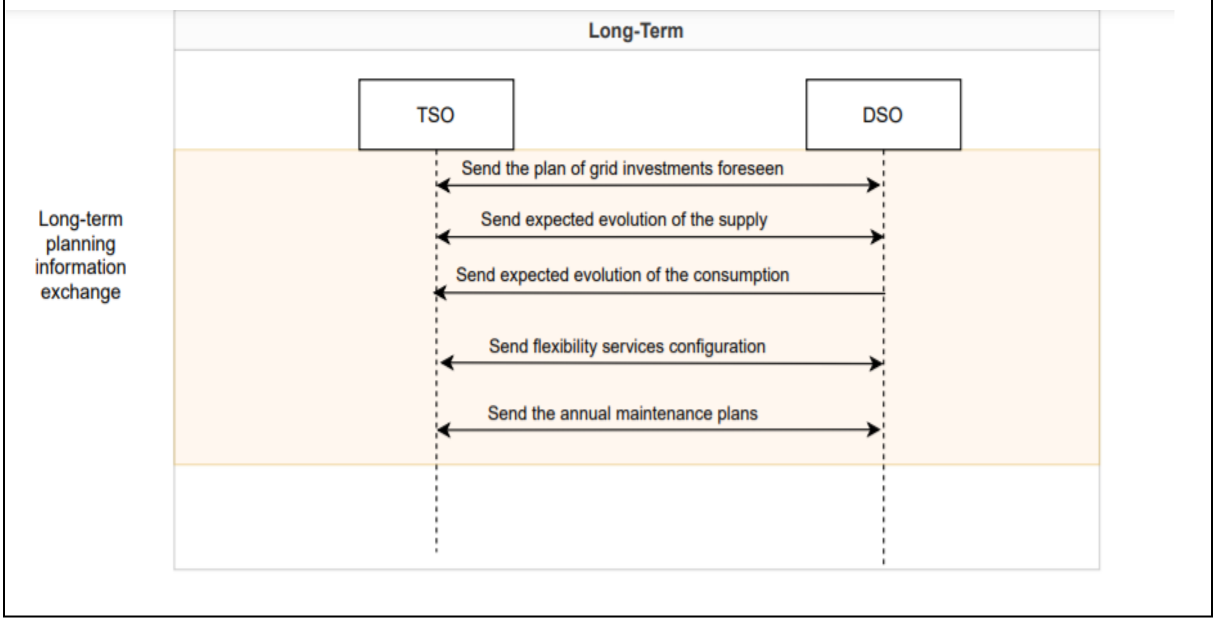
4.1. Overview of scenarios

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



<u>Scenario step by step analysis</u>

Scenario	
Scenario name	Long-term information exchange

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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 configurations between both operators in order to update the dedicated markets accordingly	REPORT	TSO/DSO	DSO/TSO	INFO 4	
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

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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

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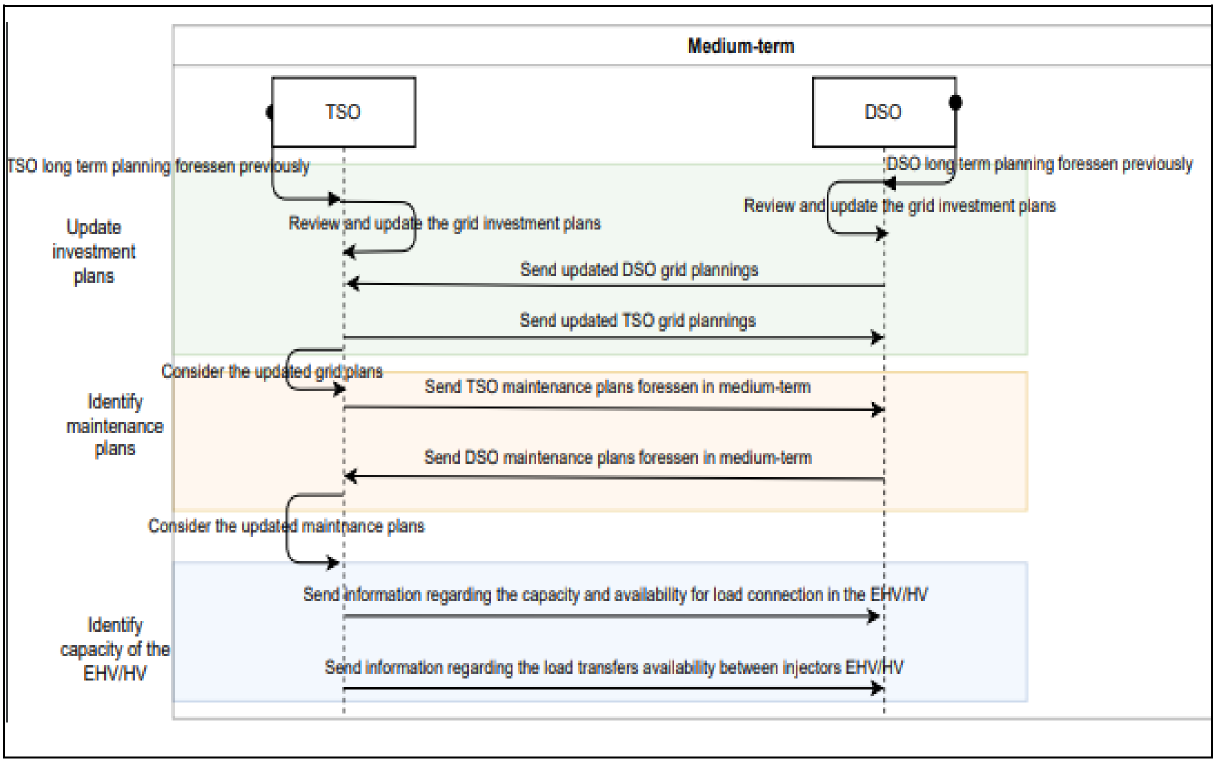

Scenario step by step analysis

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 previously (long-term)	TSO uses the long-term plans as basis for the medium-term updates		TSO			
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	

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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

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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

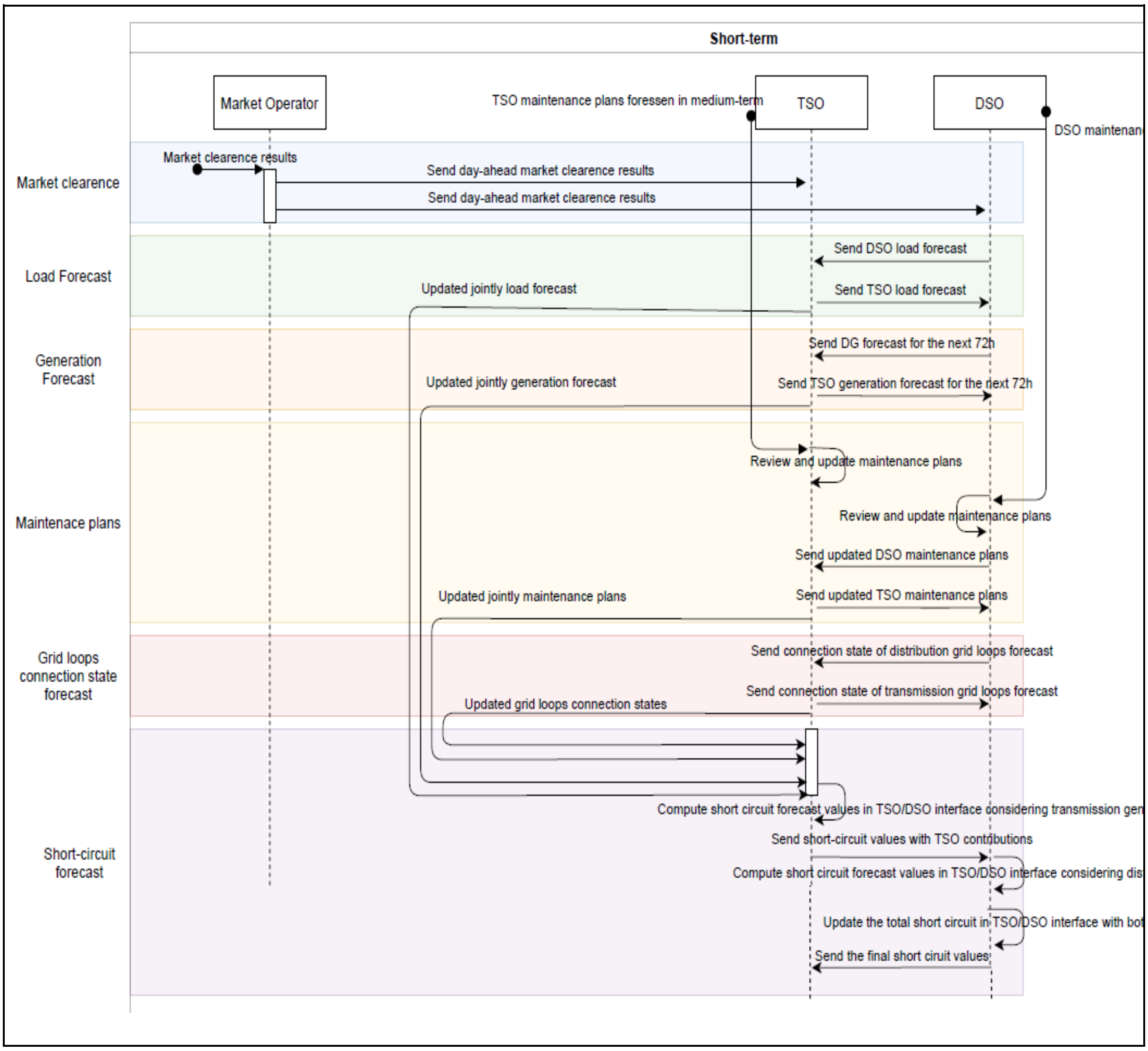
  Business section:

  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	REPORT	DSO	TSO	INFO 13	

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			aggregated by node belonging to the observability area.					
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 technology type.	REPORT	DSO	TSO	INFO 15	
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	EXECUTE	TSO			

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			future operational planning purposes					
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	TSO exchanges with DSO the forecasted	REPORT	TSO	DSO	INFO 20	

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		grid loops forecast	connection state of transmission grid loops					
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 hours of the next day.	REPORT	TSO	DSO	INFO 21	
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	EXECUTE	DSO			

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			TSO/DSO interface					
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

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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	t.b.d	
INFO 2	Expected supply evolution	t.b.d	

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INFO 3	Expected consumption evolution	t.b.d	
INFO 4	Flexibility services configuration	t.b.d	
INFO 5	Annual maintenance plan	t.b.d	
INFO 6	Updated DSO grid planning	t.b.d	
INFO 7	Updated TSO grid planning		
INFO 8	Medium-term TSO maintenance plans	t.b.d	
INFO 9	Medium-term DSO maintenance plans	t.b.d	
INFO 10	Capacity and availability for load connection in the EHV/HV	t.b.d	
INFO 11	Load transfers availability between injectors EHV/HV	t.b.d	
INFO 12	Day-ahead market clearance results	t.b.d	
INFO 13	DSO load forecast	t.b.d	
INFO 14	TSO load forecast	t.b.d	
INFO 15	DG forecast for the next 72h	t.b.d	
INFO 16	TSO generation forecast for the next 72h	t.b.d	
INFO 17	Updated DSO maintenance plans	t.b.d	
INFO 18	Updated TSO maintenance plans	t.b.d	

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INFO 19	Connection state of distribution grid loops forecast	t.b.d	
INFO 20	Connection state of transmission grid loops forecast	t.b.d	
INFO 21	Short-circuit values with TSO contributions	t.b.d	
INFO 22	Final short-circuit values	t.b.d	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.9 WECL-ES-01: Long-term congestion management

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:

6. **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.

7. **Plan/Forecast:**

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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.

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 (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.

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 to 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.

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 to 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	• Implement flexibility provision/usage through a market platform.

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		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.	• 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	• To apply market procedures to obtain flexibility services attending DSO requirements. • Implement flexibility provision/usage through a market platform.

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		used to evaluate customer engagement plan.	• 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.

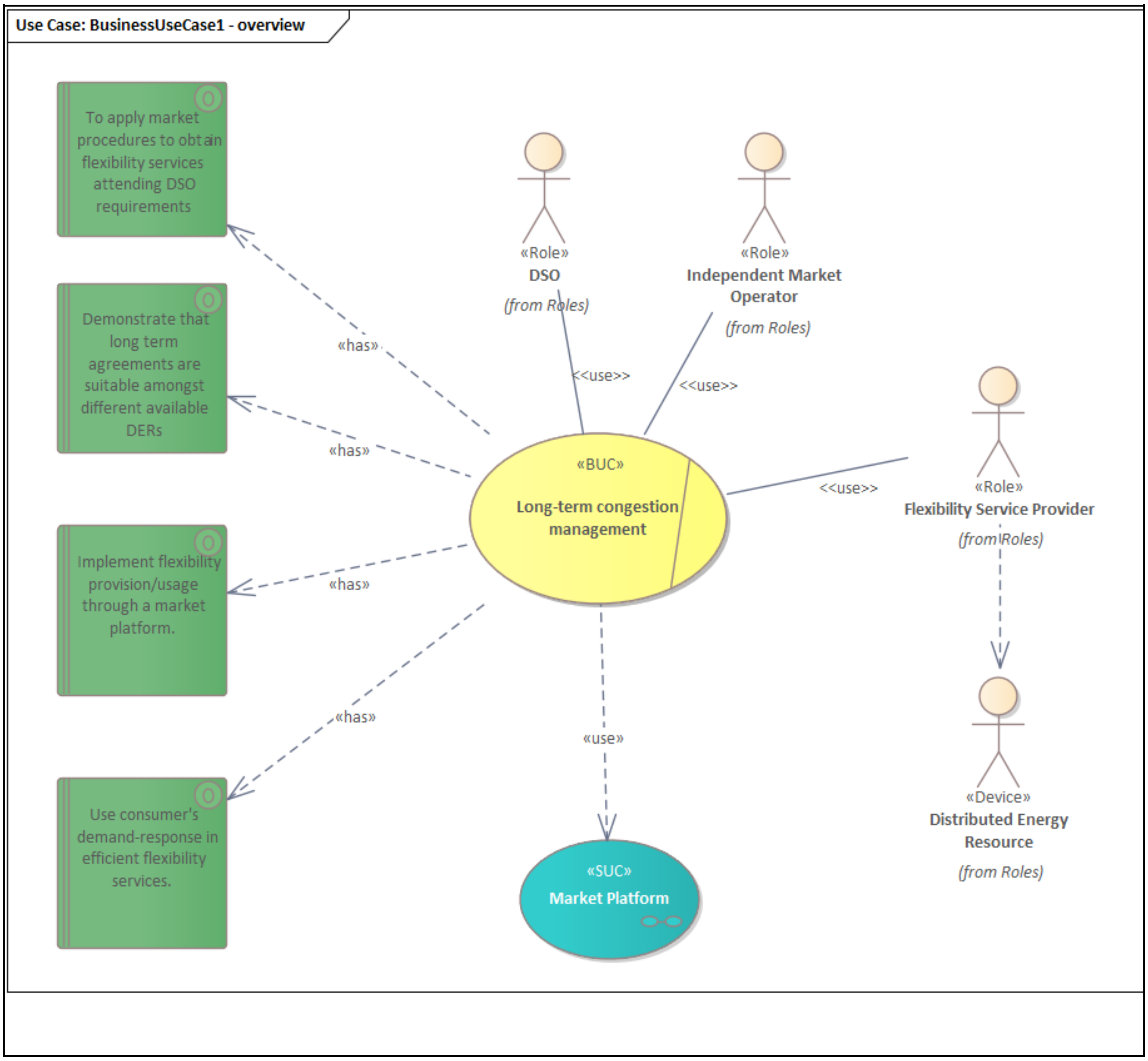
1.7. Further information to the use case for classification/mapping

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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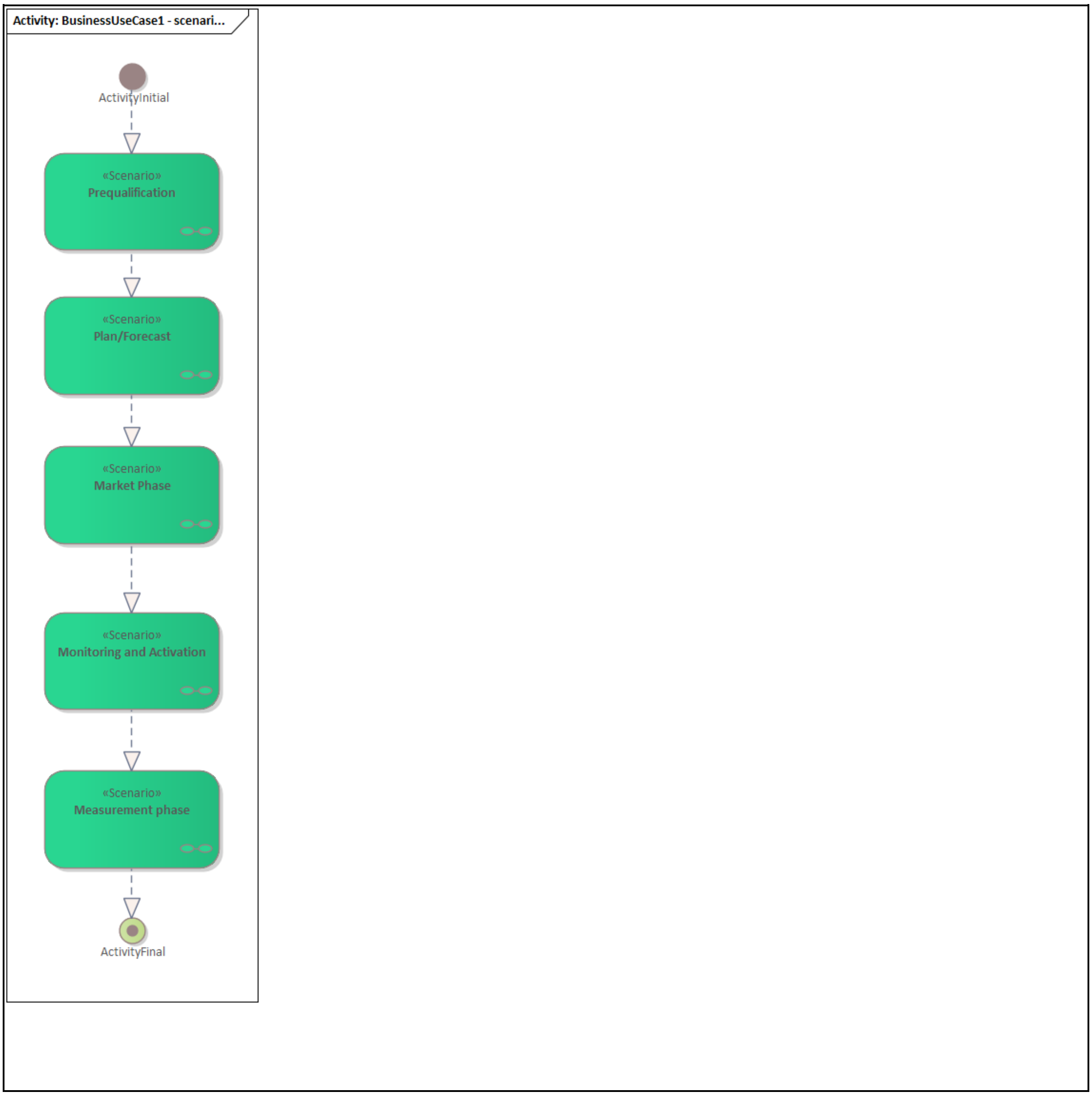
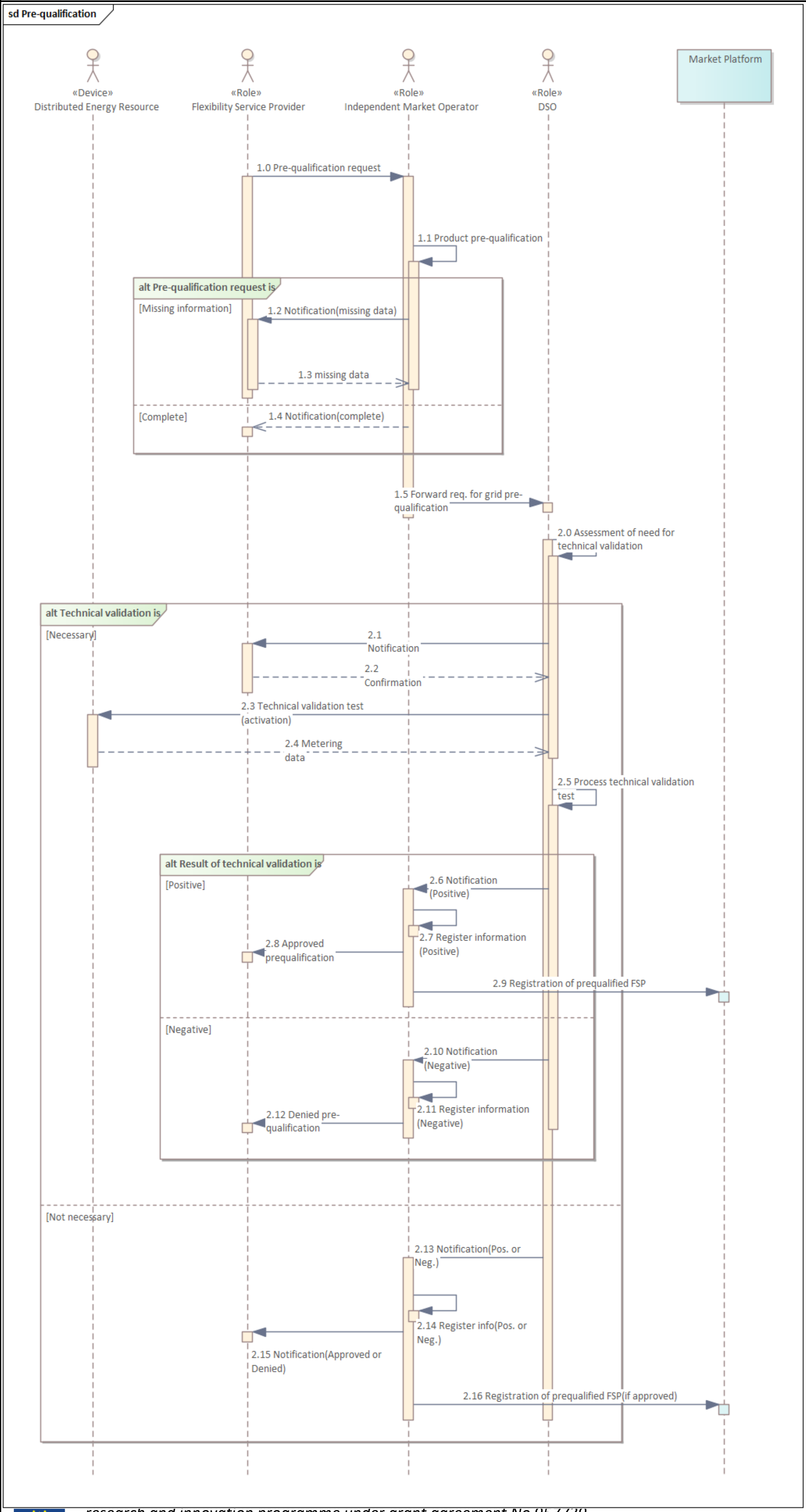

Activity: BusinessUseCase1 - scenari...
ActivityInitial
«Scenario»
Prequalification
«Scenario»
Plan/Forecast
«Scenario»
Market Phase
«Scenario»
Monitoring and Activation
«Scenario»
Measurement phase
ActivityFinal



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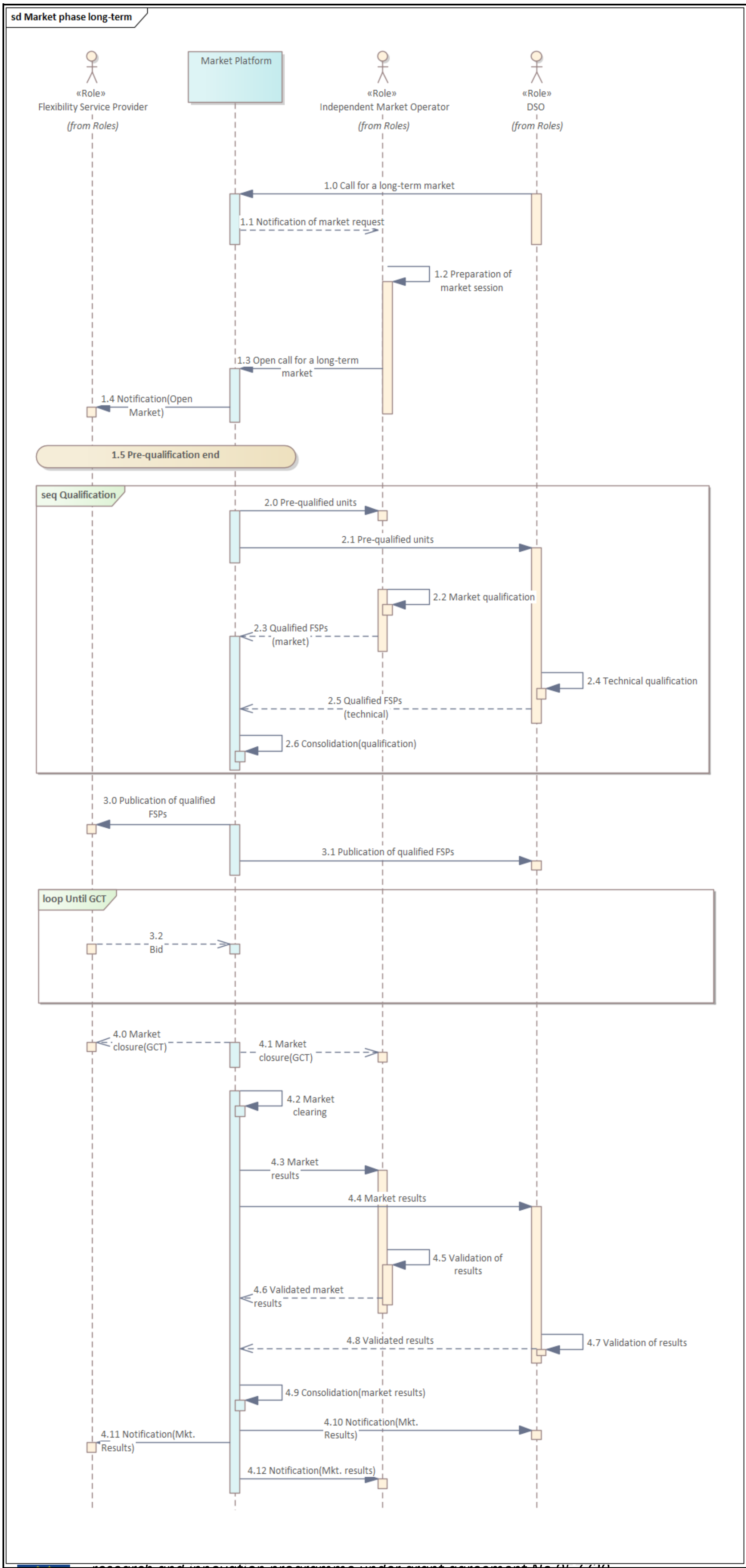
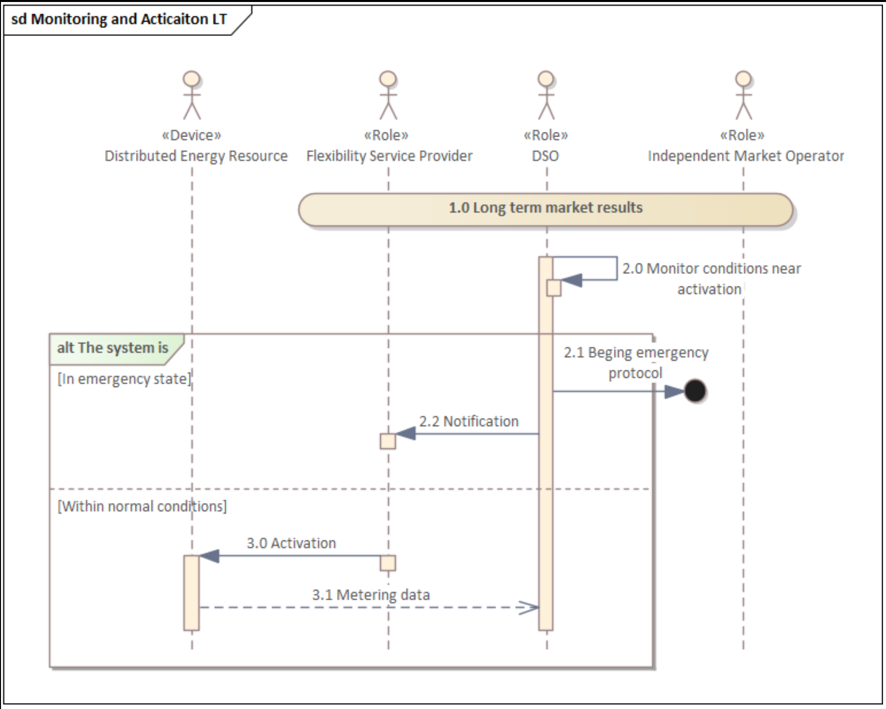
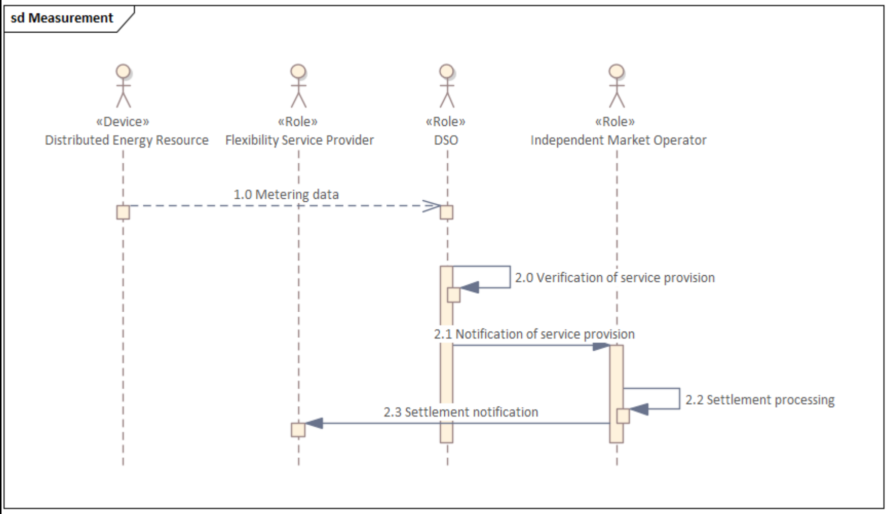


research and innovation programme under grant agreement No 957739





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 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. Further qualification is evaluated within this scenario.	Markets are cleared and FSPs are nominated to deliver the product.

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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.

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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	

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2.0 [40]	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		
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	Process technical validation	The DSO internally processes the results of the	EXECUTE	DSO	DSO		

[40] 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.

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	technical validation		technical validation test						
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			

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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		

- Step No 1.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

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	DSO evaluates the need for a long-term market flexibility	The DSO evaluates internally the need for a long-term market for flexibility. This step is an	EXECUTE	DSO	DSO		

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	for flexibility		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.					

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 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	REPORT	Market platform	IMO		

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			created by the DSO					
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 can be negotiated for weeks or months, it is possible for the pre-qualification phase to run in parallel with the market phase. Nevertheless,	N/A	N/A	N/A	N/A	

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			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 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	Technical qualification	A process by which the	EXECUTE	DSO	DSO		

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	the technical qualification		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.					
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	

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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)	

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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 sate 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 to proceed according 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 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	REPORT	DSO	FSP		

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			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	EXECUTE	DSO	DSO		

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			with the service procured and the baseline predefined.					
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	

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		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	

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		○ Direction: Upward 4. Local area: Selection of the trading area. Choice by postal code, connection point, lines… (to be determined). ○ 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). ○ Type of product: availability/activation ○ 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.	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.10 WECL-ES-02: Short-term congestion management

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 time frame 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 time frame 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

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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 time frame 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**: **11. 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. **12. 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.

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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.

13. **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.

14. **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 to 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.

15. **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 to 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	• Implement flexibility provision/usage through a market platform.

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		ICT costs that are directly related to the implementation of each coordination scheme will be considered.	• 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.

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			• 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

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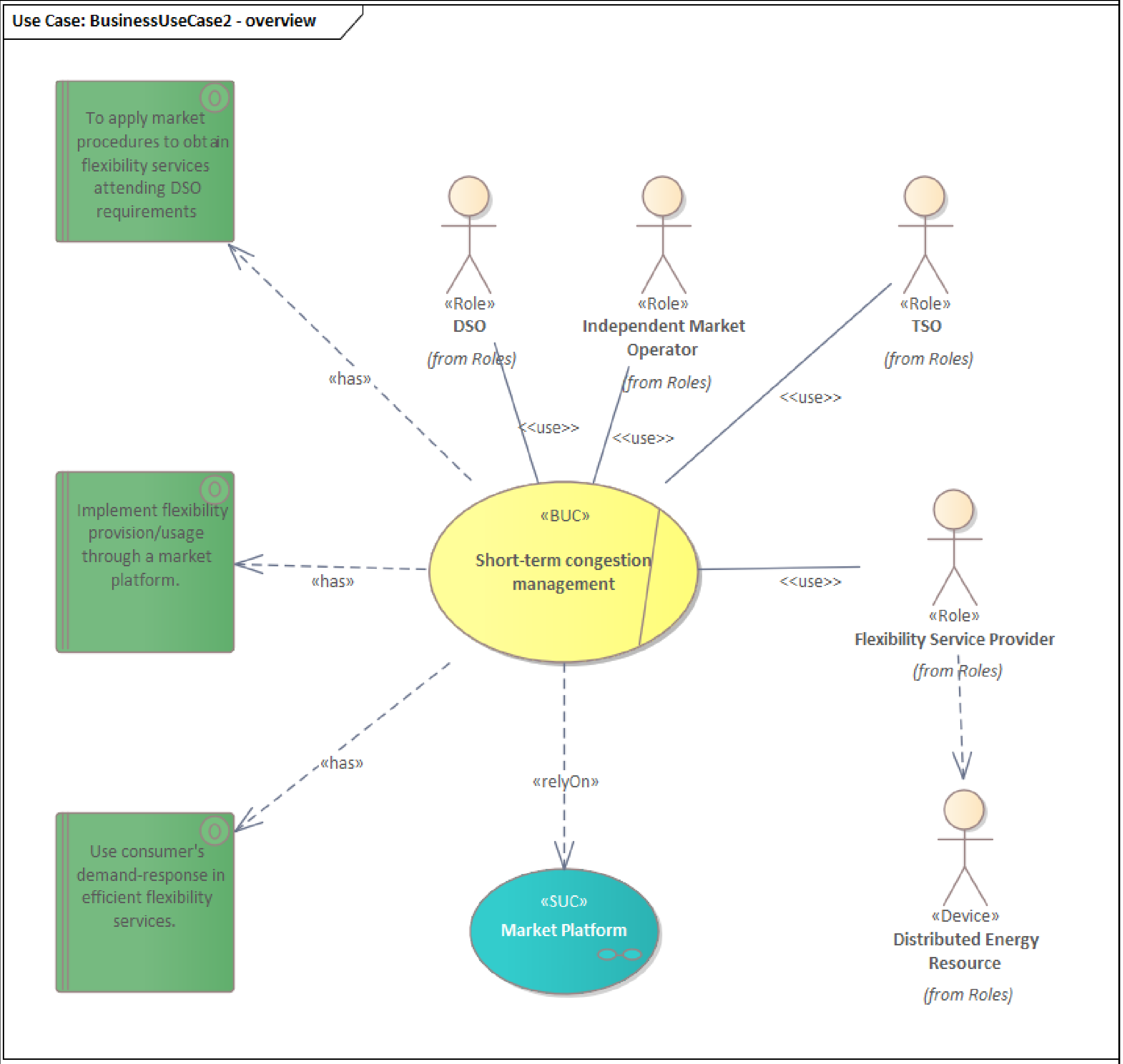
Local congestion management, Distributed energy resources, flexible providers, traditional short term solutions, short term

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


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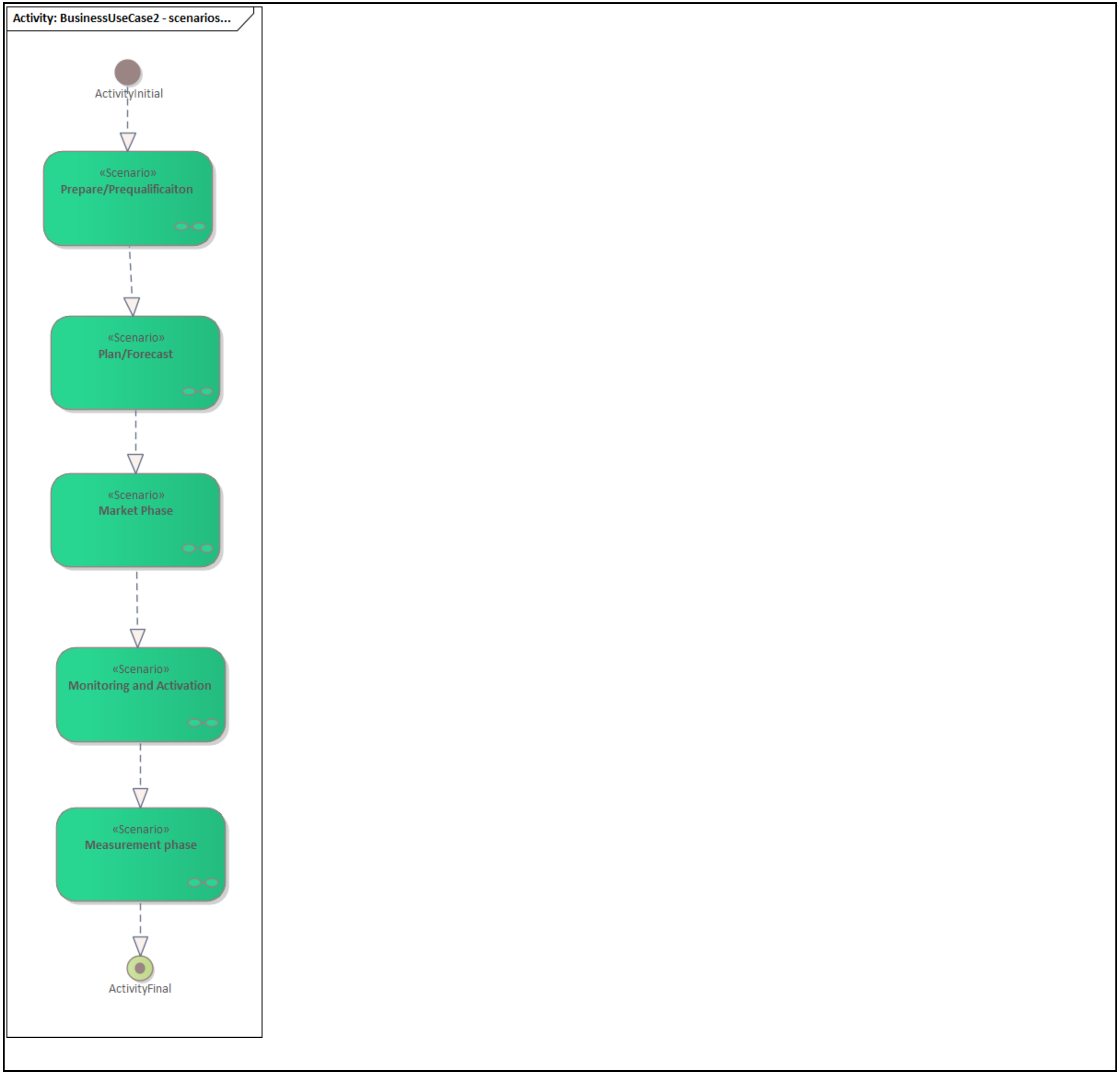

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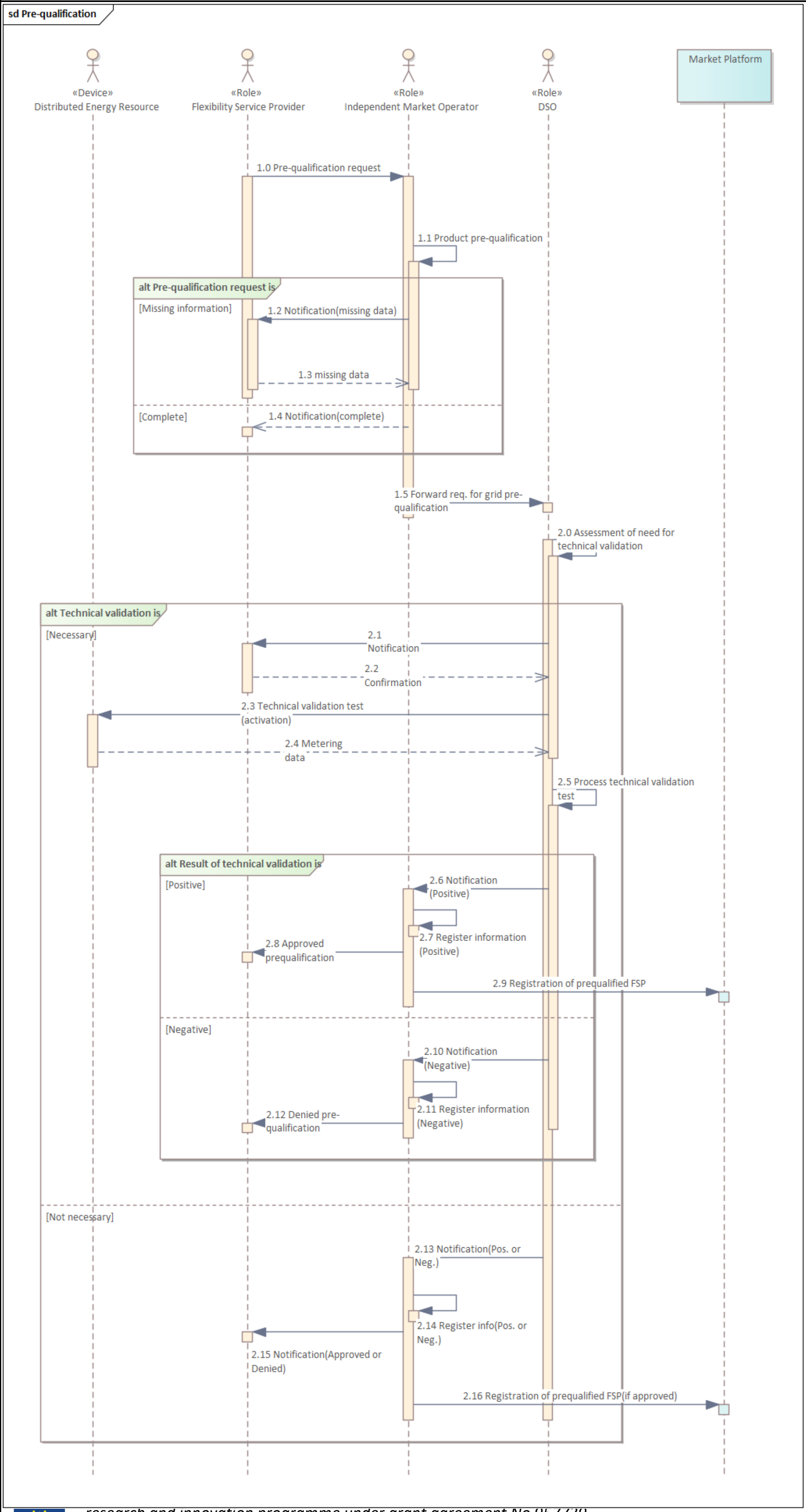

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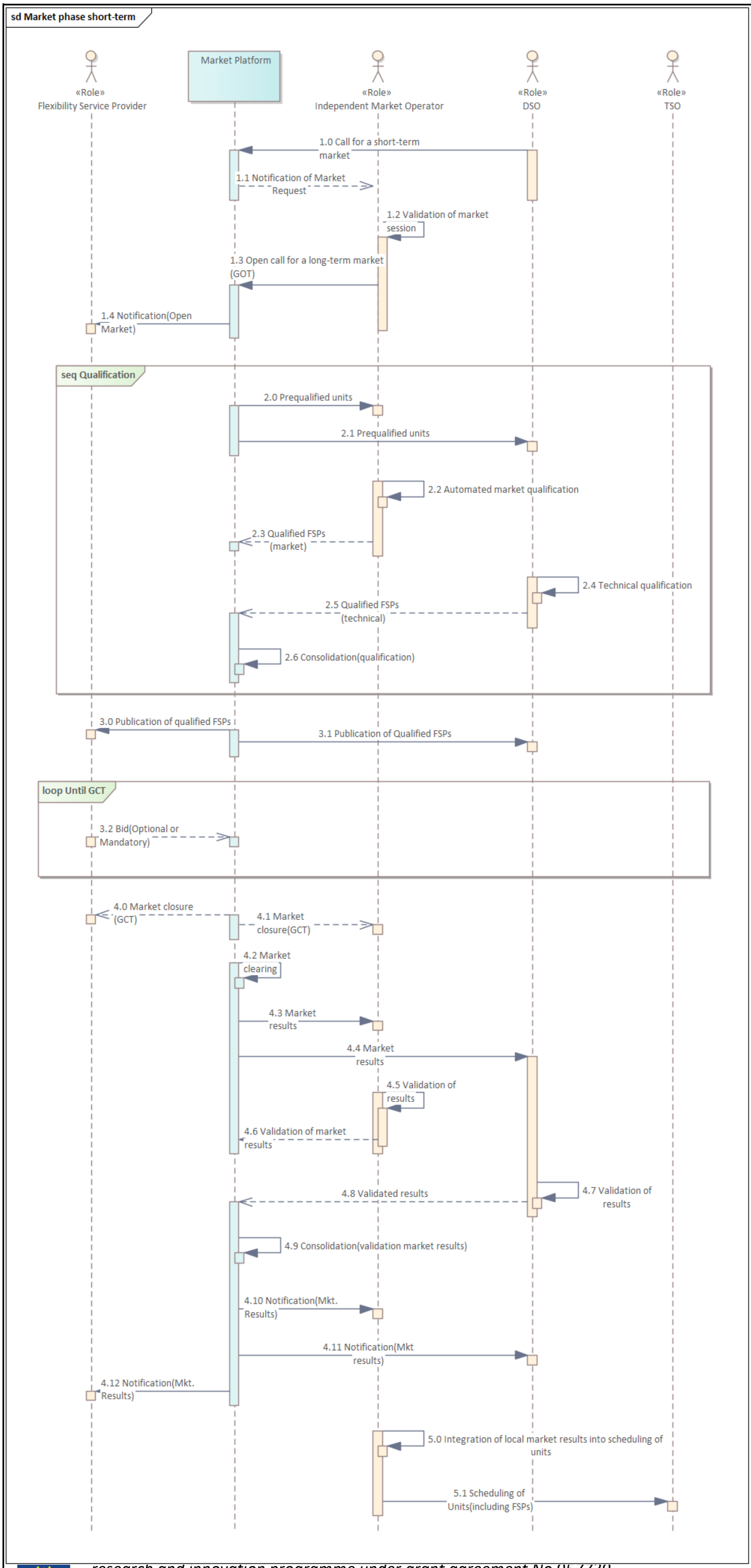

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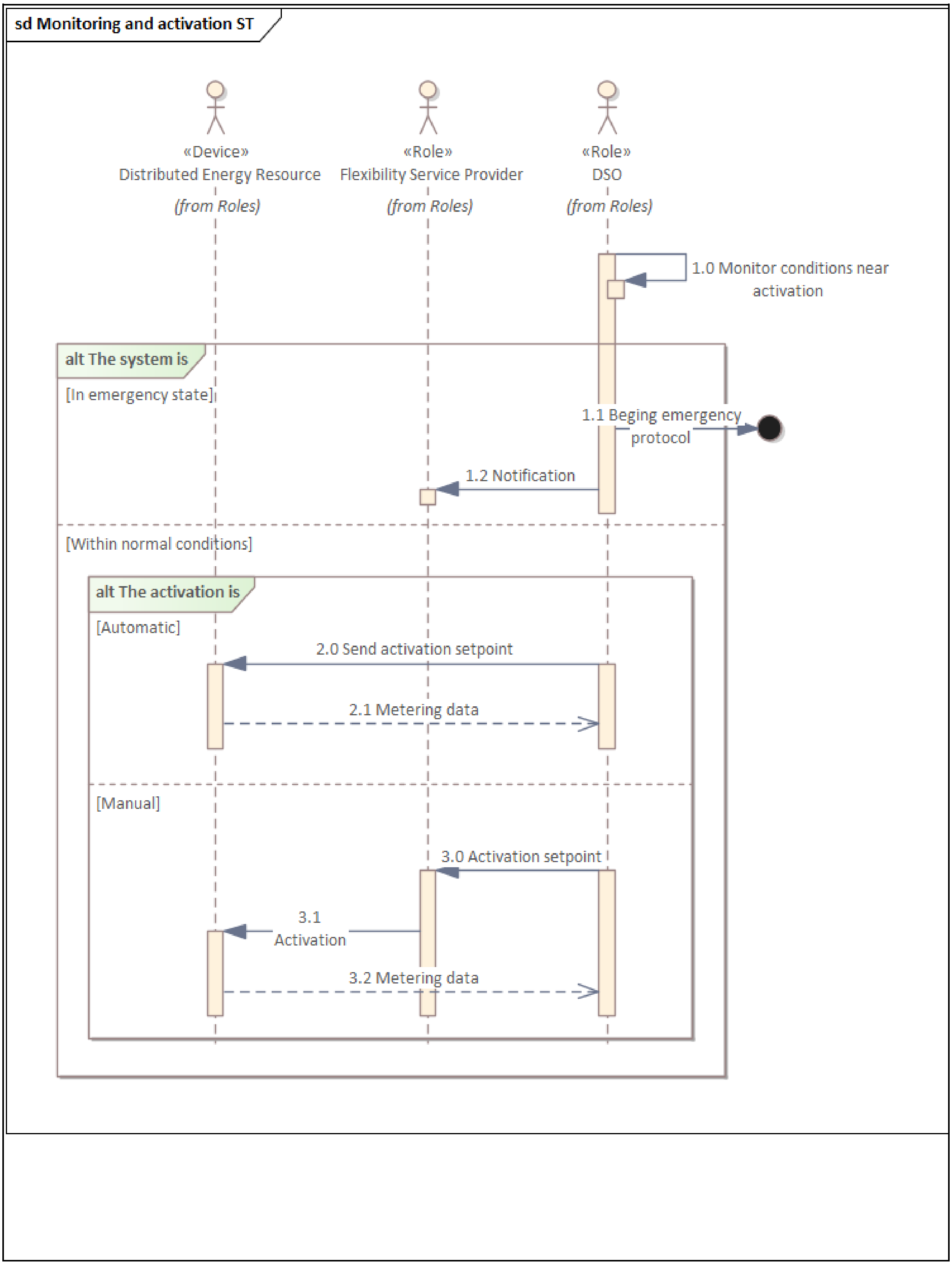

3. Technical details

3.1. Actors

Actors

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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	DSO	The DSO and/or the IMO receives a request from a FSP to be pre-	The FSP complies with the prerequisites publicly made	The FSP is successfully verified and tested, receiving the

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		the product it intends to sell.		qualified to offer the long term local congestion management products	available by the DSO/IMO	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.

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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	

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2.0 [41]	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		
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	Process technical validation	The DSO internally processes the results of the	EXECUTE	DSO	DSO		

[41] 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.

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	technical validation		technical validation test						
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 (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 the 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.

<u>Scenario step by step analysis</u>

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.	EXECUTE	DSO	DSO		

			Therefore, the internal steps carried out by the DSO are not modelled in detail.					

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	EXECUTE	IMO	IMO		

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			the IMO may identify missing information, request completion from the DSO, and final 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	GET	Market Platform	IMO	I.E.09	

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			process. The DSO 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.					
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		

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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,	EXECUTE	IMO	IMO		

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			results are validated						
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[42]).	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		

[42] All the DERs in the specific area will be checked to determine which ones are capable of providing the required service.

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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 sate 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 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 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	REPORT	DSO	FSP		

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			exempted from providing flexibility, or may not be notified at all. This situation is outside the scope of this BUC.						
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		

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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	EXECUTE	IMO	IMO		

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			price/payment) may occur.					
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.: 7. Service window: Selection of the required date and duration of the service	

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		○ Start date/hour: 01/06/2021 ○ Duration: 3h ○ Opening time: 8:00 PM ○ Closing time: 10:00 PM 8. Availability: Selection of the capacity, the direction and the estimated hours of activation. ○ Capacity: 4MW ○ 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.: ○ Day: 01/06/2021 ○ Hour: 19h ○ Duration: 2h ○ Capacity to modify: 1MW ○ Direction: Upward 10. Local area: Selection of the trading area. Choice by postal code, connection point, lines… (to be determined). ○ 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). ○ Type of product: availability/activation ○ 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.	

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		• 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	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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

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

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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

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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


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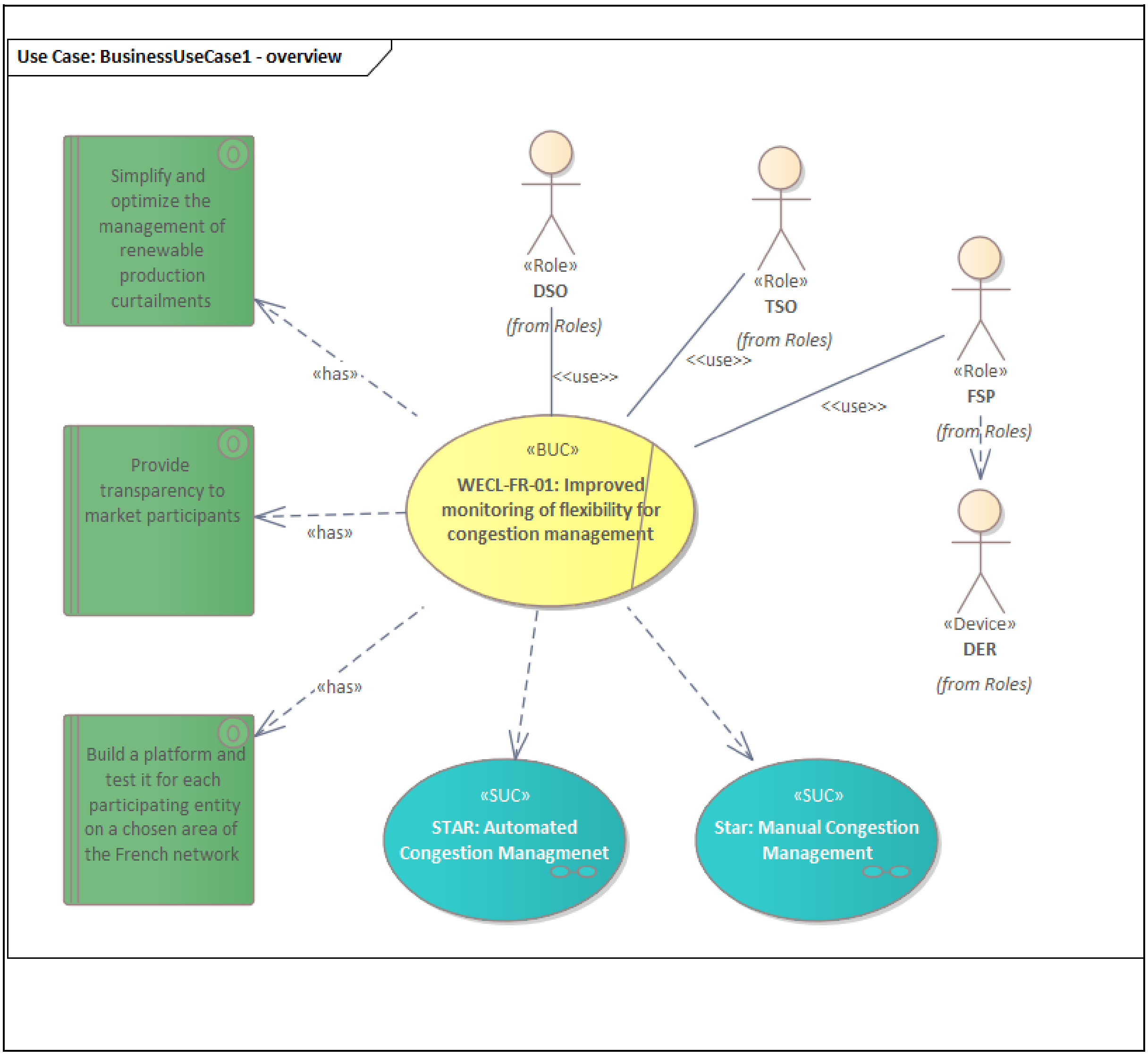

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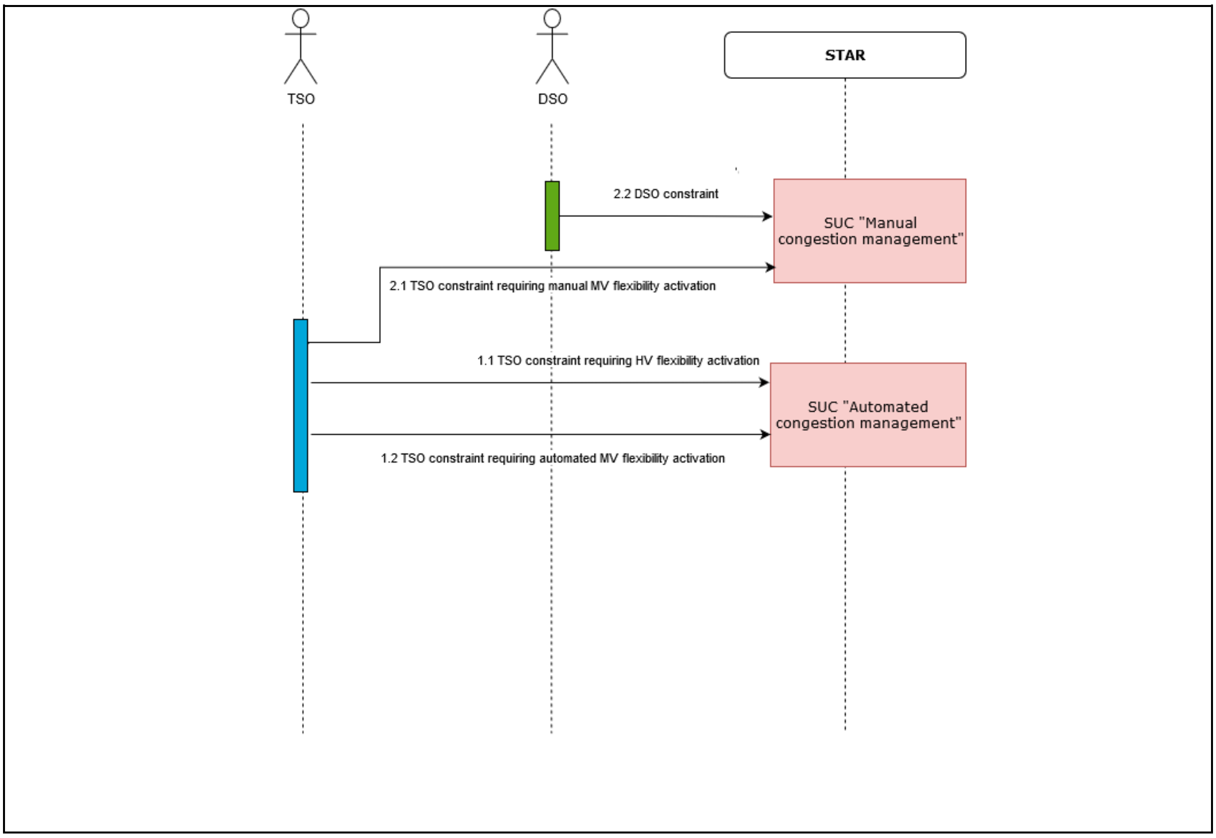

3. Technical details

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)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.	

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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 resolve grid constraints by activating the most technically and economically optimal remedial action	TSO	Congestion management on TSO or DSO network	Automate NAZA	
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

<u>Scenario step by step analysis</u>

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	

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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

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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	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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

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

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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 (ie 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

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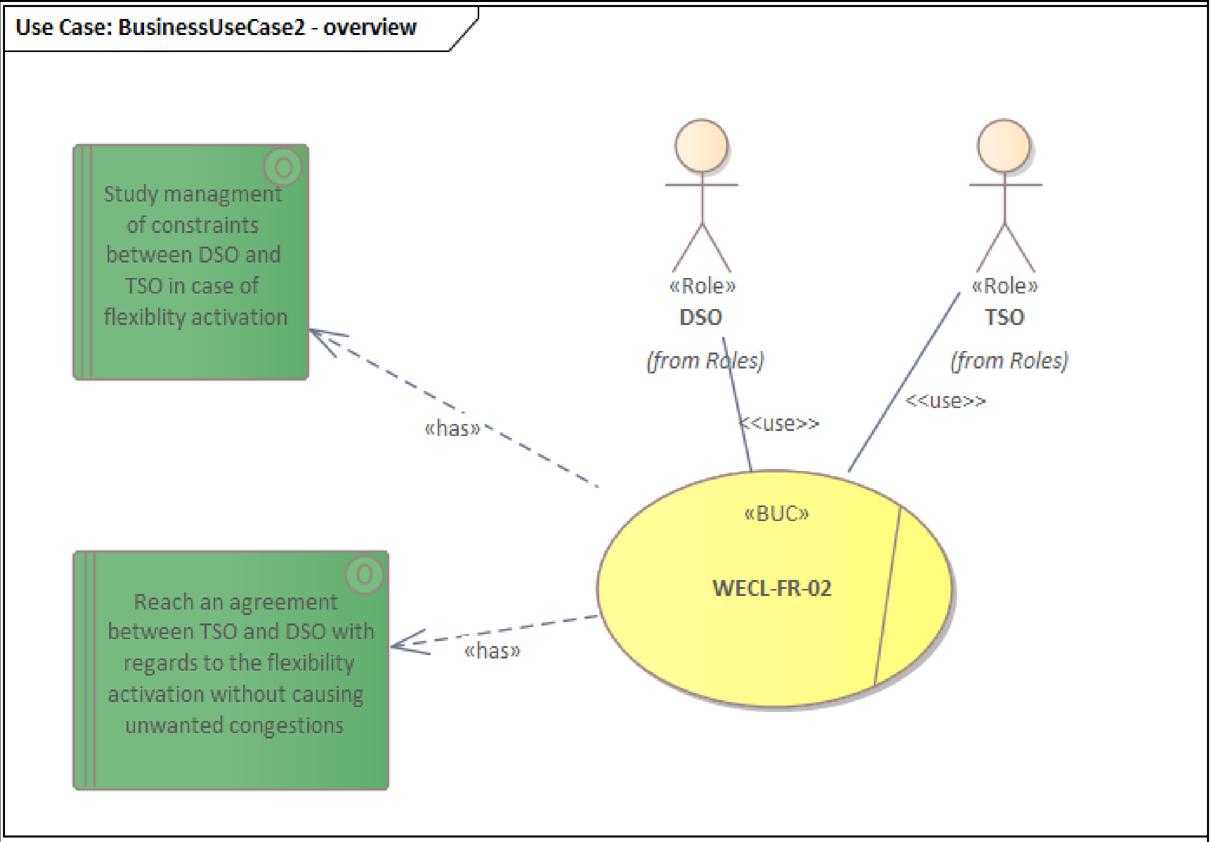
Nature of the use case
Business Use Case
Further keywords for classification
TSO-DSO coordination, information exchange, DER flexibility activation

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)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".	

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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

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	Pre-qualification process	TSO and DSO will study the most efficient ways to identify the required information exchange so that flexibility activations by one SO does not create contingencies to the other.	TSO/DSO	Local flexibility procurement by either the TSO or the DSO	- Stablished markets in which TSO and/or DSO can procure flexibility. - Necessary TSO/DSO communication infrastructure.	Secure scheduling of flexibility activations

4.2. Steps - Scenarios

Prequalification process

Scenario #1 description

TSO and DSO will study the most efficient ways to identify the required information exchange so that flexibility activations by one SO does not create contingencies to the other.

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***
1.1								
1.2								

- Step No 1.x / Name of process

  Business section:

  Information sent:

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Business object	*Instance name*	*Instance description*

- Step No 1.x / Name of process

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*

Monitoring and activation

Scenario #2 description

Scenario step by step analysis

Scenario									
Scenario name	n								
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									
2.4									
2.5									
2.6									

- 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*

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6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.13 SUC-PT-01: Evaluation of the Product & Grid pre-qualification requirements

Evaluation of the Product & Grid prequalification requirements

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***
		SUC-PT-01 - Evaluation of the Product & Grid prequalification requirements

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	16/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*Evaluation processes that DSO/TSO executes to procure congestion management products. These processes are included in the prequalification scenario described in the Business Use Cases Template (BUC 01 e BUC 02).*
Objective(s)	- Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe. - Enable FSPs and their resources for flexibility markets, since Prequalification phase is necessary for the following phases that we will approach. - List of requirements for product prequalification for DSO and TSO. - Ensure coordination between system operators for all scenarios. - Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-01 & WECL-PT-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC is focused evaluation processes of product and grid prequalification for DSO/TSO system operator.
Complete description
This SUC is divided into two different processes, the product and the grid evaluation processes. For each process we describe each step, where we address which requirements are mandatory and which are informative to prequalify a FSP. We also separate the processes for DSO and TSO when necessary.

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For product evaluation is identified which mandatory and informative requirements, such as mode of activation, minimum quantity to deliver, locational information, etc, are required to evaluate whether the unit can (technically) deliver the product it wants to sell/deliver. For Grid evaluation, in prequalification phase, a grid impact assessment is evaluated. In order to do this evaluation, it is defined what kind of grid data is the most appropriate: Comprehensive grid data -selecting the most efficient combination of flexibilities and switching of topology Partial grid data -using essentially the sensitivities of flexibilities, eg. Traffic lights system Simple Rule – Empirical selection Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about product and grid prequalification is foreseen. This implementation is supported by work done in previous H2020 projects.

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	
	Prequalification to be taken at unit level, aggregated, portfolio level if technically feasible
	System Operators have equal access to FSPs database (Flex Register)
Prerequisites	
	System Operators have access to all required information about FSPs
	The grid qualification occurs only if ‘product prequalification’ of the concerned resource had been successful.

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

Classification information
Relation to other use cases
WECL-PT-01 & WECL-PT-02
Level of depth
System Use Case
Prioritisation
High
Generic, regional or national relation
National
Nature of the use case
Further keywords for classification
Congestion Management; Flexibility; Prequalification

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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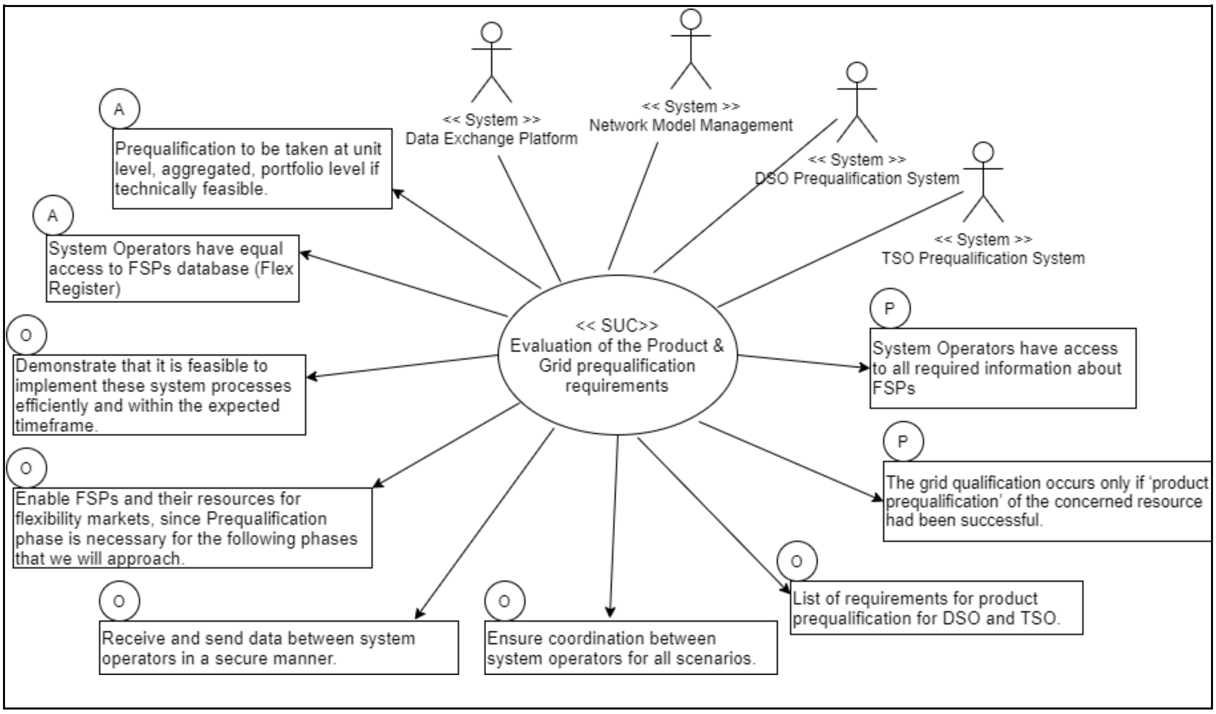

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)	***Group description***		
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Data Exchange Platform	System	Platform used by several entities to exchange information for different proposes. The 3 types of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in the real-time type. The exchange of information related with the markets are is included in the scheduled data. The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	
DSO Prequalification System	System	The DSO Prequalification System function involves managing all the tools and platforms that concern the product and grid prequalification on the distribution network.	
Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the power system that can be used in different analysis, including, but not limited to, steady state power flow, state estimation,	

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		contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of DSO/TSO.	
TSO Prequalification System	System	The TSO Prequalification System function involves managing all the tools and platforms that concern the product and grid prequalification on the transmission network.	

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	Prequalification for FSPs connected to Distribution Grid	Where the information about flexibility assets is evaluated and stored.	DSO Prequalification System	FSP wants to participate in Flexibility Market		
2	Prequalification for FSPs connected to Transmission Grid	Where the information about flexibility assets is evaluated and stored.	TSO Prequalification System	FSP wants to participate in Flexibility Market		

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

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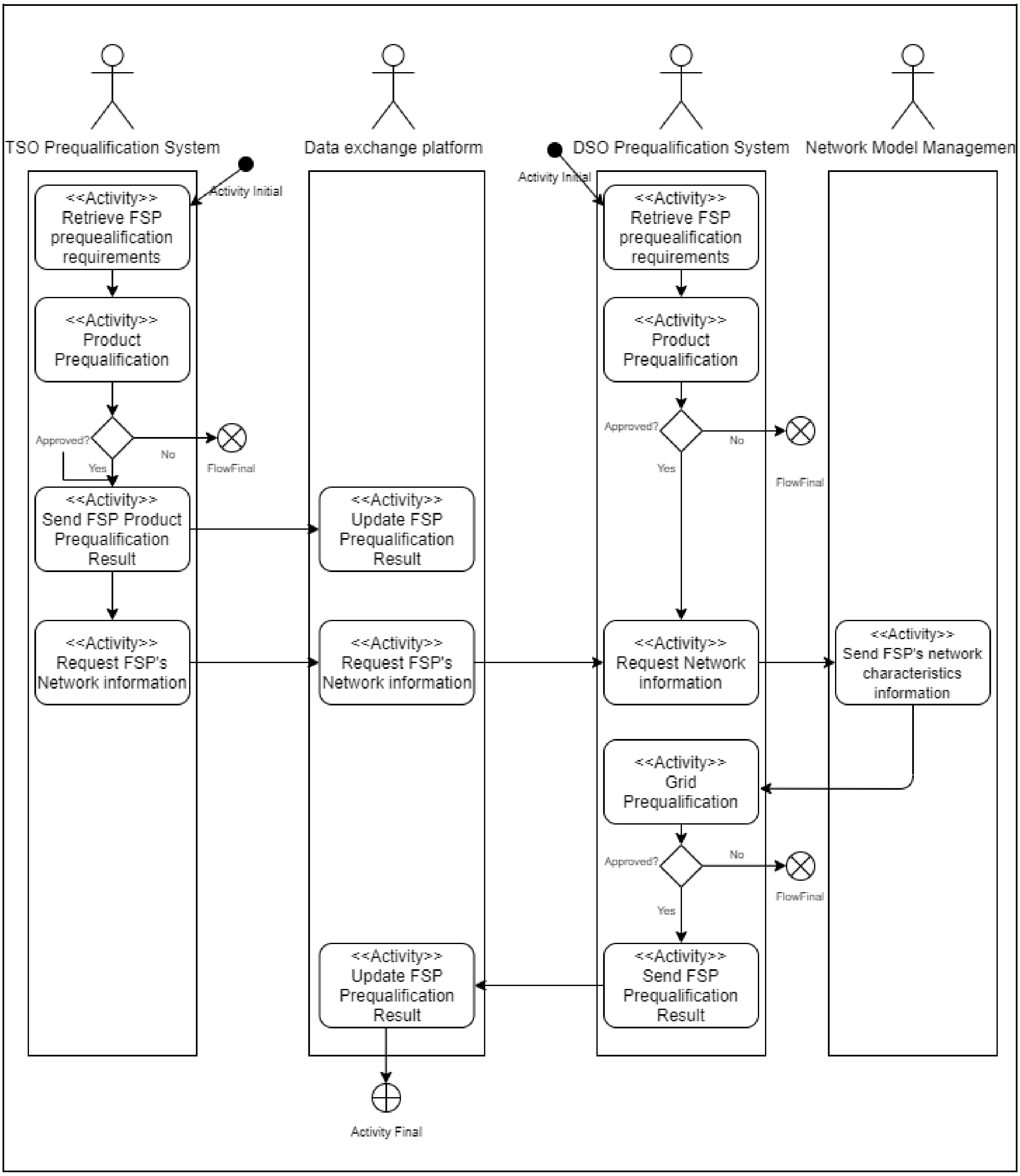

Scenario step by step analysis

Scenario								
Scenario name	Prequalification for FSPs connected to Distribution Grid							
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		Retrieve FSP prequealification requirements	For FSPs interested in DSO market:		DSO Prequalification System			

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			Prequalification Requirements (Eliminatory): -Mode of activation (If it is Automatic should be tested) -Minimum Quantity Prequalification Requirements (Non-Eliminatory): -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					
1.2		Product Prequalification	For FSPs interested in DSO market: Requirements to be evaluated in the prequalification of the product: -Mode of activation (If it is Automatic should be tested) -Minimum Quantity (0.01 MW)		DSO Prequalification System			
1.1		Retrieve FSP prequealification requirements	For FSPs interested in TSO market:		TSO Prequalification System			

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			Prequalification Requirements (Eliminatory): -Mode of activation (If it is Automatic should be tested) -Minimum Quantity Prequalification Requirements (Non-Eliminatory): -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					
1.2		Product Prequalification	For FSPs interested in TSO market: Requirements to be evaluated in the prequalification of the product: -Mode of activation (If it is Automatic should be tested) -Minimum Quantity (1 MW)		TSO Prequalification System			
1.3		Send FSP Product Prequalification Result	If FSP is interested in TSO Market:		TSO Prequalification System	Data exchange platform	ID-1	

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			Send the Product Prequalification result					
1.4		Update FSP Prequalification Result	If FSP is interested in TSO Market: Update the FSP's Product Prequalification result		Data exchange platform			
1.5		Request FSP's Network information	If FSP is connected to Distribution Grid: Send the requirements from step 1.1		TSO Prequalification System	Data exchange platform	ID-2	
1.5		Request FSP's Network information	If FSP is connected to Distribution Grid: Send the requirements from step 1.1		Data exchange platform	DSO Prequalification System	ID-2	
1.5		Request Network information	The DSO Flexibiity System should request the network information around the FSP to make the Grid Prequalification		DSO Prequalification System	Network Model Management	ID-3	
1.6		Send network information	Provide the required network information		Network Model Management	DSO Prequalification System	ID-4 (internal information)	
1.7		Grid Prequalification	Given the network information provided, it is assessed whether the FSP is in a network area where it can provide flexibility.		DSO Prequalification System			
1.8		Send FSP Prequalification Result	If FSP is interested in DSO Market: Send the Product and Grid prequalification result.		DSO Prequalification System	Data exchange platform	ID-5	

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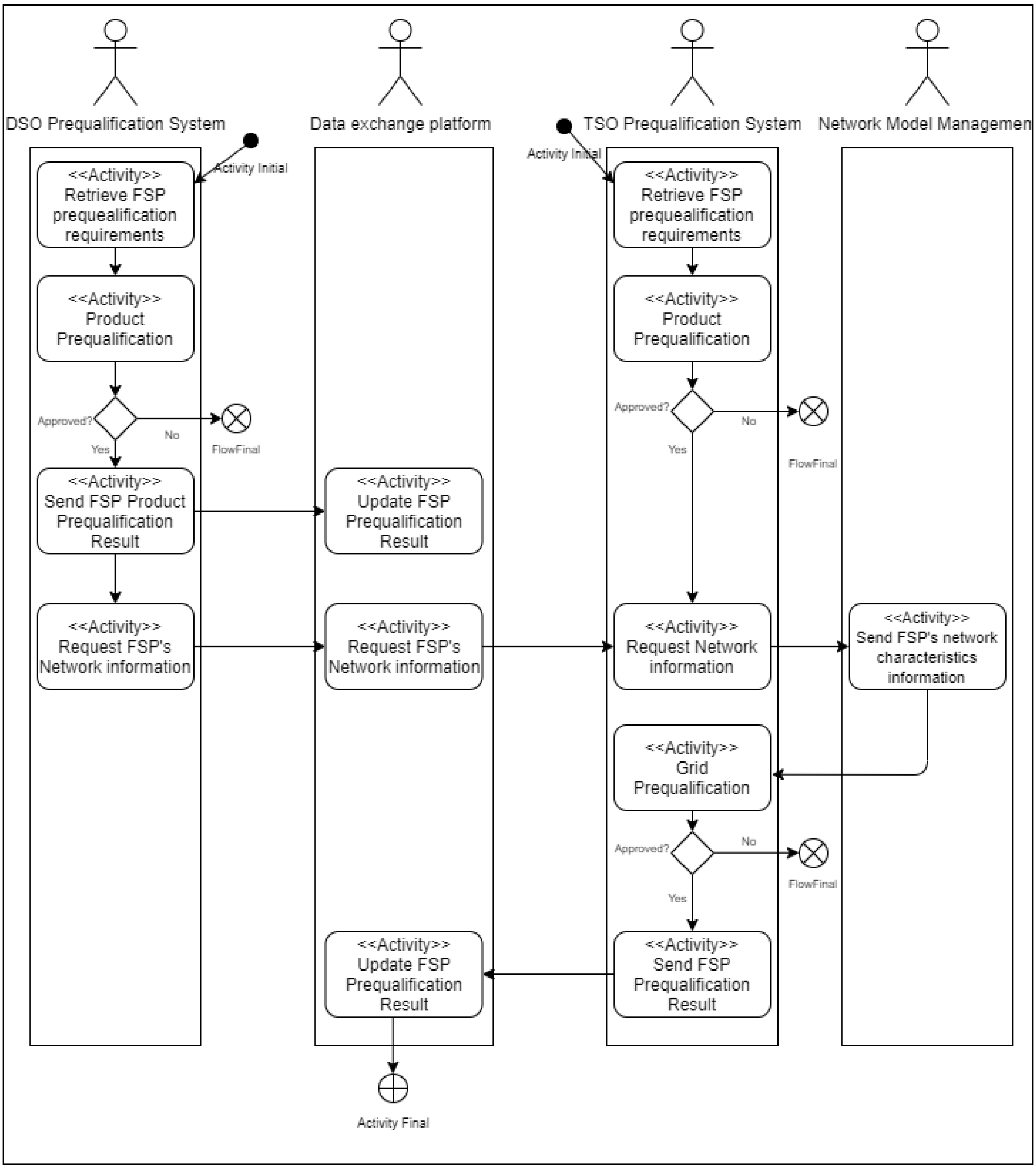
			If FSP is interested in TSO Market: Send the Grid Prequalification result					
1.9		Update FSP Prequalification Result	If FSP is interested in DSO Market: Update the FSP's Product and Grid prequalification result. If FSP is interested in TSO Market: Update the FSP's Grid Prequalification result		Data exchange platform			

Scenario name #2

Scenario #2 description



Scenario step by step analysis

Scenario								
Scenario name	Prequalification for FSPs connected to Transmission Grid							
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		Retrieve FSP prequealification requirements	For FSPs interested in TSO market:		TSO Prequalification System			

			Prequalification Requirements (Eliminatory): -Mode of activation (If it is Automatic should be tested) -Minimum Quantity Prequalification Requirements (Non-Eliminatory): -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					
1.2		Product Prequalification	For FSPs interested in TSO market: Requirements to be evaluated in the prequalification of the product: -Mode of activation (If it is Automatic should be tested) -Minimum Quantity (1 MW)		TSO Prequalification System			
1.1		Retrieve FSP prequealification requirements	For FSPs interested in DSO market:		DSO Prequalification System			

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			Prequalification Requirements (Eliminatory): -Mode of activation (If it is Automatic should be tested) -Minimum Quantity Prequalification Requirements (Non-Eliminatory): -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					
1.2		Product Prequalification	For FSPs interested in DSO market: Requirements to be evaluated in the prequalification of the product: -Mode of activation (If it is Automatic should be tested) -Minimum Quantity (0.1 MW)		DSO Prequalification System			
1.3		Send FSP Product Prequalification Result	If FSP is interested in TSO Market:		DSO Prequalification System	Data exchange platform	ID-1	

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			Send the Product Prequalification result					
1.4		Update FSP Prequalification Result	If FSP is interested in TSO Market: Update the FSP's Product Prequalification result		Data exchange platform			
1.5		Request FSP's Network information	If FSP is connected to Transmission Grid: Send the requirements from step 1.1		DSO Prequalification System	Data exchange platform	ID-2	
1.5		Request FSP's Network information	If FSP is connected to Transmission Grid: Send the requirements from step 1.1		Data exchange platform	TSO Prequalification System	ID-2	
1.5		Request Network information	The TSO Prequalification System should request the network information around the FSP to make the Grid Prequalification		TSO Prequalification System	Network Model Management	ID-3	
1.6		Send network information	Provide the required network information		Network Model Management	TSO Prequalification System	ID-4 (internal information)	
1.7		Grid Prequalification	Given the network information provided, it is assessed whether the FSP is in a network area where it can provide flexibility.		TSO Prequalification System			
1.8		Send FSP Prequalification Result	If FSP is interested in TSO Market: Send the Product and Grid prequalification result.		TSO Prequalification System	Data exchange platform	ID-5	

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			If FSP is interested in DSO Market: Send the Grid Prequalification result					
1.9		Update FSP Prequalification Result	If FSP is interested in TSO Market: Update the FSP's Product and Grid prequalification result. If FSP is interested in DSO Market: Update the FSP's Grid Prequalification result		Data exchange platform			

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
ID-1	Product Prequalification Result	ID Name Resource Mode of activation (If it is Automatic should be tested) Minimum Quantity 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 Mandatory: Product Prequalification Result: (Approved/Reproved)	
ID-2	FSP information for Grid Prequalification	ID Name Resource Mode of activation (If it is Automatic should be tested) Minimum Quantity 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 Mandatory: Product Prequalification Result: (Approved)	ID-1

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ID-3	Request the network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	
ID-4	Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed of several lines.	ID-3
ID-5	FSP information for Product and Grid Prequalification	ID Name Resource Mode of activation (If it is Automatic should be tested) Minimum Quantity 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 Mandatory: Product Prequalification Result: (Approved) Grid Prequalification: (Approved/Reproved)	ID-3, ID-4

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6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

10.14 SUC-PT-02: Day-Ahead & Intraday Flexibility needs

Day-Ahead & Intraday Flexibility needs

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***
		SUC-PT-02 - Day-Ahead & Intraday Flexibility needs

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	16/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*This SUC is one more process that system operators (DSO/TSO) should take into account in order to procure congestion management products. This process is included in the Plan/Forecast scenario described in the Business Use Cases Template (BUC 01).*
Objective(s)	- Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe. - Identify potential network constrains and planning of the grid operation for the next day/hours considering the load and generation forecasts - Promote the participation of flexible resources connected at all voltage levels grids in distribution and transmission networks operation - Ensure coordination between system operators for all scenarios. - Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-01, SUC-07

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC is focused on the steps that system operators should perform to plan and forecast their grid utilization.
Complete description
This SUC supports the coordination between DSO and TSO so that they can determine how much flexibility they will need to acquire, for a short-term timeframe. The coordination is needed to prevent congestions in the distribution and transmision grids due to activation of active power flexibilities for the needs DSO and TSO. This coordination process starts day-ahead and ends intraday, after the opening of the intraday flexibility market. In this SUC is described the steps that system operators should go through in order to identify potential network restrictions for the next day and intraday and to understand the amount of flexibility they will need to solve their needs and constraints.

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The steps needed to identify the amount of flexibility required address the following aspects, such as the grid layout, weather forecasts, information on the flexible assets. Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about planning, forecast and the amount of flexibility needed is foreseen. This implementation is supported by work done in previous H2020 projects.

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	For Day-Ahead Forecast is expected a prediction for the next 24h.
2	For the Intraday Forecast is expected a prediction for the next 6h.
3	For forecasting the status of the networks, the tools have access to forecasts of exogenous data.
4	
Prerequisites	
1	Platforms for data exchange between DSO and TSO have to be developed or are already developed.
2	

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

Classification information
Relation to other use cases
WECL-PT-01, SUC-07
Level of depth
System Use Case
Prioritisation
High
Generic, regional or national relation
National
Nature of the use case
Further keywords for classification
Congestion Management; Short-term Plan/Forecast Flexibility;

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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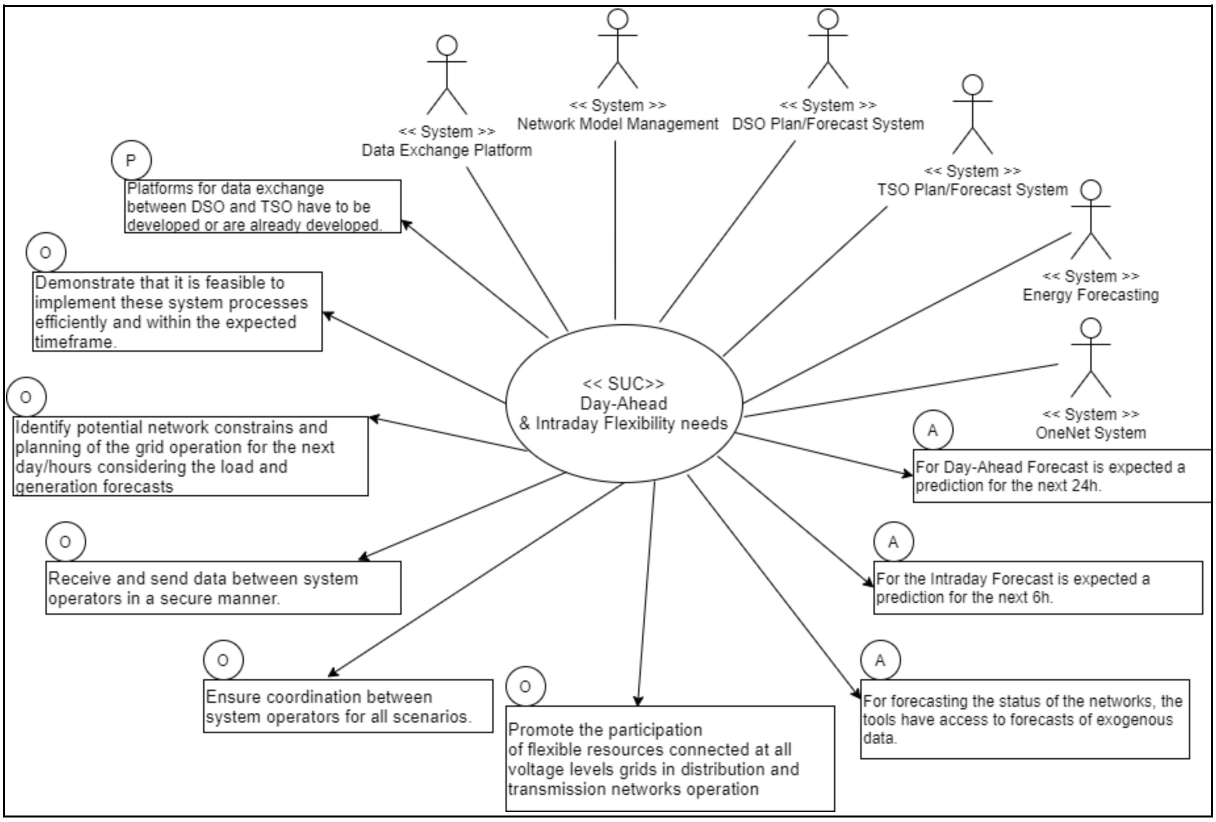

3. Technical details

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 Plan/Forecast System	System	The DSO Forecast System function involves managing all the tools and platforms that concern the_network planning and forecasting, and recognition of distribution network congestions on the distribution network.	
TSO Plan/Forecast System	System	The TSO Forecast System function involves managing all the tools and platforms that concern the_network planning and forecasting, and recognition of distribution network congestions on the transmission network.	
Data exchange Platform	System	Platform used by several entities to exchange information for different proposes. The 3 types of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in the real-time type. The exchange of information related with the markets are is included in the scheduled data. The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	

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Energy Forecasting	System	The Energy Forecasting business (EF) function involves the forecasting of one or more of the items consumption (load), production (primarily intermittent or price inelastic production), direct current and area inter-exchange. This also include energy forecast for intermittent or price inelastic production that is part of Distributed Energy Resources (DER).	
Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the power system that can be used in different analysis, including, but not limited to, steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of DSO/TSO.	
OneNet System	System	Need to be provided by WP5 leader	
Stakeholder connected to OneNet System	System	Entity or Actor such as System Operator, Market Operator, FSP, etc that is connected to OneNet System	

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	Day-Ahead & Intraday Flexibility needs for DSO	Steps that system operators should perform to plan and forecast their grid utilization for the next day or the next 6 hours and to exhange data about their flexibility needs.	DSO Plan/Forecast System			
2	Day-Ahead & Intraday Flexibility needs for TSO	Steps that system operators should perform to plan and forecast their grid utilization for the next day or the next 6 hours and to exhange data about their flexibility needs.	TSO Plan/Forecast System			
3	Day-Ahead & Intraday Flexibility	Steps that system operators should perform to plan and forecast their grid utilization for	DSO Plan/Forecast System			

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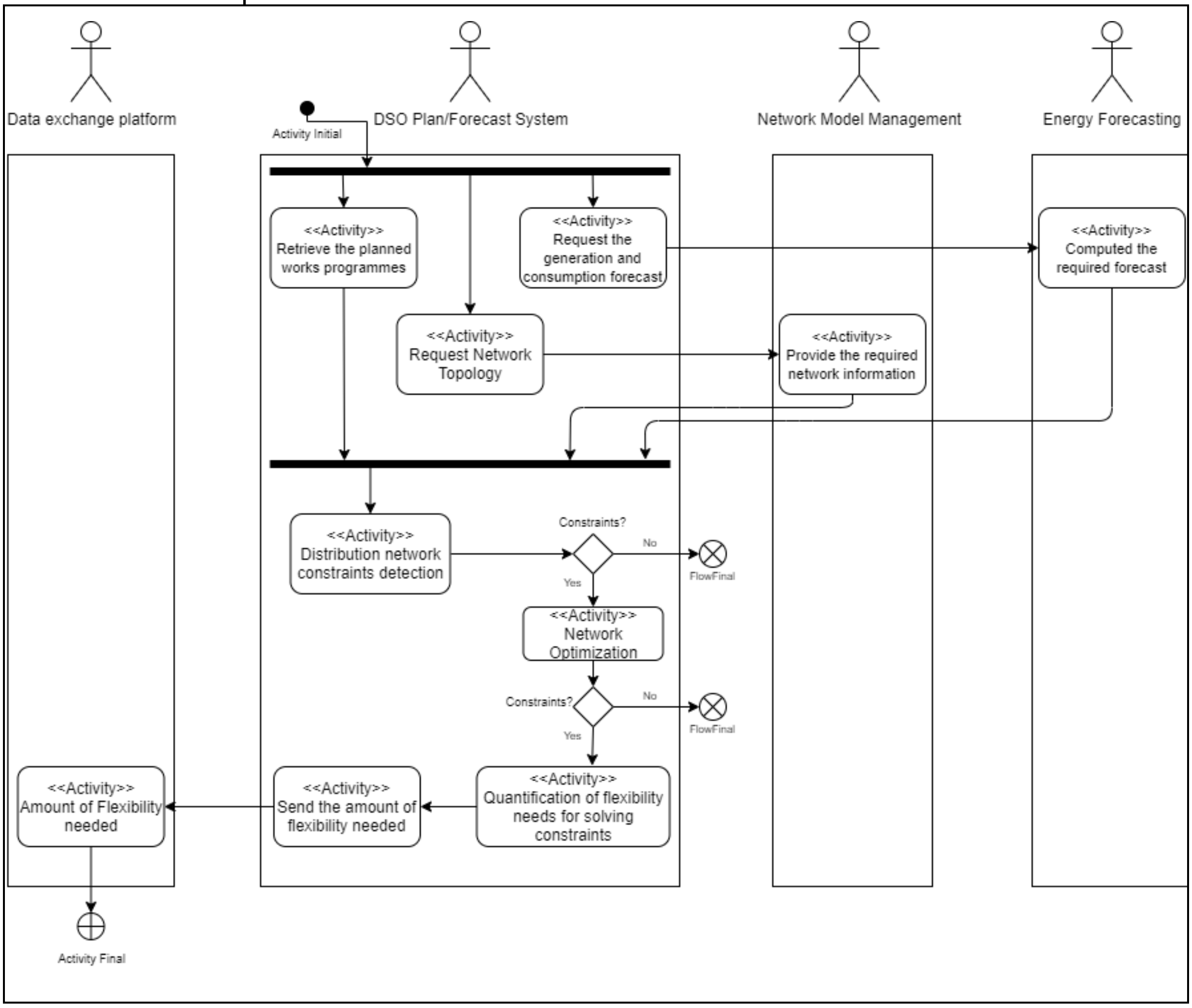
	needs for DSO within OneNet System	the next day or the next 6 hours and to exhange data about their flexibility needs.				
4	Day-Ahead & Intraday Flexibility needs for TSO within OneNet System	Steps that system operators should perform to plan and forecast their grid utilization for the next day or the next 6 hours and to exhange data about their flexibility needs.	TSO Plan/Forecast System			

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description



<u>Scenario step by step analysis</u>

Scenario	
Scenario name	Day-Ahead & Intraday Flexibility needs for DSO

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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		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"		DSO Plan/Forecast System			
1.2		Request the generation and the consumption forecast	Producers should provide the forecast of their generation for the next day or the next 6 hours.		DSO Plan/Forecast System	Energy Forecasting	ID-1	
1.3		Compute the required forecast	The forecast should be computed for the next 72 hours in intervals of 15 minutes. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	DSO Plan/Forecast System	ID-2	
1.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		DSO Plan/Forecast System	Network Model Management	ID-3	
1.5		Provide the required network information			Network Model Management	DSO Plan/Forecast System	ID-4	
1.6		Distribution network constraints detection	Considering the consumption and production forecast, the DSO should evaluate if some constraints are forecasted to exist in distribution system.		DSO Plan/Forecast System			
1.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration		DSO Plan/Forecast System			
1.8		Quantification of flexibility needs for solving constraints	Quantification of flexibility needs for solving technical restrictions in distribution network. In case network assets cannot solve all technical restrictions, flexibility from DER will be considered to solve the problem. Quantify flexibility n eeded to		DSO Plan/Forecast System			

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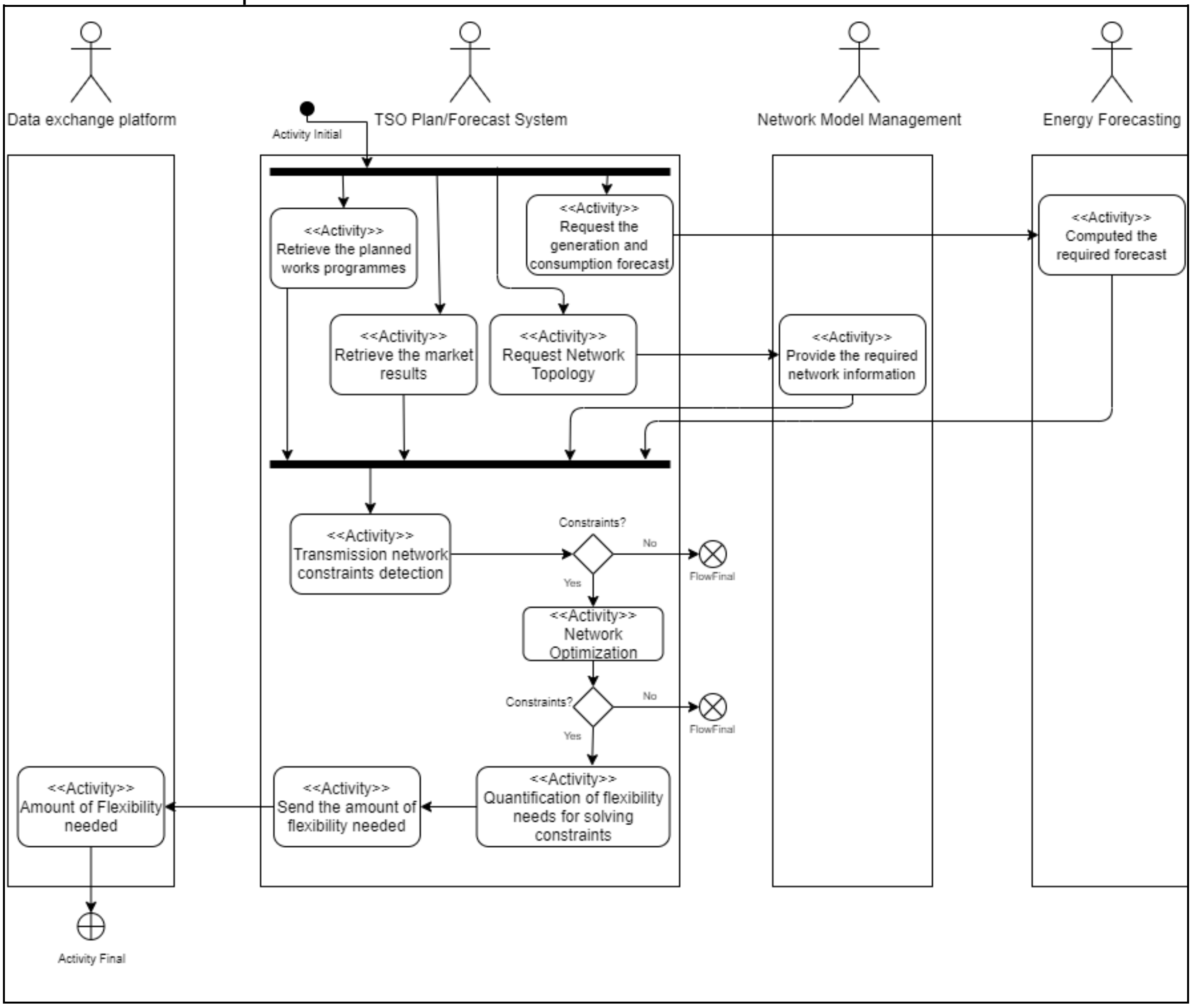
			solve constraints per node/zone.					
1.9		Send the amount of flexibility needed	Send the Quantify flexibility needed to solve constraints per node/zone for the next day or for the next 6 hours.		DSO Plan/Forecast System	Data exchange Platform	ID-5	

Scenario name #2

Scenario #2 description



Scenario step by step analysis

Scenario								
Scenario name	Day-Ahead & Intraday Flexibility needs for TSO							
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		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any		TSO Plan/Forecast System			

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			planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"					
2.2		Retrieve the market results	If the SGU participate in the markets, the market results should be taken into account in the operational planning		TSO Plan/Forecast System			
2.3		Request the generation and the consumption forecast	Producers should provide the forecast of their generation for the next day or the next 6 hours.		TSO Plan/Forecast System	Energy Forecasting	ID-1	
2.4		Compute the required forecast	The forecast should be computed for the next 72 hours in intervals of 15 minutes. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	TSO Plan/Forecast System	ID-2	
2.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		TSO Plan/Forecast System	Network Model Management	ID-3	
2.5		Provide the required network information			Network Model Management	TSO Plan/Forecast System	ID-4	
2.6		Transmission network constraints detection	Considering the consumption and production forecast, the TSO should evaluate if some constraints are forecasted to exist in Transmission system.		TSO Plan/Forecast System			
2.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration)		TSO Plan/Forecast System			
2.8		Quantification of flexibility needs for solving constraints	Quantification of flexibility needs for solving technical restrictions in transmission network. In case network assets cannot solve all technical restrictions, flexibility will be considered to solve the problem. Quantify flexibility n eeded to solve constraints per node/z one.		TSO Plan/Forecast System			

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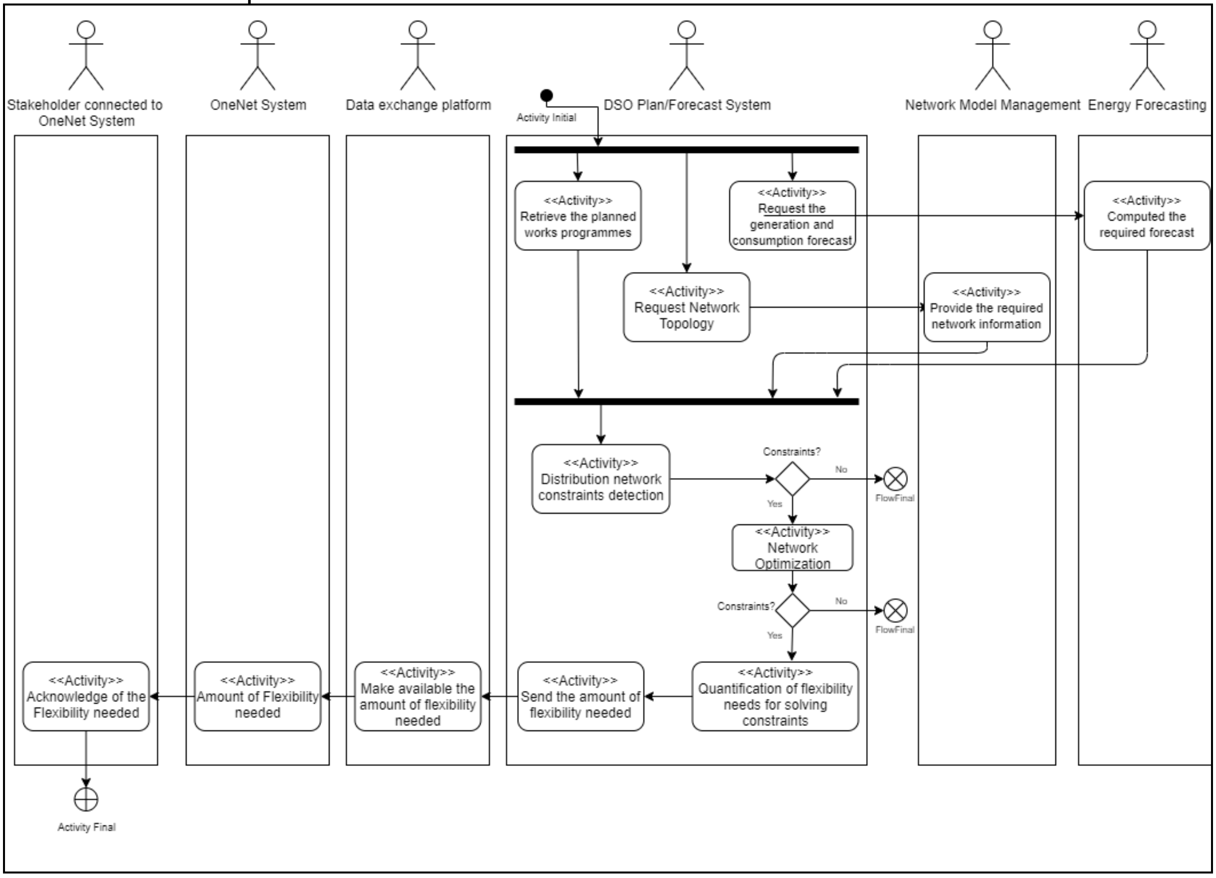
2.9		Send the amount of flexibility needed	Send the Quantify flexibility needed to solve constraints per node/zone for the next day or for the next 6 hours.		TSO Plan/Forecast System	Data exchange Platform	ID-5	

Scenario name #3

Scenario #3 description



Scenario step by step analysis

Scenario								
Scenario name	Day-Ahead & Intraday Flexibility needs for DSO within OneNet System							
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		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"		DSO Plan/Forecast System			

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3.2		Request the generation and the consumption forecast	Producers should provide the forecast of their generation for the next day or the next 6 hours.		DSO Plan/Forecast System	Energy Forecasting	ID-1	
3.3		Compute the required forecast	The forecast should be computed for the next 72 hours in intervals of 15 minutes. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	DSO Plan/Forecast System	ID-2	
3.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		DSO Plan/Forecast System	Network Model Management	ID-3	
3.5		Provide the required network information			Network Model Management	DSO Plan/Forecast System	ID-4	
3.6		Distribution network constraints detection	Considering the consumption and production forecast, the DSO should evaluate if some constraints are forecasted to exist in distribution system.		DSO Plan/Forecast System			
3.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration		DSO Plan/Forecast System			
3.8		Quantification of flexibility needs for solving constraints	Quantification of flexibility needs for solving technical restrictions in distribution network. In case network assets cannot solve all technical restrictions, flexibility from DER will be considered to solve the problem. Quantify flexibility needed to solve constraints per node/zone.		DSO Plan/Forecast System			
3.9		Send the amount of flexibility needed	Send the amount of flexibility needed to solve constraints per node/zone for the next day or for the next 6 hours.		DSO Plan/Forecast System	Data exchange Platform	ID-5	
3.10		Make available the amount of flexibility needed	Make available the amount of flexibility needed to solve constraints per node/zone for the next day or for the next 6 hours in OneNet System.		Data exchange Platform	OneNet System	ID-5	

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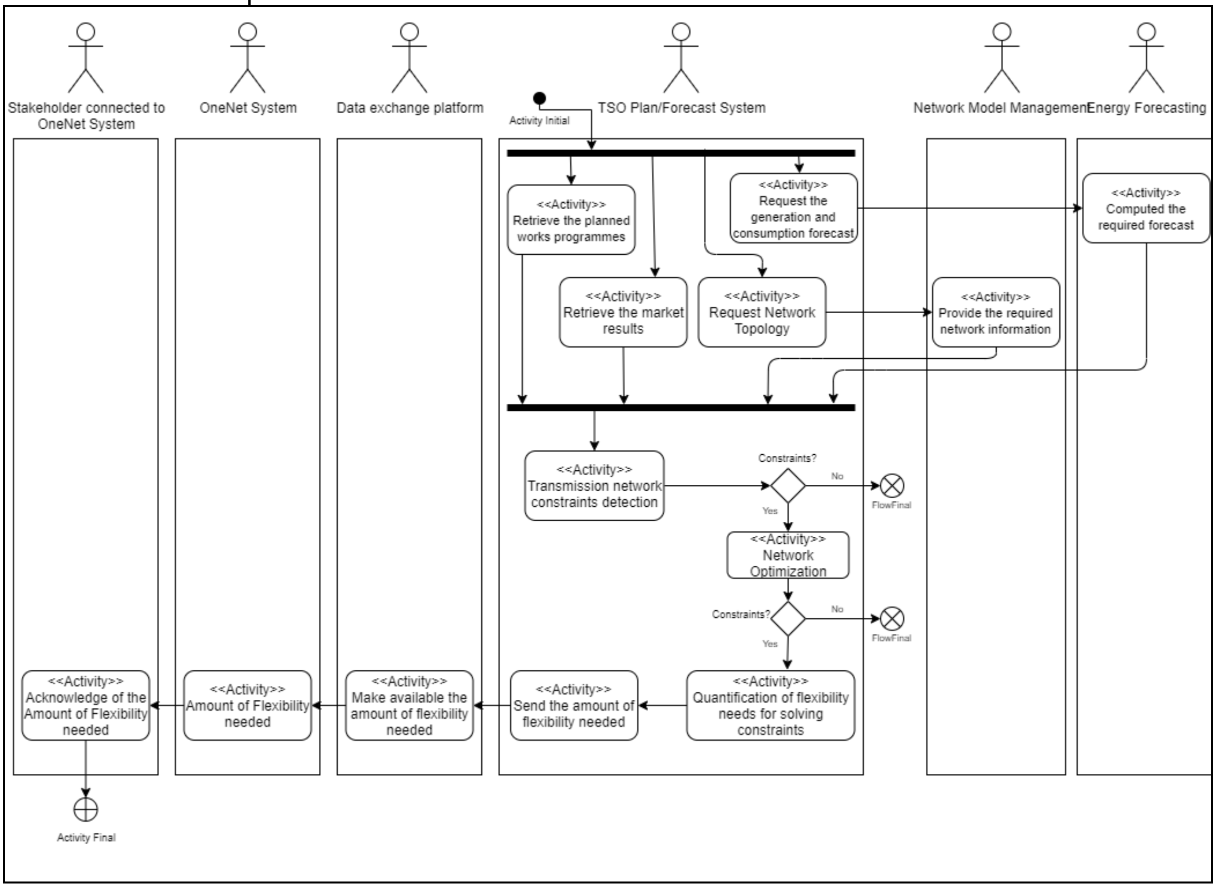
Scenario name #4

Scenario #4 description



Scenario step by step analysis

Scenario								
Scenario name	Day-Ahead & Intraday Flexibility needs for TSO within OneNet System							
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		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"		TSO Plan/Forecast System			
4.2		Retrieve the market results	If the SGU participate in the markets, the market results should be taken into account in the operational planning		TSO Plan/Forecast System			
4.3		Request the generation and the	Producers should provide the forecast of their generation		TSO Plan/Fore	Energy Forecasting	ID-1	

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		consumption forecast	for the next day or the next 6 hours.		cast System			
4.4		Compute the required forecast	The forecast should be computed for the next 72 hours in intervals of 15 minutes. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	TSO Plan/Forecast System	ID-2	
4.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		TSO Plan/Forecast System	Network Model Management	ID-3	
4.5		Provide the required network information			Network Model Management	TSO Plan/Forecast System	ID-4	
4.6		Transmission network constraints detection	Considering the consumption and production forecast, the TSO should evaluate if some constraints are forecasted to exist in Transmission system.		TSO Plan/Forecast System			
4.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration)		TSO Plan/Forecast System			
4.8		Quantification of flexibility needs for solving constraints	Quantification of flexibility needs for solving technical restrictions in transmission network. In case network assets cannot solve all technical restrictions, flexibility will be considered to solve the problem. Quantify flexibility needed to solve constraints per node/zone.		TSO Plan/Forecast System			
4.9		Send the amount of flexibility needed	Send the amount of flexibility needed to solve constraints per node/zone for the next day or for the next 6 hours.		TSO Plan/Forecast System	Data exchange Platform	ID-5	
4.10		Make available the amount of flexibility needed	Make available the amount of flexibility needed to solve constraints per node/zone for the next day or for the next 6 hours in OneNet System.		Data exchange Platform	OneNet System	ID-5	

5. Information exchanged

Information exchanged

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Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
ID-1	Request the generation and the consumption forecast	Request ID Type of Request Substation Transformer Feeder Start Time (day; hour; minute) End Time (day; hour; minute) The time should be done in intervals of 15 minutes.	
ID-2	Generation and the consumption forecast	Request ID Type of Request Substation Quantile Pconso_Substation Pprod_Substation Qconso_Substation Qprod_Substation Transformer Quantile Pconso_Transformer Pprod_Transformer Qconso_Transformer Qprod_Transformer Feeder Quantile Pconso_Feeder Pprod_Feeder Qconso_Feeder Qprod_Feeder Start Time (day; hour; minute) End Time (day; hour; minute)	ID-1
ID-3	Network information request	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	

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ID-4	Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed of several lines.	ID-3
ID-5	Amount of flexibility needed	The amount of flexibility required per flexibility aggregation node/zone will be quantified. Node/Zone Quantity (MW)	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.15 SUC-PT-03: Long-term Flexibility needs

Long-term Flexibility needs

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***
		SUC-PT-03 - Long-term Flexibility needs

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	16/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*This SUC is one more process that system operators (DSO/TSO) should take into account in order to procure congestion management products. This process is included in the Plan/Forecast scenario described in the Business Use Cases Template (BUC 02).*
Objective(s)	- Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe. - Cover grid investment needs through flexibility services. - Anticipate technical problems arisen as a consequence of planned action on the distribution grid for some years in advance considering the load and generation forecast as well as the schedule for the planned interventions on the grid. - Improve network operation security during maintenance actions, using flexibility to minimize the risk of reduced redundancy. - Ensure coordination between system operators for all scenarios. - Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC is focused on the steps that system operators should perform to plan and forecast their grid utilization.
Complete description

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This SUC supports the coordination between DSO and TSO so that they can determine how much flexibility they will need to acquire, for a long-term timeframe. The coordination is needed to anticipate technical problems, improve network operation security and avoid investments in the distribution and transmission grids with the activation of active power flexibilities. In this SUC is described the steps, such as a probabilistic power flow checking and forecasting of possible congestion areas, that system operators should go through considering the possibility of reserving flexibility services for congestion management years in advance. Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about planning, forecast and the amount of flexibility needed is foreseen. This implementation is supported by work done in previous H2020 projects.

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	
	System Operators have estimated consumption growth rates for subsequent years
	For Long-term Planning is expected a prediction for the next 2-3 years
Prerequisites	
	Historical load diagram profile from HV/MV/LV substations, most recent year
	Full characterization of network topology
	Up-to-date ongoing investments

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

Classification information
Relation to other use cases
WECL-PT-02
Level of depth
System Use Case
Prioritisation
High
Generic, regional or national relation
National
Nature of the use case
Further keywords for classification
Congestion Management; Short-term Plan/Forecast Flexibility

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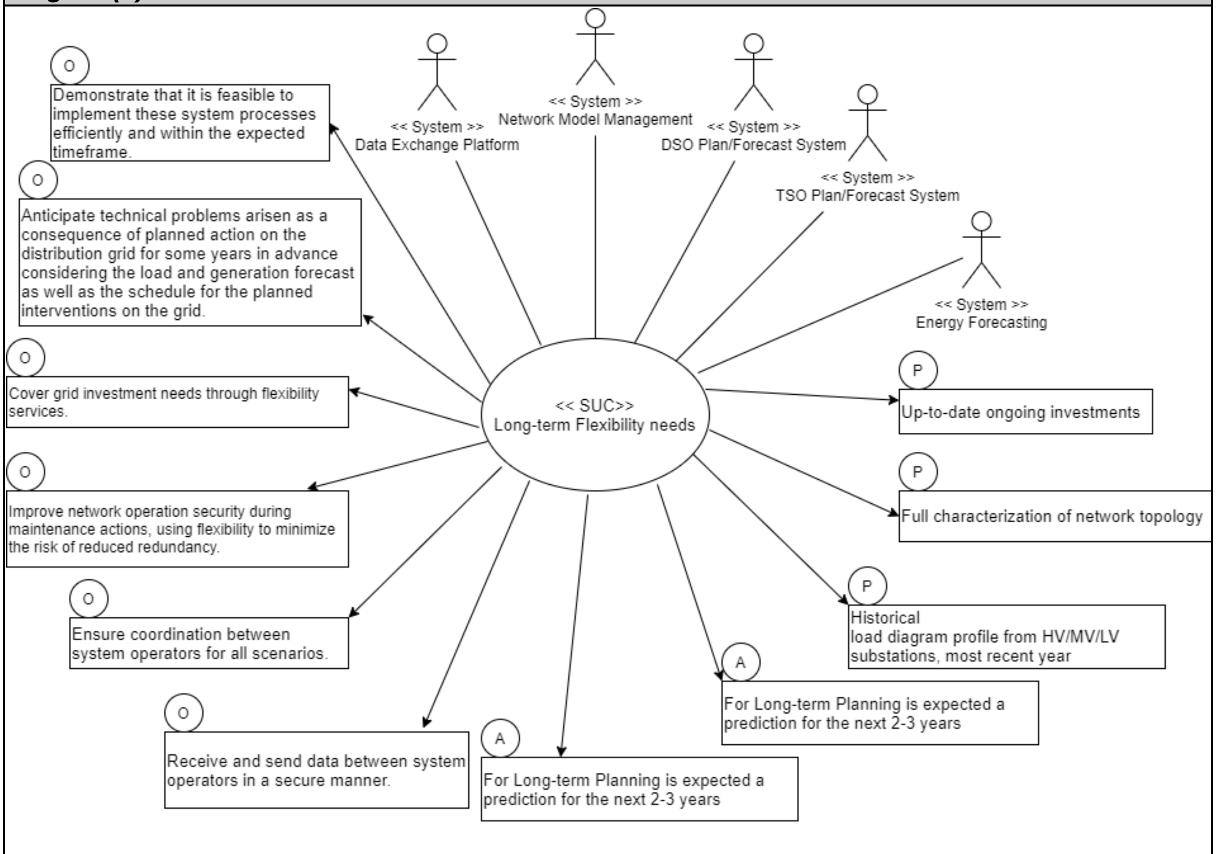
1.8. General remarks

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 Plan/Forecast System	System	The DSO Forecast System function involves managing all the tools and platforms that concern the_network planning and forecasting, and recognition of distribution network congestions on the distribution network.	
TSO Plan/Forecast System	System	The TSO Forecast System function involves managing all the tools and platforms that concern the_network planning and forecasting, and recognition of distribution network congestions on the transmission network.	
Data exchange Platform	System	Platform used by several entities to exchange information for different proposes. The 3 types of data (Real-time; scheduled and structural data) can be exchanged in this platform. The	

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		operational/control data are not included in the real-time type. The exchange of information related with the markets are is included in the scheduled data. The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	
Energy Forecasting	System	The Energy Forecasting business (EF) function involves the forecasting of one or more of the items consumption (load), production (primarily intermittent or price inelastic production), direct current and area inter-exchange. This also include energy forecast for intermittent or price inelastic production that is part of Distributed Energy Resources (DER).	
Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the power system that can be used in different analysis, including, but not limited to, steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of DSO/TSO.	

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 Flexibility needs for DSO	Steps that system operators should perform to plan and forecast their grid utilization for the next 2 or 3 years and to exhange data about their flexibility needs.				
2	Long-term Flexibility needs for TSO	Steps that system operators should perform to plan and forecast their grid utilization for the next 2 or 3 years and to exhange data about their flexibility needs.				

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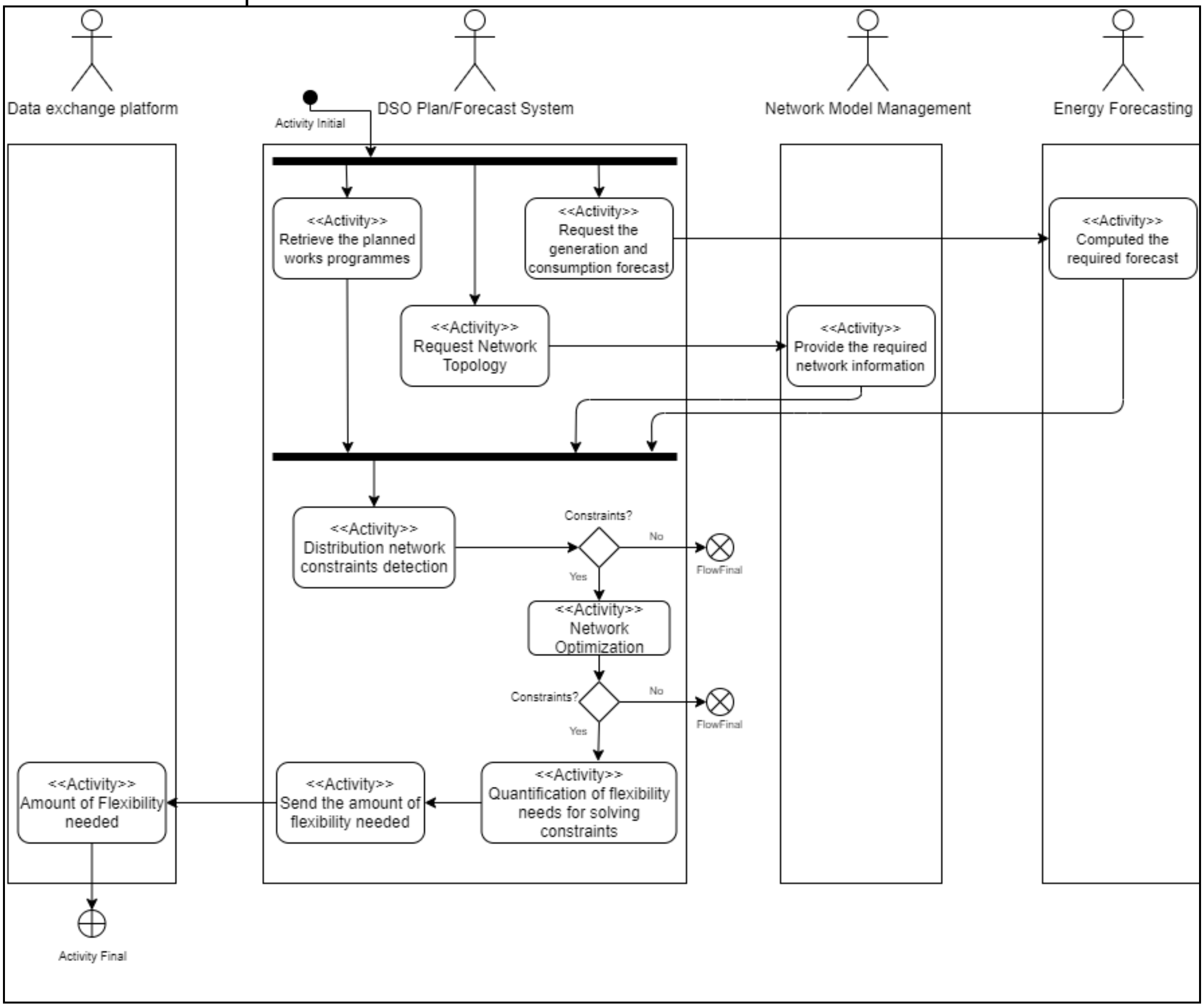
4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description



Scenario step by step analysis

Scenario								
Scenario name	Long-term Flexibility needs for DSO							
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		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works.		DSO Plan/Forecast System			

			This activity is described in the SUC "Maintenance plans information exchange"					
1.2		Request the generation and the consumption forecast	Producers should provide the forecast of their generation for the 2-3 years		DSO Plan/Forecast System	Energy Forecasting	ID-1	
1.3		Compute the required forecast	The forecast should be computed for the next 2-3 years. Define planning horizon, define load and distributed energy sources growth rates. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	DSO Plan/Forecast System	ID-2	
1.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		DSO Plan/Forecast System	Network Model Management	ID-3	
1.5		Provide the required network information			Network Model Management	DSO Plan/Forecast System	ID-4	
1.6		Distribution network constraints detection	Internal DSO process that forecasts network constraints in the long term, based on predicted load and generation availability and grid data, as well as expected asset unavailability due to maintenance.		DSO Plan/Forecast System			
1.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration)		DSO Plan/Forecast System			
1.8		Quantification of flexibility needs for solving constraints	Identify flexibility required per node/zone of the network in terms of quantity in MW and duration in steps of hours to eliminate the overloads and under/over voltage problems.		DSO Plan/Forecast System			
1.9		Send the amount of flexibility needed	Send the Quantify flexibility needed to solve constraints per nod		DSO Plan/Forecast System	Data exchange Platform	ID-5	

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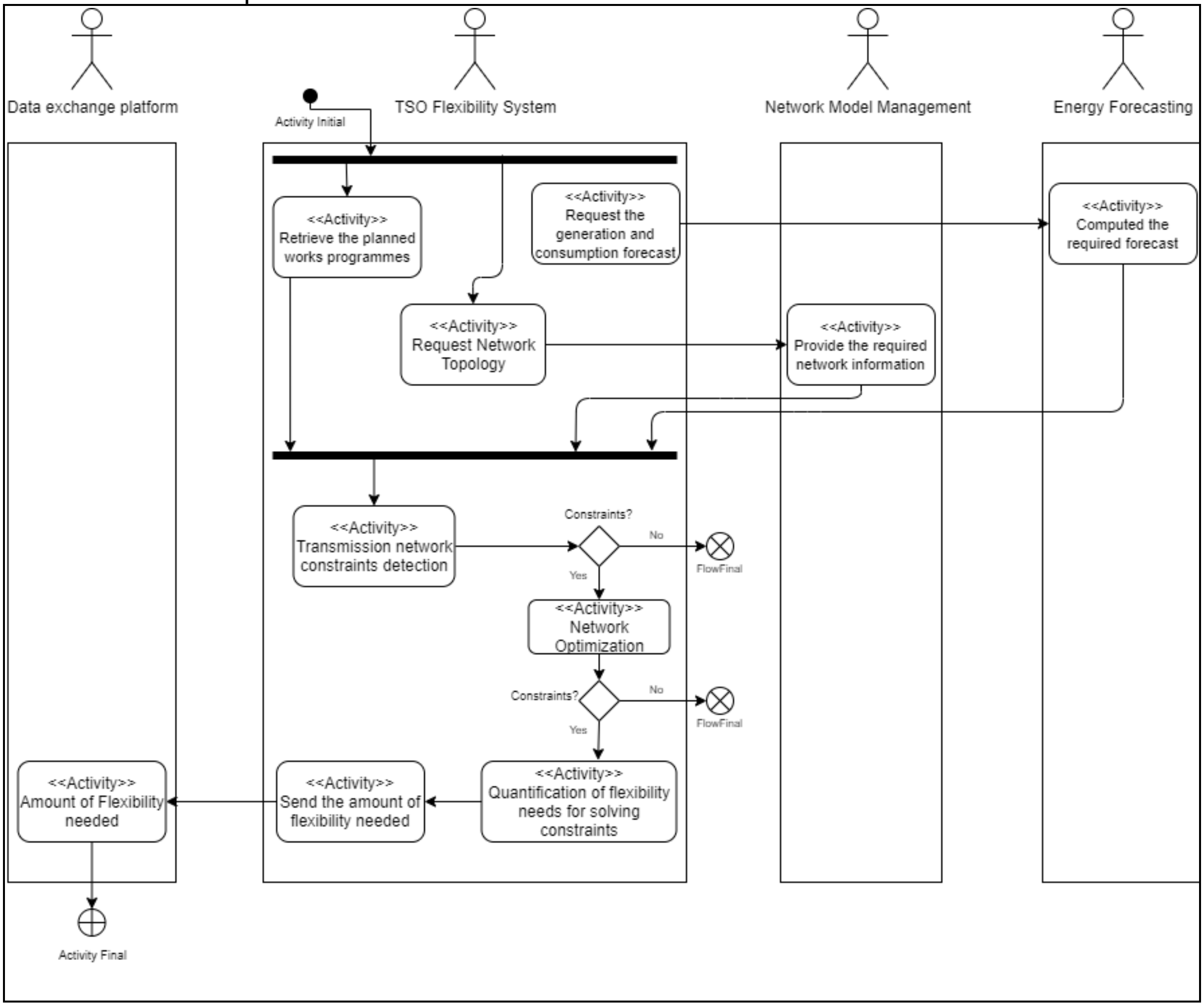
			e/zone for the next 2-3 years					
1.10		Amount of Flexibility needed	Flexibility needed to solve constraints per node/zone for the next 2-3 years		Data exchange Platform			

Scenario name #2

Scenario #2 description



Scenario step by step analysis

Scenario								
Scenario name	Long-term Flexibility needs for TSO							
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		Retrieve the planned	To determine the consumption and production profiles, the		TSO Plan/Forecast System			

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		works programmes	SO should take into consideration any planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"					
2.2		Request the generation and the consumption forecast	Producers should provide the forecast of their generation for the 2-3 years		TSO Plan/Forecast System	Energy Forecasting	ID-1	
2.3		Compute the required forecast	The forecast should be computed for the next 2-3 years. Define planning horizon, define load and distributed energy sources growth rates. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	TSO Plan/Forecast System	ID-2	
2.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		TSO Plan/Forecast System	Network Model Management	ID-3	
2.5		Provide the required network information			Network Model Management	TSO Plan/Forecast System	ID-4	
2.6		Transmission network constraints detection	Internal TSO process that forecasts network constraints in the long term, based on predicted load and generation availability and grid data, as well as expected asset unavailability due to maintenance		TSO Plan/Forecast System			
2.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration)		TSO Plan/Forecast System			
2.8		Quantification of flexibility needs for solving constraints	Identify flexibility required per node/zone of the network in terms of quantity in MW and duration in steps of hours to eliminate the overloads and under/over voltage problems.		TSO Plan/Forecast System			

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2.9		Send the amount of flexibility needed	Send the Quantify flexibility needed to solve constraints per node/zone for the next 2-3 years		TSO Plan/Forecast System	Data exchange Platform	ID-5	
2.10		Amount of Flexibility needed	Flexibility needed to solve constraints per node/zone for the next 2-3 years		Data exchange Platform			

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
ID-1	Request the generation and the consumption forecast	Request ID Type of Request Substation Transformer Feeder Start Time (day; hour; minute) End Time (day; hour; minute)	
ID-2	Generation and the consumption forecast	Request ID Type of Request Substation Quantile Pconso_Substation Pprod_Substation Qconso_Substation Qprod_Substation Transformer Quantile Pconso_Transformer Pprod_Transformer Qconso_Transformer Qprod_Transformer Feeder Quantile Pconso_Feeder Pprod_Feeder Qconso_Feeder Qprod_Feeder Start Time (day; hour; minute) End Time (day; hour; minute)	ID-1
ID-3	Network information request	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center.	

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		A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	
ID-4	Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed of several lines.	ID-3
ID-5	Amount of flexibility needed	The amount of flexibility required per flexibility aggregation node/zone will be quantified. Node/Zone Quantity (MW)	

6. Requirements (optional)
7. Common terms and definitions
8. Custom information (optional)

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10.16 SUC-PT-04: Selection of Bids

Selection of Bids

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***
		SUC-PT-04 – Selection of Bids

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	16/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*This SUC is one more process that system operators (DSO/TSO) should take into account in order to procure congestion management products. This process is included in the Market phase scenario described in the Business Use Cases Template (BUC 01 e BUC 02).*
Objective(s)	- Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe. - Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a technical point of view. - Ensure coordination between system operators for all scenarios. - Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-01 & WECL-PT-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC is focused on the steps that system operators should perform to select bids from FSP's.
Complete description
After the system operators have identified the amount of flexibility they need to solve their needs and possible constraints, FPS offers bids can cover the amount of flexibility identified. In this SUC is described which bid parameters, such as flexibility direction, possibility for aggregation, etc., are addressed in order to select what bids can solve system operators needs and constraints taking into account the impact of each bid on both the operator's network and the neighbouring operator's network. In addition to the parameters of the bids, another aspect to consider when selecting bids is the coordination between DSO and TSO markets, namely the coordination in forwarding bids from the DSO market to the TSO market and vice versa. Furthermore, it is described which parameters are addressed in order to select which bids can and cannot be acquired and the merit order list (MOL) of the previous acquired bids.

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After the selection of the bids, based on the requirements described above, a merit order list (MOL) of the acquired bids is defined. Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about the bids that need to be analysed by the operator they are connected to and the bids that are forwarded from one network operator to another. This implementation is supported by work done in previous H2020 projects.

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	
	Capacity bids from Long-term Markets are selected or not in Short-term markets
	A congestion solution done by a DSO or TSO should not cause another DSO or TSO congestion problem
Prerequisites	
	FSPs bids information are available for DSO and TSO
	FSPs offer bids in DSO and TSO Markets
	DSO MO and TSO MO send the DSO and TSO only the bids that can solve their needs.

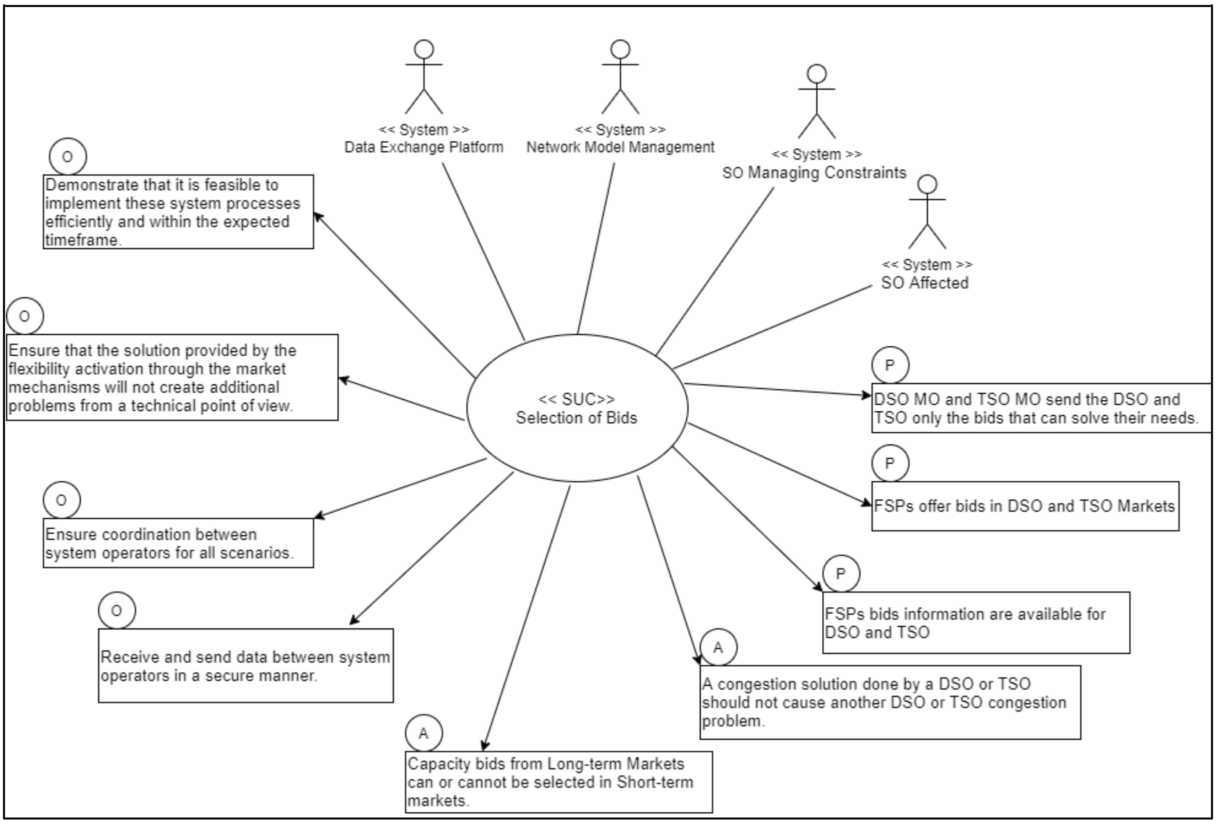
1.7. Further information to the use case for classification/mapping

Classification information
Relation to other use cases
WECL-PT-01 & WECL-PT-02
Level of depth
System Use Case
Prioritisation
High
Generic, regional or national relation
National
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***
SO Managing Constraints	System	The SO Managing Constraints function involves managing all the tools and platforms that concern to the coordination model with the neighboring system operator and to the bid selection in order to solve the constrains of the network.	
SO Affected	Role	The SO Affected function is the SO that can be affected by the activations of bids connected to its own network or connected near its network by the SO Managing Constraints.	
Data Exchange Platform	System	Platform used by several entities to exchange information for different proposes. The 3 types of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in the real-time type. The exchange of information related with the markets are is included in the scheduled data. The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	

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3.2. References

4. Step by step analysis of use case

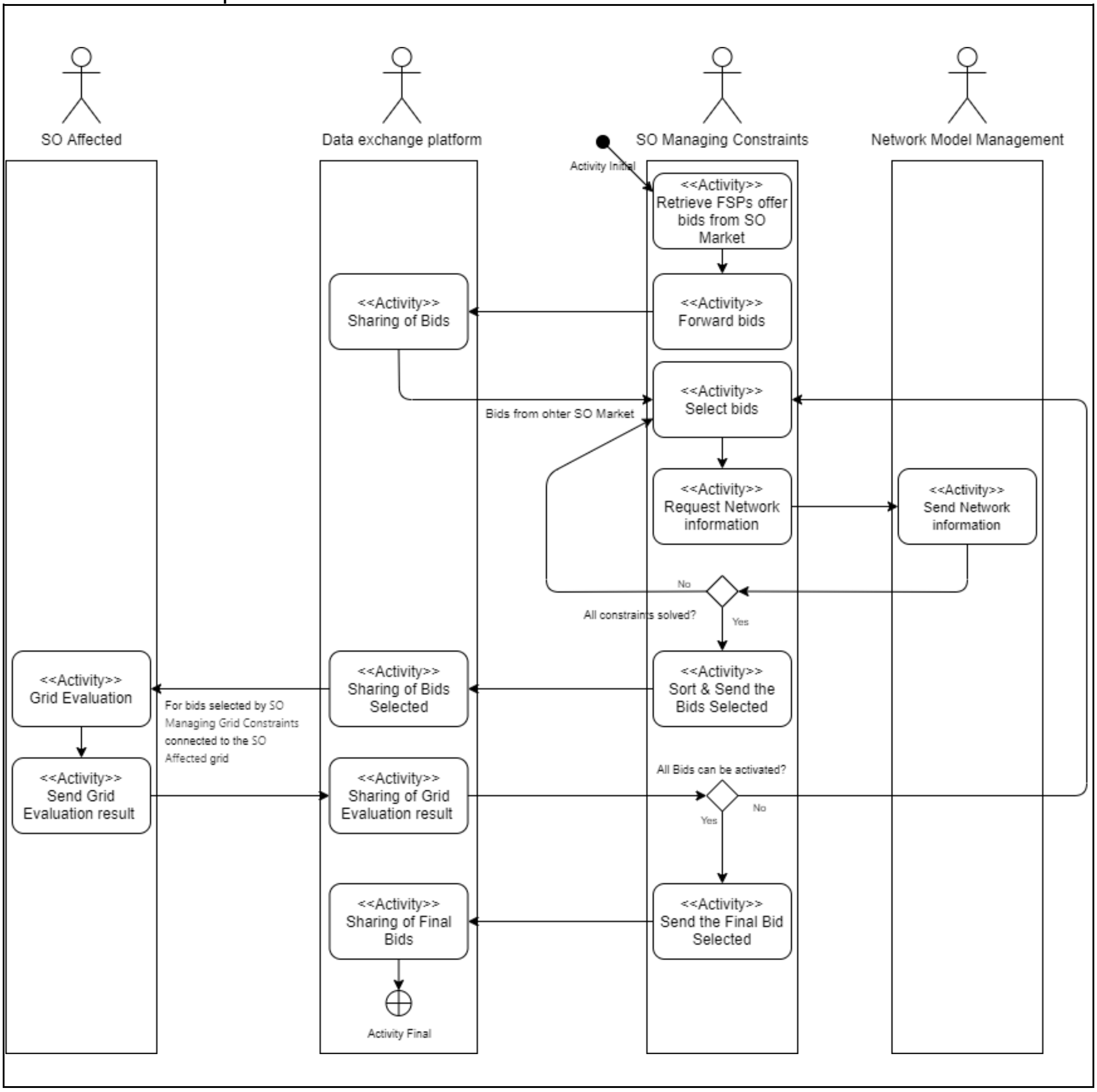
4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Selecting Bids		SO Managing Constraints	SO Managing Constraints wants to activate flexibility to solve network constraints		

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description



<u>Scenario step by step analysis</u>

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

Scenario								
Scenario name	Selecting Bids							
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		Retrieve FSPs offer bids from DSO Market	To solve the constraints of the network, the SO needs the know which bids offered by the FSP can match its needs.		SO Managing Constraints			
1.2		Forward bids	Forward bids that have granularity to solve the needs of the neighboring system operator		SO Managing Constraints	Data exchange platform	ID-1	
1.3		Select bids	Select which bids can solve the constraints considering both bids from its own market and from the neighboring system operator		SO Managing Constraints			
1.4		Request Network information	Request the network information considering the location of the selected bids connected to its own grid.		SO Managing Constraints	Network Model Management	ID-2	
1.5		Send Network information	Provide Network information		Network Model Management	SO Managing Constraints	ID-3	
1.6		Sort & Send the Bids Selected	Select bids connected to its own network and bids connected to the the neighbouring network that can solve all constraints. For bids connected to its own network, the grid information		SO Managing Constraints			

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			(Grid Evaluation) is already being considered. Bids connected to the neighbouring network need to be checked. Sort bids by a merit order list.					
1.7		Sharing of Bids Selected	Share selected and sorted bids.		SO Managing Constraints	Data exchange platform		
1.8		Grid Evaluation	SO Affected needs to evaluate its own grid		SO Affected			
1.9		Send Grid Evaluation result	SO Affected needs to assess whether the bids selected by SO Managing Constraints will impact its network.		SO Affected	Data exchange platform	ID-4	
1.10		Sharing of Grid Evaluation result			Data exchange platform	SO Managing Constraints	ID-4	
1.12		Send the Final Bid Selected	Send the Final Bids Selection considering the Grid Evaluation from its own network and the neighbouring network.		SO Managing Constraints	Data exchange platform	ID-5	
1.13		Sharing of Final Bids			Data exchange platform			

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
ID-1	Bids forward	Bid ID Resource Connected SO Day Hour Duration Quantity Flexibility direction Full Activation time Price	

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ID-2	Request Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	
ID-3	Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed of several lines.	
ID-4	Validation Result	Bid ID Grid Result Evaluation: (approved/reproved) or for a specific bid the activation is limited to a certain amount in order to not create constraints.	
ID-5	Final Bids Selection	Bid ID Resource Connected SO Day Hour Duration Quantity Flexibility direction Full Activation time	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.17 SUC-PT-05: Evaluate Grid Constraints

Evaluate Grid Constraints

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
		SUC-PT-05 – Evaluate Grid Constraints

1.2. Version management

Version management				
Version No.	Date	Name of author(s)	Changes	Approval status
	16/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	*This SUC is one more process that system operators (DSO/TSO) should take into account in order to procure congestion management products. This process is included in the Market and Activation scenarios described in the Business Use Cases Template (BUC 01 e BUC 02).*
Objective(s)	- Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe. - Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a grid point of view. - Ensure coordination between system operators for all scenarios. - Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-01 & WECL-PT-02 & SUC-01

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC is focused on the steps that system operators should take to accept and validate the acquired bids in the market phase.
Complete description
This SUC supports the coordination between DSO and TSO in the market and activation phase. To avoid the acceptation and the activation of bids results in new constraints, the system operator to which the resource is connected should make a check of the state of its network in order to be sure that the activation does not cause any future problem. In this SUC it is described which parameters are addressed and analysed in order to validate the activation of the accepted bids in the market phase. To do this, the grid data used by system operators should be as up-to-date as possible to ensure that the bids that will be activated will not bring consequences. The dynamic grid constraints evaluation is a continuous process, during the market and activation phases.

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Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about the bids that are located in another system operator's network and may or may not be activated. This implementation is supported by work done in previous H2020 projects.

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	
	Only considered selected bids
Prerequisites	
	This process occurs after each intraday market
	FSPs bids information are available for DSO and TSO

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

Classification information
Relation to other use cases
WECL-PT-01 & WECL-PT-02 & SUC-01
Level of depth
System Use Case
Prioritisation
High
Generic, regional or national relation
National
Nature of the use case
Further keywords for classification

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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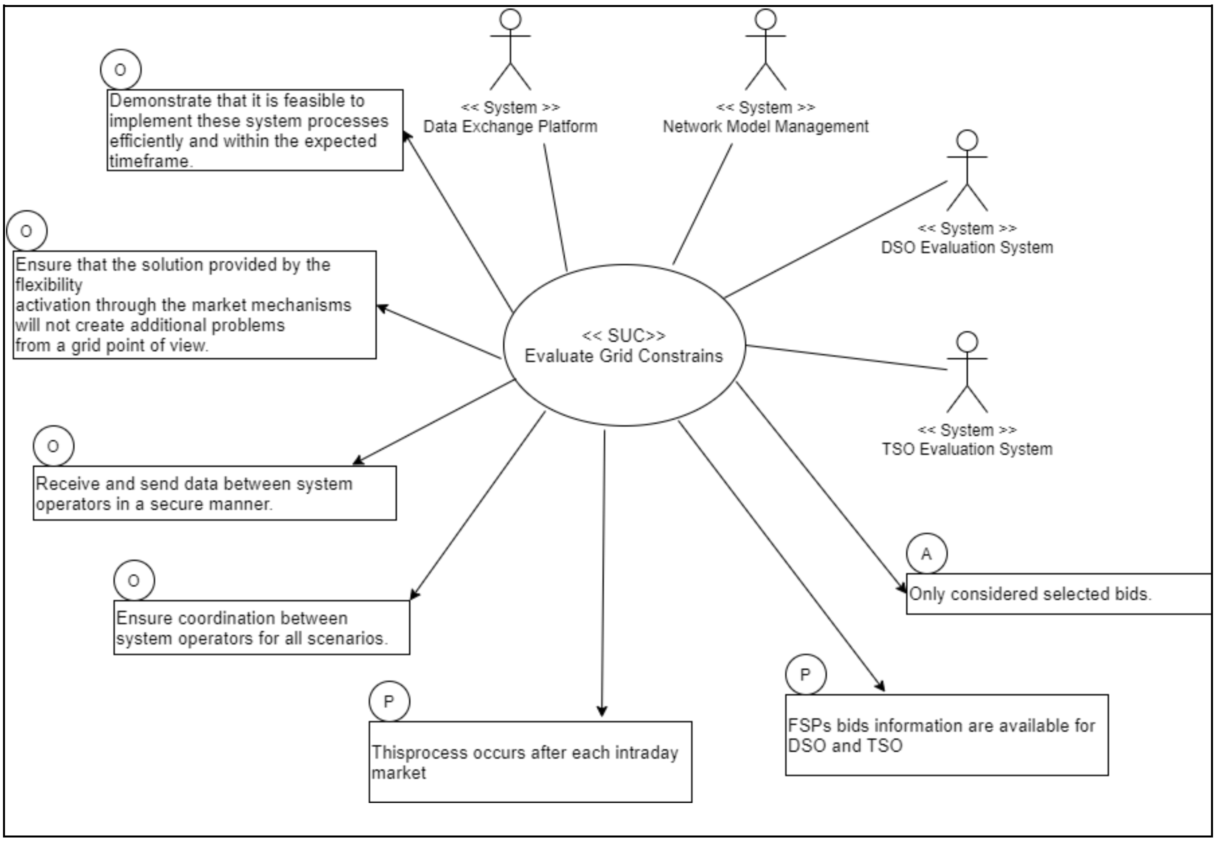

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
SO Managing Constraints	System	The SO Managing Constraints function involves managing all the tools and platforms that concern to the coordination model with the neighboring system operator and to the bid selection in order to solve the constrains of the network.	
SO Affected	System	The SO Affected function is the SO that can be affected by the activations of bids connected to its own network or connected near its network by the SO Managing Constraints.	
Data exchange Platform	System	Platform used by several entities to exchange information for different proposes. The 3 types of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in the real-time type. The exchange of information related with the markets are is included in the scheduled data. The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	

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Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the power system that can be used in different analysis, including, but not limited to, steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of DSO/TSO.	

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	Evaluate Grid Constraints	The system operator to which the resource is connected should make a check of the state of its network in order to be sure that the activation does not cause any future problem.	DSO Evaluation System/ TSO Evaluation System			

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

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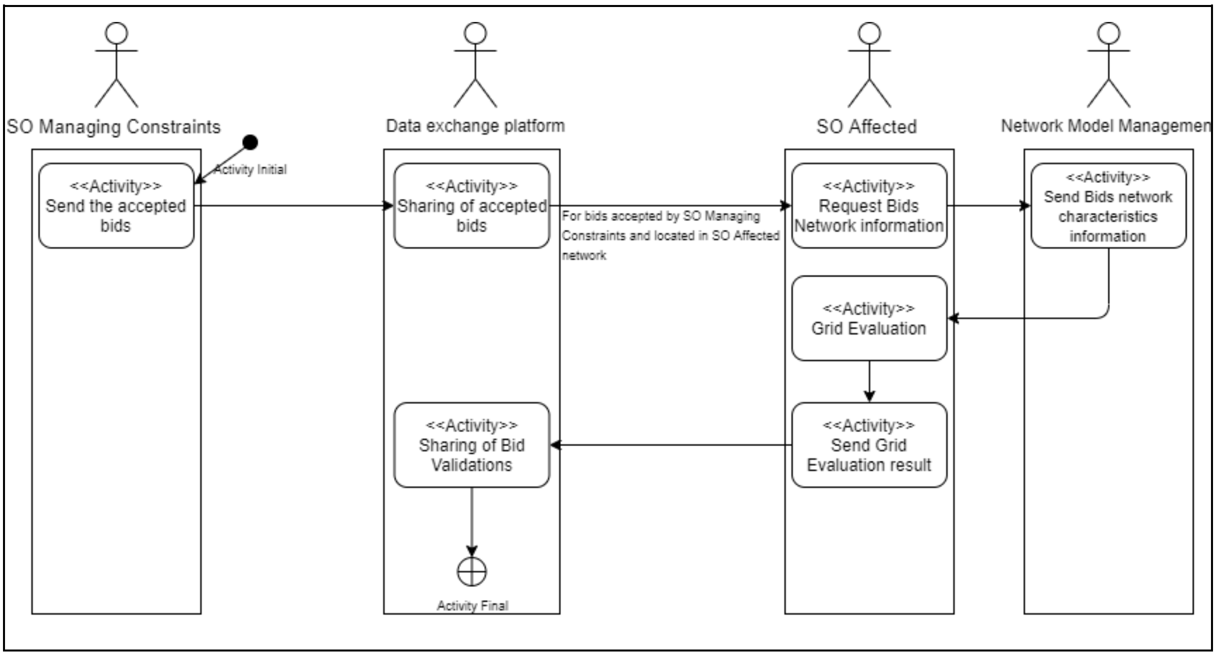

Scenario step by step analysis

Scenario								
Scenario name	Evaluate Grid Constraints							
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 Final selected bids	Final Bids Selection from SUC-04		SO Managing Constraints	Data exchange Platform	ID-1	
1.2		Sharing the accepted bids	Final Bids Selection from SUC-04		Data exchange Platform	SO Affected	ID-1	
1.3		Request Network information	Send the requirements from step 1.1		SO Affected	Network Model Management	ID-2 (internal information)	
1.4		Send Bids network characteristics information			Network Model Management	SO Affected	ID-3 (internal information)	
1.5		Grid Evaluation	SO Affected needs to evaluate its own grid		SO Affected			
1.6		Send Grid Evaluation result			SO Affected	Data exchange Platform	ID-4	
1.7		Sharing of Bid Validations			Data exchange Platform			

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5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
ID-1	Accepted bids	Bid ID Resource Connected SO Day Hour Duration Quantity Flexibility direction Full Activation time	
ID-2	Request Bids Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	ID-1
ID-3	Network information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation center. Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed of several lines.	ID-2
ID-4	Validation Result	Bid ID Grid Result Evaluation: (approved/reproved)	ID-2, ID-4

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

10.18 SUC-PT-06: Maintenance plans information exchange

Maintenance plans information exchange

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**
		SUC-PT-06 - Maintenance plans information exchange

1.2. Version management

Version management				
Version No.	**Date**	**Name of author(s)**	**Changes**	**Approval status**
	23/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Define the information exchange related with the maintenance plans defined in multiple time horizons (from long-term to near to real time) as partially described in the Business Use Cases Template (BUC 03).
Objective(s)	- Anticipate grid constraints due to maintenance works scheduled - Have an updated view of the maintenance plans defined by TSO and DSO from long-term until close to real-time.
Related business case(s)	WECL-PT-03

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC describes the processes of the exchange of maintenance plans from long-term until short-term planning, that affect the power flows between the transmission and distribution networks.
Complete description
An accurate definition of the maintenance plans is crucial for the operational activities of different stakeholder like consumers and grid operators. The maintenance work plans should be defined between distribution and transmission operators in an annual basis (long-term). This SUC has as objective to keep tracking the schedule of the maintenance works and update them when needed, by exchanging more detailed information during different time-frames (medium-term until close to real-time). This implementation is supported by work done in previous H2020 projects.

1.5. Key performance indicators (KPI)

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

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1.6. Use case conditions

Use case conditions	
Assumptions	
1	Network evolution planning is available (grid investments)
2	Expected evolution of the consumption available
3	Expected evolution of the generation available
Prerequisites	
1	List of foreseen maintenance work plans from DSO and TSO
2	For scenario 2 and 3 the annual maintenance plans needs to be done

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

Classification information
Relation to other use cases
WECL-PT-03
Level of depth
Prioritisation
Generic, regional or national relation
Generic
Nature of the use case
SUC
Further keywords for classification
Operational Planning, Maintenance Plans

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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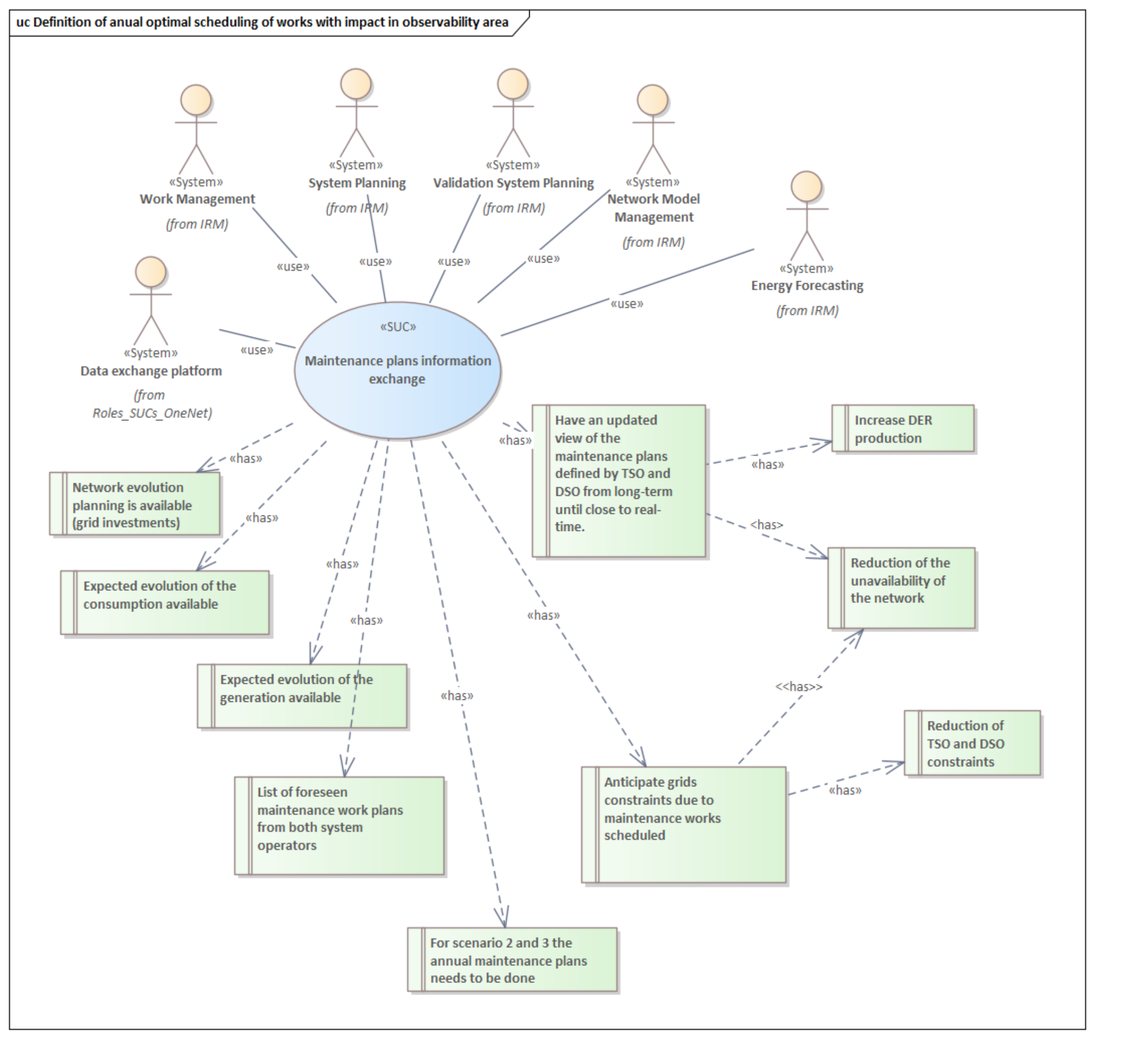

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)	***Group description***		
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Work Management	System	The Work Management (WM) business function involves the tracking of field service orders through request, schedule, dispatch, execution and completion. The focus is on efficient use of available resources to meet work requirement in regard to time and quality.	
System Planning	System	The System Planning involves network development, long term planning and maintenance planning. Supports cooperation and coordination to develop of a secure,	

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		environmentally sustainable and economic network system aimed at an adequate grid for the purpose of a well-functioning network operation and market operation. This is done through good planning with focus on future infrastructure characteristics, efficient asset management, critical infrastructure protection, system operability perspective and maintenance management.	
Data Exchange Platform	System	Platform used by several entities to exchange information for different proposes. The 3 type of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in real-time type. The exchange of information related with the markets are included in the scheduled data. Data-agnostic ICT infrastructure that enables secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	
Energy Forecasting		The Energy Forecasting business (EF) function involves the forecasting of one or more of the items consumption (load), production (primarily intermittent or price inelastic production), direct current and area inter-exchange. This also include energy forecast for intermittent or price inelastic production that is part of Distributed Energy Resources (DER).	
Network model management		The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the network grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the network grid that can be used in different analysis of the grid, including but not limited to steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, so that all analysis shares the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination.	
Validation System Planning		Corresponds to the second SO system that is the one that is responsible to assess the work programmes planned and validate their feasibility.	

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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	Year-ahead works programming	Interactions between the TSO and DSO to define the schedule of the work plans (maintenance and expansion) for the entire year.		Year-Ahead Trigger		
2	Monthly-ahead, Weekly-ahead or on event update of maintenance plans	Interactions between the TSO and DSO to update the maintenance work plans defined previously(year-ahead, monthly-ahead), with a monthly-ahead or weekly-ahead time horizon. Also addresses the process in case on an unexpected event occur close to real-time.		Monthly-Ahead Trigger, Weekly-Ahead Trigger or On event trigger		

4.2. Steps - Scenarios

Scenario #1 Year-ahead works programming

Scenario #1 Interactions between the TSO and DSO to define the schedule of the work plans (maintenance and expansion) for the entire year.

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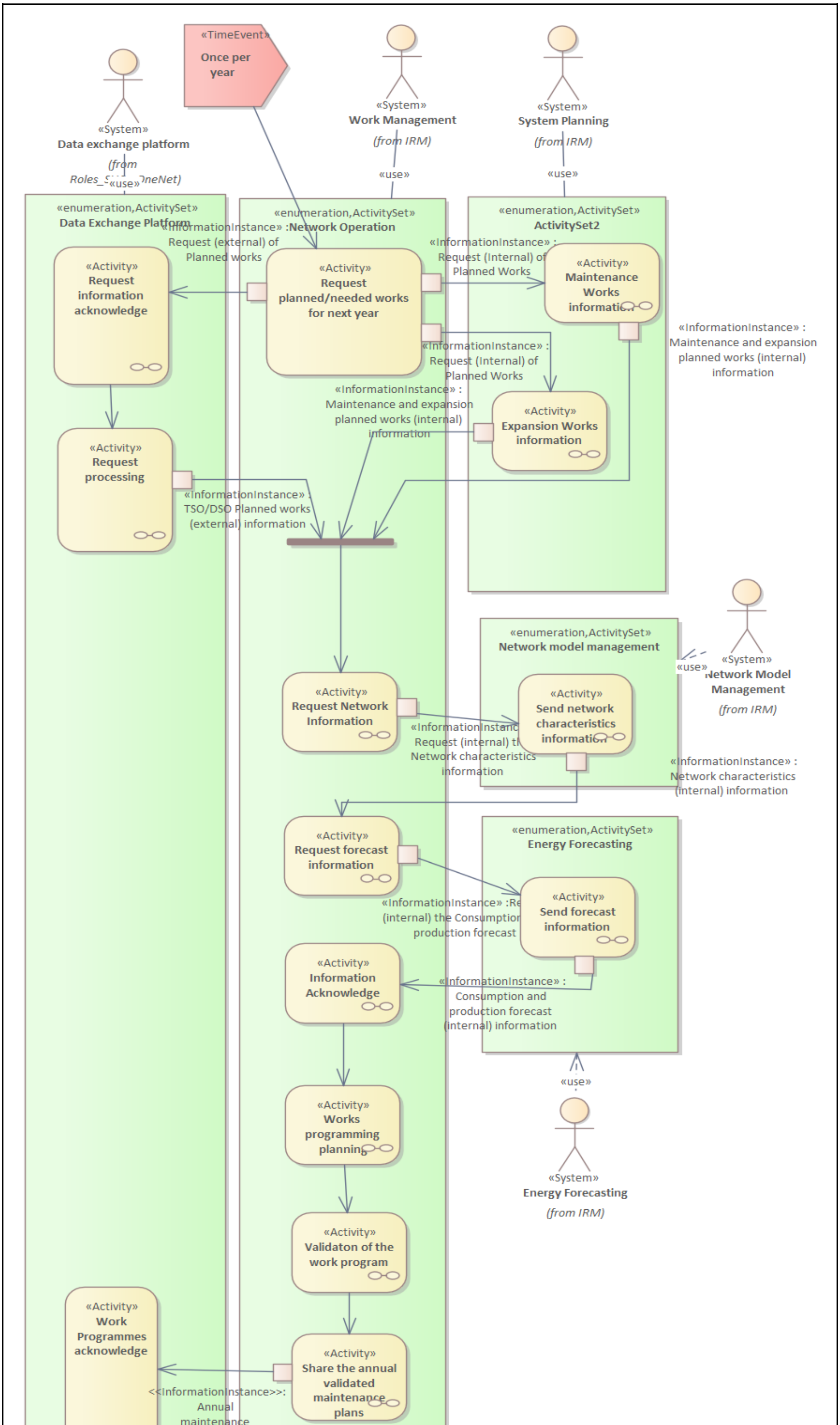

«TimeEvent»
Once per year
«System»
Data exchange platform
(from Roles_S... OneNet)
«System»
Work Management
(from IRM)
«System»
System Planning
(from IRM)
«use»
«enumeration,ActivitySet»
Data Exchange Platform
«enumeration,ActivitySet»
:Network Operation
«enumeration,ActivitySet»
ActivitySet2
«InformationInstance» :
Request (external) of Planned works
«InformationInstance» :
Request (Internal) of Planned Works
«Activity»
Request information acknowledge
«Activity»
Request planned/needed works for next year
«Activity»
Maintenance Works information
«InformationInstance» :
Maintenance and expansion planned works (internal) information
«Activity»
Expansion Works information
«Activity»
Request processing
«InformationInstance» :
TSO/DSO Planned works (external) information
«enumeration,ActivitySet»
Network model management
«System»
Network Model Management
(from IRM)
«Activity»
Request Network Information
«Activity»
Send network characteristics information
«InformationInstance» :
Network characteristics (internal) information
«enumeration,ActivitySet»
Energy Forecasting
«Activity»
Request forecast information
«Activity»
Send forecast information
«Activity»
Information Acknowledge
«InformationInstance» :
Consumption and production forecast (internal) information
«System»
Energy Forecasting
(from IRM)
«Activity»
Works programming planning
«Activity»
Validaton of the work program
«Activity»
Work Programmes acknowledge
«Activity»
Share the annual validated maintenance plans
<<InformationInstance>>:
Annual maintenance

Scenario step by step analysis

Scenario								
Scenario name	Prepare							
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		Request planned/needed works for next year	One time a year, the TSO and DSO should request the expected works to from each other that could affect them, mainly in the observability area. The System Planning should transmit the works concerning to the network expansion and the times with impact in the existing network as well as the maintenance works planned to the next year		Work Management	Data Exchange Platform	Info1- Request (external) of Planned works	
1.2		Request planned/needed works for next year	One time a year, the TSO and DSO should request the expected works to from each other that could affect them, mainly in the observability area. The System Planning should transmit the works concerning to the network expansion and the times with		Work Management	System Planning	Info2-Request(internal) of Planned works	

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			impact in the existing network as well as the maintenance works planned to the next year					
1.3		Request information acknowledge			Data exchange platform			
1.4		Request processing	The data information exchange platform should send the request to the SOs. When the information from the SOs is available, the data exchange platform should send it to the other SO, or notify him.		Data exchange platform	Work Management	Info9 – TSO/DSO Planned works (external) information	
1.5		Maintenance Works information	Send the information concerning the planned maintenance works in own network.		System Planning	Work Management	Info4-Maintenance and expansion planned works (internal) information	
1.6		Expansion works information	Send the information concerning the planned expansion works in own network.		System Planning	Work Management	Info4-Maintenance and expansion planned works (internal) information	
1.7		Request Network Information	Request the network characteristics and topology of the grid in order to assess if the maintenance plans have impact on the SO network		Work Management	Network model management	Info5-Request (internal) the Network characteristics information	
1.8		Send Network characteristics information			Network model management	Work Management	Info6-Network characteristics (internal) information	

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1.9		Request forecast information	The yearly production and consumption forecast is needed to execute the definition of yearly maintenance plan and consequent analysis by the SO.		Work Management	Energy Forecasting	Info7-Request (internal) the Consumption and production forecast	
1.10		Send Forecast information			Energy Forecasting	Work Management	Info8-Consumption and production forecast (internal) information	
1.11		Information acknowledges			Work Management			
1.12		Works programming planning	The SO should validate the works planned by the other SO. The SO should include in the programming the network expansion works needs and also integrate in the planning the works concerning the maintenance of the existing network. If the works in his own network have impact in the other SO network, the SO should request the validation of these works.		Work Management			

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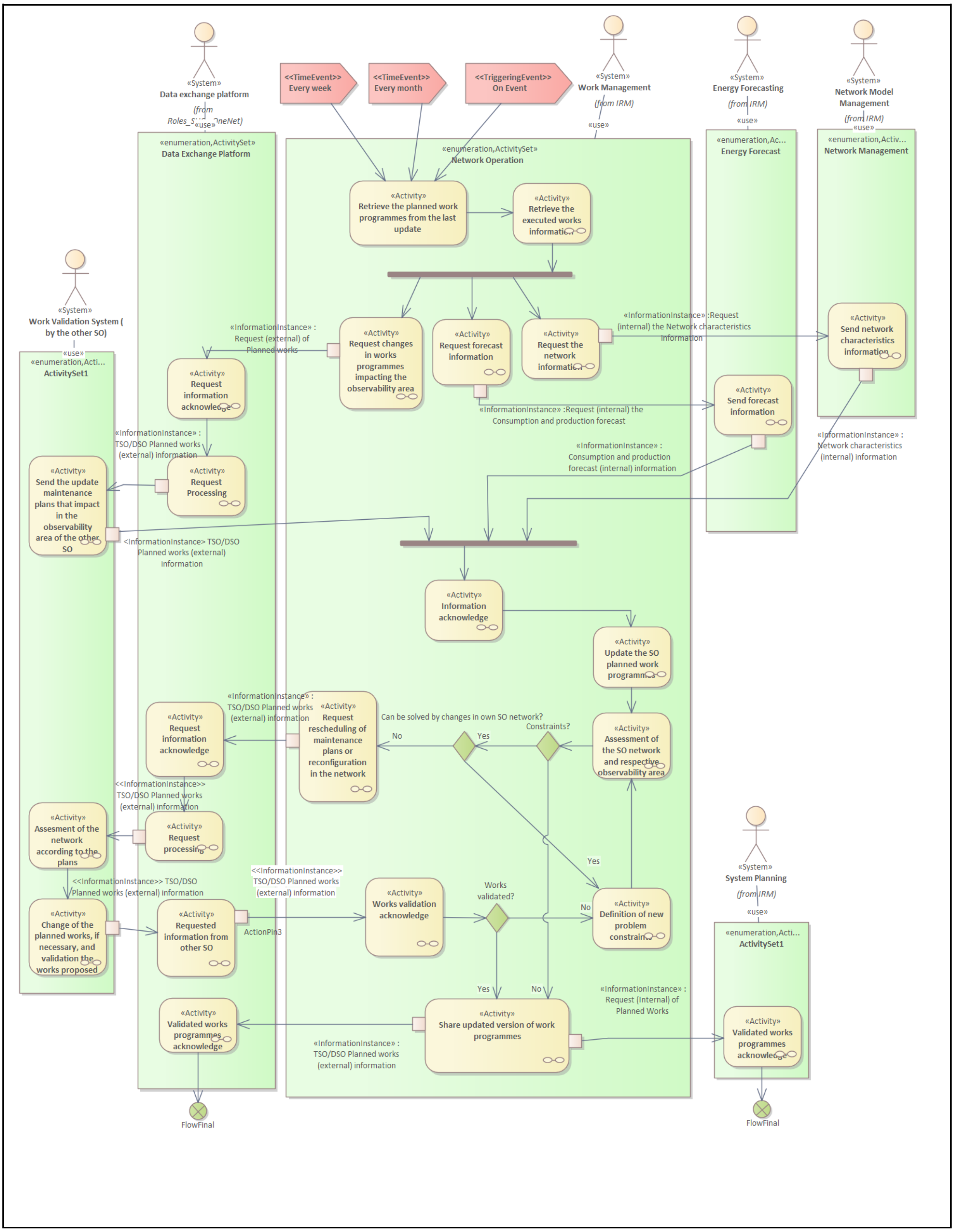
1.13		Internal validation of the work program	The SO should validate the work programmes concerning the validation of their plans for his network and respectively observability area		Work Management			
1.14		Share the annual validated maintenance plans	Send internally validated works programmes to the other SO and internal systems. If the internal works have impact in the other SO network, the first SO should also share this information.		Work Management	Data exchange platform	Info9-Annual TSO/DSO Planned works (external) information	
1.15		Work programmes acknowledge			Data exchange platform			

Scenario #2 Monthly-ahead update of maintenance plans

Scenario #2 defines the interactions between the TSO and DSO to update the maintenance work plans defined previously (year-ahead), with a monthly-ahead time horizon.



Scenario step by step analysis

Scenario	
Scenario name	Monthly-ahead, Weekly-ahead or on event update of maintenance plans

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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		Retrieve the planned work programmes from the last update	The system should retrieve the latest version of the work programmes from specific data-base.		Work Management			
2.2		Retrieve the executed works information	The information about the executed works that were made between the last update and the time of analysis should be retrieved. If new constraints exist, this information should also be included in the same data-base.		Work Management			
2.3		Request changes in works programmes impacting the observability area	The SO should request the other SO if there is any update on the maintenance plans that can affect the observability area or his own network.		Work Management	Data Exchange Platform	Info1-Request (external) of Planned works	
2.4		Request information acknowledge			Data Exchange Platform			
2.5		Request Processing	The data information exchange platform should send the request to the SOs. When the information from the SOs is available, the data exchange platform should send it to the other SO, or notify him.		Data Exchange Platform	Work Validation System		

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			The other SO should change the planned works, if necessary, and validate the works proposed by the first SO that can impact in the observability area.					
2.6		Send the update maintenance plans that impact in the observability area of the other SO	The second SO change the planned works, if necessary, and validate the works proposed by the first SO that can impact in the observability area.		Work Validation System	Data Exchange Platform		
2.7		Request forecast information ,	The respective time-horizon production and consumption forecast is needed to execute the definition of the maintenance plans and consequent analysis by the SO.		Work Management	Energy Forecasting	Info7-Request (internal) the Consumption and production forecast	
2.8		Send forecast information			Energy Forecasting	Work Management	Info8-Consumption and production forecast (internal) information	
2.9		Request the network information	Request the network characteristics and topology of the grid in order to assess if the maintenance plans have impact on the SO network		Work Management	Network model Management	Info5-Request (internal) the Network characteristics information	

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2.10		Send network characteristics information			Network model Management	Work Management	Info6-Network characteristics (internal) information	
2.11		Information acknowledge			Work Management			
2.12		Update the SO planned work programmes	The SO should update the works in his own system and observability area.		Work Management			
2.13		Assessment if the SO network and respective observability area	The time of the works and the sequence of the operation of each equipment should be defined, as well as the possible network constraints should be evaluated.		Work Management			
2.14		Request rescheduling of maintenance plans or reconfigurations in the network	When the constraints identified by the SO can only be solved by rescheduling of the works or reconfigurations in the network of the other SO, a request should be sent with the proposed modifications.		Work Management	Data Exchange Platform	Info9 – TSO/DSO Planned works (external) information	
2.15		Request information acknowledge			Data Exchange Platform			
2.16		Request processing	The data information exchange platform should send the		Data Exchange Platform	Work Validation System	Info9 – TSO/DSO Planned works	

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			request to the SOs. When the information from the SOs is available, the data exchange platform should send it to the other SO, or notify him. The other SO should change the planned works, if necessary, and validate the works proposed by the first SO that can impact in the observability area.				(external) information	
2.17		Assessment of the network according to the plans	The second SO (the one asked for changes and validation) should assess his network according to the maintenance plans proposed and potential changes or rescheduling of the works		Work Validation System			
2.18		Change of the planned works, if necessary, and validation of the work programmed	After the assessment the validation and changes in the plan (when needed) should be sent to the first SO		Work Validation System	Data Exchange Platform	Info9 – TSO/DSO Planned works (external) information	
2.19		Requested information from the other SO			Data Exchange Platform	Work Management	Info9 – TSO/DSO Planned works (external) information	
2.20		Works validation acknowledge			Work Management			

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2.21		Definition of new problem constraints	If the works were not validated, some time constraints should be considered or reconfiguration of the network		Work Management			
2.22		Share updated version of work programmes	The new schedule of the works, with daily or hourly detail, should be shared between the SOs		Work Management			
2.23		Validated works programmes acknowledge			Work Management	System Planning	Info10 – TSO/DSO Planned works (internal) information	
2.24		Validated works programmes acknowledge			Work Management	Data exchange Platform	Info9 – TSO/DSO Planned works (external) information	

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
INFO1	Request (external) of Planned works	Request of planned works with impact in the SO network. The request can be done in a specific observability area. Date Request ID Observability area ID or Bus ID	
INFO2	Request(internal) of Planned works	Request of planned works in the SO system. Date Request ID Year	

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INFO4	Maintenance and expansion planned works (internal) information	Maintenance and expansion planned works exchanged internally	
INFO5	Request (internal) the Network characteristics information	Corresponds to the network model and characteristics that has the structural information of the network. This is required to the computation process. Structural network information request: Int. Request ID Type of request Substation Transformer Feeder	
INFO6	Network characteristics (internal) information	Corresponds to the network model and characteristics that has the structural information of the network. This information is exchange between the SO owned systems Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed by several lines.	
INFO7	Request (internal) the Consumption and production forecast	The consumption and generation forecast (scheduled information) are needed by several SUCs. This BO request intends to be general for all the SUCs Request ID Type of Request Substation Transformer Feeder Start Time (day;hour;minute)	

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		End Time (day;hour;minute) The time should be done in intervals of 15 minutes.	
INFO8	Consumption and production forecast (internal) information	The consumption and generation forecast (scheduled information) should be provided by several SUC and is explored in detail in SUC 7 The time should be done in intervals of 15 minutes.	
INFO9	TSO/DSO Planned works (external) information	Jointly Work programmes information exchanged between operators	
INFO10	TSO/DSO Planned works (internal) information	Validated TSO/DSO planned works information exchanged internally	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.19 SUC-PT-07: Consumption and gen. forecast info. exchange

Consumption and generation forecast information exchange

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***
		SUC-PT-07 - Consumption and generation forecast information exchange

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
	23/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Describes the processes and the information exchange related with the forecast of consumption and generation aggregated in the interface TSO/DSO nodes, as partially described in the Business Use Cases Template (BUC 03).
Objective(s)	- Improve TSO and DSO forecast processes by taking into account each other's generation and load forecasts. - Improve programming of TSO and DSO operation activities. - Contribute to the improvement of the forecast of technical constraints.
Related business case(s)	WECL-PT-01 & WECL-PT-03

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC presents the information exchanged between TSO and DSO regarding load and generation forecast in short-term. The load and generation forecasts should be aggregated by node level in interface TSO/DSO and could be disaggregated concerning their technology/type.
Complete description
The forecast of load and generation is essential to the operational planning of network in order to ensure a secure operation of the grid and warrant the security of supply. This information can be used by the operators to foresee grid constraints. This SUC explores the exchange of this information between operators in order to improve their planning activities, in short-term. The generation forecast should be disaggregated by technology type (Solar, Wind, Hydro, CHP, among others). The load forecast can also be exchanged in a disaggregated way by distinguishing different type of consumers (residential, industrial, etc.). This information should be exchanged day-ahead between operators, having into consideration the market clearance results.

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This data exchange is to be exchanged every 24h. The data shall include the forecast the next 72h with a granularity of 15 minutes.

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	Forecast data time-span: 72 h
2	Forecast data refresh rate: 24 h
3	Forecast data granularity: 15 minutes
4	Load and generation forecasts required for the operational planning are always available.
Prerequisites	
1	The generation and load forecast is presented for HV TSO/DSO interface buses or HV buses in meshes between EHV/HV feeders
2	The observability area is defined and agreed upon between TSO and DSO
3	The DSO and TSO forecast the 72 h ahead data of the load and generation aggregated at node level for the observability area, with the generation disaggregated by technology type (wind, PV, hydro, CHP, etc.)

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

Classification information
Relation to other use cases
WECL-PT-03 - Exchange of information for operation planning SUC 02 - Day-Ahead & Intraday Flexibility needs SUC 05 - Evaluate Grid Constrains SUC 06 - Maintenance plans information exchange
Level of depth
System Use Case
Prioritisation
Generic, regional or national relation
National
Nature of the use case
System Use Case
Further keywords for classification
Forecast, Operational Planning

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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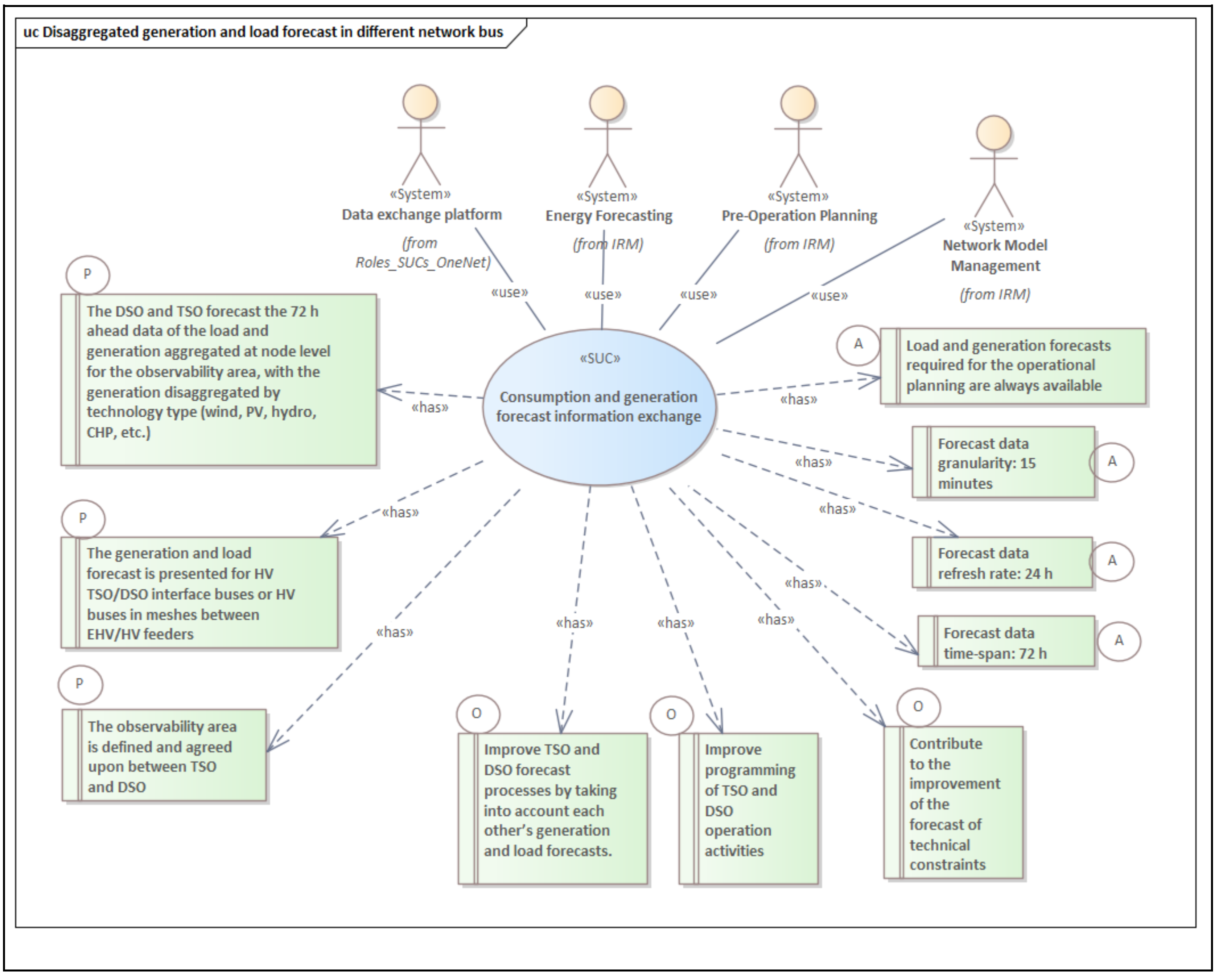

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Data exchange platform	System	Platform used by several entities to exchange information for different proposes. The 3 types of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in the real-time type. The exchange of information related with the markets are is included in the scheduled data. The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	
Pre-Operation Planning	System	The Predictive Operation Planning (POP) business function involved in forecasting the future operation situation with an acceptable level of reliability, the inclusion of what-if scenarios and risk assessment.	

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		These include the management of adequate that requires system operators and planners to take into account scheduled and reasonably expected unscheduled availability of equipment, while maintaining a constant balance between supply and demand.	
Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the power system that can be used in different analysis, including, but not limited to, steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of each SO.	
Energy Forecasting	System	The Energy Forecasting business (EF) function involves the forecasting of one or more of the items consumption (load), production (primarily intermittent or price inelastic production), direct current and area inter-exchange. This also include energy forecast for intermittent or price inelastic production that is part of Distributed Energy Resources (DER).	

3.2. References

4. Step by step analysis of use case

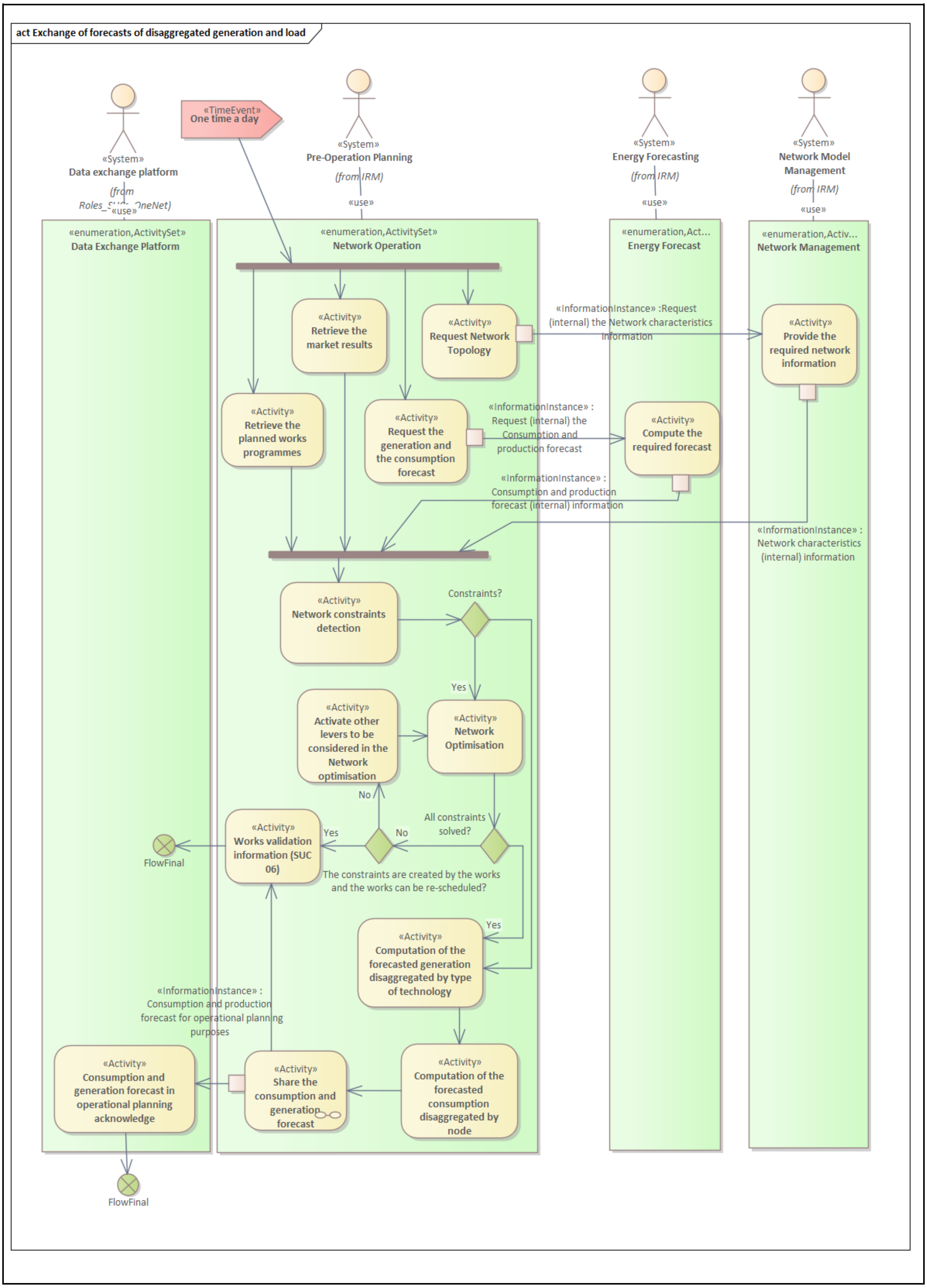
4.1. Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	Exchange forecasts of disaggregated generation and load			One time a day: every day, at a defined hour from DSO to TSO and from TSO to DSO		

4.2. Steps - Scenarios

Exchange forecasts of disaggregated generation and load

Scenario #1 description



Scenario step by step analysis

Scenario

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

Scenario name	Exchange forecasts of disaggregated generation and load							
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		Retrieve the market results	If the SGU in the observability area participate in the markets, the market results should be taken into account in the operational planning		Pre-Operation Planning			
1.2		Request Network Topology	The system should request the network information to define the aggregation of information		Pre-Operation Planning	Network Model Management	Info1-Request (internal) the Network characteristics information	
1.3		Provide the required network information			Network Model Management	Pre-Operation Planning	Info2-Network characteristics (internal) information	
1.4		Request the generation and the consumption forecast	Producers should provide the forecast of their generation. The forecast of the consumption should be done by HV/MV substation.		Pre-Operation Planning	Energy Forecasting	Info3-Request (internal) the Consumption and production forecast	
1.5		Compute the required forecast	The forecast should be computed for the next 72 hours in intervals of 15 minutes. The forecast creation process is not the main focus of the present SUC.		Energy Forecasting	Pre-Operation Planning	Info4-Consumption and production forecast (internal) information	

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1.6		Retrieve the planned works programmes	To determine the consumption and production profiles, the DSO and TSO should take into consideration the works planned (SUC 06)		Pre-Operation Planning				
1.7		Network constraints detection	Considering the consumption and production forecast, the DSO and the TSO should evaluate if some constraints can exist in their respective network.						
1.8		Network Optimisation	To avoid the forecasted constraints in operational planning, the DSO and the TSO can activate some levers. The levers available to solve the constraints can be different in each system.		Pre-Operation Planning				
1.9		Activate other levers to be considered in the network optimisation	If in the first iteration the operational constraints have not been solved, the SO can activate other levers. As an example, the SO can consider the production or consumption curtailment in SGU without curtailment contracts or in passive grid users, change		Pre-Operation Planning				

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			the contracted reactive power profile of producers, use a conservation voltage reduction lever, consider the other network reconfiguration topologies (normally the ones with human intervention needs), etc.						
1.10		Works validation information (SUC 06)	The information concerning the works validation should be provided to other SOs and internally to the different entities in the SO. If the works were not validated, the system should change the schedule of the planned works in collaboration with other entities - SUC 06.		Pre-Operation Planning				
1.11		Computation of the forecasted generation disaggregated by type of technology	The computation of the aggregated generation by technology type should be presented per TSO/DSO interface node in each observability area.		Pre-Operation Planning				
1.12		Computation of the forecasted consumption disaggregated by node	The system should aggregate the forecasts by node in each		Pre-Operation Planning				

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			observability area.					
1.13		Share the consumption and generation forecast	The final result after the levers procurement should be transmitted to the data exchange platform.		Pre-Operation Planning	Data exchange platform	Info5-Consumption and production forecast for operational planning purposes	
1.14		Consumption and generation forecast in operational planning acknowledge	The information about the forecast of load and generation per node in the observability area is transmitted to the data exchange platform by each SO and could be acknowledged the other SO.		Data exchange platform			

5. Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Request (internal) the Network characteristics information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchanged between different processes internal to the SO.	
Info2	Network characteristics (internal) information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchanged between different processes internal to the SO.	

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Info3	Request (internal) the Consumption and production forecast	The consumption and generation forecast (scheduled information) are needed by several SUCs.	
Info4	Consumption and production forecast (internal) information	The consumption and generation forecast (scheduled information) are needed by several SUCs.	
Info5	Consumption and production forecast for operational planning purposes	The consumption and generation forecast (scheduled information) should be provided by several SUCs.	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.20 SUC-PT-08: Short-circuit levels information exchange

Short-circuit levels information exchange

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*
		SUC-PT-08 - Short-circuit levels information exchange

1.2. Version management

Version management				
Version No.	*Date*	*Name of author(s)*	*Changes*	*Approval status*
	23/06/2021	E-REDES NESTER REN INESC TEC		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	Describes the short-circuit levels forecasts information exchange between TSO and DSO, for the substations EHV/HV located in interface TSO/DSO, as partially described in the Business Use Cases Template (BUC 03).
Objective(s)	- Improve TSO and DSO grid planning by taking into account each other's short-circuit contributions in the TSO/DSO interface - Improve security of operation and quality of service
Related business case(s)	WECL-PT-03

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC presents the processes and information exchanged between TSO and DSO regarding short-circuit levels (three-phase short-circuits) foreseen in the EHV/HV substations in the short-term (day-ahead).
Complete description
The short-circuit levels is one of the most important operational security parameters and for that reason is crucial to monitor it. With the increase of the DERs the grid operators have the necessity to monitor the short-circuit levels closely throughout a shorter-period (ideally daily). In the EHV/HV substations, located in the interface TSO/DSO, it is relevant to consider the active contributions for the short circuit power that comes from either transmission or distribution networks. For that reason, in this SUC is established the process to compute and exchange the complete short-circuit power in the interface nodes (EHV/HV substations) that could be used for operational planning purposes. The active contributions from transmission and distribution assets are specific and taken into consideration for the short-circuit power in different stages. The fault type under this SUC will focus only in the three-phase symmetrical short-circuit transient. For the day-ahead forecast of the short-circuit level in the interface, firstly TSO computes the short-circuit power only considering the contributions from its grid. Then these values are exchanged with the DSO in order to complete the final value of the short-circuit power for each EHV/HV substation, by

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adding the contribution from the distribution assets to it. The process finishes when both operators have the final value for the short-circuit levels in the TSO/DSO interface. Independently of the different topological arrangements of each country, the calculation of the short-circuit powers should follow a similar approach that is proposed in 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	
1	Only three-phase symmetrical short-circuit transient will be analysed
2	Time-span: 24 hours
3	Refresh-rate: 24 hours
4	Granularity of 30 minutes
Prerequisites	
1	The automatic structure and method for calculating the short-circuit power should be used: an automatic structure and method for calculating the short-circuit power should be developed and integrated into the pre-operational planning of the SOs to improve the efficiency of the process

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

Classification information
Relation to other use cases
WECL-PT-03
Level of depth
Prioritisation
High
Generic, regional or national relation
Generic
Nature of the use case
SUC
Further keywords for classification
Operational Planning, Short-Circuit Power

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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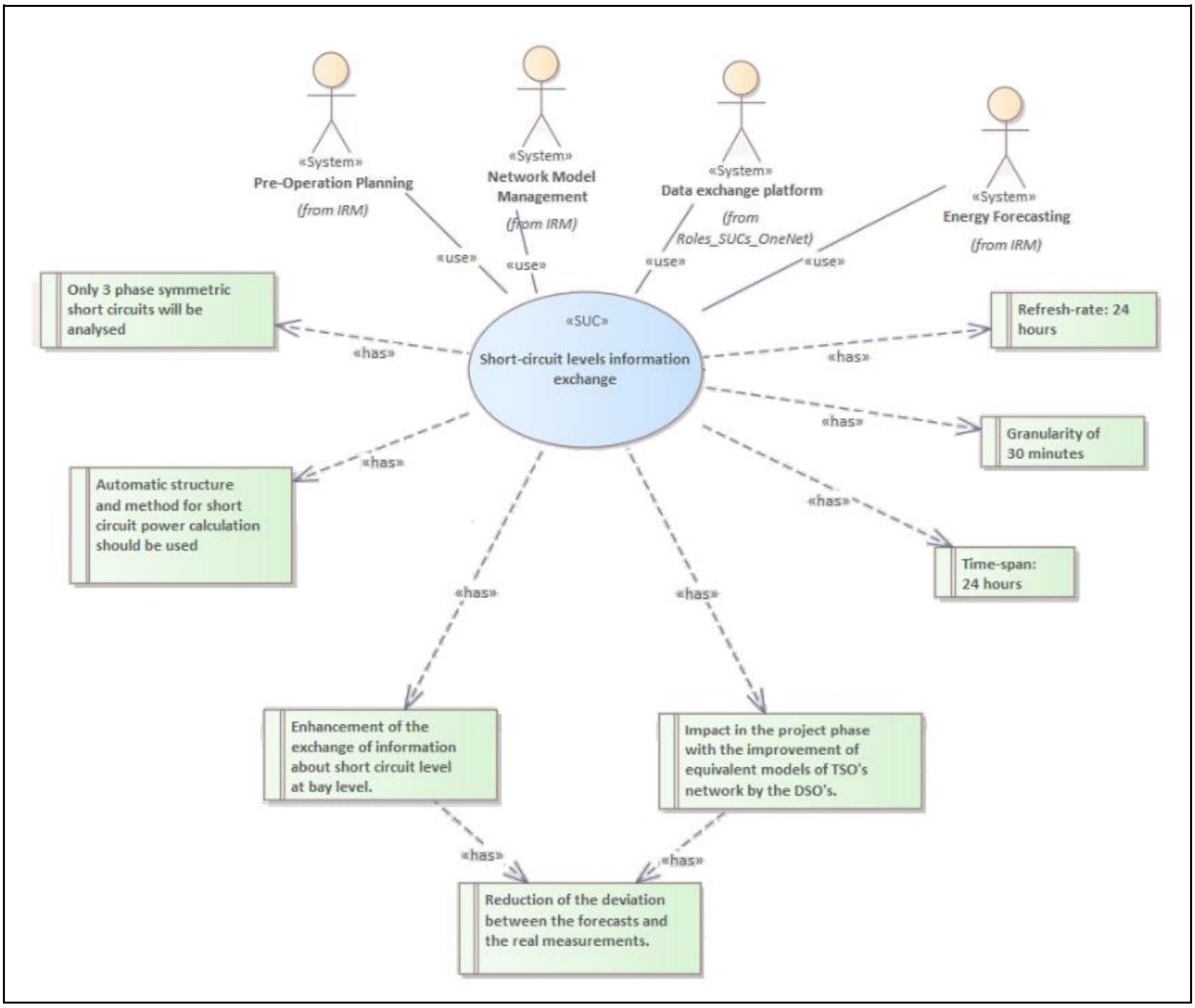

3. Technical details

3.1. Actors

Actors			
Grouping (e.g. domains, zones)	***Group description***		
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the network grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the network grid that can be used in different analysis of the grid, including but not limited to steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, so that all analysis shares the same source information.	

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		Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of each SO.	
Energy Forecasting	System	The Energy Forecasting business (EF) function involves the forecasting of one or more of the items consumption (load), production (primarily intermittent or price inelastic production), direct current and area inter-exchange. This also include energy forecast for intermittent or price inelastic production that is part of Distributed Energy Resources (DER).	
Data exchange platform	System	Platform used by several entities to exchange information for different proposes. The 3 type of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in real-time type. The exchange of information related with the markets are included in the scheduled data. Data-agnostic ICT infrastructure that enables secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	
Pre-Operation Planning	System	The Predictive Operation Planning (POP) business function involved in forecasting future operation situation with an acceptable level of reliability, the inclusion of what-if scenarios and risk assessment. This include the management of adequate that requires system operators and planners to take into account scheduled and reasonably expected unscheduled availability of equipment, while maintaining a constant balance between supply and demand.	

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	Short-circuit power definition at bay level considering TSO information	In this scenario only the information provided by the TSO is used to determine the short-circuit power. This information is obtained based on the EHV/HV transmission system and on the producers, connected to these networks.		1 time a day		
2	Short-circuit power definition at bay level considering TSO and DSO information	In this scenario the information provided by the TSO and by DSO is used to determine the short-circuit power. In a first step the TSO provide the short-circuit power information based on the EHV/HV transmission system and on the producers connected to these networks. Using the TSO		1 time a day		

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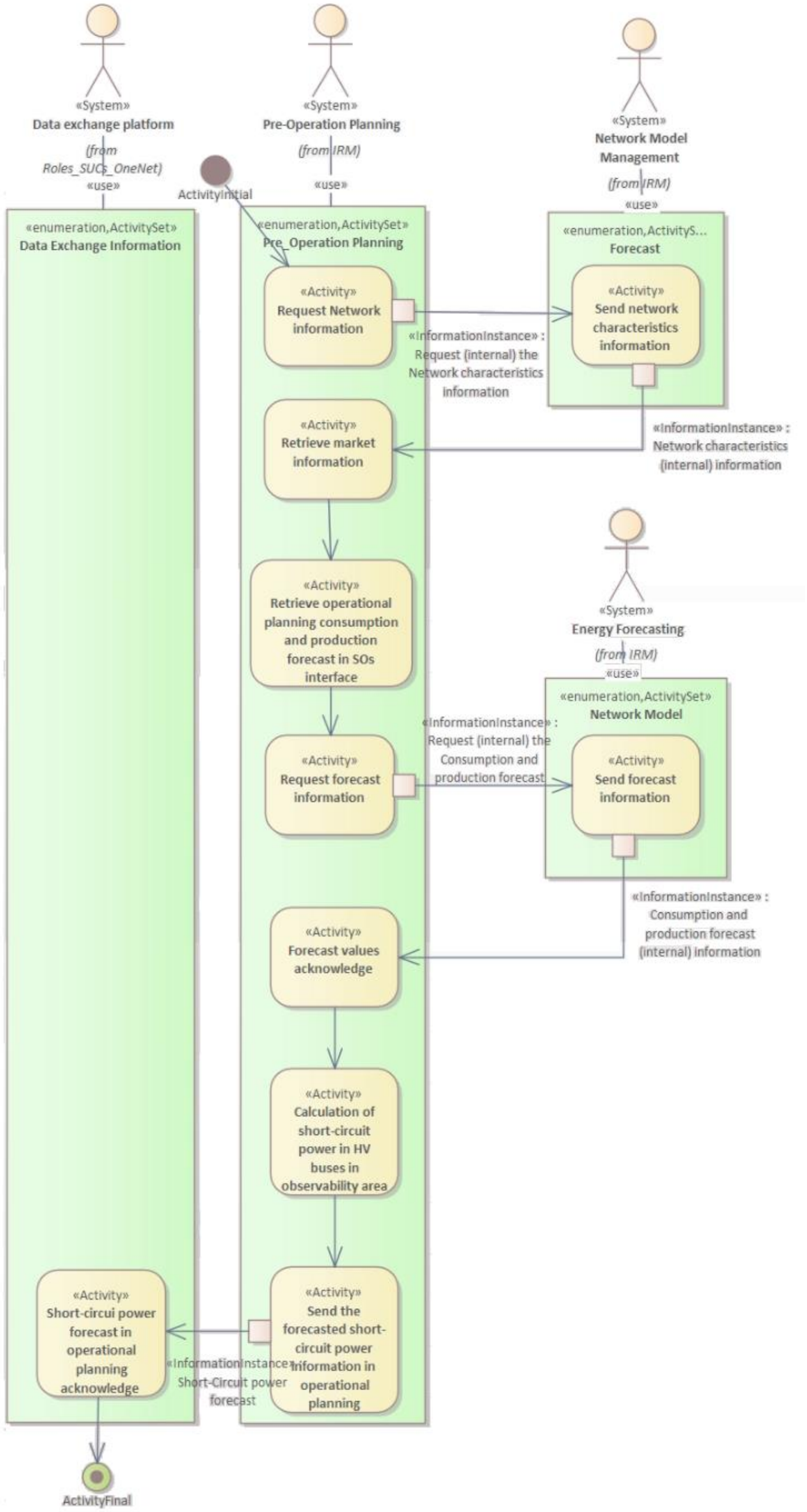
		information, the DSO compute the short-circuit power also considering the impact of the DER, connected to distribution network.				

4.2. Steps - Scenarios

4.2.1. Short-circuit power definition at bay level considering TSO information

In this scenario only the information provided by the TSO is used to determine the short-circuit power. This information is obtained based on the EHV/HV transmission system and on the producers, connected to these networks.



«System»
Data exchange platform
(from Roles_SUCs_OneNet)
«use»
«System»
Pre-Operation Planning
(from IRM)
«use»
«System»
Network Model Management
(from IRM)
«use»
ActivityInitial
«enumeration,ActivitySet»
Data Exchange Information
«enumeration,ActivitySet»
Pre_Operation Planning
«enumeration,ActivityS...
Forecast
«Activity»
Request Network information
«InformationInstance» : Request (internal) the Network characteristics information
«Activity»
Send network characteristics information
«Activity»
Retrieve market information
«InformationInstance» : Network characteristics (internal) information
«Activity»
Retrieve operational planning consumption and production forecast in SOs interface
«System»
Energy Forecasting
(from IRM)
«use»
«enumeration,ActivitySet»
Network Model
«InformationInstance» : Request (internal) the Consumption and production forecast
«Activity»
Request forecast information
«Activity»
Send forecast information
«InformationInstance» : Consumption and production forecast (internal) information
«Activity»
Forecast values acknowledge
«Activity»
Calculation of short-circuit power in HV buses in observability area
«Activity»
Short-circui power forecast in operational planning acknowledge
«Activity»
Send the forecasted short-circuit power information in operational planning
«InformationInstance» : Short-Circuit power forecast
ActivityFinal

Scenario step by step analysis

Scenario								
Scenario name	Short-circuit power definition at bay level considering TSO information							
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		Request Network information	Request the network characteristics		Pre-Operation Planning	Network Model Management	Info1-Request (internal) the Network characteristics information	
1.2		Send network characteristics information			Network Model Management	Pre-Operation Planning	Info2-Network characteristics (internal) information	
1.3		Retrieve market information	This process should be executed after the day-ahead market. The market results should be available and use in this process.		Pre-Operation Planning			
1.4		Retrieve operational planning consumption and production forecast in SOs interface	The consumption and production forecast information provided in operational planning by the SOs (TSOs and DSOs) should be take into account in the method.		Pre-Operation Planning			
1.5		Request forecast information	The production and consumption forecast is needed to execute the method. The information should be provided by technology. Some quantiles can be		Pre-Operation Planning	Energy Forecasting	Info3-Request (internal) the Consumption and production forecast	

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			provided if stochastic methods are used						
1.6		Send forecast information	Send requested information		Energy Forecasting	Pre-Operation Planning	Info4-Consumption and production forecast (internal) information		
1.7		Forecast values acknowledge			Pre-Operation Planning				
1.8		Calculation of short-circuit power in HV buses in observability area			Pre-Operation Planning				
1.9		Send the forecasted short-circuit power information in operational planning	The SOs should send the information of the forecast short-circuit power for the 24 of the next day		Pre-Operation Planning	Data exchange platform	Info5-Short-Circuit power forecast		
1.10		Short-circuit power forecast in operational planning acknowledge			Data exchange platform				

4.2.2. Short-circuit power definition at bay level considering TSO and DSO information

In this scenario the information provided by the TSO and by DSO is used to determine the short-circuit power. In a first step the TSO provide the short-circuit power information based on the EHV/HV transmission system and on the producers connected to these networks.
Using the TSO information, the DSO compute the short-circuit power also considering the impact of the DER, connected to distribution network.

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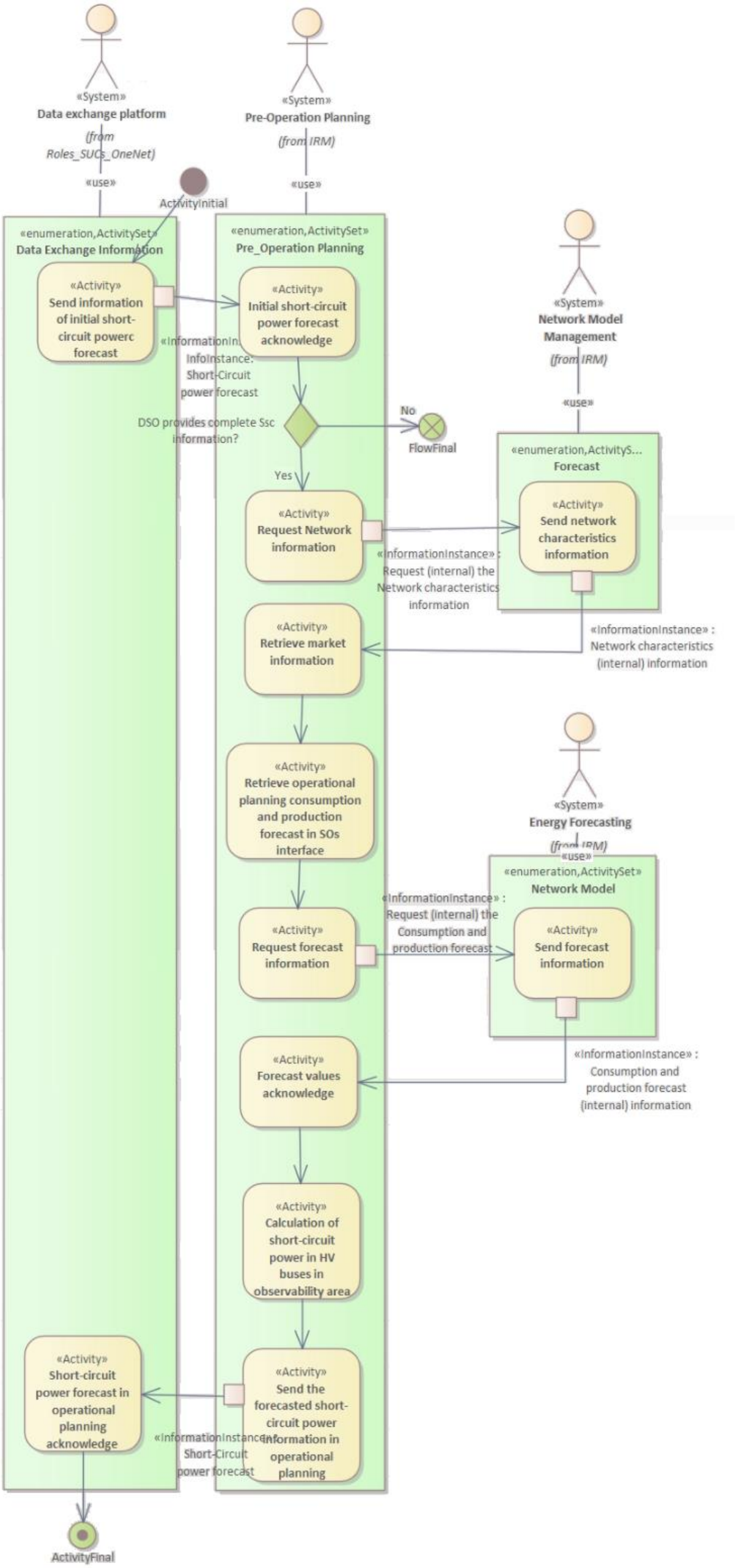

«System»
Data exchange platform
(from Roles_SUCs_OneNet)
«use»
ActivityInitial
«System»
Pre-Operation Planning
(from IRM)
«use»
«enumeration,ActivitySet»
Data Exchange Information
«Activity»
Send information of initial short-circuit powerc forecast
«enumeration,ActivitySet»
Pre_Operation Planning
«Activity»
Initial short-circuit power forecast acknowledge
«InformationIn... InfoInstance: Short-Circuit power forecast
DSO provides complete Ssc information?
No
FlowFinal
Yes
«System»
Network Model Management
(from IRM)
«use»
«enumeration,ActivityS...
Forecast
«Activity»
Request Network information
«Activity»
Send network characteristics information
«InformationInstance» : Request (internal) the Network characteristics information
«Activity»
Retrieve market information
«InformationInstance» : Network characteristics (internal) information
«Activity»
Retrieve operational planning consumption and production forecast in SOs interface
«System»
Energy Forecasting
(from IRM)
«use»
«enumeration,ActivitySet»
Network Model
«Activity»
Request forecast information
«InformationInstance» : Request (internal) the Consumption and production forecast
«Activity»
Send forecast information
«Activity»
Forecast values acknowledge
«InformationInstance» : Consumption and production forecast (internal) information
«Activity»
Calculation of short-circuit power in HV buses in observability area
«Activity»
Short-circuit power forecast in operational planning acknowledge
«Activity»
Send the forecasted short-circuit power information in operational planning
«InformationInstance» Short-Circuit power forecast
ActivityFinal

Scenario step by step analysis

Scenario								
Scenario name	Short-circuit power definition at bay level considering TSO and DSO information							
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		Send information of initial short-circuit power forecast	The data information platform should transmit the information of initial short-circuit power provided by the amount SOs		Data exchange platform	Pre-Operation Planning	Info5-Short-Circuit power forecast	
2.2		Initial short-circuit power forecast acknowledge			Pre-Operation Planning			
2.3		Request Network information	Request the network characteristics		Pre-Operation Planning	Network Model Management	Info1-Request (internal) the Network characteristics information	
2.4		Send network characteristics information			Network Model Management	Pre-Operation Planning	Info2-Network characteristics (internal) information	
2.5		Retrieve market information	This process should be executed after the day-ahead market. The market results should be available and use in this process.		Pre-Operation Planning			
2.6		Retrieve operational planning consumption and production forecast in SOs interface	The consumption and production forecast information provided in operational planning by the SOs (TSOs and DSOs) should be take into account in the method.		Pre-Operation Planning			

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2.7		Request forecast information	The production and consumption forecast is needed to execute the method. The information should be provided by technology. Some quantiles can be provided if stochastic methods are used		Pre-Operation Planning	Energy Forecasting	Info3-Request (internal) the Consumption and production forecast		
2.8		Send forecast information	Send requested information		Energy Forecasting	Pre-Operation Planning	Info4-Consumption and production forecast (internal) information		
2.9		Forecast values acknowledge			Pre-Operation Planning				
2.10		Calculation of short-circuit power in HV buses in observability area			Pre-Operation Planning				
2.11		Send the forecasted short-circuit power information in operational planning	The SOs should send the information of the forecast short-circuit power for the 24 of the next day		Pre-Operation Planning	Data exchange platform	Info5-Short-Circuit power forecast		
2.12		Short-circuit power forecast in operational planning acknowledge			Data exchange platform				

5. Information exchanged

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

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Info1	Request (internal) the Network characteristics information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between the DSO owned systems	
Info2	Network characteristics (internal) information	The structural information of the network (lines) characteristics are required to the computation process. This information is exchange between the DSO owned systems	
Info3	Request (internal) the Consumption and production forecast	The consumption and generation forecast (scheduled information) are needed by several SUCs. This BO request intends to be general for all the SUCs	
Info4	Consumption and production forecast (internal) information	The consumption and generation forecast (scheduled information) should be provided by several SUCs.	
Info5	Short-Circuit power forecast	Exchange of short-circuit power in each node in the observability area.	

6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.21 SUC-ES-01: Local Market Platform

SUC-ES-01 – Local Market Platform

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***
SUC-ES-01	Local congestion management	Local Market Platform

1.2. Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
1.0	21/06/2021	Comillas, i-DE, UFD, OMIE		

1.3. Scope and objectives of use case

Scope and objectives of use case	
Scope	This SUC describes the Local Market Platform, a system responsible for receiving the DSO needs on market sessions for flexibility procurement, the bids from FSPs, for the market clearing and for the communication of market results to different stakeholders.
Objective(s)	- Enable local flexibility procurement by DSOs - Open market sessions at the request of the DSO - Collect bids from market participants - Clear the local flexibility markets - Communicate market results to stakeholders
Related business case(s)	WECL-ES-01 and WECL-ES-02

1.4. Narrative of Use Case

Narrative of use case
Short description
This SUC describes the Local Market Platform, a system responsible for receiving the DSO needs on market sessions for flexibility procurement, the bids from FSPs, for the market clearing and for the communication of market results to different stakeholders. The market platform will be the main information exchange enabler and will also act as a Flexibility Resource Register, as proposed by the Active System Management (ASM) report [1].
Complete description
The Local Market Platform will be operated by the Independent Market Operator, and will serve as the interface for the different market participants as well as for clearing the different market. This system use case starts with the request from the DSO for a market session. This request, as well as the rest of the SUC, are product agnostic, meaning that it applies to all products described in the two BUCs. Three scenarios are defined for this SUC, namely (i) flexibility resource register, (ii) market request, (iii) market session. **Scenarios**: 16. **Flexibility Resource Register:**

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In this scenario, the FSP applicants will be able to request to be allowed to participate in market sessions, follow up the pre-qualification process, and update their information whenever needed. This scenario will also serve as a global register of flexibility resources to DSOs and to the IMO. These registers will provide information for the following scenarios (e.g. location, type of DER etc), and will be used in process such as the qualification and the settlement.

17. Market Request:

This scenario describes how the market platform will enable and handle a market session request by the DSO. It involves the interface in which the DSO may request a market session, the notification to the IMO, the validation process, the registration and the final notification to market participants. Within this scenario, differences may exist depending on the products that will be trades (e.g. long or short-term, availability or activation), which are highlighted in the step-by-step analysis.

18. Market Session:

The market session scenario describes the activities comprised between the notification of an open market session to the publication of market results. Therefore, it can be divided into three macro processes, namely the (i) qualification, (ii) the negotiation period, and (iii) the market clearing and results.

In this scenario, the Local Market Platform also interacts with the OneNet System by publishing the market results on a certain periodicity. Market results are collected and published onto the OneNet System every n hours or daily. The objective of this interaction is to make other SOs aware of activations in case those activations can impact in their operations (e.g. activations of units near the border between two SOs).

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	-Collect bids from market participants -Clear the local flexibility markets
2	ICT Cost	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.	-Enable local flexibility procurement by DSO -Open market sessions -Clear the local flexibility markets -Communicate market results
3	Available flexibility	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.	-Enable local flexibility procurement by DSOs -Open market sessions

1.6. Use case conditions

Use case conditions
Assumptions

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The DSO is allowed to use flexibility solutions to defer/eliminate traditional capital investments where they are appropriate and cost-effective and 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
Communication infrastructure between DSOs, FSPs, IMO and the Market Platform should be in place FSP engagement

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

Classification information
Relation to other use cases
WECL-ES-01; WECL-ES-02
Level of depth
Generic
Prioritisation
High priority
Generic, regional or national relation
National?
Nature of the use case
System Use Case
Further keywords for classification
Local Market Platform, Local congestion management

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case

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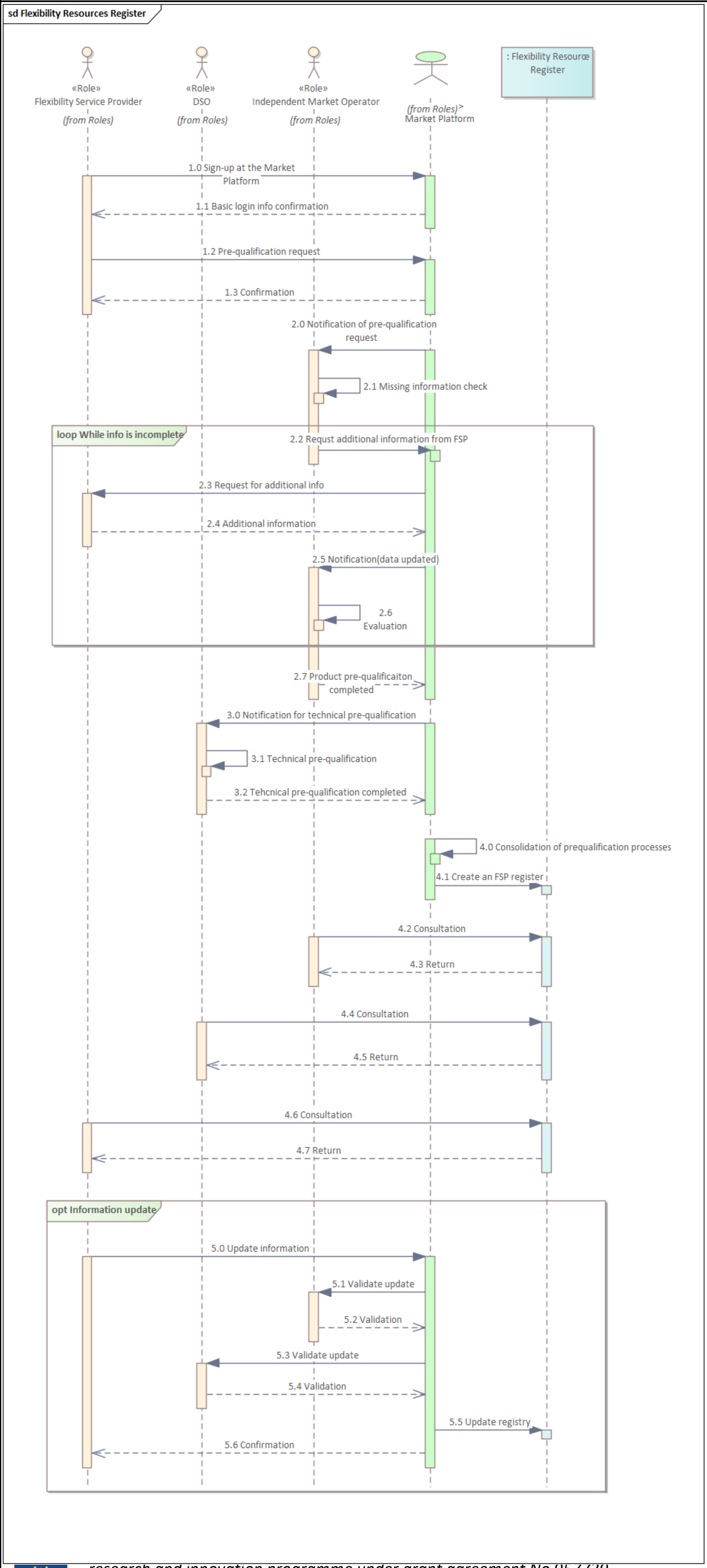
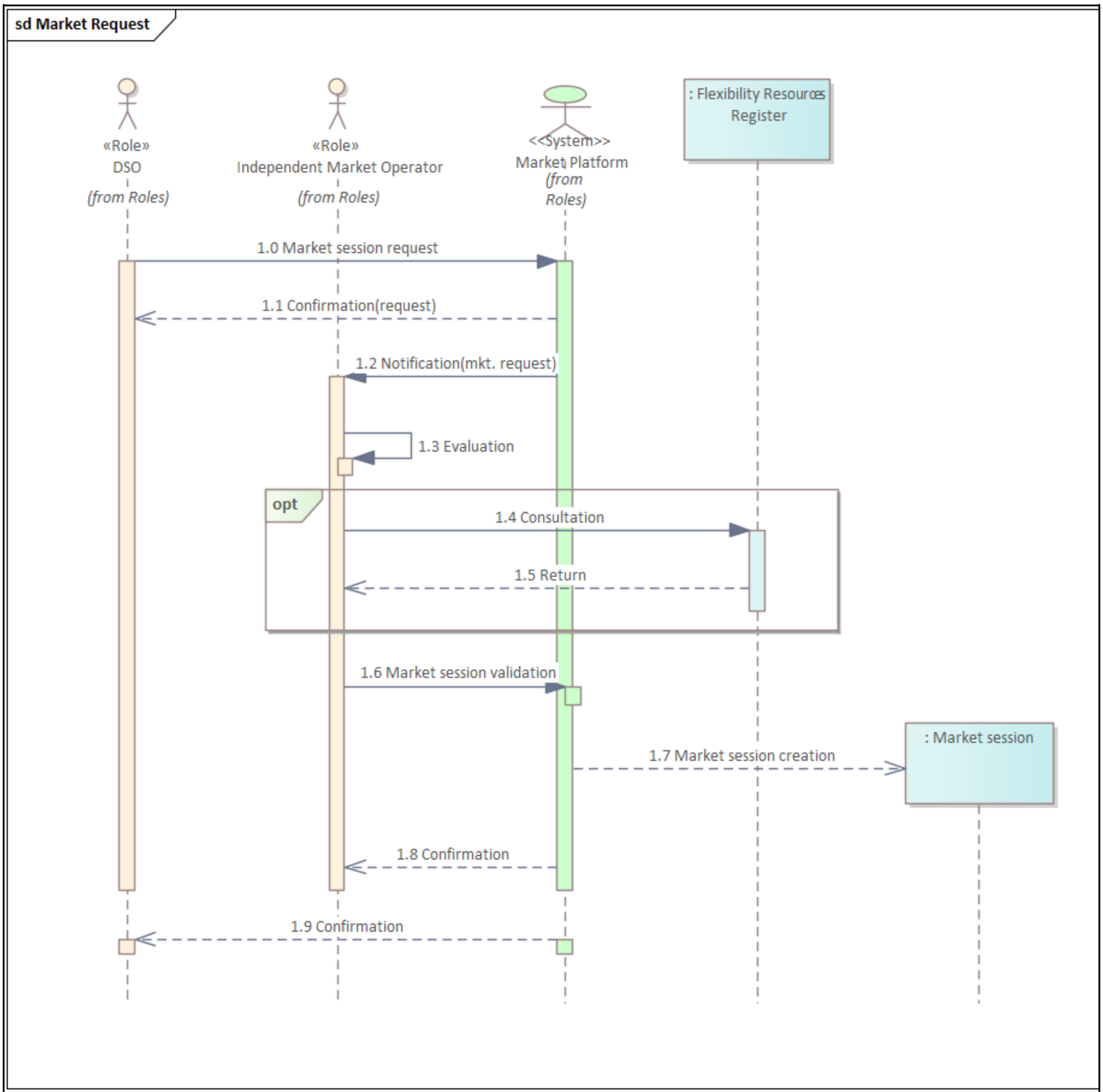

sd Flexibility Resources Register
«Role»
Flexibility Service Provider
(from Roles)
«Role»
DSO
(from Roles)
«Role»
Independent Market Operator
(from Roles)
(from Roles)
Market Platform
: Flexibility Resource Register
1.0 Sign-up at the Market Platform
1.1 Basic login info confirmation
1.2 Pre-qualification request
1.3 Confirmation
2.0 Notification of pre-qualification request
2.1 Missing information check
loop While info is incomplete
2.2 Requst additional information from FSP
2.3 Request for additional info
2.4 Additional information
2.5 Notification(data updated)
2.6 Evaluation
2.7 Product pre-qualificaiton completed
3.0 Notification for technical pre-qualification
3.1 Technical pre-qualification
3.2 Tehcnical pre-qualification completed
4.0 Consolidation of prequalification processes
4.1 Create an FSP register
4.2 Consultation
4.3 Return
4.4 Consultation
4.5 Return
4.6 Consultation
4.7 Return
opt Information update
5.0 Update information
5.1 Validate update
5.2 Validation
5.3 Validate update
5.4 Validation
5.5 Update registry
5.6 Confirmation



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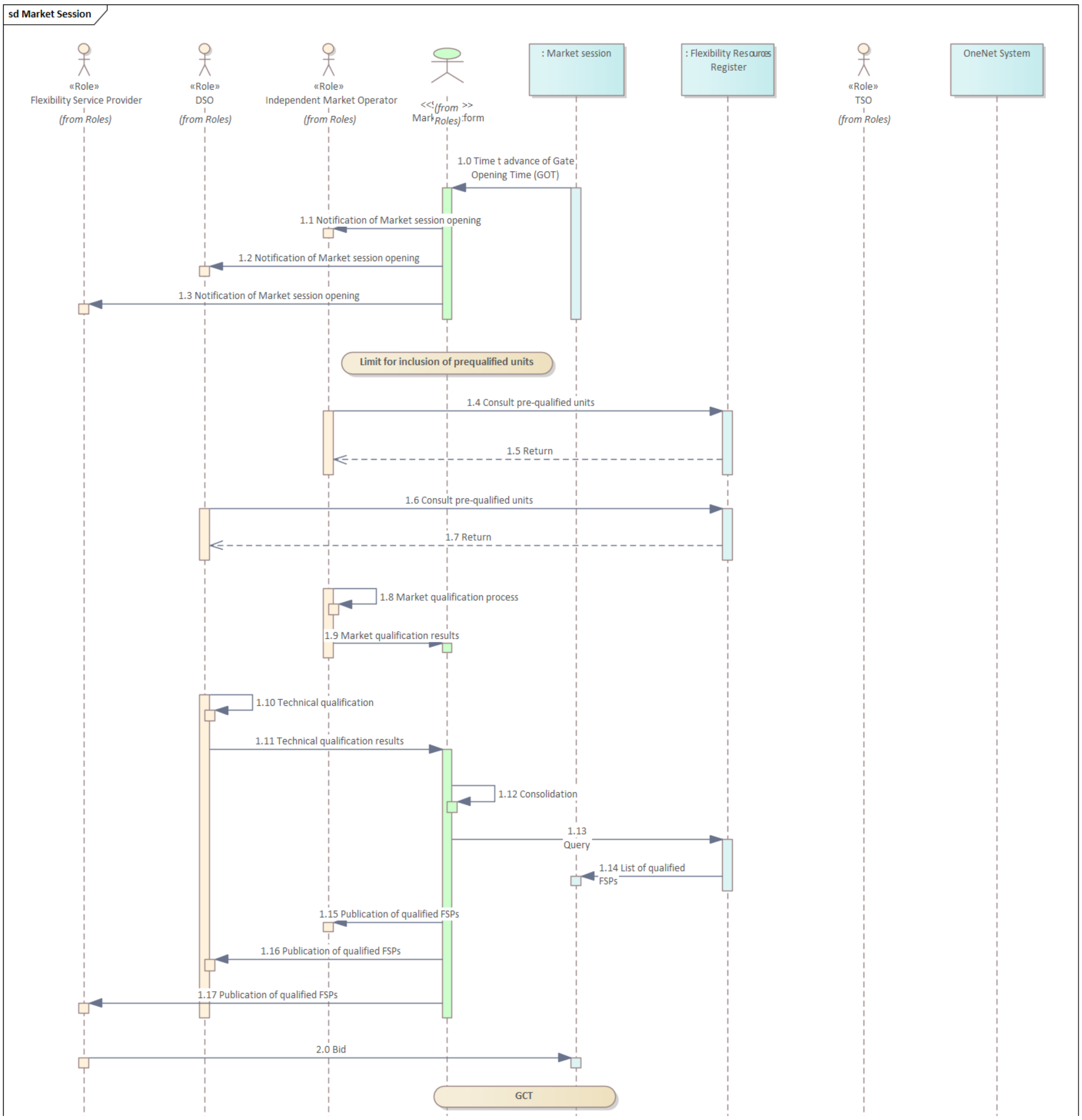
Market session - Part 1



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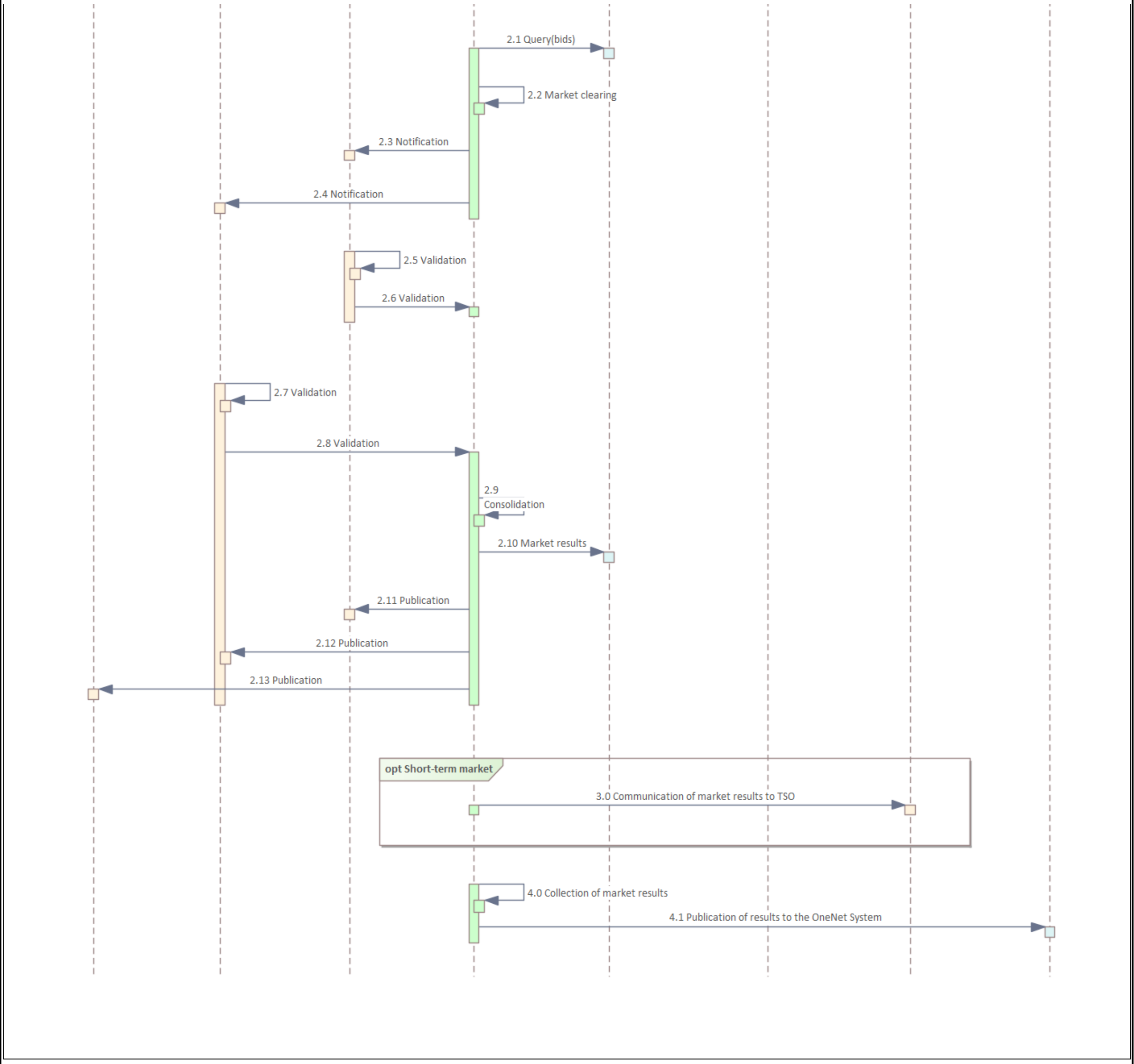
Market session - Part 2



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*

Market Platform	System	System designed to act as the flexibility resources register, the enabler for information exchange among market participants, and to clear market sessions	
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". Moreover, the DSO is responsible for connection of all grid users at the distribution level.	
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.	
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.	
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.	
OneNet System	System	Pan-European information exchange proposed by the OneNet project.	

3.2. References

[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	Flexibility Resource Register	Register of FSPs able to provide the different flexibility products. Includes the information exchange during the pre-qualification process, and registration once it is finished, and the maintenance of the	Market Platform	The reception of a pre-qualification request by an applicant FSP	The Market Platform should be up and running. Necessary communications with DSOs, FSPs and IMO should also be operational.	The FSP has a register in the market platform containing the necessary information requested during the pre-qualification process

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		register for the period in which the FSP is active.				
2	Market Request	This scenario describes how the market platform will enable and handle a market session request by the DSO.	Market Platform	A market session request is registered in the platform	The Market Platform should be up and running. Necessary communications with DSO and IMO should also be operational.	A market session is validated, registered and communicated to market participants
3	Market Session	The market session scenario describes the activities comprised between the notification of an open market session to the publication of market results.	Market Platform	The Gate Opening Time of a market session.	A market session has been created. The market platform is up and running.	A market session is cleared and results are communicated to market participants.

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4.2. Steps - Scenarios

Flexibility Resource Register

Scenario #1 description

Register of FSPs able to provide the different flexibility products. Includes the information exchange during the pre-qualification process, and registration once it is finished, and the maintenance of the register for the period in which the FSP is active.

Scenario step by step analysis

Scenario name	Flexibility Resource Register

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 sign-up to the LMP	Sign-up at the Market Platform	The FSP opens the Local Market Platform front-end and signs up	CREATE	FSP	LMP	I.E.01	
1.1	LMP validates new account	Basic login info confirmation	The FSP receives a confirmation of the creation of new account. Email/phone validations may be included	REPORT	LMP	FSP	I.E.01	
1.2	FSP requests to be pre-qualified	Pre-qualification request	The FSP opens the Local Market Platform front-end, signs in, and requests to have its resources pre-qualified.	CREATE	FSP	LMP	I.E.02 I.E.03 I.E.04	
1.3	LMP sends a confirmation that the pre-qualification request was made	Confirmation	LMP sends a confirmation that the pre-qualification request was made	REPORT	LMP	FSP		
2.0	LMP notifies the IMO that a	Notification of pre-	The IMO is informed about the	REPORT	LMP	IMO		

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	pre-qualification was requested	qualification request	request for a pre-qualification.					
2.1	IMO checks if information is missing	Missing information check	Process also defined in step 1.1 of the BUCs WECL-ES-01 and WECL-ES-02.	EXECUTE	IMO	IMO		
2.2	IMO registers at the LMP that additional information is necessary	Request additional information from FSP	IMO registers at the LMP that additional information is necessary	CREATE	IMO	LMP		
2.3	LMP notifies FSP that additional information is required	Request for additional info	LMP notifies FSP that additional information is required.	REPORT	LMP	FSP		
2.4	FSP provides the requested information	Additional information	FSP login to the platform and provides the requested information	CHANGE	FSP	LMP		
2.5	LMP notifies the IMO that the data on the pre-qualification request was updated	Notification (data update)	LMP notifies the IMO that the data on the prequalification request was updated	REPORT	LMP	IMO		
2.6	IMO evaluates if pre-qualification data is complete	Evaluation	IMO checks if pre-qualification data is complete. If pre-qualification request is still incomplete, GOTO step 2.2. If information is complete, IMO	EXECUTE	IMO	IMO		

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			concludes the product pre-qualification.					
2.7	IMO registers the successful resource pre-qualification to the LMP	Product pre-qualification completed	IMO registers the successful resources pre-qualification to the LMP	CREATE	IMO	LMP		
3.0	The LMP informs the DSO that a technical pre-qualification was requested	Notification for technical pre-qualification	The LMP informs the DSO that a technical pre-qualification was requested	REPORT	LMP	DSO		
3.1	The DSO conducts the technical pre-qualification process	Technical pre-qualification	This step is defined in steps 2.0 to 2.6 of the BUCs WECL-ES-01 and WECL-ES-02.	EXECUTE	DSO	DSO, FSP		
3.2	DSO concludes technical pre-qualification and registers the information into the LMP	Technical pre-qualification concluded	The DSO concludes technical pre-qualification and registers the information into the LMP	CREATE	DSO	LMP		
4.0	The LMP automatically consolidates the pre-qualification results	Consolidation of pre-qualification results	The LMP automatically consolidates the pre-qualification results	EXECUTE	LMP	LMP		
4.1	The LMP creates an FSP register on the Flexibility Resources Register	Create an FSP register	The LMP creates an FSP register on the Flexibility Resources Register	CREATE	LMP	LMP: Flexibility Resources Register		

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4.2; 4.4; 4.6;	IMO, DSO and FSP are able to consult the register at the Flexibility Resources Register	Consultation	IMO, DSO and FSP are able to consult the register at the Flexibility Resources Register, in case information regarding the FSP has to be confirmed.	GET	IMO; DSO; FSP	LMP: Flexibility Resources Register		
4.3; 4.5; 4.7	The LMP returns the consultation	Return	The LMP returns the consultation	REPORT	LMP: Flexibility Resources Register	IMO; DSO; FSP		
5.0;	The FSP updates information	Update information	The FSP updates information	CHANGE	FSP	LMP		
5.1; 5.2; 5.3; 5.4	The IMO and the DSO validate the update	Update validation	The IMO and the DSO validate the update	EXECUTE; REPORT	IMO; DSO	LMP		
5.5	The LMP updates the Flexibility registry	Update registry	The LMP updates the Flexibility registry	REPORT	LMP	LMP: Flexibility Resources Register		
5.6	The LMP confirms the update	Confirmation	The LMP confirms the update	REPORT	LMP	FSP		

Market Request

Scenario #2 description

This scenario describes how the market platform will enable and handle a market session request by the DSO.

Scenario step by step analysis

Scenario								
Scenario name	Market Request							
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 requests the	Market session request	The DSO requests the creation of a	CREATE	DSO	LMP	I.E.05; I.E.06	

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	creation of a Market Session		Market Session					
1.1	The LMP sends a confirmation that the market session was requested	Confirmation(request)	The LMP sends a confirmation that the market session was requested	REPORT	LMP	DSO		
1.2	The IMO is notified that a market session was requested	Notification (market request)	The IMO is notified that a market session was requested (e.g. by email)	REPORT	LMP	IMO		
1.3	The IMO evaluates if the requested market session is valid	Evaluation	The IMO evaluates if the requested market session is valid. This evaluation is, in principle, automatic	EXECUTE	IMO	IMO		
1.4	The IMO may consult the Flexible Resources Registry in order to evaluate the market session request	Consultation	The IMO may consult the Flexible Resources Registry in order to evaluate the market session request. This consultation is optional, and done in case the evaluation has to be carried out manually	GET	IMO	LMP: Flexibility Resources Registry		
1.5	The LMP returns the consultation	Return	The LMP returns the consultation	REPORT	LMP	IMO		
1.6	The IMO validates the market	Market session validation and defined in a date of the auction	The IMO validates the market session and	EXCUTE; CREATE	IMO	LMP		

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	session and registers it into the LMP	calendar (previously defined by the IMO)	registers it into the LMP					
1.7	A new market session is created within the LMP	Market session creation	A new market session is created within the LMP	CREATE	LMP	: Market Session		
1.8	The LMP confirms to the IMO that a Market Session was created	Confirmation	The LMP confirms to the IMO that a Market Session was created	REPORT	LMP	IMO		
1.9	The LMP confirms to the DSO that a Market Session was created	Confirmation	The LMP confirms to the DSO that a Market Session was created	REPORT	LMP	DSO		

Market Session

Scenario #3 description

The market session scenario describes the activities comprised between the notification of an open market session to the publication of market results.

Scenario step by step analysis

Scenario								
Scenario name		Market Session						
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	Market session becomes active	Hours in advance of Gate Opening Time (GOT)	After a Market Session is created, it will become active at a certain time t before the Gate Opening Time. After it becomes active, stakeholders are notified of an upcoming Market Session.	TIMER	LMP: Market Session	LMP		

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			The time t is defined according to the product being traded. In case of long-term markets, it may mean weeks/months/years in advance, while for short-term markets it may be defined as minutes or hours in advance.						
1.1; 1.2: 1.3	IMO, DSO and FSPs are notified on the opening of a Market Session	Market session opening	IMO, DSO and FSPs are notified on the opening of a Market Session	REPORT	LMP	IMO; DSO; FSP			
N/A	Limit for the inclusion of prequalified units	Limit for inclusion of prequalified units	This marks the limit for inclusion of prequalified units. This is especially relevant for the long-term markets, which could be open years in advance. FSPs may still be allowed to request and conclude their prequalification processes up to this point. The prequalification process is defined in details on the associated BUCs	TIMER	N/A	N/A			
1.4; 1.6	The IMO and the DSO consult the Flexibility	Consult pre-qualified units	The IMO and the DSO consult the Flexibility Resources Register. This consultation aims at retrieving	GET	IMO; DSO	LMP: Flexibility Resources Register	I.E.07		

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	Resources Register		the pre-qualified FSPs and starting the qualification processes. This consultation may be done automatically					
1.5; 1.7	The Flexibility Resources Register returns the consultation	Return	The Flexibility Resources Register returns the consultation	REPORT	LMP: Flexibility Resources Register	IMO; DSO	I.E.07	
1.8	The IMO executes the market qualification process	Market qualification process	The IMO opens the market qualification process. This process is also described in steps 2.2 and 2.3 of the BUCs.	EXECUTE	IMO	IMO		
1.9	The IMO registers into the LMP the results of the market qualification	Market qualification results	The IMO registers into the LMP the results of the market qualification	CREATE	IMO	LMP	I.E.08	
1.10	The DSO executes the Technical qualification process	Technical qualification	The DSO runs the Technical qualification process. This process is also described in steps 2.4 and 2.5 of the BUCs..	EXECUTE	DSO	DSO		
1.11	The DSO registers into the LMP the results of the technical qualification	Market qualification results	The DSO registers into the LMP the results of the technical qualification	CREATE	DSO	LMP	I.E.08	
1.12	The LMP consolidates the results of the qualificati	Consolidation	The LMP consolidates the results of the qualification processes received from	EXECUTE	LMP	LMP		

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	on processes		DSO and IMO. This process is automatic					
1.13; 1.14	The LMP creates a list of qualified FSPs for the Market Session	Query; List of qualified FSPs	The LMP creates a list of qualified FSPs for the Market Session	GET; CREATE	LMP	: Flexibility Resources Register; : Market Session	I.E.08	
1.15; 1.16: 1.17	The LMP publishes the qualified FSPs for the Market Session	Publication of qualified FSPs	The LMP publishes the qualified FSPs for the Market Session	REPORT	LMP	IMO; DSO; FSP		
2.0	FPSs enter bids for the Market Session	Bid	FPSs enter bids for the Market Session	CREATE	FSP	LMP: Market Session	I.E.09	
2.1	The LMP gets all bids submitted to the Market Session	Query(bids)	After the Gate Closure Time, the LMP gets all bids submitted to the Market Session	GET	LMP	LMP: Market Session		
2.2	The LMP clears the Market Session	Market Clearing	The LMP clears the Market Session	EXECUTE	LMP	LMP		
2.3; 2.4	IMO and DSO are notified on the preliminary market results	Notification	IMO and DSO are notified on the preliminary market results.	REPORT	LMP	IMO; DSO		
2.5: 2.6	The IMO validates the market results and confirms it on the LMP	Validation	The IMO validates the market results and confirms it on the LMP	EXECUTE; REPORT	IMO	LMP	I.E.10	
2.7; 2.8	The DSO validates the market results and confirms it	Validation	The DSO validates the market results and confirms it on the LMP	EXECUTE; REPORT	DSO	LMP	I.E.10	

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	on the LMP							
2.9	The LMP consolidated the validations of both IMO and DSO	Consolidation	The LMP consolidated the validations of both IMO and DSO	EXECUTE	LMP	LMP	I.E.10	
2.10	The LMP register to the Market Session the consolidated market results	Market results	The LMP register to the Market Session the consolidated market results	CREATE	LMP	LMP: Market Session	I.E.10	
2.11; 2.12; 2.13	The LMP publishes the market results. IMO, DSO and relevant FSPs are notified	Publication	The LMP publishes the market results. IMO, DSO and relevant FSPs are notified	REPORT	LMP	IMO; DSO; FSP	I.E.10	
3.0	The Local Market Platform sends short-term market results to the TSO	Communication of market results to TSO	The Local Market Platform sends short-term market results to the TSO.	REPORT	LMP	TSO	I.E.10	
4.0	The LMP collects certain number of market results before sending to the OneNet System	Collection of Market results	The LMP collects certain number of market results before sending to the OneNet System	TIMER; EXECUTE	LMP	LMP	I.E.10	
4.1	The LMP sends the collected market results to the OneNet System	Publication of results to the OneNet System	The LMP sends the collected market results to the OneNet System	REPORT	LMP	OneNet System	I.E.10	

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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	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.06	Product parameters	Composed of product parameters concerning the market session being requested. E.g.: 13. 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 14. 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	

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		15. 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.: ○ Day: 01/06/2021 ○ Hour: 19h ○ Duration: 2h ○ Capacity to modify: 1MW ○ Direction: Upward 16. Local area: Selection of the trading area. Choice by postal code, connection point, lines… (to be determined). ○ Area: postal code 17. Activation Announcement: Time in advance that a DSO informs a DER that its activation is programmed confirmed. 18. Form of Remuneration: It establishes form of payment to winner DERs Two different terms are defined availability and activation (depending on the product). ○ Type of product: availability/activation Availability/Activation cap price: X €/MW or X €/MWh	
I.E.07	List of pre-qualified units	List of pre-qualified units for a given market session	
I.E.08	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.09	Bid	Composed of bidding information 5. General attributes • FSP identifier 6. 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.10	Validate market results	Validated market results by either the IMO (market), the DSO (technical) or the consolidated market results.	

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6. Requirements (optional)

7. Common terms and definitions

8. Custom information (optional)

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10.22 SUC-FR-01: TSO automated activation

SUC-FR-01 – STAR – TSO automated 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***
SUC-FR-01		System for Trackability of Renewable Activations for Automated and Manual Congestion Management : TSO automated activation case

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	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. The business use case WECL-FR-01 related to this SUC 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 based on the blockchain technology, enabling such objectives and test it for each participating entity on a chosen area of the French network. This system use case particularly highlights the information to be tracked and processes to follow in order to meet the BUC WECL-FR-01 objective in the case where the TSO automatically activates flexibilities in a context of congestion management.
Related business case(s)	WECL-FR-01

1.4. Narrative of Use Case

Narrative of use case
Short description
Need:

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In order to simplify and optimize the management of renewable production curtailments building the STAR platform, we have to define the information exchanges and processes needed to perform the related BUC's traceability objectives in the case of TSO automated activations. Service (short description of how the service meets the objectives): This SUC highlights the needed information and processes between TSO, DSO, FSP and producers in the case of DSO manual activations for the four following phases: - Market phase - Monitoring and Activation - Measurement and settlement - Platform consultation
Complete description
This SUCs provides requirements in terms of data exchanges and processes between TSO, DSO, FSPs and producers for the STAR platform to handle the related BUC's traceability objectives in the case of TSO automated flexibility activations. It focuses on the following phases: - Market phase: This is the process of collecting offers and production forecasts from the producers. The market algorithm, however, is outside the scope of this SUC. - Monitoring and activation: This phase is related to the flexibility activation orders' transmission and monitoring. Every transmission and reception of activation orders between actors should be registered. Activations are not triggered via the platform, STAR only tracks them and has the relevant information accessible to the participants. - Measurement and Settlement: In this service phase, the process of production metering and settlement related information tracking is tackled. - Platform consultation : At any time, the platform will enable the different actors to have access authorized information through interfaces.

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
WECL-FR-01
Level of depth

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Prioritisation
Generic, regional or national relation
Generic
Nature of the use case
System 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

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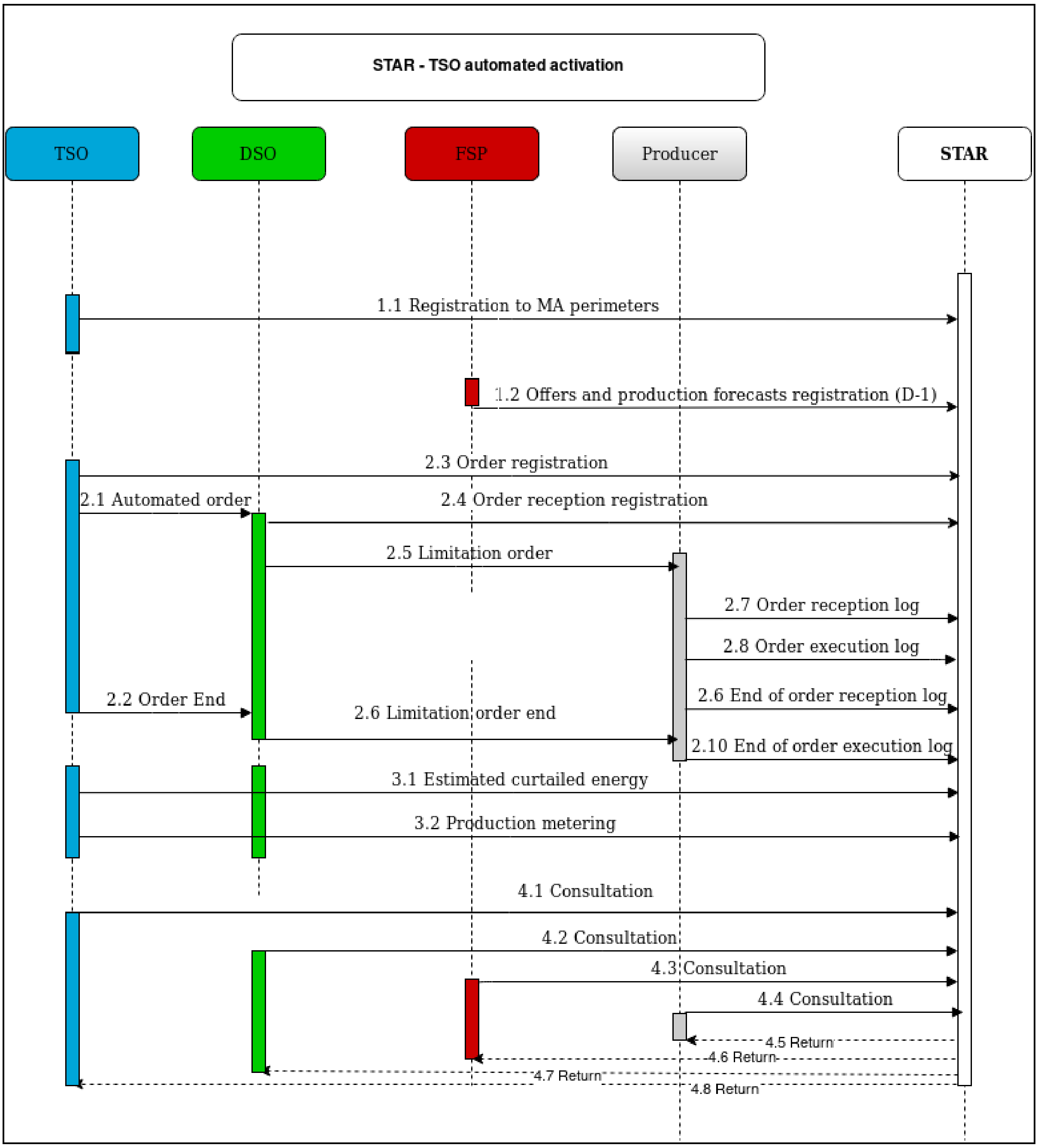

3. Technical details

3.1. Actors

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

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	Market phase	This is the process of collecting offers and production forecasts from the producers.The market algorithm, however, is outside the scope of this SUC.	Producer	Offer or production forecast formulation	Offer or production forecast formulation ready to be registered	Offer or production forecast formulation registered
2	Monitoring and Activation	This phase is related to the flexibility activation orders' transmission and monitoring. Every transmission and reception should be registered.	TSO, DSO	Order transmission	Order sent	Order registered
3	Measurement and settlement	In this service phase, the process of production metering and settlement related information tracking will be tackled.	TSO, DSO	Metering data collection	Metering data to be registered	Metering data registered
4	Platform consultation	Anytime, the platform should enable the different actors to have access authorized information through interfaces.	All	Information consultation	Consultation request	Information delivered

4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

Add activity or activity set diagram.

<u>Scenario step by step analysis</u>

Scenario

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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***
1.1		Registration to MA perimeters	The TSO registers in STAR whether FSPs participate the MA market or not		TSO	STAR platform	FSPs eligible to the MA participation and their perimeters	Determined such information
1.2		Offers and production forecasts registration	FSPs who participate the MA market should provide day-ahead their flexibility offers as well as production forecasts.		FSP	STAR platform	Daily offers (capacity time series and price) and production forecasts (power time series)	Determined such information

- 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	Monitoring and 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***

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2.1		Automated order	In order to solve a congestion, a so-called NAZA TSO automaton sends a limitation order either to the DSO or directly to the producer if it is connected to the TSO's network		TSO	DSO (or directly producer)	Target in MW, automaton ID	Determined such information
2.2		Automated order end	Once the congestion is solved, the TSO sends the order to end the flexibility activation		TSO	DSO (or directly producer)	Deactivation order date, automaton ID	Determined such information
2.3		Order registration	Whether it is an activation or deactivation order, every issuance will be tracked in the STAR platform		TSO	STAR platform	Target in MW, Activation order date, automaton ID, impacted producers ID	Determined such information
2.4		Order reception registration	When the DSO receives the TSO 's order, it will acknowledge it in the STAR platform		DSO	STAR platform	Reception log	Determined such information
2.5		Limitation order	Once the DSO has received the TSO's activation order, it can send sub-orders to the relevant producers		DSO	Producer	Target in MW	Determined such information
2.6		Limitation order end	Once the DSO has received the TSO's deactivation order, it can send sub-orders to the relevant producers		DSO	Producer	Deactivation order	Determined such information

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2.7		Order reception log	Once the producer has received the DSO’s activation order, it will acknowledge it in the STAR platform		Producer	STAR platform	Reception log	Determined such information
2.8		Order execution log	Once the producer has executed the DSO’s activation order, it will register it in the STAR platform		Producer	STAR platform	Execution log	Determined such information
2.9		End of order reception log	Once the producer has received the DSO’s deactivation order, it will acknowledge it in the STAR platform		Producer	STAR platform	Reception log	Determined such information
2.10		End of order execution log	Once the producer has executed the DSO’s deactivation order, it will register it in the STAR platform		Producer	STAR platform	Execution log	Determined such information

- 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

Scenario name #3

Scenario #3 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name	Measurement 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***
3.1		Estimated curtailed energy	The producer's compensation is proportional to the energy that has been curtailed during the flexibility activation. Therefore it is part of the settlement process to provide an estimation of this energy in the STAR platform. The computation itself is not in STAR's scope. This computation is done by the DSO, or by the TSO in cases of HV producers.		DSO or TSO	STAR platform	Power time series, producer ID	Determined such information
3.2		Production metering	The DSO (or TSO in case of HV producers) provides the metering collected during the activation, which is another data needed in the settlement process		DSO or TSO	STAR platform	Power time series, producer ID	Determined such information

- Step No 3.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

- Step No 3.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

Scenario name #4

Scenario #4 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name	Platform consultation							
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		Consultation	Every actor can anytime request authorized information via STAR interfaces		TSO	STAR platform	Information request	Determined such information
4.2		Consultation	Every actor can anytime request authorized information via STAR interfaces		DSO	STAR platform	Information request	Determined such information
4.3		Consultation	Every actor can anytime request authorized information via STAR interfaces		FSP	STAR platform	Information request	Determined such information
4.4		Consultation	Every actor can anytime request authorized		Producer	STAR platform	Information request	Determined such information

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			information via STAR interfaces					
4.5		Return	The STAR platform returns requested information		STAR platform	TSO	Information requested	Determined such information
4.6		Return	The STAR platform returns requested information		STAR platform	DSO	Information requested	Determined such information
4.7		Return	The STAR platform returns requested information		STAR platform	FSP	Information requested	Determined such information
4.8		Return	The STAR platform returns requested information		STAR platform	Producer	Information requested	Determined such information

- Step No 4.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

- Step No 4.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

5. Information exchanged

Information exchanged

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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)

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10.23 SUC-FR-02: DSO manual activation

SUC-FR-02 – STAR – DSO Manual 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***
SUC-FR-02		System for Trackability of Renewable Activations for Automated and Manual Congestion Management : DSO manual activation case

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	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. The business use case WECL-FR-01 related to this SUC 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 based on the blockchain technology, enabling such objectives and test it for each participating entity on a chosen area of the French network. This system use case particularly highlights the information to be tracked and processes to follow in order to meet the BUC WECL-FR-01 objective in the case where the DSO manually activates flexibilities in a context of congestion management.
Related business case(s)	WECL-FR-01

1.4. Narrative of Use Case

Narrative of use case
Short description
Need: In order to simplify and optimize the management of renewable production curtailments building the STAR platform, we have to define the information exchanges and processes needed to perform the related BUC's traceability objectives in the case of DSO manual activations.

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Service (short description of how the service meets the objectives): This SUC highlights the needed information and processes between TSO, DSO, FSP and producers in the case of DSO manual activations for the four following phases: - Forecast phase - Monitoring and Activation - Measurement and settlement - Platform consultation
Complete description
This SUCs provides requirements in terms of data exchanges and processes between TSO, DSO, FSPs and producers for the STAR platform to handle the related BUC's traceability objectives in the case of DSO manual flexibility activations. It focuses on the following phases: - Forecast phase: This is the process of collecting production forecasts from the producers. In this SUC, this process is non compulsory for producers. - Monitoring and activation: This phase is related to the flexibility activation orders' transmission and monitoring. Every transmission and reception of activation orders between actors should be registered. - Measurement and Settlement: In this service phase, the process of production metering and settlement related information tracking is tackled. - Platform consultation : At any time, the platform will enable the different actors to have access authorized information through interfaces.

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
WECL-FR-01
Level of depth
Prioritisation
Generic, regional or national relation
Generic
Nature of the use case
System Use Case

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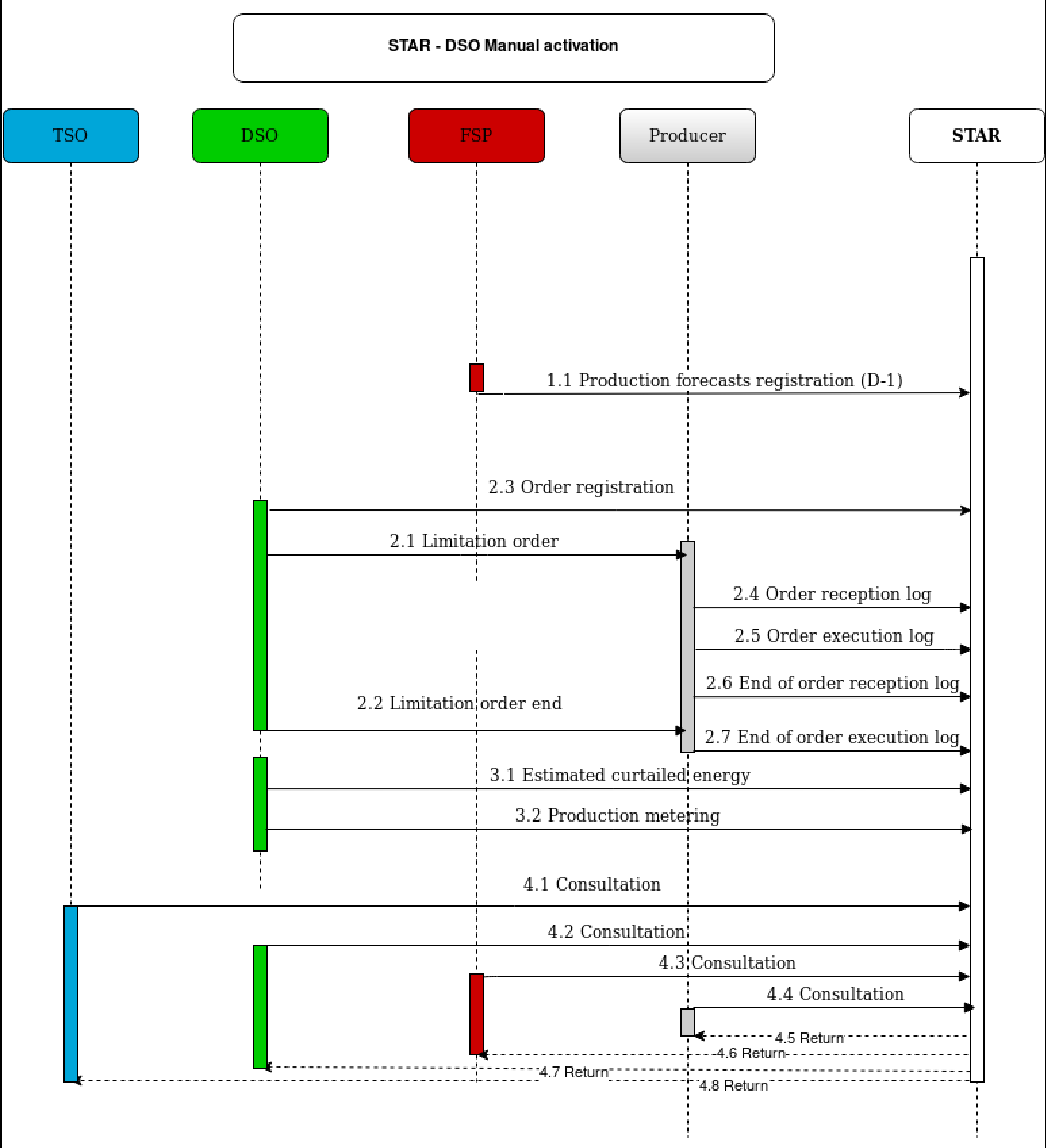
Further keywords for classification
TSO-DSO coordination, information exchange, DER flexibility activation

1.8. General remarks

2. Diagrams of use case

Diagram(s) of use case


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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
Same as BUCs			

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	Forecast phase	This is the process of collecting production forecasts from the producers. In this SUC, this process is non compulsory for producers.	Producer	Production forecast formulation	Production forecast formulation ready to be registered	Production forecast formulation registered
2	Monitoring and Activation	This phase is related to the flexibility activation orders' transmission and monitoring. Every transmission and reception should be registered.	TSO, DSO	Order transmission	Order sent	Order registered
3	Measurement and settlement	In this service phase, the process of production metering and settlement related information tracking will be tackled.	TSO, DSO	Metering data collection	Metering data to be registered	Metering data registered
4	Platform consultation	Anytime, the platform should enable the different actors to have access authorized information through interfaces.	All	Information consultation	Consultation request	Information delivered

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4.2. Steps - Scenarios

Scenario name #1

Scenario #1 description

Add activity or activity set diagram.

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***
1.1		Production forecasts registration	FSPs can optionnally provide day-ahead their production forecasts.		FSP	STAR plafform	Daily production forecasts (power time series)	Determined such information

- 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	Monitoring and 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***

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2.1		Limitation order	In order to solve a congestion, the DSO manually sends a limitation order either to a producer connected to its network		DSO	Producer	Target in MW	Determined such information
2.2		Limitation order end	Once the congestion is solved, the DSO sends the order to end the flexibility activation		DSO	Producer	Deactivation order	Determined such information
2.3		Order registration	Whether it is an activation or deactivation order, every issuance will be tracked in the STAR platform		DSO	Star platform	Target in MW, Activation order date, impacted producers ID	Determined such information
2.4		Order reception log	Once the producer has received the DSO's activation order, it will acknowledge it in the STAR platform		Producer	STAR platform	Reception log	Determined such information
2.5		Order execution log	Once the producer has executed the DSO's activation order, it will register it in the STAR platform		Producer	STAR platform	Execution log	Determined such information
2.6		End of order reception log	Once the producer has received the DSO's deactivation order, it will acknowledge it in the STAR platform		Producer	STAR platform	Reception log	Determined such information

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2.7		End of order execution log	Once the producer has executed the DSO's deactivation order, it will register it in the STAR platform		Producer	STAR platform	Execution log	Determined such information

- 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*

Scenario name #3

Scenario #3 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name	Measurement 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*
3.1		Estimated curtailed energy	The producer's compensation is proportional to the energy that has been curtailed during the flexibility activation. Therefore it is part of the settlement process to provide an estimation of this energy in		DSO	STAR platform	Power time series, producer ID	Determined such information

			the STAR platform. The computation itself is not in STAR's scope. This computation is done by the DSO since the producer is connected to its network.					
3.2		Production metering	The DSO provides the metering collected during the activation, which is another data needed in the settlement process		DSO	STAR platform	Power time series, producer ID	Determined such information

- Step No 3.x / Name of process

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*

- Step No 3.x / Name of process

  Business section:

  Information sent:

Business object	*Instance name*	*Instance description*

Scenario name #4

Scenario #4 description

Add activity or activity set diagram.

Scenario step by step analysis

Scenario								
Scenario name	Platform consultation							
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		Consultation	Every actor can anytime request authorized		TSO	STAR platform	Information request	Determined such information

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			information via STAR interfaces					
4.2		Consultation	Every actor can anytime request authorized information via STAR interfaces		DSO	STAR platform	Information request	Determined such information
4.3		Consultation	Every actor can anytime request authorized information via STAR interfaces		FSP	STAR platform	Information request	Determined such information
4.4		Consultation	Every actor can anytime request authorized information via STAR interfaces		Producer	STAR platform	Information request	Determined such information
4.5		Return	The STAR platform returns requested information		STAR platform	TSO	Information requested	Determined such information
4.6		Return	The STAR platform returns requested information		STAR platform	DSO	Information requested	Determined such information
4.7		Return	The STAR platform returns requested information		STAR platform	FSP	Information requested	Determined such information
4.8		Return	The STAR platform returns		STAR platform	Producer	Information requested	Determined such information

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			requested information					

- Step No 4.x / Name of process

Business section:

Information sent:

Business object	*Instance name*	*Instance description*

- Step No 4.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)

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