# OneNet Concept and Requirements

# D5.1

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| **PU** | Public | x |
| **CO** | Confidential, only for members of the consortium (including the Commission Services) | |
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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. Key partners in the consortium include already mentioned ENTSO-E and EDSO, Elering, E-Redes, RWTH Aachen University, University of Comillas, VITO, European Dynamics, UBITECH Energy, Engineering, and the EUI's Florence School of Regulation (Energy).

The key elements of the project are:

1. Definition of a common market design for Europe: this means 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 instead enabling an open architecture of interactions among several platforms so that everyone can join any market across Europe; and
3. Large-scale demonstrators to implement and showcase the scalable solutions developed throughout the project. These demonstrators are organized in four clusters coming to include countries in every region of Europe and testing innovative use cases never validated before.


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# List of Abbreviations and Acronyms

| Acronym | Meaning |
|---|---|
| AML | Anti-Money Laundering |
| BEMS | Building Management System |
| BRP | Balance Responsible Party |
| CA | Consent Administrator |
| CAPEX | Capital Expenditure |
| CEC | Citizen Energy Communities |
| DER | Distributed Energy Resources |
| DG | Distributed Generation |
| DH | Datahub |
| DLT | Distributed Ledger Technology |
| DSO | Distribution System Operator |
| ECP | Energy Communication Platform |
| EDX | Energy Data eXchange |
| EV | Electric Vehicle |
| FR | Flexibility Register |
| FUR | Functional Requirements |
| IDSA | International Data Space Agency |
| IMO | Independent Market Operator |
| IoT | Internet of Things |
| IP | Internet Protocol |
| KYC | Know Your Customer |
| LEC | Local Energy Communities |
| LMP | Local Market Platform |
| MO | Market Operator |
| NFR | Non-functional Requirements |
| OPEX | Operational Expenditure |
| P2P | Peer-to-Peer |
| REC | Renewable Energy Communities |
| RES | Renewable Energy Resources |
| SE | Secure Element |
| SGUs | Significant Grid Users |
| SO | System Operator |
| T&D CP | Transmission & Distribution Coordination Platform |
| TEE | Trusted Execution Environment |



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| | |
|---|---|
| TOTEX | Total Expenditure |
| TPM | Trusted Platform Module |
| TSO | Transmission System Operator |
| V2B | Vehicle to Building |
| V2G | Vehicle to Grid |
| VPP | Virtual Power Plant |



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# Executive Summary

The rapid transition occurring in the power systems domain, due to the high penetration rate of Renewable Energy Resources, changes dramatically the operation and control practices of the network operators, regardless the voltage level. To be robust in stochasticity introduced by renewables, the power system has to be flexible mitigating the problems occurred, by leveraging the capabilities of both generation and demand side to adapt their production and consumption, respectively. In addition to that, the accelerated development in Information and Communication Technology (ICT), provides a fertile ground for advanced supervision and control approaches from the operators, and for new consumer-centric business models in the energy domain. Building upon on the work conducted in previous H2020 projects, the OneNet project aims to create one network of Europe, by proposing new markets, products, and services and by creating a unique Information Technology (IT) architecture. Whilst a single platform for Europe cannot be considered, OneNet proposes innovative mechanisms of system of platforms, which are the key technical enablers for the proposed vision. This deliverable sets the cornerstone for the definition of the IT for the OneNet, by providing the requirements, functional and non-functional, along with the initial technical specifications.

To accomplish the above-mentioned ambitions, this deliverable initially explores the regulatory and ICT requirements for scaling up coordination models amongst the system operators with a view to provide services. Specifically, the regulatory framework existing at a pan-European level, along with the main regulatory requirements that should be addressed at a national level, about unlocking and coordination of the potential of distributed flexibility, cost-efficient integration of distributed flexibility, incentives for participation of flexibility provides, and transparent and interoperable data exchange platforms, are thoroughly presented. To ensure the data exchange interoperability amongst the stakeholders, it is crucial to set up platforms for the secure, encrypted, comprehensive and accessible exchange of information involving the stakeholders of the energy domain. Different architectures from previous H2020 projects and initiatives in European Union are presented, focusing on the aspects of security, reliability, transparency and connectivity. Afterwards, this deliverable investigates the requirements for coordination amongst the operators from a consumer-centric approach. Finally, game-changing technologies for the power sector, such as Distributed Ledger Technologies and Blockchain, and the data governance following International Data Space Agency approach, are presented.

Using as a basis the work mentioned above, a collective approach was followed for the proper definition of the Demonstrators' System Use Cases (Demo SUCs), between the partners engaged in the horizontal work packages (WP2-WP5) and the demonstration ones (WP7-WP10). Through a series of workshops, each cluster and its demonstrators defined the Demo SUCs. In total 42 have been identified and reported in this deliverable. Thereafter, a screening process was conducted to investigate the data exchanges and used services between actors/platforms for each demonstrator and the OneNet system, and thus extracting the envisioned





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functionalities anticipated by the former. Using that as an input along with SUCs identified in other H2020 projects, three General OneNet System Use Cases (General SUCs) were conceptually formulated for the implementation of the OneNet Framework; a decentralized system that allows the secure and scalable cross-platform cooperation and integration, leveraging on the more used and promising standard interfaces and interoperability mechanisms like IDS components and FIWARE context broker.

Building on the definition of the Demo and General SUCs, the conceptual description of the OneNet System and its envisioned functionalities are introduced. The OneNet Framework facilitates the platforms integration and cooperation offering a secure, scalable and well documented solution to enable the participation not only of the platforms, but also to create a complete ecosystem in which energy stakeholders can participate. The key feature of the OneNet Framework is to make available a data interoperability mechanism to all platforms to support data exchange for facilitating market and network operations and the cooperation between network operators, like TSOs and DSOs as well as the involvement of other players like prosumers and aggregators. Concisely, OneNet framework will focus on:

- the adoption of open standards and interfaces to allow the seamless participation of various users,
- data privacy control and data access according to regulations for each stakeholder,
- definition of standard models and protocols for data exchange,
- the provision of data management features like data harmonization, data quality assessment, semantic annotation,
- dataflow monitoring and logging,
- Identification, Authentication and Authorization mechanisms for ensuring secure and trusted data exchange and platforms integration.

Finally, the Functional and Non-Functional requirements of the OneNet system are derived, which lay the foundation for the in-depth definition of the OneNet architecture and its components. Specifically, 33 Functional requirements and 25 Non-Functional requirements for OneNet are extracted.

In conclusion, this deliverable contributes to six pillars of the OneNet project:

- Presentation of the necessary regulatory and IT requirements for scaling up coordination models amongst the system operators, both of transmission and distribution ones, with a view to provide near-real services,
- Introduction of necessary additional requirements for enabling the large-scale integration of the consumer perspective within the cross-stakeholder coordination, and reference to the game-changing technologies to build on,
- Extensive report of the System Use Cases developed by the OneNet's Demonstrators (utilizing the IEC-625592 template), and how they envision their connection to the OneNet system,


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- Definition of the General OneNet System Use Cases,
- Initial Conceptualization of OneNet system, and
- Definition of Functional and Non-Functional Requirements based on the above-mentioned elements, for the development of the OneNet system.



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## 1 Introduction

This section provides an overview of the objectives for the work package 5 (WP5) that Deliverable 5.1 belongs to, along with a detail analysis of the main outcomes that are expected from this deliverable. Finally, in order to facilitate the reader, an overview of the content for each chapter is provided.

### 1.1 WP5 objectives

WP5 in OneNet is entitled as "Open IT Architecture for OneNet". The main objective of WP5 is to set the basis for the OneNet architecture establishment and the implementation of the IT for OneNet, which is part of the work to be conducted in the context of WP6. Specifically, the main objectives of WP5 are twofold (Figure 1.1):

- To design an open conceptual architecture for effective yet seamless operation of a smarter pan-European electricity system where market and network technical operations are coordinated closer to real-time amongst them and across countries and,
- To provide requirements, functional and technical specifications, along with interoperable and standardizable interfaces for an open scalable decentralized interconnection platform, technology agnostic, adaptable and flexible IT architecture, which fully supports the OneNet concept, and provides the necessary backbone for the WP6 subsequent implementation of the OneNet data sovereignty-preserving working space.

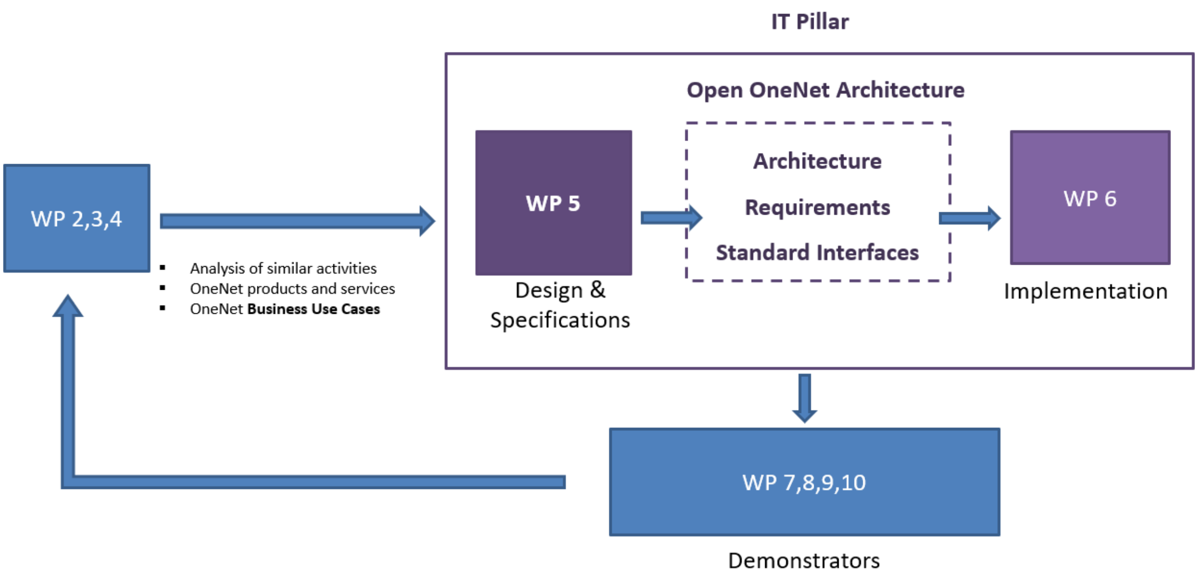


*Figure 1.1: Interactions of WP5 with the rest OneNet WPs.*


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## 1.2 Description of Task 5.1

Within WP5, Task 5.1 (T5.1) strives to elicit the necessary regulatory, technological and IT requirements for scaling up coordination models amongst TSOs and DSOs, actually validated in previous H2020 projects, with a view to provide near real-time scalable coordination among market and network operation. Moreover, the aim of T5.1 is to establish the necessary additional requirements for enabling the large-scale integration of the consumer perspective within the cross-stakeholder coordination, while leveraging on continuous alignment with ongoing projects H2020, and building upon game changing technologies, such as IoT (Internet of Things), DLT (Distributed Ledger Technology) and blockchain and innovative market models, such as P2P (Peer-to-Peer) trading. T5.1 additional objective is to address specific requirements for enabling cross-country coordinated market and network operation, with a view to design a smarter multi-stakeholder multi-country pan-European electricity system.

Requirements emerging from the WP2, and especially from the Business Use Cases (BUCs) derived directly from the engaged stakeholders in the demonstrators', are analysed and grouped in order to form the System Use Cases (SUCs), and technical requirements. Those steps lead to the conceptual description of the OneNet system and its envisioned functionalities, whereas an initial try to recognise the relevant assets (platforms, proprietary systems, etc.) that need to be integrated. All end-user requirements related to the multi- country dimension of the demonstration projects, as well the ones related to the sophisticated data governance tier for the information sharing between all stakeholders, are "translated" into functional requirements (FUR), whereas the non-functional requirements (NFR) about different quality aspects of the of the OneNet platform are identified, analysed and reported. Figure 1.2 illustrates the way that other tasks in WP5 and WP4, are expected to utilize the outcome of T5.1, in order to continue the in-depth definition of the OneNet architecture and its components, as long as the definition of the integrated system operation for OneNet.



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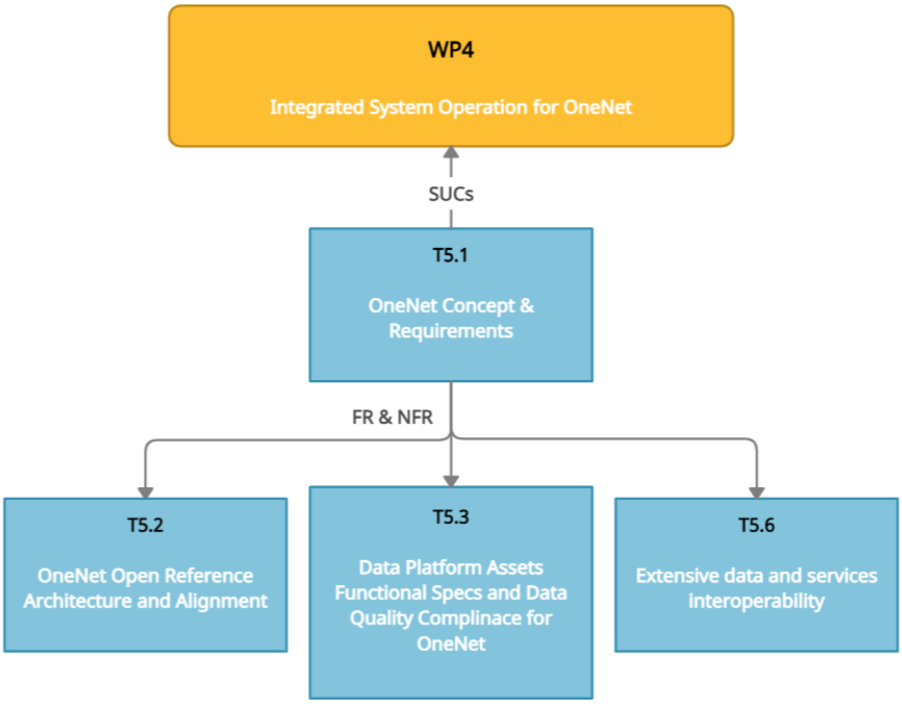


*Figure 1.2: Utilization of T5.1 outcome from other OneNet tasks.*

## 1.3 Report Outline

As mentioned above, this deliverable mainly focuses on the definition of FUR and NFR for the OneNet system. First, chapter 2 introduces the regulatory and ICT requirements for coordination amongst the System Operators (SOs), with a special focus on real-time services. In a similar way, the subsequent chapter 3, introduces the requirements for cross-stakeholder coordination, especially for the end-customer, also providing the game-changing technologies emerging in the new era of power systems.

Afterwards in chapter 4, the methodology followed for the derivation both of the Demonstrators' System Use Cases (Demo SUCs) and the General OneNet System Use Cases (General OneNet SUCs) is thoroughly presented. A brief description of Demo SUCs[1], and an extensive description of the General OneNet SUCs is provided. Building upon on the previous chapters, chapter 6 introduces a high-level architecture of the OneNet system and presents an inclusive list of the FUR and NFR of the OneNet. Finally, chapter 6 presents the main insights of this deliverable, in order to be used as an input for the rest tasks of the OneNet. The structure of this deliverable is illustrated in Figure 1.3.

[1] Please consult Appendix C for an extensive description.



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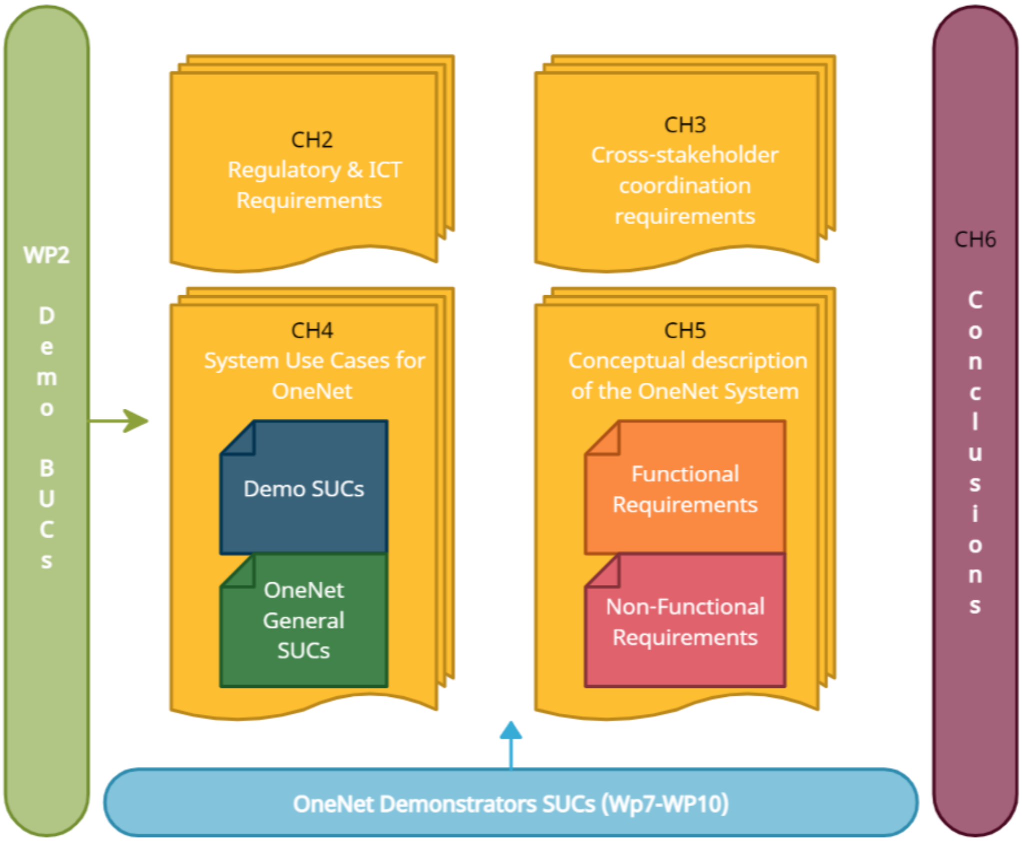


*Figure 1.3: Structure of Deliverable 5.1.*



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# 2 Regulatory and ICT requirements for coordination amongst TSOs and DSOs

This section includes the necessary regulatory and ICT requirements for scaling up coordination models amongst the SOs, i.e., TSOs and DSOs., with a view to provide near-real services. The experience gained in previous H2020 projects is used as a reference to build upon.

## 2.1 Regulatory requirements

Under the general context of the energy system decarbonization, it is expected a continuous decrease of conventional fossil-fuel generation, traditional active and reactive power flexibility providers, and a continuous increment of distributed energy resources (DER) including distributed generation (DG) based on renewable energy sources (RES) characterized by its variability and, to a large extent, by not being dispatchable. As a consequence, TSOs are facing a harder-to-balance power system, with a decreasing amount of traditional flexibility sources, so new flexibility sources must be found at the distribution level. In parallel, DSO are experiencing an increase in the complexity of the operation of their grids, the responsibility of accommodating more generation resources at the distribution level, more frequent and variable grid constraints to be solved, inverted power flows and the possibility of injecting energy from the distribution to the transmission grid. Finally, traditional customers are empowering and becoming more active participants, and ICT developments are contributing to improve the observability and controllability of grids and DER at different voltages levels.

The EU regulatory context sets rules and guidelines on these topics, and can be summarized as follows:

- **Regulation 2017/1485** (SOGL, guideline on transmission system operation [1]) is first approach to the use of flexibility from distribution networks for the operation of the transmission system. It provides "rules and responsibilities for the coordination and data exchange between TSOs, between TSOs and DSOs, and between TSOs or DSOs and SGUs (significant grid users), in operational planning and in close to real-time operation". In particular, it establishes (article 182) the guidelines for the prequalification and delivery of active power reserves by units or groups connected to the distribution system, which include service delivery information, timelines and coordination with reserve connecting DSOs and other possible intermediary DSOs.
- **Directive 2019/944** (common rules for the internal market [2]) promotes the active participation of consumers in the energy market and recognizes the role of aggregators as intermediaries between customers and the wholesale market (article 17), which should be allowed (with balancing responsibilities) to participate in a non-discriminatory way in the market. Regarding



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balancing responsibilities, distributed flexibility providers (such as customers or aggregators) could be required by regulation to pay financial compensation to other market BRPs (Balance Responsible Parties) in case their flexibility activation directly affect their balances. It also establishes (article 32) that DSOs have the responsibility of integrating new generation and loads, thus should be allowed and incentivized by regulation to integrate distributed flexibility based on market procedures, to efficiently operate their grids and to avoid costly network expansions. In this sense they should be responsible of specifying the flexibility services to be procured. Special emphasis is also put on the need of network expansion plans and of informing them to system users. Finally, TSO-DSO (article 57) should cooperate by exchanging all relevant information and data relevant to the grid operation and planning, and to achieve a coordinated access to the distributed flexibility.

- **Regulation 2017/2195** (EGBL network code [3]) refers to the cooperation that TSOs should establish with DSOs (article 15), so that the distributed flexibility can provide balancing services, all the information needed for settlement is properly provided by the DSOs to the TSO, and TSO-DSO coordinated methodologies for costs sharing are elaborated when flexibility limitations are set by the corresponding DSOs. In addition, aggregation of resources should be allowed to provide balancing services subject to the requirements defined to become a balancing service provider (article 18.4.b).

Several relevant tasks are then left to national regulations to implement or concretize the rules and guidelines established in the EU regulation, defining potential existing barriers and regulatory requirements that should be addressed for an effective unlocking of the distributed flexibility and an efficient and coordinated TSO-DSO distributed flexibility usage. Several references such as [4]– [6], address the existing EU regulation and challenges in similar context, as well as the challenges of its transposition to national regulation frameworks. There are also strong coordination efforts among TSO and DSO at EU level, as can be checked in [7], or in a the very recent [8], that also highlight important regulatory requirements from the point of view of the system operators.

These are some of the main regulatory requirements that should be addressed at national levels:

- There are still EU countries where the participation of distributed flexibility in TSO ancillary services is not yet regulated, and thus, not allowed in practice. For example, balancing market are very often not yet open to demand-side bidding, or rules and requirements are not adapted to their technical characteristics making their participation unfeasible [6]. In addition, in [9] new potential services may be considered as a consequence of the decarbonization process.

- There are still almost no rules in place in EU countries to allow DSOs to activate flexibility services at the distribution level. This lack of regulation entails that in practice, in many countries DSO are not yet allow to acquire flexibility services. Regulations clarifying the role of DSOs and allowing them to use local flexibility would increase distributed flexibility from which DSO would also benefit [4], [5]. See also [9] for a characterization of potential DSO services that could profit from distributed flexibility.
- Both previous bullets are in close relationship to the need of regulating and clearly defining the roles of TSOs and DSOs. Indeed, in addition to extending DSOs responsibilities to the procurement and activation of flexibility, [8], [10] state that these roles definition should clarify and facilitate data collection and management, and the possible access for the different stakeholders involved. In addition, regulators should ensure that TSO and DSO assigned roles guarantee they act with neutrality and transparency, independently of the TSO-DSO coordination model chosen [10], supported by data exchanges platforms of historical and real time data, communication protocols for interoperability, and clearly defined responsibilities. Although not consensual, some also defend (for example [11] or DSOs in [8]) that the EU regulation should include a consensual harmonized role model (possibly based on the ENTSO-e harmonized role model ebIX- EFET- ENTSO-E [12] extended or in combination with other roles models such as EU-SysFlex [13] or USEF [14] roles model) to set a common language among all EU involved entities.
- Linked to the previous topic is also the observability of the network, in particular for lower voltages levels, which shall continue to improve with smart metering deployment to allow grid state estimation algorithms. Again, access to historical and near real-time smart metering data is essential for observability and settlement purposes, but also for business models related to flexibility provision without having to resort to unnecessary metering equipment duplication. Equipment interoperability must also be enforced to allow different stakeholders the easy access to the data needed. Roadmap [8] also suggests regulating sub-metering to improve observability and settlement processes.
- In addition to allowing the participation of distributed flexibility in flexibility markets, and to guarantee an efficient flexibility usage, incentives to TSOs and DSOs to use this flexibility should be developed. Currently, in many cases OPEX (Operational Expenditure) is penalized while CAPEX (Capital Expenditure) is just accepted after being audited, so the procurement of flexibility is seen as a cost without any economic benefit. Incentives should therefore be the TOTEX (Total Expenditure) and outputs related such as losses reduction, quality of service improvement, long-term investment plans elaboration, or innovation actions [6], [15]. Cost recovering mechanisms for data exchanges and coordination platforms should also be developed [8].


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- Regulation should incentivize the development of mechanisms to coordinate the use of the distributed flexibility so that it can provide flexibility services to TSOs and DSOs. Although market-based should be preferred, other mechanisms, such as rule-based, tariff-based, connection agreements, etc., could complement them, although the link between the different mechanisms should be clear, and no conflicting set-ups should be installed [11]. Coordination should also be incentivized during network planning [6], [11].
- Transparency and efficiency in the grid connection charge computation, use of shallow rather than deep connection charges, or flexible network access should be considered to facilitate DER investments by end-users and its grid integration by properly assessing the value of flexibility provision business models [6].
- Baseline methods should be further investigated and regulated, since it is not yet clear how the flexibility provided by DER resources that do not have individual schedule commitments would be verified for verification and settlement purposes [6]. Roadmap [8] also suggests the convenience of reaching EU agreements on best practices of baseline methodologies.
- The figure of independent aggregator means that the activation of distributed flexibility may directly impact other stakeholders with own or delegated balance responsibilities such as suppliers. Although the EU regulation suggests that financial compensations could be defined for this matter, it remains a challenge how all involved stakeholders will interact and which agreements or compensations will or will not be required, without creating barriers to flexibility aggregation [16]. Indeed, aggregation is still incipient and aggregation rules have not yet clearly defined [4].
- Liquidity can benefit from increasing the flexibility value allowing value stacking [17] to provide multiple flexibility services, with the same portfolio, to one or multiple flexibility users. However, coordination mechanism must also be put in place to avoid double our counter-activations, and double payments of flexibility activations must be analysed. In addition, procedures should be defined to share the costs of the flexibility activation among those profiting from the flexibility [8], [18].

As a final summary, regulation should therefore support:

- Mechanisms to unlock the potential of the distributed flexibility to help DSOs plan and operate their grids, in coordination with TSO in case the activation of distributed flexibility can impact the TSO grid operation.
- Mechanisms to coordinate the use of the distributed flexibility so that it can also provide flexibility services to the SOs, avoiding uncontrolled cross impacts, efficiently managing TSO-DSO


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competition for the same resources, coordinating settlements, and guaranteeing the secure operation of the DSO grids.

- Incentives for DSO and TSO to use this flexibility with a cost-efficient integration of distributed flexibility into their operation and planning process.
- Incentives to the participation of potential distributed flexibility providers to increase the amount of the distributed flexibility available.
- Transparent and interoperable data exchange platforms for historical and real time access to improve observability and allow real time monitoring and control, verification and settlement.

## 2.2 ICT requirements

ENTSO-E provides a forum for cooperation between European TSOs, involving stakeholders and the EU institutions, in order to create a cleaner, more cost-effective and safer electricity system for Europeans. To ensure this, it is necessary to set up a platform for the secure, encrypted, comprehensive and accessible exchange of information involving European TSOs. There are a few existing dedicated platforms for exchanging energy data. Some of these platforms serve as input to projects and others as part of projects. In addition, there are data platforms that are supplier products for data exchange, not specifically to energy data. The boundary between data platforms and market / trading platforms is not always very clear for the industry stakeholders. In addition, a distinction must be made between platforms and other devices / systems. In the next chapter, the focus will be on the ECCo SP platform since this is one of the most project references at time of writing. However, it is important to note that there are a couple of other platforms – e.g., IEGSA, Estfeed, CoordiNet – used for similar purpose.

ENTSO-E provided a simple communication platform that allows secure, encrypted, comprehensive and accessible information exchange and can also be used between TSOs and DSOs. This platform is designed to be easy to use. It handles direct communication at multiple communication levels using different protocols. It currently contains two main functional blocks. One is the Energy Communication Platform (ECP), which operates in the communication layer. The other main block is the Energy Data eXchange (EDX), which is responsible for the service layer.

The ECP platform, as depicted in Figure 2.1, is implemented according to the MADES standard, and is responsible for:

- **Security**: the content of the messages is only available to the recipients and the channel is encrypted, and all users can be authenticated at any time.
- **Reliability**: all messages are delivered correctly and immediately, with validation, if they work properly.



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- **Transparency**: traceability of sent messages is guaranteed.
- **Connectivity** to different external platforms; allows you to connect, send and receive messages using different technologies.

| | SOURCE | | | | | | PURPOSE FOR DATA | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DATA TYPE | UTILITY | DER PROVIDER | PUC | AVAILABLE? | PUBLIC ACCESS? | MACHINE READABLE? | SYSTEM PLANNING | REGULATORY COMPLIANCE | COMMERCIAL USE | GRID OPERATIONS | MARKET EFFICIENCY |
| 1. Distribution Capital investment | ✓ | | | ● | ○ | × | ✓ | ✓ | | ✓ | |
| 2. Circuit capacity (nominal) | ✓ | | ✓ | ● | ○ | ● | ✓ | ✓ | | ✓ | ✓ |
| 3. Circuit connectivity models | ✓ | | | ○ | ○ | × | ✓ | | | ✓ | |
| 4. Customer data (individual) | ✓ | | | ● | × | ● | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5. Customer data (aggregate) | ✓ | | | ● | ○ | ● | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6. DER capacity (existing and queued) | ✓ | ✓ | ✓ | ● | ○ | ○ | ✓ | | ✓ | ✓ | ✓ |
| 7. DER services performance | ✓ | ✓ | ✓ | ○ | × | × | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8. Distributed generation adoption forecasts | ✓ | ✓ | ✓ | ● | ● | × | ✓ | ✓ | | ✓ | ✓ |
| 9. Grid conditions (historic) | ✓ | | | ● | ○ | × | ✓ | ✓ | ✓ | ✓ | ✓ |
| 10. Grid conditions (real time) | ✓ | | | ○ | × | × | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11. Hosting capacity | ✓ | | | ● | ● | ● | ✓ | ✓ | ✓ | | |
| 12. Hourly DER gross profiles | ✓ | ✓ | | ● | × | ○ | ✓ | | ✓ | ✓ | |
| 13. Interconnection cost data | ✓ | | | ● | ● | × | ✓ | ✓ | ✓ | | ✓ |
| 14. Load growth forecast | ✓ | | | ● | ● | ● | ✓ | ✓ | | | |
| 15. Locational net benefits or value | ✓ | | | ● | ○ | ○ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 16. Market potential or saturation studies | | ✓ | | ● | × | × | ✓ | | | | ✓ |
| 17. Planned resiliency and reliability projects | ✓ | | | ● | ● | ● | ✓ | | | ✓ | |
| 18. Project attributes | ✓ | ✓ | | ● | ● | ● | ✓ | | | ✓ | |
| 19. Reliability statistics | ✓ | | ✓ | ● | ● | ○ | ✓ | ✓ | | ✓ | |
| 20. Utility rates | ✓ | | ✓ | ● | ● | ○ | ✓ | ✓ | | | ✓ |
| 21. Voltage & power quality | ✓ | | | ● | ● | ○ | ✓ | ✓ | | ✓ | ✓ |

*Figure 2.1: Grouping and use of electricity system data*[19].

### 2.2.1 Architecture and communication

The ECP architecture is illustrated in Figure 2.2. It consists of three main components:

- The endpoint provides a connection between users and applications to the messaging platform. The endpoint is also a messaging user interface and API for integrating the ECP platform and business applications,
- The "Element Library" serves as a central library and serves as a reliable anchor for the MADES network, which manages information about all components,
- The broker component provides "Endpoint Messaging" services. This represents the focal point of all endpoints.



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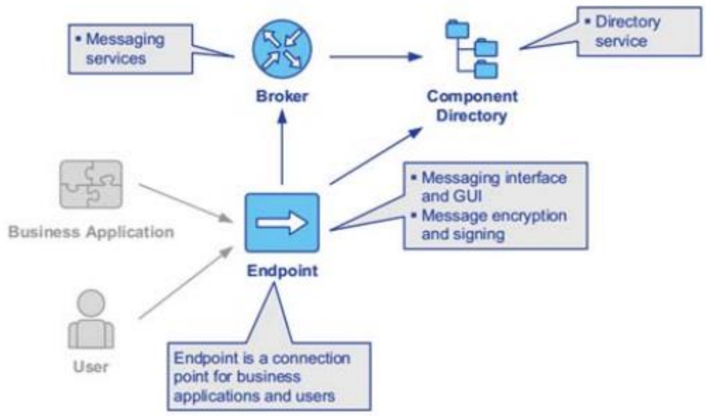


*Figure 2.2: ECP architecture* [20].

Information about linked endpoints and brokers can be shared from one Component library's unique ECP network with other Component libraries so that endpoints from different central libraries can also communicate with each other. The ECP network consists of several components, with the Component directory in the middle, so the system remains operational even if the Component directory is not available. ECP has a distributed architecture and no real central component. The EDX network is based on two modules: one instance of the Service Catalogue and several instances of the Toolbar, as illustrated in Figure 2.3.

Each module is responsible for providing different things:

- The Service Provider Catalog is responsible for securing and managing the network configuration and is not involved in messaging.
- The Toolbar/ Toolbox, on the other hand, is a messaging interface for business applications that implements message delivery.

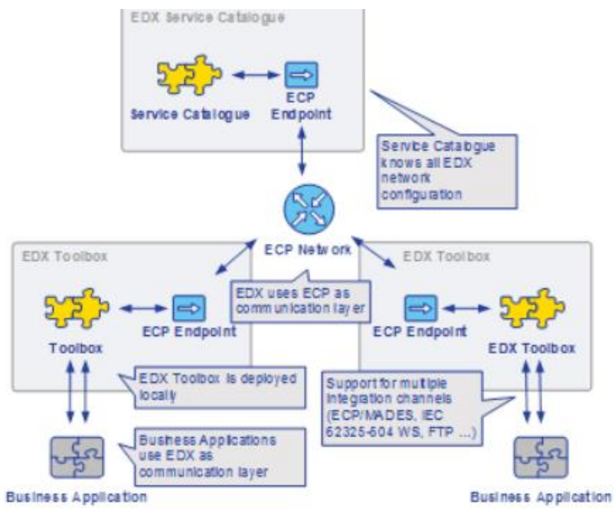


*Figure 2.3: EDX architecture* [19].

## 2.2.2 Security

ECP is designed to operate as a highly reliable and secure messaging system. The communication aspects of ECP are shown in Figure 2.4. The ECP guarantees that received messages, if available, will be delivered to the recipient. The sender can check the delivery status of the message at any time to determine if the message is still on its way (and where it is heading) or if the message has already arrived. Upon successful delivery of the message, the sender will send a confirmation. All messages are encrypted and signed. Message flow information is recorded by all ECP message processing components. ECP provides a non- 'undeniable' messaging service that allows you to check messages and all metadata, including sender, recipient, time of sending, delivery, and so on. In the communication layer, ECP components use a secure communication protocol (SSL) - the information is transmitted encrypted. In addition, both participants in the communication are always identified with a standard PKI certificate.


*Figure 2.4: ECP platform communication schemes [19].*

## 2.2.3 Near real-time case description

The ECCo SP platform has been tested as part of the H2020 TDX-ASSIST project for data exchange between system operators. This section provides a brief description of the two use cases. The underlying ECP platform has been used by transmission system operators across Europe for almost a decade.

In the framework of the TDX-ASSIST project, the use case of "Activation of DSO-connected resources for balancing purposes in the market environment" was presented in Slovenia. The ICT architecture that implements





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this is illustrated in Figure 2.5. The ECCo SP connects the TSO and DSO to share distribution network measurement results and is displayed with potential alarms if network constraints (e.g., voltage problem, line congestion) exist. As the DSO shares the platform with the TSO and other market participants, the DSO is aware of the activation of energy sources in the distribution network and is able to validate these requests considering the current state of the distribution network. In addition to the measurements, the real-time data exchange in this scenario includes market documents corresponding to capacity and energy management, a Merit Order List (MOL) for activating the selected bids and activation signals together with the accompanying receipts.

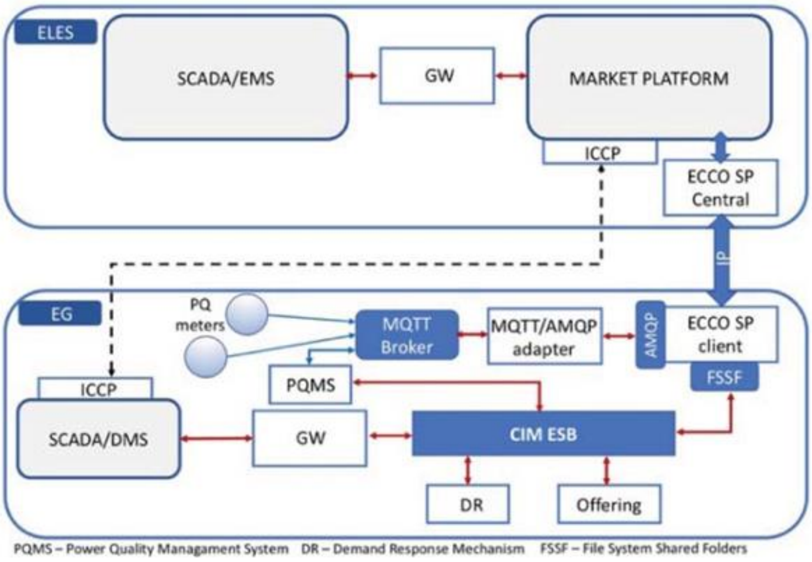


*Figure 2.5: Near real-time data exchange on the ECCo SP AMQP interface* [19].

## 2.2.4 Long-term planning case description

This case corresponds to the exchange of reduced network models between the DSO and the TSO within a predefined area. The information in this exchange is in-line with Article 43 of the SO GL, which describes the structural exchange of data between the TSO and the DSO. As this information is very static in nature, there is no need for an advanced communication infrastructure. The information described must be exchanged at least once a month so that the file sharing mechanism of the ECCo SP platform can be used.

## 2.2.5 IT architectural principles

The recommended general IT architecture based on ECCo SP experiences is illustrated in the simplest and most concise way in Figure 2.6, and it depicts a high-level architecture model for BRIDGE report 'European energy data exchange reference architecture', that uses industry standard architecture methodologies, e.g.,


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TOGAF (The Open Group Architecture Framework) or SGAM (Smart Grid Architecture Model). This concludes that the system can be divided into 5 main layers, moving from the lower to the higher syntactic layer:

1. Components layer
2. Communication layer
3. Information layer
4. Functions and relations layer
5. Business layer

There is not a direct hierarchical connection between the individual layers, they can be interoperable, a layer can be omitted if the application environment requires it. This is strictly true for the components and communication layers, which can be accessed directly by the layer containing functions and relationships.

At the level of the top two layers, including the business layer, each business actor can connect with different roles through a frontend that provides information and responds to user interventions with a backend that includes calculations, functions, and procedures.

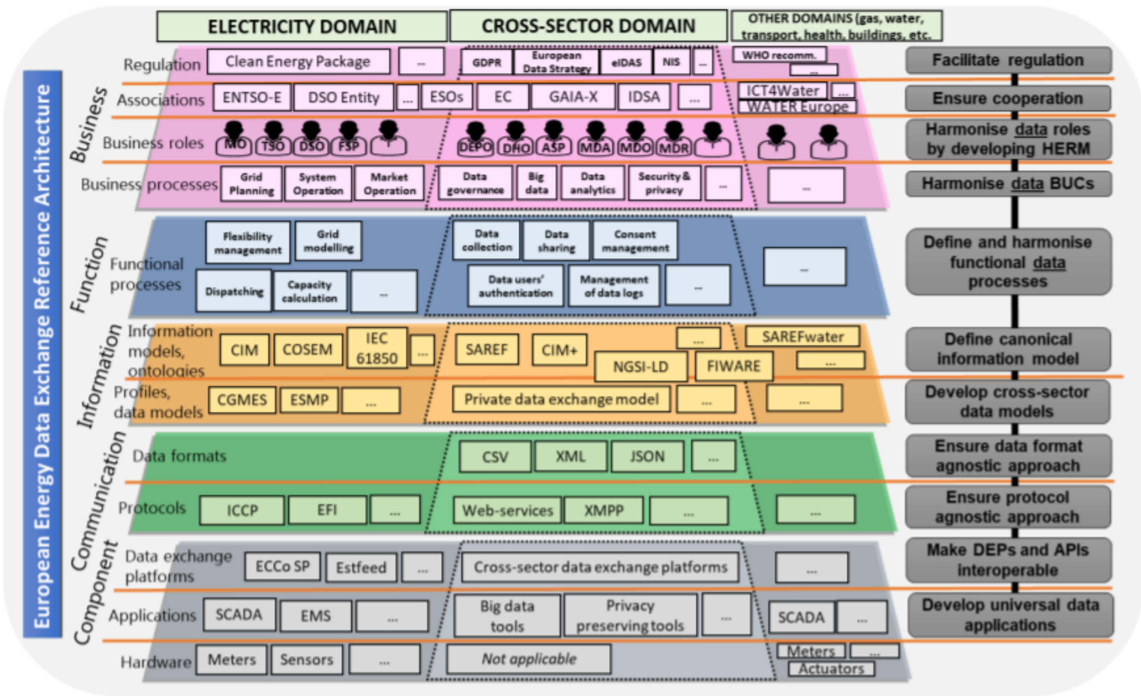


*Figure 2.6: European energy data exchange reference architecture* [21].

# 3 Cross-stakeholder coordination requirements

This chapter initially contains the coordination requirements from a consumer-centric perspective. Afterwards, the game-changing technologies used in the new era of power systems are presented.

## 3.1 Consumer perspective

To start with, this chapter follows the description of the consumer types, as highlighted in Mid-term report for Task 4.3 of the OneNet project, entitled as "*OneNet milestone on consumer engagement*". More specifically, it is following the definitions of active consumers, renewable self-consumers, Renewable Energy Communities (RECs) and Citizen Energy Communities (CECs), as depicted in the Clean Energy Package and the respective EU Directives [22].

From the prosumers' perspective [23], one way of integrating them in the energy market is by offering flexibility services to the grid and other energy actors. In order to incentivise prosumers, monetization is required. However, critical barriers exist, limiting the business opportunities for prosumers. These barriers vary from regulatory to technical ones existing in the legislation of the European countries. Due to these, many potential revenue streams that would be available to prosumers are out of reach to them. This is mostly true for small prosumers since some large industrial consumers already have access to flexibility markets.

Having access to flexibility markets is not the only problem for prosumers. The grid characteristics are not always aligned with what the flexibility prosumers can offer. When this is the case, both actors end up losing an opportunity to cooperate in what could be a win-win situation. To harmonize both interests there is the need for an easy to access system that also values flexibility for both prosumers and the grid.

Prosumers are not the only ones having problems accessing flexibility markets and their business opportunities. For aggregators, once again, due to the lack of regulatory frameworks and technical barriers such as high minimum bid sizes, it makes difficult to participate.

A very crucial requirement for the large-scale integration of the consumer perspective within the cross-stakeholder coordination is the organizational aspect. In more detail, when the consumers are organized into a group, and specifically when they are organized in a legal entity, for instance an energy community, there is a better interaction with the rest of the stakeholders.

The BRIDGE report on the '*Exploration of citizen engagement methodologies in European R&I projects*' produced by the BRIDGE Consumer and Citizen Engagement Working Group [24] provides some more insights into this topic. The Governance and Organizational models sub-group highlighted that in order to create long lasting engagement of citizens and consumers, it is crucial to create collectively run organisations [24]. The work of the sub-group focused


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on exploring the procedure of structuring citizen-led organisations through the example of energy communities (RECs and CECs). The BRIDGE report defined the governance principles of such organisations as: "*principles that guide the decision-making process on energy-related projects or policymaking. When governance principles have consistently proved to lead to good practices, they can be codified/institutionalised in legal governance structures/legal organisational model in national company law. Depending on the purpose that the governance structure/legal organisational model serves, the decision-making principles may vary. Governance principles hence are principles that guide the decision-making process and are either at the discretion of the project developer(s) to be defined and specified or codified in national company law*".

More specifically, the BRIDGE sub-group firstly reviewed the relevant corporate legislation in European Member States and then the statutes of several citizen-led organisations participating in European R&I projects. They also reviewed the legal forms chosen by the national governments to support the transposition of the REC and CEC definitions. Finally, they interviewed community leaders, in order to add hands-on experience to their research [24].

The abovementioned research concluded that in the analysed countries, three types of legal statutes are represented [24]:

- Associative legal statutes: those are usually not for profit organisations, ranging from simple non-profit associations to more complex associations adding in complexity as the protections to participants becomes higher.
- Company legal forms: those legal forms are traditional business forms, i.e., limited liability company, allowing for profit activities and requiring capital investment. Those forms involve a limit of liability of the participants and heavier constraints than not-for-profit statues.
- Cooperatives and foundations, as well as forms of specific purpose partnerships. Those forms usually have higher organisational burdens and specific advantages attached to them. It was found that the cooperative model is the most common organisational model they were able to study in their exercise.

The BRIDGE report deduced that creating a legal form appears to be a landmark in the life of a collective initiative of consumers allowing for activities and collective actions to be concretized and allowing for a better and more efficient interaction with other stakeholders. In the recommendations part of the report, it is stated that Member States should explore how energy communities could fit in already existing legal models at the national level. It is highlighted that "*Energy community initiators are subject to administrative burdens similar to other energy companies, which can be disproportionate compared to their nature of being non-profit and led by volunteers. Member states could offer to support communities in the early phases of set up with legal advice, and specific*


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*administrative procedures inspired by the non-profit registration procedures. This would be in line with the article 22(4)(h) of the 2018 renewable energy directive, requiring member states to implement a supportive framework for renewable energy communities (REC)*". To sum up, collective action, through democratic organizational forms, seems to allow for a sustained involvement of consumers and for a better interaction with the rest of the energy market stakeholders.

In line with the above, a report produced as part of the FLEXCoop project titled '*Flexibility services for energy cooperatives; An overview of possible flexibility-based services using residential equipment control*' adds another aspect in this topic [25]. It acknowledges that consumers often engage into flexibility services for ethical reasons such as environmental reasons (i.e., contributing to the energy transition) or social reasons (i.e., improving quality of life in their local community) rather than for economic reasons. It is also stated that, through its democratic governance model, a CEC or a cooperative allows for consumers to be represented and taken into consideration while decisions about their environment, community, houses are being taken. Moreover, these collective action schemes offer to the participants a sense of control and power over their energy consumption. Therefore, the cooperative gathers several consumers with more resources and assets, who can then be a 'higher-scale interlocutor' – a 'trusted partner' for service and technology providers. As further stated in the FLEXCoop report, CECs and cooperatives in particular are an opportunity to overpass some energy market shortcomings.

Another Deliverable produced from the same project indicates that "*In a decentralized context where more and more electricity is produced from distributed resources, a set of new services are emerging to ensure that RES energy can be produced and consumed locally at an affordable price. Demand-side flexibility services are a cornerstone of these services ensuring that electricity is consumed when the most efficient for the system*" [26].

In the same context, a relevant BEUC report, i.e., the European Consumer Organisation adds that demand response (including dynamic price contracts and aggregation contracts) is considered a very efficient solution for a consumer-centric energy market and for their cooperation with other market players [27]. However, there are some risks connected to it, such as the fact that consumers can easily get confused about tariffs and they have no way to protect themselves against bill shocks. Some recommendations listed for providers of new electricity offers to tackle these risks are to ensure that marketing and communication materials provide clear and complete information on offers, including how the tariff and rewards levels are set and inform consumers if flexible electricity offers are adequate for their consumption patterns, and look out for any signs of vulnerability, among others. They are also advised to ensure full compliance with GDPR and allow consumers to easily terminate the contract and switch.


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Finally, the BEUC report titled '*The Future of the Energy Consumers: Bright or Burdensome*' [28] highlights that the decarbonisation and decentralisation of energy generation, as well as the digitalisation of the energy sector are bringing big changes for consumers, while at the same time incentivize their engagement and interaction with the other market players. This report provides for concrete recommendations. In more detail, with regards to the flexibility services that consumers provide to the grid, it suggests that in order to get consumers on board, the Member States must ensure that the products for flexible consumption should be affordable, and the remuneration for their flexibility enough to make it financially appealing for them. In the field of digitalization and automation it is recommended that more needs to be done to enforce data protection legislation. Finally in terms of the regulation, it is suggested that the Member States ought to make sure that the legislative framework gets rapidly adjusted to the dynamic and fast-evolving energy landscape and is able to consider new business and consumer models.

## 3.2 Game changing technologies

### 3.2.1 Flexible Buildings as a connector between energy actors

Buildings have always been at the core of the energy demand infrastructure but nowadays they are also able to integrate energy generation, storage and even respond to grid signal to supply flexibility services [29]. Flexible buildings are a type of building that besides energy consumption are able to generate, store and/or supply the grid flexibility. They become an active part of the energy system. This has direct benefits to the building energy efficiency as well as the overall energy system efficiency.

In order to enable this flexibility a Building Energy Management System (BEMS), or similar smart controller, is used to interact with the grid and control the building's energy systems, which might range from generating and storing energy, supply energy to the grid and increase or decrease demand through a set of controllable loads. This interaction is not limited to the grid and can be expanded locally as part of local energy communities. Once again, this interaction is enabled by the exchange of signals by members of the same community, letting them optimize trades with each other. It becomes clear that for buildings to become flexible they need: their energy resources to be digitally connected, such as in a IoT digital platform; to be digitally connected with other energy systems such as DSO, aggregator, and/or LEC (Local Energy Communities) platforms; and for the building's energy resources to be able to be controlled in response to the signals of these other platforms.

With this interaction in the core of flexible buildings, occupants are able to have an active role in the energy system as prosumers, doing much more than just consuming energy. Their integration opens up a new array of data-driven energy services, such as demand side flexibility, allowing the DSO to address network constraints at the local


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level by using this flexibility from active buildings. Finally, with these actors now having the possibility to interact with other energy systems the need for an energy market that is able to include them and offer their services becomes clear.

### 3.2.2 E-mobility flexibility and stakeholders' coordination

The electrification of mobility [30] is a paramount measure to achieve decarbonisation, requiring the integration of the transport and energy sectors. The electricity system might face several technical challenges with the increase of Electric Vehicles (EVs) unless their utilization is well managed. EV charging has to be smartly managed, or else, EVs could become a burden to the energy system, especially during peak consumption and/or congested areas. Only if properly managed, can the effect of an expanding EV market be neutral to the grid, possibly even having a positive effect if used as bidirectional energy resources.

Ground-breaking services and technologies are able to achieve this goal. The electrical grid systems of the future will be increasingly complex and will have to be managed with smart solutions that fit each driver's charging requirements alongside the system's requirements and available resources.

Charging (Figure 3.1) can be seen as "smart" whenever it is remotely monitored and controlled. Types of smart charging:

- **V1G**: While plugged-in, EV charging can be controlled, either by slowing down, accelerating, halted, or delayed. When the battery is full the services halt.
- **V2G** (Vehicle-to-Grid): While plugged-in, EV can trade energy with the grid bidirectionally (charging or discharging).
- **V2B/V2H** (Vehicle-to-Building/Home): While plugged-in, EV can trade energy with the building bidirectionally (charging or discharging).


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| Features | "Dumb Charging" | Smart Charging | V1G | Bidirectional Charging V2B V2H |
|---|---|---|---|---|
| One-way EV charging | ⚡ | ⚡ | ⚡ | ⚡ |
| Set time of charge | | ⚡ | ⚡ | ⚡ |
| Set charge rate | | | ⚡ | ⚡ |
| Access energy markets | | | ⚡ | ⚡ |
| Store + discharge energy | | | | ⚡ |

*Figure 3.1: EV Charging Classification* [30].

Aggregation of bi-directional EVs in Virtual Power Plants (VPPs) within large geographical areas offer flexibility to the grid. They can work as distributed energy assets capable of easing demand needs and enter ancillary services markets. This allows EVs to grow into integrated resources, implemented in the electricity network as required, reacting to price signals beyond retail price. EV batteries can improve grid stability. Currently there are two large key changes in the electrical grid that affects its balancing, more electric cars, and more renewable energy sources. To keep the grid balanced, DSOs and TSOs spend millions of euros yearly. So, there is the need, even request, for DSOs and TSOs to innovate and provide these necessary ancillary services by procuring energy from private homes and vehicles.

Renewable energy sources are increasing in the grid, and this raises questions in securing supply. It is getting more regular to have congestions in the transmission grid, particularly between production centres and consumption centres. However, EVs by facilitating a more efficient TSO redispatch can mitigate this issue and sustain the energy transition. Utilising its flexibility potential via V2G, will allow TSO's to increase network stability, and to decrease redispatch costs.

Combining EV charging and energy storage can offer interesting services to EV drivers and the grid, such as fast charging, particularly, in remote areas where the grid is not able to deliver it. This structure improves the existing charging services for EV drivers and further helps locally produced renewable sources to be integrated in the energy mix. This combination can even provide other new services to both users and the grid in the long run.



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### 3.2.3 DLT and Blockchain

The energy industry is particularly well suited for Distributed Ledger Technologies (DLT) and its blockchain technology applications. With the rise of IoT, the entire energy industry may soon find its operations transformed into a vast global network of connected devices all feeding digital data into blockchain-enabled platforms that can capture and share information in real time [31].

Blockchain can offer more trustworthy and efficient platforms for energy transacting (executing and recording transactions, as well as, tracking asset ownership). Allowing transactions to be recorded and settled nearly instantly, there would be no need for an intermediary and all involved actors will use the same single platform. Executable computer code indicating the terms of the contract among the involved can create a “smart contract” that processes transactions automatically with no human involvement. This could be applied across the full range of the energy sector whenever coordination and settlement among stakeholders is required. Blockchain has the potential to enable P2P transacting between end-users (Figure 3.2). These local trading networks could also ease power line losses and congestion issues.

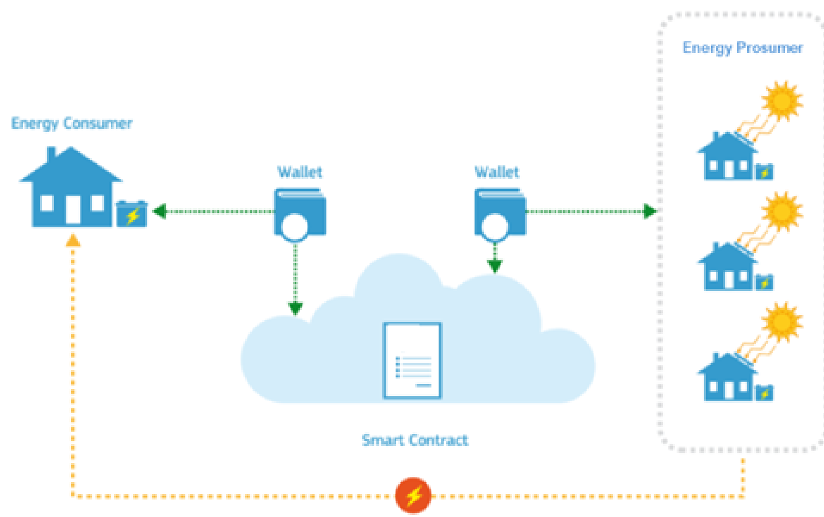


Figure 3.2: P2P transactions between prosumers, using smart contracts in the blockchain [31].

Nowadays energy actors are increasingly required to deliver large sets of data for regulatory compliance. With the current methods to achieve this, it is becoming a massive burden, plus having the risk of sensitive information to fall into the wrong hands**.** Blockchain could improve regulatory reporting and compliance, enabling transparency and access to regulators while securing that those entities preserve control over the information and to whom it is access by. A blockchain-based platform could also facilitate the creation of a standard data structure for the industry.



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The current energy ecosystem is fairly dense, having thousands of actors interacting with one another, driving up complexity and cost. Blockchain would optimize cross-sector assets, by monitoring and enabling transparency between interactions, boosting cooperation among actors while concealing proprietary information. This would improve distribution reliability and efficiency by automatically facilitating the coordination and delivery of power on a lower cost.

Across the energy industry the blockchain would have the following potential benefits [31]:

- Improved transparency, accessibility, collaboration, and operating efficiency,
- Exclusion of intermediaries and costly market complexities,
- More efficient settlement cycles,
- Easier regulatory reporting and data standardization, and
- Creation of new business models and monetization through the blockchain platforms.

### Integrating DLT in the ICT sector

Integrating internal IT processes with DLTs in the ICT sector has not been simple [32]. The technical integration requirements could create an entry barrier for new participants. For example, if private blockchains do not have interfaces to other services providers, they cannot interact with others.

Related to DLT implementation these were the main challenges identified:

- Interoperability between blockchains or to another service offered outside a DLT,
- Semantics and ontologies applied to DLT data,
- Data storage and its security imperative,
- Integration to identity services outside a DLT,
- Trust for data handling in a permissionless system,
- Interoperability of DLT consensus algorithms,
- On-line and off-line trust,
- Privacy features preserved over public or permissioned blockchains, and
- Know Your Customer features for the participants in DLTs.

These challenges have to be addressed within each context, for example, integration of identity services beyond the DLTs may be needed on billing services but not for flexibility integration.



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While Blockchain and DLT were initially focused on full transparency, enterprise blockchain solution are now trying to solve the issue of user/data privacy. One approach is Know Your Customer (KYC) standardization, a decentralized schema that enables user privacy protection on enterprise blockchains while at the same time allows the exchange of value between participants subject to the necessary Anti Money Laundering (AML) practices and legislation.

### Blockchain applied to local energy communities

In an energy community use case laid out by the JRC [33] a blockchain energy model is used to allow for P2P trading between prosumers. The main objective of the model is to decentralize the energy system, allowing prosumer's energy transactions without intermediaries.

The blockchain system revolves around the use of smart contracts. These allow, for example, the prosumer to set his minimum price for selling energy and/or maximum price for buying energy. In this way the smart contracts will take care of the negotiations needed to arrive at an ideal compromise between prosumers. Using smart contracts, all these negotiations happen in a transparent and predictable way since these are immutable and can be seen by everybody.

In this use case two different ways in which the energy reached the consumer were explored. One used a neighbourhood central storage, where prosumers could store their produced energy and could afterwards release it to the grid or be consumed by them or other prosumers. The second way is to make direct energy exchanges among prosumers.

One challenge identified by the JRC in such a model is the reliance on smart meters as the point of trust for all the energy measurements for the energy exchanges happening. The smart meters are the core of the necessary data retrieval for these models to work properly, fairly and reliably. At any given moment it's hard for the system users to know for sure if their smart meters are measuring the information correctly, since they could be malfunctioning or have been tampered with. Components such as Trusted Platform Module (TPM), Trusted Execution Environment (TEE), Secure Element (SE) are suggested software and hardware configurations in order to determine if the smart meter is working properly.

Additionally, another method is suggested that allows neighbour nodes to detect when energy is being injected into the grid and validate the energy transfer using a consensus-like mechanism in order to accumulate the measurements received for every expected energy transfer. Only transfers that are verified by neighbour nodes are registered into the system.



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## 3.3 Data governance tier

### IDSA on Data Governance [34]:

Data management, rights, and decisions are normally bound by an organization borders. Consequently, when data is being shared outside of that organization, the influence of its authority over its data might be insufficient. The IDS-RAM proposes an approach to the problem by distributing the decision rights among the different roles that are part of the data space ecosystem. In this way the data governance requirements need to be met by all of the actors participating in the data space.

The business layer of the IDS-RAM lays out the roles of the participants while also considering the business perspective regarding data ownership, data provision, and data consumption. Service concepts such as data brokerage are described as well. The functional layer provides components directly related to the data governance perspective. In order to guarantee trust, security, and data sovereignty, interoperability and connectivity must be ensured. The IDS connector is the main interface used to connect participants of the data space. The interactions between components of the IDS-RAM are described in the process layer where all the major processes are related with data governance - onboarding, exchanging data, and publishing and using Data Apps. This provides a technical and dynamic view of the Architecture. Another key aspect of data governance is dealt with in the information layer. The framework for standardized collaboration and common vocabulary for participants is defined allowing for a homogeneous description of metadata in the data space. Finally, the system layer describes the technical implementation of security levels for data exchange between data endpoints.

The IDS Data Governance Model outlines a decision-making framework regarding the definition, creation, processing, and use of data. However, the IDS framework also encompasses the usage rights of data exchanged in the IDS environment. The management of metadata is paramount in distributed systems that don't rely on central data storage, allowing for various heterogeneous databases to self-organize. The following responsibility assignment matrix - RACI matrix (Figure 3.3) presents these activities in the IDS environment:



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| Activity | Data Owner / Data Provider | Data User / Data Consumer | Broker | Clearing House |
|---|---|---|---|---|
| Management | | | | |
| Determine data usage restrictions (execute data ow-nership rights) | R, A | - | S | - |
| Enforce data usage restrictions | - | R, A | - | - |
| Ensure data quality | R, A | - | S | - |
| Monitor and log data transactions | S | S | - | R, A |
| Enable data provenance | S | S | - | R, A |
| Provide clearing services | S | S | - | R, A |
| Metadata | | | | |
| Describe and publish metadata | R, A | - | S | - |
| Look up and retrieve metadata | - | R, A | S | - |
| Data Lifecycle | | | | |
| Capture and create data | R, A | - | - | - |
| Store data | R, A | S | - | - |
| Enrich and aggregate data | S | R, A | S | - |
| Distribute and provide data | R, A | - | S | - |
| Link data | S | S | R, A | - |

Legend: R – Responsible; A – Accountable; S – Supporting.

*Figure 3.3: RACI matrix of the IDS environment* [34]





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Data Sovereignty is important for Data Governance to define the rights, duties, and responsibilities of using data. This is relevant on every layer of the Model. Comparing to other architectures, it is the decentralized data exchange through the use of self-control mechanisms (the IDS connectors) that guarantees full data sovereignty.

IDS fosters interoperability among participants since it is considered that data goods self-determination is vital in this environment. Data exchange is secured and encrypted using authorization and authentication. The Data Provider can add metadata to the data transferred using IDS Vocabulary, so the terms and conditions of data sovereignty are unambiguous.

Provenance and lineage of data is provided by creating transparency and offering clearing functionality. This is achieved by the IDS connectors and Clearing House components that track the data provenance in a way that is recursively traceable. In addition to this the IDS vocabulary integrates the provenance information as part of the metadata that participants have access to during the process of data exchange.

### Data Governance on specific technologies:

The integration of flexible buildings into the overall energy system is done with the support of digitalization. It is imperative then that data privacy and cybersecurity is ensured at all stages of the data lifetime. Energy smart devices need to be compliant with relevant regulations and standards that deal with data privacy and cybersecurity. Since these energy smart devices operate at the edge, these data privacy and cybersecurity components should also be deployed at the edge level.

When using V2X technology for the stabilisation of the grid, the highest cyber-security levels should be used, to avoid hacking attacks and guarantee data storage in case of communication losses. A secure exchange of data and information between the grid, the charging station, and the EV has to be assured. An example can be a VPP solution that enables the communication between the VPP control centre and each individual controlled device without relying constantly on IP communication. The solution requires an IP communication interruption. Basically, when processing data from EVs charging, the information is then transmitted to an alternative information forum of the data managing chain. In doing this, cybersecurity is secured, avoiding hacking incidents.

## 3.4 Requirements for enabling large scale integration

This subchapter compiles all the requirements gathered in the previous sections regarding cross-stakeholder coordination:


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Consumers:

- Assure reliance on smart meters measurements – emerging blockchain based market models rely on information gathered from smart meters to conduct negotiations. Components capable of determining the validity of smart meters measurements should be implemented
- Creation of monetization incentives for prosumers to offer their flexibility to other actors
- Lift regulatory barriers to market design affecting aggregators and prosumers participation
- Alignment between grid needs and prosumers flexibility opportunities
- Collective action, through democratic organizational forms such as energy communities, seems to allow for a sustained involvement of consumers and for a better interaction with the rest of the energy market stakeholders

Game-changing technologies:

- Smart devices deployment (controllable and communicative devices) and associated smart controllers – such as Building Energy Management System (BEMS) and smart charging stations (V2X enabled)
- Exchange platforms between all energy actors – such as DSO-customer platform and VPP platforms (either for energy production/consumption, or for EV aggregation, etc.)
- Combining EV station with energy storage
- Digitalisation of assets – deployment of IoT networks and platforms capable of managing data and exchange data with other platforms
- Getting regulators on board – developing real-world blockchain solutions so lawmakers and regulators have a strong, practical base to build on
- Coming together to create a solution – getting companies to cooperate in creating a common vision and agree on using/developing common platforms and standards

Data Governance:

- Whenever there is data exchange among different organisations data management rights and decisions should be distributed among the different roles that are part of the data space ecosystem
- Define the roles of the participants in the data exchange and their business perspective regarding data ownership, data provision, and data consumption
- To define the rights, duties, and responsibilities of using data – Data Sovereignty. Data Providers should add metadata using a single Vocabulary, so the terms and conditions of data sovereignty are unambiguous.

# 4 System Use Cases for OneNet

The objective of this chapter is to collect the Demo SUCs and to define the General OneNet SUCs, which will be used for the derivation of the FUR and NFR. In order to do so, the methodology used for the definition of the General OneNet SUCs is initially presented. Then, the SUCs derived by the OneNet demonstrators are presented in detail, along with the identified data exchanges and functionalities envisioned to be performed from the demonstrators by the OneNet system. Finally, the General OneNet SUCs are derived and reported properly.

## 4.1 Methodology

The methodology followed towards the definition of the OneNet General SUCs is depicted in Figure 4.1.

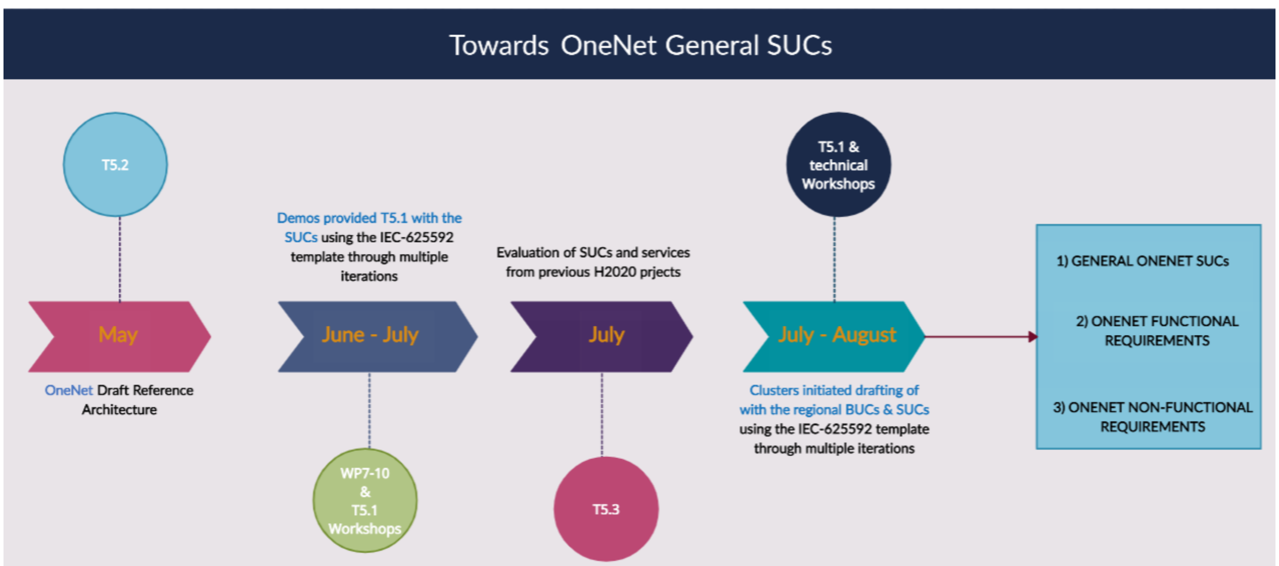


*Figure 4.1: Time plan of the actions conducted for the generation of the FUR and NFR for OneNet.*

Specifically, the actions conducted during the derivation of the OneNet FUR and NFR are the following ones:

- Task 5.2 provided an initial conceptual reference architecture of the OneNet system of platforms,
- Demonstrators provided T5.1 with the Demos SUCs using the IEC-625592 template [35] through multiple iterations. A collective approach was performed, through the organization of multiple workshops on a cluster level, and the presentation of the SUCs for the proper derivation and formulation of the SUCs. A first assessment of the SUCs that connect to the OneNet system of platforms was conducted,


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- ❖ Utilization of the work and methodology proposed in T5.3, in which an evaluation of the SUCs and services from previous projects was conducted, analysing the data exchange of each Demonstrator's SUC in order to identify connection with the OneNet[2],
- ❖ Clusters initiated drafting the Regional BUCs, which are reported in D2.3 (potential SUCs related to the Regional BUCs will be documented in next months of the project), using the IEC-625592 template. Workshops organized both on a project level (technical workshop) and on a T5.1 level with the WP7-10 demonstration clusters,
- ❖ Creation of the OneNet General SUCs based on the architecture of the OneNet system, and the envisioned functionalities anticipated by Demonstrators from the OneNet,
- ❖ The thorough analysis of all the above led to the derivation of FUR and NFR for the OneNet system.

It is necessary at this point to explicitly define the different types of SUCs presented in this deliverable. Particularly, the following definitions are given:

- ***Demo SUC:*** This SUC type is derived directly from the demonstrators and is linked to one or more Demo BUCs.
- ***Regional SUC:*** This SUC type is derived on a cluster level to showcase the connectivity amongst demonstrators belonging to the same cluster through OneNet system of platforms.
- ***OneNet General SUC:*** This SUC type is derived by following two processes; first, the data exchanges and used services between actors/platforms in both Demo and Regional SUCs with the OneNet system of platforms are identified and classified. Second, we include SUCs identified in other H2020 projects, based on the work conducted in the context of T5.3, that are relevant to the OneNet, in order to have a complete list of General SUCs that will be implemented through the OneNet system of platforms.

For the documentation of the below presented SUCs, either Demo or OneNet General ones, the following template is used:

| Name SUC | |
|---|---|
| SUC ID | |
| Objectives | |
| Narrative | |
| Steps | |

[2] For an extensive presentation of this action, please consult Appendix B.



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| | |
|---|---|
| **Involved Platforms/actors** | |
| **Related BUCs** | |
| **Connection to OneNet** | |
| **Sequence diagrams** | |

where:

- ***Name SUC:*** Contains the name of the presented SUC,
- ***SUC ID:*** The ID of the SUC based on the type, i.e., Demo (D), Regional (R) or General (G), the cluster, i.e., Northern (NO), Southern (SO), Western (WE), Eastern (EA), the country (if applicable) and the index, e.g., DSUC_SO_GR_01 which is linked to the first Demo SUC of the Greek Demo belonging to the Southern cluster,
- ***Steps:*** The sequence of steps and operations performed in order to accomplish the SUC,
- ***Objectives:*** The objective that each SUC has,
- ***Narrative:*** A full description of the SUC,
- ***Preconditions:*** The conditions that have to in place in order to the SUC to be implemented,
- ***Involved Platforms/actors:*** The actors and platforms involved in this specific SUC,
- ***Related BUCs[3]:*** BUCs that are related to the SUC. For the nomenclature of the related BUCs,
- ***Connection to OneNet:*** The way that the SUC connects to the OneNet system of platforms (if applicable),
- ***Sequence diagrams[4]:*** Sequence diagrams illustrating the data exchange for the realization of the particular SUC.

At this point of the project, Regional SUCs are still on the development phase. Hence, in the context of D5.1 Regional SUCs will not be defined. This action will take place in the following months and the information will be reported in the rest tasks of WP5, along with the vertical WPs 7 to 10.

[3] Please consult the Appendix A and a brief description, based on the input received from D2.3.
[4] They are Included in the main body of the Deliverable only for the case of the General OneNet SUC. For the Demo SUCs, please consult Appendix C.



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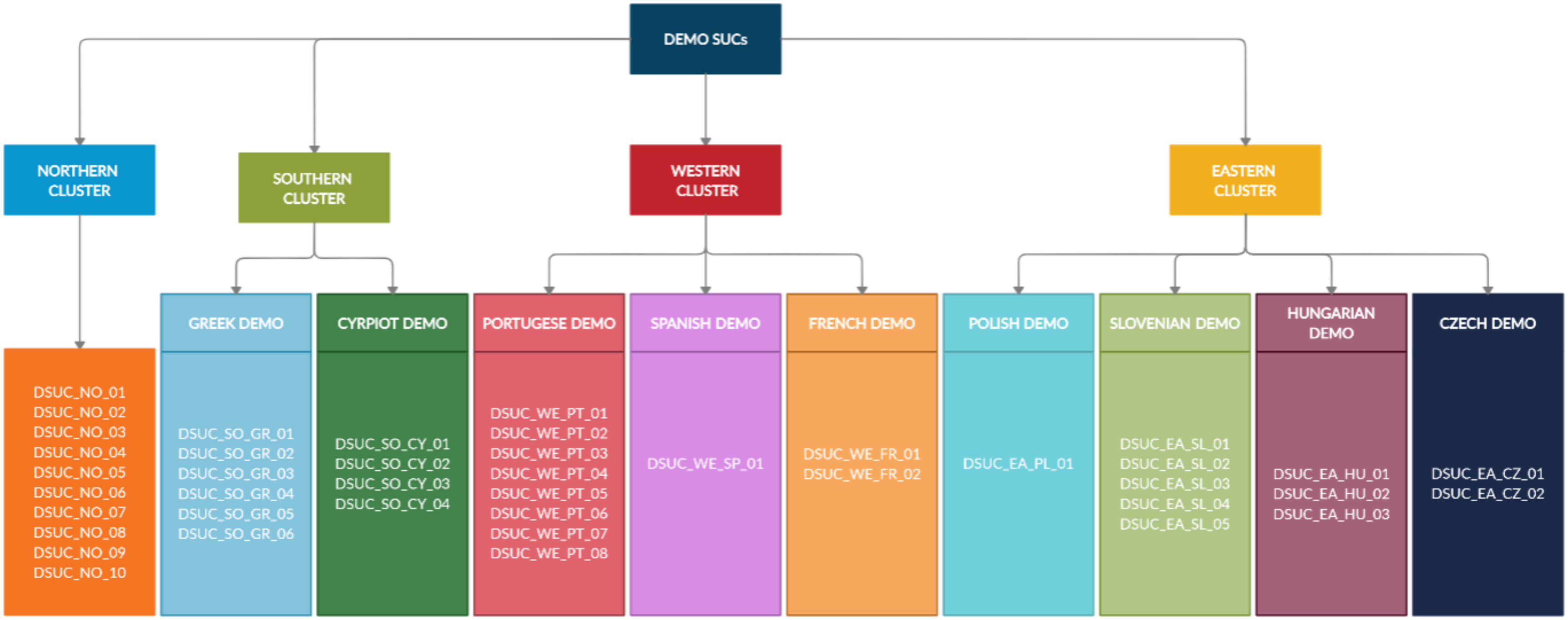


*Figure 4.2: Classification of the Demo SUCs per cluster and demonstrator.*



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## 4.2 Demo SUCs

This subsection conducts a brief presentation of the Demo SUCs, by using the table described thoroughly in the previous subsection. Afterwards, the analysis carried out to identify the connections to OneNet and the corresponding data exchanges is introduced. The full definition of the SUCs is included in the Appendix C. We need to declare that the maturity level of the reported Demo SUCs reflects the progress conducted up to M12 of the project (September 2021). Any further upgrades, refinements or redefinitions will be found in the deliverables of the vertical WPs 7-10. In order to facilitate the reader with the SUCs developed in the clusters, Figure 4.2 illustrates the Demo SUCs classification per cluster and demonstrator.

### 4.2.1 Northern Cluster

*Table 4-1: DSUC_NO_01.*

| Name SUC | Preparation to flexibility trading |
|---|---|
| SUC ID | **DSUC_NO_01** |
| Objectives | Enable the preparation of FSPs and their resources for flexibility trading in the context of OneNet Northern demonstration scope. Prequalification process is a prerequisite for the following process steps of multilateral flexibility trading and coordinated flexibility procurement by SOs. |
| Narrative | In order to prepare FSP for flexibility trading, firstly, it's contracted resources must be managed in the FR. This information makes it possible for the FSP to start prequalifying its resources. This use case also includes the steps for registering new products sent by the market operator, registration of the FSP and the SO flexibility need. These are needed later by the overall processes including flexibility trading and TSO-DSO coordination.<br><br>After these steps the resource information can be registered by the FSP, which initiates the prequalification process. Information is sent to T&D CP for grid impact assessment for which the results are stored in the FR. Next, the resource or a group of resources is product prequalified by comparing their characteristics to the product requirements. In some cases, the product prequalification is confirmed by the market operator or system operator. Again, these results are stored in the FR and shared to parties when needed. |
| Steps | ○ Flexibility contract Management<br>○ Prequalification Phase |
| Involved Business and System actors | FSP, FR, SO, MO, T&D CP |
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |




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*Table 4-2: DSUC_NO_02*

| Name SUC | Procurement and delivery support |
|---|---|
| SUC ID | DSUC_NO_02 |
| Objectives | Enable the FSPs efficiently offer their resources on different markets and the SOs to procure and monitor the flexibilities in the context of OneNet Northern demonstration scope. This process is a prerequisite for the settlement and verification phases. |
| Narrative | In the procurement phase the role of the FR is to support the MO and T&D CP by sharing relevant information and receiving the outcome of the procurement to later enable the verification and settlement. The FR is also used to provide real-time visibility for the SOs regarding the activated flexibility. |
| Steps | ○ Flexibility (capacity and energy) procurement<br>○ Activation<br>○ Delivery and real-time monitoring |
| Involved Business and System actors | FSP, FR, SO, MO, T&D CP, RP, CA |
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

*Table 4-3: DSUC_NO_03*

| Name SUC | Flexibility Register Verification and settlement |
|---|---|
| SUC ID | DSUC_NO_03 |
| Objectives | Enable quantifying the delivered flexibility volumes and support the financial and imbalance settlement based on the results in the context of OneNet Northern demonstration scope. |
| Narrative | One of the core functionalities of the FR is to conduct the verification and settlement of the flexibility bids being traded. Verification means the quantification of the delivered flexibility. This is done by gathering metering data and comparing it to either a calculated baseline or predefined plans. The product in question specifies which method is to be used. After the verification, the results are shared to parties involved in the trades. The FR can also in some cases determine the remuneration and penalties if these are described within the product specification. The FR also communicates possible adjustments to BRPs' balance position to the Imbalance Settlement Responsible. |
| Steps | ○ Verification and settlement |
| Involved Business and System actors | FR, SO, MO, T&D CP, RP, CA, MDR |
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |





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*Table 4-4: DSUC_NO_04.*

| Name SUC | Add New Product |
|---|---|
| SUC ID | **DSUC_NO_04** |
| Objectives | Creating a new product in the market |
| Narrative | In order to have any trade between a Flexibility provider and system operator, at least a market needs to offer the flexibility product. Here the process of adding a product to a market will be reviewed. The process starts from the need for a system operator (SO). When a SO need any type of flexibility, contact market operators (MO) to find which product is suitable for its need. If there is no product, which is suitable for the need of the SO, it needs to define the product properties and send it to MO. Here, MO will decide whether wants to offer this product in its market or not. If MO wants to offer the product, it will publish the description and inform the flexibility register to start the prequalification process. |
| Steps | ○ MO steps in add new product |
| Involved Business and System actors | MO, SO, FR, T&D CP, CA |
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

*Table 4-5: DSUC_NO_05.*

| Name SUC | Procurement |
|---|---|
| SUC ID | **DSUC_NO_05** |
| Objectives | Product procurement in the market |
| Narrative | The procurement process of flexibility products in a market can be divided into four main processes: opening the market, trading, matching, and closing the market. In the opening scenario, the market will be open, and the availability of trading will be informed to all relevant parties. In trading, flexibility service providers submit their bids and system operators publish their purchasing need. In the matching scenario, the market operator in cooperation with the TSO & DSO coordination platform match the bid and offer and find the optimum solution. finally, the market operator informs the results to the relevant parties in the closing scenario. |
| Steps | ○ Opening of the procurement process<br>○ Trading<br>○ Matching<br>○ Closing<br>○ Settlement |
| Involved Business and System actors | MO, SO, FR, T&D CP, ISR |



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| | |
|---|---|
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

*Table 4-6: DSUC_NO_06.*

| Name SUC | Secondary Trading |
|---|---|
| SUC ID | **DSUC_NO_06** |
| Objectives | Replacing FSP, which failed to provide flexibility |
| Narrative | When an FSP, which have a bidding contract for providing a flexibility product for future, realizes that cannot fulfil the contract, it can inform and ask market operator to find a replacement for it. This process called secondary trading and it is quite similar to the normal trading, but the process trigged by sending a request from the FSP, which is not capable to fulfil the contract. |
| Steps | ○ MO steps in New Product prequalification |
| Involved Business and System actors | MO, SO, FR, T&D CP |
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

*Table 4-7: DSUC_NO_07.*

| Name SUC | Grid Qualification of Resource |
|---|---|
| SUC ID | **DSUC_NO_07** |
| Objectives | Tool and algorithm developed to facilitate multilateral flexibility market through improved TSO-DSO coordination, also enabling cross-border marketplace. The objective of grid impact assessment is to avoid congestions by setting restrictions on the activation of flexibilities which would cause congestion in grids. |
| Narrative | Grid qualification of a flexibility resource may take place in prequalification, procurement, and activation phases. Grid impact assessment is central activity of grid qualification process. Two alternatives are possible in each phase. First, concerned SO identifies grid restrictions (constraints) by itself and provide the results to coordination platform. Second alternative is that restrictions are calculated by TSO-DSO Coordination Platform.<br><br>For the second alternative, a dedicated algorithm is needed which calculates the grid restrictions based on input information (depending on the phase – flexibility needs, and resource information or flexibility bid or flexibility activation request; and grid information either as grid model, grid topology or simple grid constraints). If both alternatives are applied to the same resource, these need to be merged into single result by updating the algorithm. |



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| | |
|---|---|
| | The impact assessment is a continuous process. In prequalification phase normally structural congestions should be considered, while in procurement and activation phases also dynamic congestions. Resource Provider's consent is needed by TSO-DSO Coordination Platform to have access to private information like Resource Information and Flexibility Bid. |
| **Steps** | ○ Grid qualification of resource in prequalification phase<br>○ Grid qualification of resource in procurement phase<br>○ Grid qualification of resource in activation phase |
| **Involved Business and System actors** | MO, SO, FR, T&D CP, RP, CA |
| **Related BUCs** | Northern regional flexibility market |
| **Connection to OneNet** | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

*Table 4-8: DSUC_NO_08.*

| **Name SUC** | **Bid Ranking & Optimization** |
|---|---|
| **SUC ID** | **DSUC_NO_08** |
| **Objectives** | Tool and algorithm developed for ranking and optimizing flexibility bids to facilitate multilateral flexibility market through improved TSO-DSO coordination, also enabling cross-border marketplace. |
| **Narrative** | An algorithm performs bid ranking and bid optimization processes. Grid model or grid topology or grid constraints are needed as input into the algorithm. Bid ranking means listing the flexibility bids for each product according to their economic value. Ranking should not be based on the price but on the 'relative price' which takes into account grid information, i.e., total costs for the System Operator(s). Several merit order lists can be produced if the ranking depends on the availability of a bid for different services. This step is repeated continuously.<br><br>Inserting purchase offers as input into the algorithm enables to perform bid optimization. Optimizing means matching flexibility bids and purchase offers in most economical way which takes into account synergies (value-stacking). This step is repeated continuously.<br><br>Bids for balancing need to be shared with relevant EU platform (MARI, PICASSO). If bids were meanwhile activated for congestion management purposes, it should be possible to withdraw the respective bids from EU platform. |
| **Steps** | Bid ranking |
| **Involved Business and System actors** | MO, SO, T&D CP |
| **Related BUCs** | Northern regional flexibility market |
| **Connection to OneNet** | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |



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Table 4-9: DSUC_NO_09

| Name SUC | Bid Selection for Activation |
|---|---|
| SUC ID | **DSUC_NO_09** |
| Objectives | Tool developed for flexibility activation to facilitate multilateral flexibility market through improved TSO-DSO coordination, also enabling cross-border marketplace. |
| Narrative | Bids not to be activated directly after matching of bids and offers by Market Operator should first pass grid impact assessment and optimization. Flexibility activation requests were collected from system operators in the optimization process and will be forwarded to selected FSPs. FSPs send back to TSO-DSO Coordination Platform confirmation about receiving the activation request as well as confirmation about actual activation.<br><br>Counter Action is needed if activation of would cause imbalance in system. Three alternative options are possible: TSO-DSO Coordination Platform selects automatically bid for counter action, System Operator sends information to coordination platform about whether counter action should be taken, or no action for counter action is taken by coordination platform. |
| Steps | Bid selection |
| Involved Business and System actors | MO, SO, T&D CP, FR, FSP |
| Related BUCs | Northern regional flexibility market |
| Connection to OneNet | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

Table 4-10: DSUC_NO_10.

| Name SUC | Flexibility call for tender opening |
|---|---|
| SUC ID | **DSUC_NO_010** |
| Objectives | Facilitate coordinated trading by centralizing information about active calls for tender. |
| Narrative | A call for tender of flexibility services relies on specific products and can cover in addition to product specifications specific periods (week ahead, day ahead, intraday, etc.), location, quantity. The call for tender is initiated by the System Operator who needs the flexibility. Information about all calls is collected and stored centrally at TSO-DSO Coordination Platform and made available to concerned market operators and system operators. Call for tender applies to all one-time auctions (e.g., long-term procurement), regular auctions (e.g., mFRR) and continuous bidding (e.g., bids from intraday market). In case of regular and continuous trading the call is opened only once for all subsequent delivery periods. |
| Steps | FCT opening |
| Involved Business and System actors | MO, SO, T&D CP |
| Related BUCs | Northern regional flexibility market |



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| | |
|---|---|
| **Connection to OneNet** | Details about the interactions will be collected from the Northern Cluster in the next months and reported in the other WP5 deliverables. |

### 4.2.2 Southern Cluster

*Table 4-11: DSUC_SO_GR_01.*

| **Name SUC** | **Improved production and consumption prediction for DSO and microgrid voltage levels** |
|---|---|
| **SUC ID** | **DSUC_SO_GR_01** |
| **Objectives** | ○ Frequency stability<br>○ Cost-effective operation of the system<br>○ Better FSPs planning and managing flexibility resources.<br>○ Better energy predictions and power system state predictions<br>○ Improved identification of the available flexibility resources on all power system levels.<br>○ Improved prediction of the system flexibility needs. |
| **Narrative** | Improved production and consumption prediction for DSO and microgrid voltage levels that will allow for better identification of the available flexibility resources, from residential prosumers to the centralized WPPs and SPPs connected to the distribution grid or any local micro-grid (local energy community), through improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration and its presentation with the improved observability on a higher operational control and monitoring levels, including regional, RSC level. |
| **Steps** | |
| **Involved Business and System actors** | Weather forecast provider, Load Forecasting operator (DSO/Micro-grid operator), Production Forecasting operator (DSO/Micro-grid operator), Production Forecasting operator (TSO/Aggregator), Load Forecasting operator (TSO/Aggregator), Flexibility Register Operator (FRO), Production scheduling operator (market operator) |
| **Related BUCs** | SOCL-GR-01 |
| **Connection to OneNet** | |

*Table 4-12: DSUC_SO_GR_02.*

| **Name SUC** | **DSO, DG and microgrid POI management** |
|---|---|
| **SUC ID** | **DSUC_SO_GR_02** |
| **Objectives** | ○ Frequency stability<br>○ Load flow and contingency monitoring and predictions<br>○ Predictive congestion management for maintaining secure and stable power system operation<br>○ Cost-effective operation of the system<br>○ Early warning on a hazardous power system regimes,<br>○ Better FSPs planning and managing flexibility resources.<br>○ Better energy predictions and power system state predictions |


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| | |
|---|---|
| | ○ Improved identification of the available flexibility resources on all power system levels.<br>○ Improved prediction of the system flexibility needs. |
| **Narrative** | Register of POIs - Point of Interest with necessary regular periodic updates, technical data, historic data, forecasted data archiving and analysis for AI applications. |
| **Steps** | |
| **Involved Business and System actors** | Load Forecasting operator (DSO/Micro-grid operator), Production Forecasting operator (DSO/Micro-grid operator), Production Forecasting operator (TSO/Aggregator), Load Forecasting operator (TSO/Aggregator), Flexibility Register Operator (FRO), Production scheduling operator (market operator), DACF operator (TSO and corresponding expert in DSO), 2DACF operator (TSO and corresponding expert in DSO), IGM manager (TSO and corresponding expert in DSO), ATC calculator (TSO and RSC), Power system control expert (TSO/DSO), Balancing mechanism operator (TSO), RES Scheduling operator (TSO based), Losses calculator (TSO), Regional DACF operator (RSC), Regional 2DACF operator (RSC), CGM manager (RSC), ATC coordinated calculator (TSO or RSC),Production Forecasting/Scheduling operator (Regional RES coordinator) |
| **Related BUCs** | SOCL-GR-01 |
| **Connection to OneNet** | |

*Table 4-13: DSUC_SO_GR_03.*

| **Name SUC** | **Change View - different aggregation level simulations** |
|---|---|
| **SUC ID** | **DSUC_SO_GR_03** |
| **Objectives** | ○ Frequency stability<br>○ Load flow and contingency monitoring and predictions<br>○ Predictive congestion management for maintaining secure and stable power system operation<br>○ Cost-effective operation of the system<br>○ Early warning on a hazardous power system regimes,<br>○ Better FSPs planning and managing flexibility resources.<br>○ Better energy predictions and power system state predictions<br>○ Improved identification of the available flexibility resources on all power system levels.<br>○ Improved prediction of the system flexibility needs. |
| **Narrative** | User defined domain of DSO/Microgrid and TSO voltage level area of interest for which simulation of a power production, consumption and load flow (contingency analysis) is being performed. |
| **Steps** | |
| **Involved Business and System actors** | DACF operator (TSO and corresponding expert in DSO), 2DACF operator (TSO and corresponding expert in DSO), IGM manager (TSO and corresponding expert in DSO), ATC calculator (TSO and RSC), Power system control expert (TSO/DSO), Regional DACF operator (RSC), Regional 2DACF operator (RSC), CGM manager (RSC), Production Forecasting/Scheduling operator (Regional RES coordinator) |


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| | |
|---|---|
| **Related BUCs** | SOCL-GR-01 |
| **Connection to OneNet** | |

*Table 4-14: DSUC_SO_GR_04.*

| **Name SUC** | **Improved congestion management process on TSO and RSC side** |
|---|---|
| **SUC ID** | **DSUC_SO_GR_04** |
| **Objectives** | ○ Frequency stability<br>○ Load flow and contingency monitoring and predictions<br>○ Predictive congestion management for maintaining secure and stable power system operation<br>○ Cost-effective operation of the system<br>○ Early warning on a hazardous power system regime<br>○ Better FSPs planning and managing flexibility resources<br>○ Better energy predictions and power system state predictions<br>○ Improved identification of the available flexibility resources on all power system levels.<br>○ Improved prediction of the system flexibility needs. |
| **Narrative** | Improved power system state estimation in order to better predict system flexibility needs, with the wider geographical observability and longer "look into the future". through improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration and its presentation with the improved observability on a higher operational control and monitoring levels, including regional, RSC level. |
| **Steps** | |
| **Involved Business and System actors** | DACF operator (TSO and corresponding expert in DSO), 2DACF operator (TSO and corresponding expert in DSO), IGM manager (TSO and corresponding expert in DSO), ATC calculator (TSO and RSC), Power system control expert (TSO/DSO), Regional DACF operator (RSC), Regional 2DACF operator (RSC), CGM manager (RSC), Production Forecasting/Scheduling operator (Regional RES coordinator) |
| **Related BUCs** | SOCL-GR-01 |
| **Connection to OneNet** | |

*Table 4-15: DSUC_SO_GR_05.*

| **Name SUC** | **Storm and Icing predictive maintenance process in TSO, DSO grid and local microgrid** |
|---|---|
| **SUC ID** | **DSUC_SO_GR_05** |
| **Objectives** | ○ Predictive congestion management for maintaining secure and stable power system operation<br>○ Cost-effective operation of the system |



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| | ○ Early warning on a hazardous power system regime |
| **Narrative** | Identification of the severe weather conditions that can cause tripping of the lines or DG outages and as a consequence partial or full blackout in the region of interest. |
| **Steps** | |
| **Involved Business and System actors** | Weather forecast provider, Maintenance and asset management operator (TSO/DSO), Outage scheduler (TSO/DSO) |
| **Related BUCs** | SOCL-GR-02 |
| **Connection to OneNet** | |

*Table 4-16: DSUC_SO_GR_06.*

| **Name SUC** | **Outage management process in TSO/DSO grid and local micro grid** |
|---|---|
| **SUC ID** | **DSUC_SO_GR_06** |
| **Objectives** | ○ Predictive congestion management for maintaining secure and stable power system operation<br>○ Cost-effective operation of the system<br>○ Early warning on a hazardous power system regime |
| **Narrative** | DSO/TSO grid, local micro grid outage management that takes into account improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration. |
| **Steps** | |
| **Involved Business and System actors** | Weather forecast provider, Maintenance and asset management operator (TSO/DSO), Outage scheduler (TSO/DSO) |
| **Related BUCs** | SOCL-GR-02 |
| **Connection to OneNet** | |

*Table 4-17: DSUC_SO_CY_01.*

| **Name SUC** | **Real Monitoring of the grid** |
|---|---|
| **SUC ID** | **DSUC_SO_CY_01** |
| **Objectives** | ○ Provide fast, accurate, and reliable visualization of the Cyprus power system operating condition (transmission level)<br>○ Enhance the situational awareness of the TSO |
| **Narrative** | This SUC deals with the monitoring schemes that will be used for obtaining in real time the operating condition of the transmission and distribution system. The monitoring system of the transmission grid will run to the ABCM-T platform and to the ABCM-D platform for the distribution grid. The real time monitoring system will provide in real time crucial information to the TSO such as: voltage phasors of all the buses, line loadings, frequency, and rate of change of frequency (ROCOF). In the case of the |



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| | distribution grid the real time monitoring scheme will provide to the DSO the node voltages and line loadings. |
| **Steps** | ○ Real time monitoring of the transmission grid operating condition<br>○ Real time monitoring of the distribution grid operating condition |
| **Involved Business and System actors** | TSO, DSO, PMU, PDC, P/Q Measurements Devices, SCADA, Smart Meter, AMI |
| **Related BUCs** | SOCL_CY_01, SOCL_CY_01 |
| **Connection to OneNet** | |

*Table 4-18: DSUC_SO_CY_02.*

| **Name SUC** | **Prequalification of the location-based limit of each market product** |
|---|---|
| **SUC ID** | **DSUC_SO_CY_02** |
| **Objectives** | ○ Provide fast, accurate, and reliable visualization of the Cyprus distribution grid<br>○ Enhance the situational awareness of the DSO |
| **Narrative** | This SUC deals with the calculation of certain operational limits in consecutive time intervals (before the clearing of the market) that should be respected by the TSO and local DSO market when the market is cleared. This SUC will be included both in the ABCM-T and ABCM-D platform and will be helpful for both operators for maintaining the operation of the grid in admissible limits |
| **Steps** | Prequalification of operational limits |
| **Involved Business and System actors** | TSO, DSO, MO, Database, OneNet System |
| **Related BUCs** | SOCL_CY_01, SOCL_CY_01 |
| **Connection to OneNet** | Send to MO information about prequalification limits for transmission and distribution system through OneNet |

*Table 4-19: DSUC_SO_CY_03.*

| **Name SUC** | **Evaluation of the Flexible Services Providers response** |
|---|---|
| **SUC ID** | **DSUC_SO_CY_03** |
| **Objectives** | ○ Real time grid assessment of the transmission and distribution grid operating condition<br>○ Evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market |
| **Narrative** | This SUC will use available monitoring information (from SCADA, smart meters, PMUs) to evaluate the response of the FSPs located at the transmission and the distribution grid after the provision of grid services. The objective of the SUC is to determine if the response of the FSPs corresponds to the awarded bids cleared by the TSO and local DSO market respectively. |



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| **Steps** | Assessment of FSPs response |
| **Involved Business and System actors** | TSO , DSO, MO, OneNet System, FSP, ABCM-T and ABCM-D platforms |
| **Related BUCs** | BUC_SO_CY_01, BUC_SO_CY_01 |
| **Connection to OneNet** | The evaluation report generated by Evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market |

*Table 4-20: DSUC_SO_CY_04.*

| **Name SUC** | **Coordination of the distributed flexible resources** |
|---|---|
| **SUC ID** | **DSUC_SO_CY_04** |
| **Objectives** | ○ Coordinate (on-line) the available flexible resources according to the grid operating conditions<br>○ Relieve congestions and achieve an efficient, stable and high-quality operation of the power grid by coordinating the flexibility resource located in the distribution grid |
| **Narrative** | This SUC will use available monitoring information (from SCADA, smart meters, PMUs) to evaluate the response of the FSPs located at the transmission and the distribution grid after the provision of grid services. The objective of the SUC is to determine if the response of the FSPs corresponds to the awarded bids cleared by the TSO and local DSO market respectively.<br><br>On-line coordination of the services provided by the distributed flexible resources to avoid operational limit violations and ensure the reliable, stable, efficient and high-quality operation of distribution grids. This SUC will be integrated within the ABCM-D platform to coordinate the operation of the available flexible resources (according to the market clearing) by considering the monitoring information (from SCADA and smart meters). The coordination signal will be sent by the DSO to the flexible resources to maintain the proper operation. |
| **Steps** | Coordination of flexible resources for the appropriate operation of the distribution grid |
| **Involved Business and System actors** | TSO, DSO, MO, FSP, ABCM-D, OneNet System |
| **Related BUCs** | BUC_SO_CY_01, BUC_SO_CY_01 |
| **Connection to OneNet** | Market operator publishes the cleared awarded bids for the local flexibility services to the operators and to the FSPs through the OneNet system |

### 4.2.3 Western Cluster

*Table 4-21: DSUC_WE_PT_01.*

| **Name SUC** | **Evaluation of the Product & Grid prequalification requirements** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_01** |


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| **Objectives** | ○ Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.<br>○ Enable FSPs and their resources for flexibility markets, since Prequalification phase is necessary for the following phases that we will approach.<br>○ List of requirements for product prequalification for DSO and TSO.<br>○ Ensure coordination between system operators for all scenarios.<br>○ Receive and send data between system operators in a secure manner. |
| **Narrative** | 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 an FSP. We also separate the processes for DSO and TSO when necessary.<br><br>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.<br><br>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:<br><br>Comprehensive grid data -selecting the most efficient combination of flexibilities and switching of topology<br><br>Partial grid data -using essentially the sensitivities of flexibilities, e.g., Traffic lights system<br><br>Simple Rule – Empirical selection<br><br>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. |
| **Steps** | ○ Prequalification for FSPs connected to Distribution Grid<br>○ Prequalification for FSPs connected to Transmission Grid |
| **Involved Business and System actors** | Data exchange platform, DSO Prequalification System, Network model management, TSO Prequalification System |
| **Related BUCs** | WECL_PT_01, WE_PT_02 |
| **Connection to OneNet** | |

*Table 4-22: DSUC_WE_PT_02.*

| **Name SUC** | **Day-Ahead & Intraday Flexibility needs** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_02** |
| **Objectives** | ○ Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.<br>○ Identify potential network constrains and planning of the grid operation for the next day/hours considering the load and generation forecasts |



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| | ○ Promote the participation of flexible resources connected at all voltage levels grids in distribution and transmission networks operation<br>○ Ensure coordination between system operators for all scenarios.<br>○ Receive and send data between system operators in a secure manner. |
| **Narrative** | This SUC focuses on the steps that system operators should perform to plan and forecast their grid utilization. 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 transmission 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.<br>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.<br>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.<br>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. |
| **Steps** | ○ Day-Ahead & Intraday Flexibility needs for DSO<br>○ Day-Ahead & Intraday Flexibility needs for TSO<br>○ Day-Ahead & Intraday Flexibility needs for DSO within OneNet System<br>○ Day-Ahead & Intraday Flexibility needs for TSO within OneNet System |
| **Involved Business and System actors** | DSO Plan/Forecast System, TSO Plan/Forecast System,<br>Data exchange Platform, Energy Forecasting, Network Model Management, OneNet System, Stakeholder connected to OneNet System |
| **Related BUCs** | WECL_PT_01 |
| **Connection to OneNet** | The DSO publishes, to stakeholders connected to the OneNet system, the amount of flexibility needed, in both Day-Ahead and Intraday timeframes. Similar approach is also followed by TSO. |

*Table 4-23: DSUC_WE_PT_03.*

| **Name SUC** | **Long-term Flexibility needs** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_03** |
| **Objectives** | ○ Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.<br>○ Cover grid investment needs through flexibility services.<br>○ 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.<br>○ Improve network operation security during maintenance actions, using flexibility to minimize the risk of reduced redundancy.<br>○ Ensure coordination between system operators for all scenarios.<br>○ Receive and send data between system operators in a secure manner. |


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| **Narrative** | This SUC is focused on the steps that system operators should perform to plan and forecast their grid utilization. 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.<br><br>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.<br><br>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.<br><br>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. |
| **Steps** | ○ Long-term Flexibility needs for DSO<br>○ Long-term Flexibility needs for TSO |
| **Involved Business and System actors** | DSO Plan/Forecast System, TSO Plan/Forecast System, Data exchange Platform, Energy Forecasting, Network Model Management |
| **Related BUCs** | WECL_PT_02 |
| **Connection to OneNet** | |

*Table 4-24: DSUC_WE_PT_04.*

| **Name SUC** | **Selection of Bids** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_04** |
| **Objectives** | ○ Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.<br>○ Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a technical point of view.<br>○ Ensure coordination between system operators for all scenarios.<br>○ Receive and send data between system operators in a secure manner |
| **Narrative** | This SUC focuses on the steps that system operators should perform to select bids from FSP's.<br><br>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.<br><br>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 |





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| | coordination between DSO and TSO markets, namely the coordination in forwarding bids from the DSO market to the TSO market and vice versa.<br>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.<br>After the selection of the bids, based on the requirements described above, a merit order list (MOL) of the acquired bids is defined.<br>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. |
| **Steps** | ○ Selecting Bids |
| **Involved Business and System actors** | SO Managing Constraints, SO Affected, Data Exchange Platform |
| **Related BUCs** | WECL_PT_01, WECL_PT_02 |
| **Connection to OneNet** | |

*Table 4-25: DSUC_WE_PT_05.*

| **Name SUC** | **Evaluate grid constraints** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_05** |
| **Objectives** | ○ Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.<br>○ Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a grid point of view.<br>○ Ensure coordination between system operators for all scenarios.<br>○ Receive and send data between system operators in a secure manner. |
| **Narrative** | This SUC is focused on the steps that system operators should take to accept and validate the acquired bids in the market phase. 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.<br>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.<br>The dynamic grid constraints evaluation is a continuous process, during the market and activation phases. 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. |



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| **Steps** | ○ Evaluate grid constraints |
| **Involved Business and System actors** | SO Managing Constraints, SO Affected, Data exchange Platform, Network Model Management |
| **Related BUCs** | WECL_PT_01, WECL_PT_02 |
| **Connection to OneNet** | |

*Table 4-26: DSUC_WE_PT_06.*

| **Name SUC** | **Maintenance plans information exchange** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_06** |
| **Objectives** | ○ Anticipate grid constraints due to maintenance works scheduled<br>○ Have an updated view of the maintenance plans defined by TSO and DSO from long-term until close to real-time. |
| **Narrative** | 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.<br><br>An accurate definition of the maintenance plans is crucial for the operational activities of different stakeholder like consumers and grid operators.<br><br>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 timeframes (medium-term until close to real-time). This implementation is supported by work done in previous H2020 projects. |
| **Steps** | ○ Year-ahead works programming<br>○ Monthly-ahead, Weekly-ahead or on event update of maintenance plans |
| **Involved Business and System actors** | Work Management, System Planning, Data Exchange Platform,<br><br>Energy Forecasting, Network model management, Validation System Planning |
| **Related BUCs** | WECL_PT_03 |
| **Connection to OneNet** | |

*Table 4-27: DSUC_WE_PT_07.*

| **Name SUC** | **Consumption and generation forecast information exchange** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_07** |
| **Objectives** | ○ Improve TSO and DSO forecast processes by taking into account each other's generation and load forecasts.<br>○ Improve programming of TSO and DSO operation activities.<br>○ Contribute to the improvement of the forecast of technical constraints. |



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| **Narrative** | 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.<br><br>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.<br><br>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.).<br><br>This information should be exchanged day-ahead between operators, having into consideration the market clearance results.<br><br>This data exchange is to be exchanged every 24h. The data shall include the forecast the next 72h with a granularity of 15 minutes. |
| **Steps** | ○ Exchange forecasts of disaggregated generation and load |
| **Involved Business and System actors** | ○ Data exchange platform<br>○ Pre-Operation Planning<br>○ Network Model Management<br>○ Energy Forecasting |
| **Related BUCs** | WECL_PT_01, WECL_PT_03 |
| **Connection to OneNet** | |

*Table 4-28: DSUC_WE_PT_08.*

| **Name SUC** | **Short-circuit levels information exchange** |
|---|---|
| **SUC ID** | **DSUC_WE_PT_08** |
| **Objectives** | ○ Improve TSO and DSO grid planning by taking into account each other's short-circuit contributions in the TSO/DSO interface<br>○ Improve security of operation and quality of service |
| **Narrative** | 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). 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 |




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| | 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.<br><br>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 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.<br><br>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. |
| **Steps** | o Short-circuit power definition at bay level considering TSO information<br>o Short-circuit power definition at bay level considering TSO and DSO information |
| **Involved Business and System actors** | Network Model Management, Energy Forecasting, Data exchange platform, Pre-Operation Planning |
| **Related BUCs** | WECL_PT_03 |
| **Connection to OneNet** | |

*Table 4-29:DSUC_WE_SP_01.*

| **Name SUC** | **Local Market Platform** |
|---|---|
| **SUC ID** | **DSUC_WE_SP_01** |
| **Objectives** | o Enable local flexibility procurement by DSOs<br>o Open market sessions at the request of the DSO<br>o Collect bids from market participants<br>o Clear the local flexibility markets<br>o Communicate market results to stakeholders |
| **Narrative** | 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. |
| **Steps** | o Flexibility Resource Register<br>o Market Request<br>o Market Session |
| **Involved Business and System actors** | FSP, Market Platform, TSO, DSO, IMO, OneNet System |
| **Related BUCs** | WECL_SP_01, WE_SP_02 |
| **Connection to OneNet** | Publication of results on a Pan-European level through the OneNet System. |

Table 4-30: DSUC_WE_FR_01.

| Name SUC | STAR – TSO automated activation |
|---|---|
| SUC ID | **DSUC_WE_FR_01** |
| Objectives | 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.<br><br>The BUC 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.<br><br>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. |
| Narrative | 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. |
| Steps | This SUC highlights the needed information and processes between TSO, DSO, FSP and producers in the case of TSO automated activations for the four following phases:<br><br>o Market phase<br>o Monitoring and Activation<br>o Measurement and settlement<br>o Platform consultation |
| Involved Business and System actors | STAR Platform, FSP, IMO, DSO, TSO, producer |
| Related BUCs | WECL_FR_01 |
| Connection to OneNet | |

Table 4-31: DSUC_WE_FR_02.

| Name SUC | STAR – DSO manual activation |
|---|---|
| SUC ID | **DSUC_WE_FR_02** |
| Objectives | 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.<br><br>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 |

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| | technology, enabling such objectives and test it for each participating entity on a chosen area of the French network.<br><br>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. |
| **Narrative** | 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. |
| **Steps** | 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:<br>o Market phase<br>o Monitoring and Activation<br>o Measurement and settlement<br>o Platform consultation |
| **Involved Business and System actors** | STAR Platform, FSP, IMO, DSO, TSO, producer |
| **Related BUCs** | WECL-FR-01 |
| **Connection to OneNet** | |

### 4.2.4 Eastern Cluster

*Table 4-32: DSUC_WE_PL_01.*

| **Name SUC** | **Prequalification of resources** |
|---|---|
| **SUC ID** | **DSUC_EA_PL_01** |
| **Objectives** | To register Distributed Energy Resource (DER) and its flexibility potential by Flexibility Service Provider (FSP) in the Flexibility Register (FR), which will enable submission of bids on the FP and participation in the flexibility market. |
| **Narrative** | This use case describes prequalification process on the FP which consists of:<br>o market prequalification (registration and assessment of a new FSP on the FP)<br>o certification of DER (registration and assessment of a new unit by FSP)<br>o product prequalification and/or static grid prequalification (registration and assessment of a new potential by FSP in response to certain product available of the FP)<br>This use case covers all obligatory steps for a FSP to participate in the flexibility market through FP |
| **Steps** | o Market prequalification<br>o Certification of DER<br>o Product and/or static grid prequalification |
| **Involved Business and System actors** | |
| **Related BUCs** | |



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| **Connection to OneNet** | |

*Table 4-33: DSUC_WE_CZ_01.*

| **Name SUC** | **Non frequency services** |
|---|---|
| **SUC ID** | **DSUC_EA_CZ_01** |
| **Objectives** | Enable the procurement of non-frequency services for DSO to address the grid related issues |
| **Narrative** | The newly created IT environment shall cover activities related to procurement of non-frequency services. The system shall:<br>○ accommodate different types of non-frequency services<br>○ enable DSOs to procure non-frequency services in a way that fits to needs of operation of distribution grid<br>○ allow access for FSP/units to the platform in order to provide non-frequency services<br>○ enable via traffic light system availability for activation of relevant resources |
| **Steps** | ○ Administration module<br>○ Market module non-frequency services<br>○ Availability for activation of relevant resources (via traffic light system) |
| **Involved Business and System actors** | DSO, Aggregator, Platform, Unit/ Flexibility provider |
| **Related BUCs** | |
| **Connection to OneNet** | |

*Table 4-34: DSUC_WE_CZ_02.*

| **Name SUC** | **Traffic light system** |
|---|---|
| **SUC ID** | **DSUC_EA_CZ_02** |
| **Objectives** | ○ Enable notification of unavailability of DSO to other market participants<br>○ Allowing safe and reliable operation of distribution grid |
| **Narrative** | In order to notify properly grid unavailability, the traffic light system shall enable:<br>○ registration of all participants FSP/DSO/TSO into the system (database includes also reserved capacity of FSP, location and other details)<br>○ DSO to report and announce outages (interruptions) / planned outages<br>○ FSP to report day ahead contracted capacities (for DSO to consider load in given nodal areas) |
| **Steps** | ○ Administration module<br>○ Outages/planned outages announcement<br>○ FSP – contracted capacities of Ancillary services |
| **Involved Business and System actors** | DSO, Aggregator, Platform, Unit/ Flexibility provider |




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| | |
|---|---|
| **Related BUCs** | |
| **Connection to OneNet** | |

*Table 4-35: DSUC_EA_HU_01[5].*

| **Name SUC** | **Prequalification** |
|---|---|
| **SUC ID** | **DSUC_EA_HU_01** |
| **Objectives** | |
| **Narrative** | Product and grid prequalification |
| **Steps** | ○ Prequalification Request<br>○ Product and grid prequalification<br>○ Approval of prequalification<br>○ Prequalification Results |
| **Involved Business and System actors** | DSO, MO, FSP |
| **Related BUCs** | EACL-HU-01, EACL-HU-02 |
| **Connection to OneNet** | The functionalities of MO, such as TSO-DSO coordination interface and flexibility register module, are provided through the interconnection to the OneNet system. |

*Table 4-36: DSUC_EA_HU_02[6].*

| **Name SUC** | **Forecasting** |
|---|---|
| **SUC ID** | **DSUC_EA_HU_02** |
| **Objectives** | |
| **Narrative** | DSO determines the volume and spatial temporal location of flexibility needs |
| **Steps** | ○ DSO receives data for modelling flexibility needs<br>○ DSO determines flexibility needs<br>○ DSO informs TSO on flexibility needs<br>○ DSO delivers flexibility needs |
| **Involved Business and System actors** | DSO, TSO, MO |
| **Related BUCs** | EACL-HU-01, EACL-HU-02 |
| **Connection to OneNet** | The functionalities of MO, such as TSO-DSO coordination interface and flexibility register module, are provided through the interconnection to the OneNet system. |

[5] This is information extracted by the BUCs and initially reflects the Demo SUCs, which are under development.
[6] Ibid, pg.66



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*Table 4-37: DSUC_EA_HU_03[7].*

| Name SUC | Procurement |
|---|---|
| SUC ID | **DSUC_EA_HU_03** |
| Objectives | |
| Narrative | Collection of supply bid in the order book, market clearing in W-1 and D-1. |
| Steps | ○ DSO receives data for modelling flexibility needs<br>○ DSO determines flexibility needs<br>○ DSO informs TSO on flexibility needs<br>○ DSO delivers flexibility needs<br>○ Flexibility market opening, DSO needs announced<br>○ FSPs submit bids<br>○ D-1 FSP bid prequalification<br>○ FSP bids delivered<br>○ Clearing<br>○ Announcement |
| Involved Business and System actors | DSO, TSO, MO, FSP |
| Related BUCs | EACL-HU-01, EACL-HU-02 |
| Connection to OneNet | The functionalities of MO, such as TSO-DSO coordination interface and flexibility register module, are provided through the interconnection to the OneNet system. |

*Table 4-38:DSUC_EA_SL_01.*

| Name SUC | Grid Prequalification |
|---|---|
| SUC ID | **DSUC_EA_SL_01** |
| Objectives | ○ Validate prequalification mechanism for various flexibility sources<br>○ Prequalify numerous flexibility sources.<br>○ Improve security of supply through a transparent and easy process |
| Narrative | Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. This use case describes the process of prequalification for units planned for use in support demand response services. |
| Steps | ○ Grid Prequalification with DSO<br>○ Grid Prequalification without DSO |
| Involved Business and System actors | TSO, DSO, FSP, MO, DSO Scada system, TSO Scada system, DSO smart grid activation system, DSO smart grid platform, Virtual power plant technical channel, Virtual |

[7] Ibid, pg. 66





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|---|---|
| | power plant business channel, Virtual power plant, Bidding platform, Settlement system, Unit controller, Flexibility marketplace platform for FSP, Flexibility marketplace platform for MO, Flexibility marketplace platform for DSO, Flexibility marketplace platform for TSO |
| **Related BUCs** | |
| **Connection to OneNet** | |

*Table 4-39: DSUC_EA_SL_02.*

| **Name SUC** | **Product Prequalification** |
|---|---|
| **SUC ID** | **DSUC_EA_SL_02** |
| **Objectives** | ○ Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>○ Improve security of supply.<br>○ Validate demand response mechanism to prevent congestion in the distribution grid.<br>○ Test flexibility products to prevent congestion in the distribution grid under market conditions. |
| **Narrative** | Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. |
| **Steps** | ○ Product Prequalification |
| **Involved Business and System actors** | TSO, DSO, FSP, MO, DSO Scada system, TSO Scada system, DSO smart grid activation system, DSO smart grid platform, Virtual power plant technical channel, Virtual power plant business channel, Virtual power plant, Bidding platform, Settlement system, Unit controller, Flexibility marketplace platform for FSP, Flexibility marketplace platform for MO, Flexibility marketplace platform for DSO, Flexibility marketplace platform for TSO |
| **Related BUCs** | |
| **Connection to OneNet** | |

*Table 4-40: DSUC_EA_SL_03.*

| **Name SUC** | **Bidding** |
|---|---|
| **SUC ID** | **DSUC_EA_SL_03** |
| **Objectives** | ○ Deferral of grid reinforcement investments (defer or avoid secondary substation replacement). |





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| | |
|---|---|
| | ○ Improve security of supply.<br>○ Organize a marketplace with fair competition between aggregators |
| **Narrative** | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process for bidding flexibility in the distribution grid. It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| **Steps** | ○ Bidding |
| **Involved Business and System actors** | TSO, DSO, FSP, MO, DSO Scada system, TSO Scada system, DSO smart grid activation system, DSO smart grid platform, Virtual power plant technical channel, Virtual power plant business channel, Virtual power plant, Bidding platform, Settlement system, Unit controller, Flexibility marketplace platform for FSP, Flexibility marketplace platform for MO, Flexibility marketplace platform for DSO, Flexibility marketplace platform for TSO |
| **Related BUCs** | |
| **Connection to OneNet** | |

*Table 4-41: DSUC_EA_SL_04.*

| **Name SUC** | **Activation** |
|---|---|
| **SUC ID** | **DSUC_EA_SL_04** |
| **Objectives** | ○ Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>○ Improve security of supply.<br>○ Organize a marketplace with fair competition between aggregators |
| **Narrative** | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate an activation of flexibility resources in distribution grid. It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| **Steps** | ○ Activation |
| **Involved Business and System actors** | TSO, DSO, MO, DSO Scada system, TSO Scada system, DSO smart grid activation system, DSO smart grid platform, Virtual power plant technical channel, Virtual power plant business channel, Virtual power plant, Bidding platform, Settlement system, Unit controller, Flexibility marketplace activation module |
| **Related BUCs** | |
| **Connection to OneNet** | |



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*Table 4-42: DSUC_EA_SL_05.*

| Name SUC | Settlement |
|---|---|
| SUC ID | **DSUC_EA_SL_05** |
| Objectives | ○ Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>○ Improve security of supply.<br>○ Validate demand response mechanism to prevent congestion in the distribution grid.<br>○ Monetize activated flexibility so that the FSP receives reimbursement. |
| Narrative | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process of monetizing activated flexibility It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| Steps | ○ Settlement |
| Involved Business and System actors | TSO, DSO, FSP, MO, DSO Scada system, TSO Scada system, DSO smart grid activation system, DSO smart grid platform, Virtual power plant technical channel, Virtual power plant business channel, Virtual power plant, Bidding platform, Settlement system, Unit controller, Marketplace settlement module for FSP, Marketplace settlement module for MO, Marketplace settlement module for DSO, marketplace settlement module for other balance groups |
| Related BUCs | |
| Connection to OneNet | |

### 4.2.5 Interaction status between OneNet and Demos

Starting from the Demo SUCs, all the crucial information that could be useful for the design tasks in WP5 as well as for the implementation phase in WP6 are identified. In particular, Table 4-43Table 4-44 highlight two fundamental information:

- the connection between each Demo and the OneNet system at high level,
- the data exchanges and the involved actors (Full list exists in Appendix B).

As shown in these summary tables, not all the demos have already reported this level of information. This activity will then be continued during the design phase, in the other tasks of WP5, in order to have a complete and detailed picture of the interactions between the demos and the OneNet system.



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*Table 4-43: Connection to OneNet system as identified by the Demonstrators' SUCs.*

| Cluster | Country | DSUC | Connection to OneNet |
|---|---|---|---|
| **Southern** | Cyprus | **DSUC_SO_CY_02** | Send to the MO information about prequalification limits for transmission and distribution system through OneNet |
| | | **DSUC_SO_CY_03** | Publish the evaluation report, which is generated by evaluating the response of the FSPs, according to the awarded bids cleared in the corresponding market |
| | | **DSUC_SO_CY_04** | MO publishes the cleared awarded bids for the local flexibility services to the operators and to the FSPs through the OneNet system |
| **Western** | Portugal | **DSCU_WE_PT_02** | The DSO publishes, to stakeholders connected to the OneNet system, the amount of flexibility needed, in both Day-Ahead and Intraday timeframes. Similar approach is also followed by TSO. |
| | Spain | **DSUC_WE_SP_01** | Publish the local market results on a pan-European level through the OneNet system |
| **Eastern** | Hungary | **DSUC_EA_HU_01** | The functionalities of MO, such as TSO-DSO coordination interface and FR module, are provided through the interconnection to the OneNet system. |
| | Hungary | **DSUC_EA_HU_02** | The functionalities of MO, such as TSO-DSO coordination interface and flexibility register module, are provided through the interconnection to the OneNet system. |
| | Hungary | **DSUC_EA_HU_03** | The functionalities of MO, such as TSO-DSO coordination interface and FR module, are provided through the interconnection to the OneNet system. |

*Table 4-44: Identification of data exchanges between Demonstrators and the OneNet system.*

| ID | SUC_ID | Functional Description of Data exchange | Data Producer | Data Consumer |
|---|---|---|---|---|
| **OneNet_Spanish_44** | DSUC_SP_01 | Send the collected market results | LMP | **OneNet System** |




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| | | | | |
|---|---|---|---|---|
| OneNet_Portuguese_09 | DSUC_PT_02 | Publication of the amount of flexibility needed | DSO/TSO Forecast System | **OneNet System** |
| OneNet_Cypriot_13 | DSUC_SO_CY_02 | Forward the prequalification limits | ABCM-T & ABCM-D platforms | **OneNet System** |
| OneNet_Cypriot_13 | DSUC_SO_CY_02 | Forward of prequalification limits | **OneNet System** | Market Operator |
| OneNet_Cypriot_14 | DSUC_SO_CY_03 DSUC_SO_CY_04 | Send the cleared awarded bids | Market Operator | **OneNet System** |
| OneNet_Cypriot_14 | DSUC_SO_CY_03 | Forward the cleared awarded bids | **OneNet System** | ABCM-T & ABCM-D platforms |
| OneNet_Cypriot_17 | DSUC_SO_CY_03 | Send evaluation report for FSPs | ABCM-T & ABCM-D platforms | **OneNet System** |
| OneNet_Cypriot_18 | DSUC_SO_CY_03 DSUC_SO_CY_04 | Forward of the cleared awarded bids | **OneNet System** | FSPs |
| OneNet_Cypriot_17 | DSUC_SO_CY_03 | Forward of the evaluation report for FSPs | **OneNet System** | Market Operator |
| OneNet_Cypriot_17 | DSUC_SO_CY_03 | Forward of the evaluation report for FSPs | **OneNet System** | FSPs |
| OneNet_Cypriot_20 | DSUC_SO_CY_04 | Send coordination signals of FSPs | ABCM-T & ABCM-D platforms | **OneNet System** |
| OneNet_Cypriot_20 | DSUC_SO_CY_05 | Forward coordination signals of FSPs | **OneNet System** | FSPs |
| OneNet_Hungarian_03 | DSUC_EA_HU_01 | Send Prequalification Signals | DSO | **OneNet System** |
| OneNet_Hungarian_03 | DSUC_EA_HU_01 | Forward Prequalification Signal | **OneNet System** | Flexibility Register |
| OneNet_Hungarian_05 | DSUC_EA_HU_02 | Publish flexibility needs | DSO | **OneNet System** |
| OneNet_Hungarian_07 | DSUC_EA_HU_03 | FSPs submit bids | FSPs | **OneNet** |



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| | | | | |
|---|---|---|---|---|
| | | | | **System** |
| **OneNet_Hungarian_07** | DSUC_EA_HU_03 | Forward submitted FSPs bids | **OneNet System** | Flexibility register |
| **OneNet_Hungarian_09** | DSUC_EA_HU_03 | Publish of market clearing results | Market Operator | **OneNet System** |

## 4.3 General OneNet SUCs

The General OneNet SUCs are used to describe the general concept of the OneNet solution that focuses on facilitating the platforms integration and cooperation offering a secure and scalable interoperable framework. The analysis of the Demo SUCs conducted so far highlighted how the OneNet solution is mainly focused on the integration of different platforms and stakeholders that need to interact with each other or that produce data that can be used by other countries or for other contexts other than those in which they are produced. This approach is perfectly in-line with OneNet's vision of creating a European-wide data exchange ecosystem that enables a range of cross-platform and cross-country services.

### 4.3.1 Systems and Actors

The first step for the identification of the General OneNet SUCs was the identification of the generic actors involved in the OneNet ecosystem:

**OneNet Participants**

A OneNet participant is any actor involved in the OneNet ecosystem. It can be divided into data source, data provider, data consumer and service provider.

- **Data Source** is the more generic source of data that could be integrated within OneNet system. It could be represented by a Data Provider (see below), a single database, an IoT device, a file system etc.
- **Data Provider** is a specific OneNet participant that provide data to the system. To submit metadata to a Broker, or exchange data with a Data Consumer, the Data Provider uses software components (OneNet connector) that are part of the OneNet System. To facilitate a data request from a Data Consumer, the Data Provider should provide proper metadata about the data the Broker Service Provider (see below).
- **Data Consumer** receives data from a Data Provider. From a business process perspective, the Data Consumer is the mirror entity of the Data Provider; the activities performed by the Data Consumer are therefore similar to the activities performed by the Data Provider. Before the connection to a Data Provider can be established, the Data Consumer can search for existing datasets by making an inquiry



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at Broker Service Provider. The Broker Service Provider then provides the required metadata for the Data Consumer to connect to a Data Provider.

- **Service Provider** is a specific OneNet participant that provides services or tools. The Service Provider registers its services in the OneNet Framework in order to be used, integrated and tested within any cross-platform integration or orchestration process.

### OneNet System

The OneNet System is the IT solution that will be developed within the OneNet project. It consists of a several tool and components (system actors):

- **OneNet Workbench** is one of the components of the OneNet system. It acts as a data orchestrator to test and evaluate the performance and scalability of the cross-platform services that aims to use near real-time IoT metering and Big Data at consumer and/or network level.
- **OneNet Middleware** is the core component of the OneNet system. It is implemented using a decentralized approach based on the more used and promising standard architecture and interfaces, namely IDS and FIWARE. It allows the integration and collaboration of the OneNet participants, facilitating the cross-platform market and network operations, ensuring scalability and interoperability, while maintaining the data ownership.
- **OneNet Connector,** is a specific instance of the OneNet Decentralized Middleware, will be placed inside each platform and will allow an easy integration and cooperation among the platforms, maintaining the data ownership and preserving access to the data sources.
- **Context Broker** is the core component of the OneNet connector in FIWARE-based implementations of the IDS Architecture. In fact, the Context Broker offers the FIWARE NGSI APIs and associate information model (entity, attribute, metadata) as the main interface for sharing data by the OneNet participants. Data Providers use the APIs to publish or to expose the data they offer (normally through a System Adaptor), and Data Consumers retrieve or subscribe (to be later notified) to the data offered.
- **Broker Service Provider** is an intermediary that stores and manages information about the data sources available in OneNet system. The activities of the Broker Service Provider mainly focus on receiving and providing metadata. The Broker Service Provider must provide an interface for Data Providers to send their metadata. The metadata should be stored in an internal repository (Broker Service Registry) for being queried by Data Consumers in a structured manner.
- **Broker Service Registry** maintains the metadata repository, storing all the information about metadata and data sources. It is the "persistent" part of the Broker Service Provider.


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- **Identity Provider** offers a service to create, maintain, manage and validate identity information of and for participants in the OneNet System. This is imperative for secure operation and to avoid unauthorized access to data.
- **Clearing House** is an intermediary that provides clearing and settlement services for all financial and data exchange transactions. In OneNet, clearing activities are separated from broker services, since these activities are technically different from maintaining a metadata repository. The Clearing House logs all activities performed in the course of a data exchange. After a data exchange, or parts of it, has been completed, the Broker Service Provider confirms the data transfer by logging the details of the transaction at the Clearing House. Based on this logging information, the transaction can then be billed. The logging information can be used also to re-solve conflicts (e.g., to clarify whether a data package has been received by the Data Consumer or not). The Clearing House also provides reports on the performed (logged) transactions for billing, conflict resolution, etc.
- **Vocabulary Provider** manages and offers vocabularies that can be used to annotate and describe datasets. In particular, the Vocabulary Provider provides the Information Model of the OneNet, which is the basis for the description of data sources. In addition, other domain specific vocabularies can be provided.

### 4.3.2 Definition of General SUCs

After the identification of the systems and actors involved, three different SUCs were identified for describing the implementation of the OneNet Framework, as a decentralized system that allows the secure and scalable cross-platform cooperation and integration, leveraging on the more used and promising standard interfaces and interoperability mechanisms like IDS components and FIWARE context broker. The General OneNet SUCs are presented in Table 4-45.

*Table 4-45: General OneNet System Use Cases.*

| General SUC ID | Title | Comments |
|---|---|---|
| **GSUC _01** | Cross-Platform Energy Data Exchange for market-based flexibility management | Main steps to allow a cross-platform energy data-exchange using OneNet Middleware |
| **GSUC _02** | AI, Big Data, IoT Data Orchestration for cross-platform services | OneNet Orchestration Workbench for enabling AI, Big Data and IoT cross-platform services |
| **GSUC _03** | Integration of devices and other data sources to OneNet using FIWARE | Enabling a standardized data exchange providing a context-based and data-model agnostic connector. |


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#### 4.3.2.1 GSUC_01: Cross-Platform Energy Data Exchange for market-based flexibility management

*Table 4-46: GSUC_01.*

| Name SUC | Cross-Platform Energy Data Exchange for market-based flexibility management |
|---|---|
| SUC ID | GSUC _01 |
| Objectives | • Enable the cross-platform data exchange<br>• Ensure a standardized connection of different platforms<br>• Allow the discovery of data sources and services<br>• Definition of common vocabularies for improving interoperability<br>• Manage data exchange in a secure and trusted way |
| Narrative | This General OneNet SUC describes the main steps to allow a cross-platform energy data-exchange using OneNet Middleware. This cross-platform data exchange enables several cross-platform services for market-based flexibility management (e.g., pre-qualification, market phase, service activation, etc.)<br><br>The cross-platform data-exchanged is based on IDS reference model and foresees an interaction between the OneNet Participants (platforms, applications or services that act as Data Provider or Data Consumer) and the OneNet Middleware.<br><br>The OneNet system includes several components for managing the data-exchange in a standard, secure and trusted way. |
| Steps | **Scenario 1 – Identification of OneNet Participant**<br><br>The OneNet Identity provider addresses the need to be able to make access control related decisions that are based on reliable identities and properties of participants, a concept for Identity and Access Management (IAM) is mandatory.<br><br>The following aspects are central for the concept:<br><br>• identification (i.e., claiming an identity),<br>• authentication (i.e., verifying an identity), and<br>• authorization (i.e., making access decisions based on an identity).<br>The Identification of a OneNet Participant is made by requesting to the Identity Provider an identity token using a certificate.<br><br>The Identity provider return an Identity Token that can be used for requesting an Access Token.<br><br>The Access Token is used for any data access request.<br><br>**Scenario 2 – Registration of the connector**<br><br>The OneNet participant (through OneNet connector) makes a request to the Broker Service Provider to register its details. The Broker Service Provider validates the associated data and adds them to the Broker registry. Permit is only provided to authenticated participants.<br><br>**Scenario 3 – Cross-Platform data exchange** |



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| | |
|---|---|
| | After the registration of its OneNet connector, a OneNet participant can act as Data Provider or Data consumer within the OneNet system.<br>The Data Provider publishes metadata to the Broker Service Provider that contains information about data provided.<br>The Data Consumer can find a specific data source (though OneNet Connector Id/Participant Id) or query for data sources.<br>The Broker Serviced Provider returns information about data sources.<br>The Data Consumer can request for data in two ways: on demand (pull request); periodically (publish/subscribe)<br>**Scenario 3a – Data Pull request**<br>The Data Consumer searches data through the Broker Service Provider returns information about data source metadata.<br>The Data Consumer requests for specific dataset to Broker Service Provider.<br>The Data Consumer is able to pull data directly from the Data Provider.<br>All the data exchanges are logged into Clearing House.<br>**Scenario 3b – Data Publish/Subscribe**<br>The Data Consumer searches data through the OneNet Middleware. The Broker Service Provider returns information about data source metadata.<br>The Data Consumer subscribes for specific dataset to Broker Service Provider and this information is registered into Broker Registry and shared with the Data Provider.<br>The Data Provider create a listener for the specific dataset.<br>When Data Provider publishes data, it transfers data to the Data Consumer.<br>All the data exchanges are logged into Clearing House. |
| **Involved Platforms/ actors** | OneNet Participant<br>○ **Data Provider**<br>○ **Data Consumer**<br><br>OneNet System<br>○ **Broker Service Provider**<br>○ **Broker Service Registry**<br>○ **Identity Provider**<br>○ **Clearing House**<br>○ **Vocabulary Provider** |
| **Sequence diagrams** | **Scenario 1 – Identification** |



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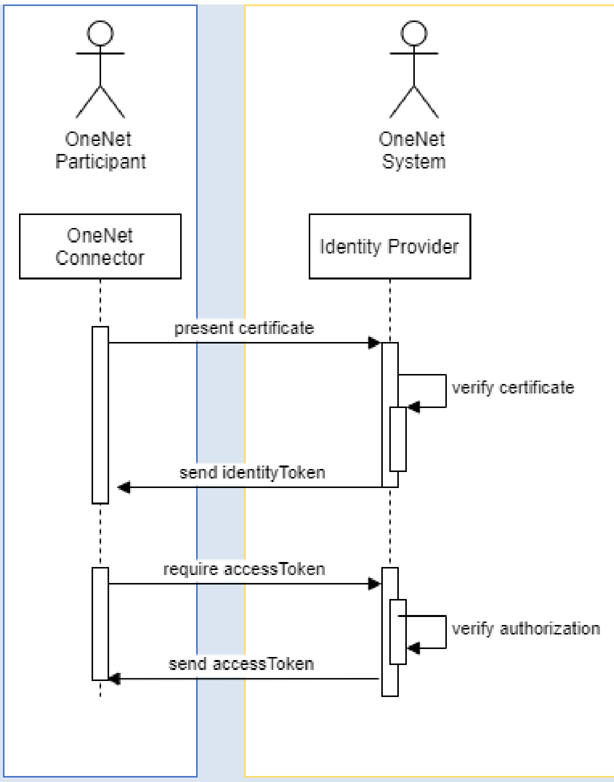
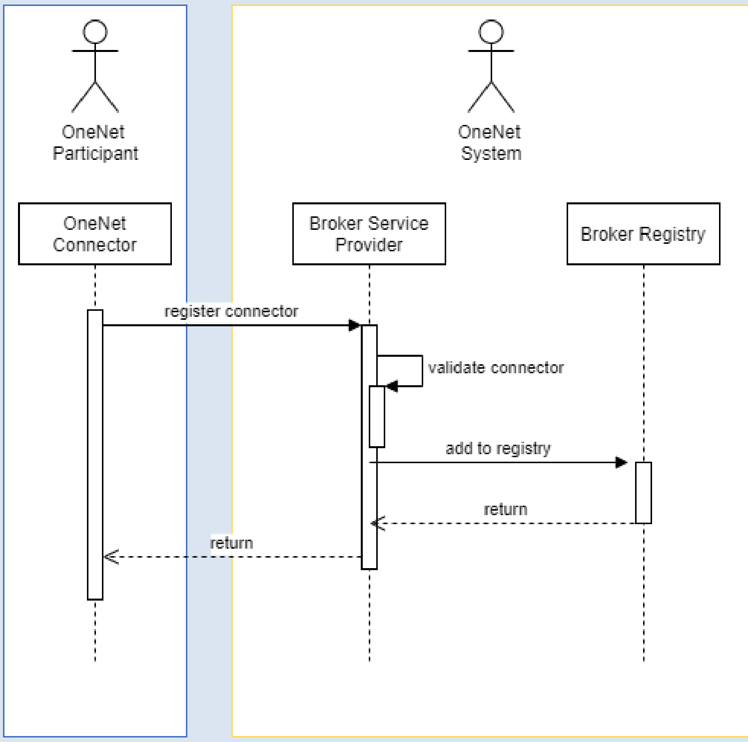



**Scenario 2 – Registration of the connector**



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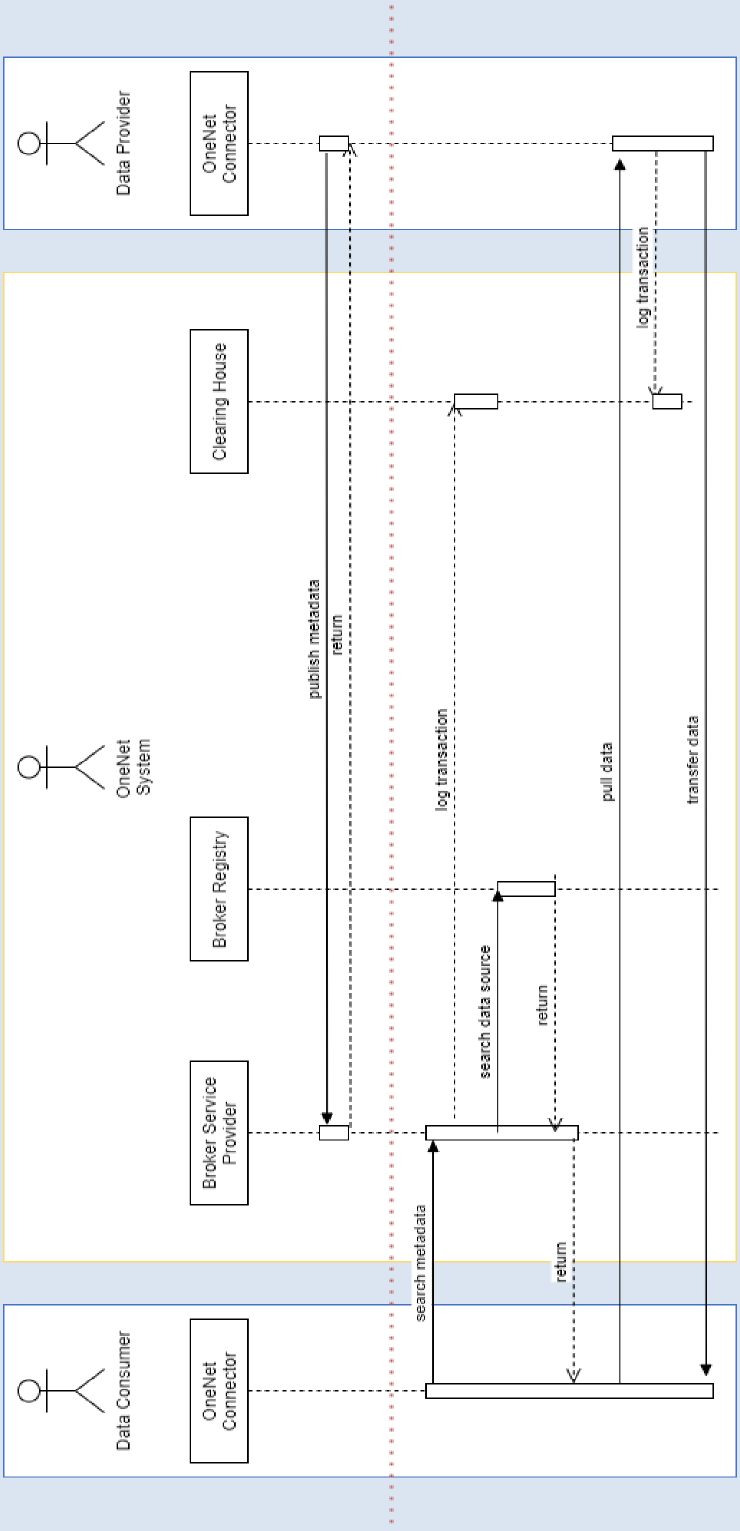
**Scenario 3 – Cross-Platform data exchange**

***Data Pull Request***



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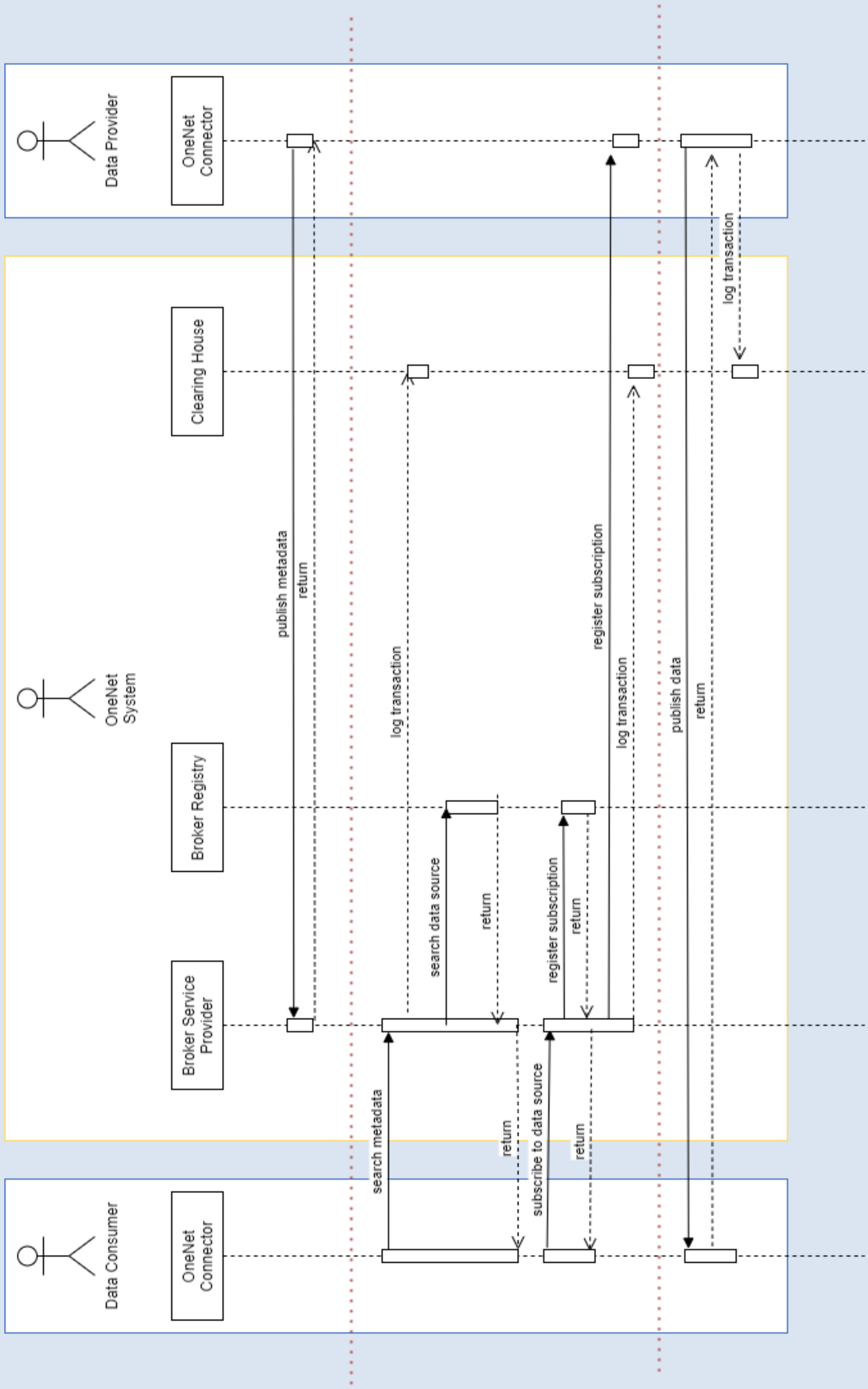




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#### 4.3.2.2 GSUC_02: AI, Big Data, IoT Data Orchestration for cross-platform services

*Table 4-47: GSUC_02.*

| Name SUC | AI, Big Data, IoT Data Orchestration for cross-platform services |
|---|---|
| SUC ID | GSUC _02 |
| Objectives | ○ Enable AI, Big Data and IoT data orchestration for cross-platform services<br>○ Tracking the performance of the cross-platform services |
| Narrative | This General OneNet SUC describes the OneNet Orchestration Workbench for enabling AI, Big Data and IoT cross-platform services. The OneNet Orchestration Workbench aims to allow the necessary scalability support for the near real time IoT sensing, gathering and big data management of consumer and/or network data at the grid.<br><br>The OneNet Orchestration Workbench allows to integrate data coming from the OneNet middleware and implement a data pipeline orchestration.<br><br>It also should include:<br>• Job Scheduling<br>• App/Service registry and discovery<br>• Error/Retries management<br>• SLAs tracking, alerting and notification |
| Steps | The Service Provider register its service in the OneNet Workbench.<br><br>The Service Provider create a workflow, using OneNet Middleware Data for running a service.<br><br>The OneNet Workbench monitors the execution of the job, manages the errors and needed retries as well as tracking the performance.<br><br>The Service Provider access to a log result for all the activities of the job. |
| Involved Platforms/ actors | **Third-Party Actors**<br>• Service Provider<br><br>**OneNet System**<br>• OneNet Middleware<br>• OneNet Workbench |



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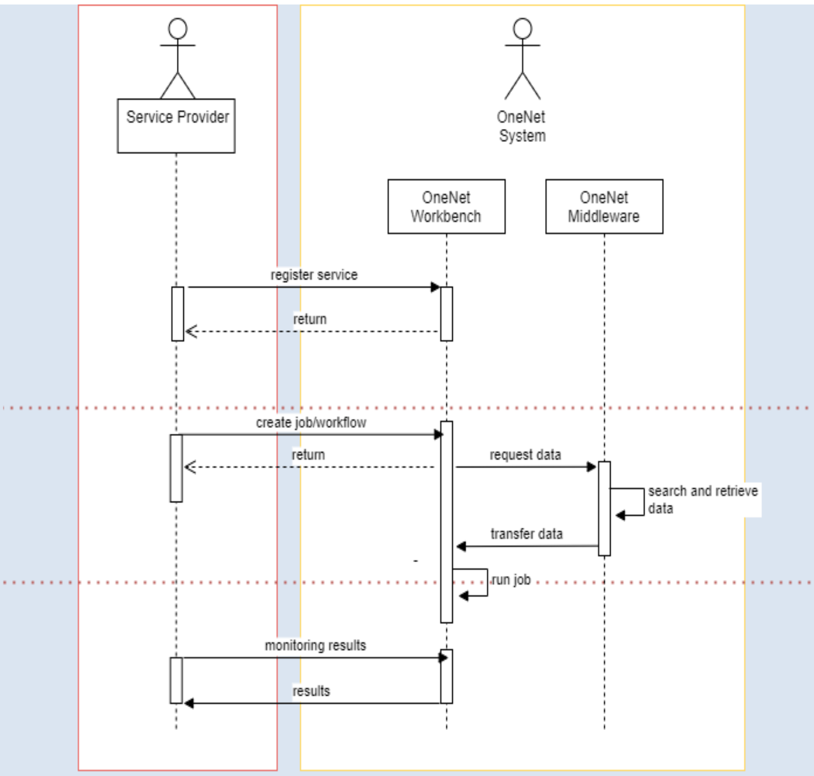
| | |
|---|---|
| **Sequence diagrams** |  |



### 4.3.2.3 GSUC_03: Integration of devices and other data sources to OneNet using FIWARE

*Table 4-48: GSUC_03.*

| **Name SUC** | **Integration of devices and other data sources to OneNet using FIWARE** |
|---|---|
| **SUC ID** | GSUC _03 |
| **Objectives** | ○ Connect different data sources using standardized FIWARE components<br>○ Adaption and evolution of the FIWARE context Broker for providing a data-model agnostic connector based on NSGI-LD |
| **Narrative** | Platforms and applications in Smart Energy domain need to produce and exchange data in a standardized way defining unambiguously the data used for sharing them with other applications.<br><br>The definitions that describe data format and meaning, can be called context. This General OneNet SUC describes how the OneNet System leverages the FIWARE Context Broker and FIWARE Smart Energy Architecture for enabling a standardized data exchange providing a context-based and data-model agnostic connector. This connector uses REST API named NGSI-LD, that introduces the Linked Data (LD) concept in the already existing NGSI standard. The API operations allow applications to create entities, search the graph-based and subscribe to entities notifications. |
| **Steps** | The GSUC_03 “Integration of devices and other data sources to OneNet using FIWARE” is an extension of the GSUC_01. |





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| | |
|---|---|
| | ○ **Scenario 1 – Identification (see GSUC_01)**<br><br>○ **Scenario 2 – Data Provider and Consumer**<br>This scenario foresees three different steps/actions:<br>• Context Provision – Data Provider can create, modify, and delete an NGSI-LD Entity.<br>• Context Consumption – a Data Consumer can retrieve or query for NGSI-LD Entities.<br>• Context Subscription – Data Consumer subscribe to a regular or event-driven update notifications of the context of one or more Entities<br><br>○ **Scenario 3 – IoT Devices integration**<br>A Data source is registered to the OneNet system using IoT Agent.<br>After the registration each data source is mapped as an Entity associated to a Context Provider.<br>This scenario includes two different actions:<br>• **Set Command**<br>A Third-Party Actor request to set an attribute in the device's entity, for which the IoT Agent is registered as Data Source.<br>The IoT Agent contacts the device to perform the command itself, updating special status and info attributes in the entity as soon as it has any information of the command progress.<br>The device returns an acknowledgement of the command, and the result of the action is returned to the Context Broker.<br>• **Get Data**<br>A Third-Party Actor queries for a context using the NGSI Context Broker.<br>IoT Agent receives the request from the Context Broker and acts a Context Provider, so if any component asks the Context Broker for the value of that sensor, its request will be redirected to the IoT Agent.<br>The device returns the data the IoT Agent that transfer the NGSI response to the Context Broker which in turn transfer it to the Third-Party applicant. The entire process is synchronous for the Third Party; the Context Broker won't return a response until the device has returned its response to the IoT Agent. |
| **Involved Platforms/ actors** | **OneNet Participant**<br>• Data Provider<br>• Data Consumer<br>• Data Source (IoT Device + IoT Agent). In this particular Use Case the Data Source represents the integration of an **IoT Agent** within any IoT device. The **IoT Agent** is a component that let device send its data to and be managed from a FIWARE NGSI Context Broker using its own native protocols. IoT Agent is also able to deal with security aspects of the FIWARE architecture.<br><br>**OneNet System**<br>• Identity Provider<br>• Context Broker<br>• Broker Registry |



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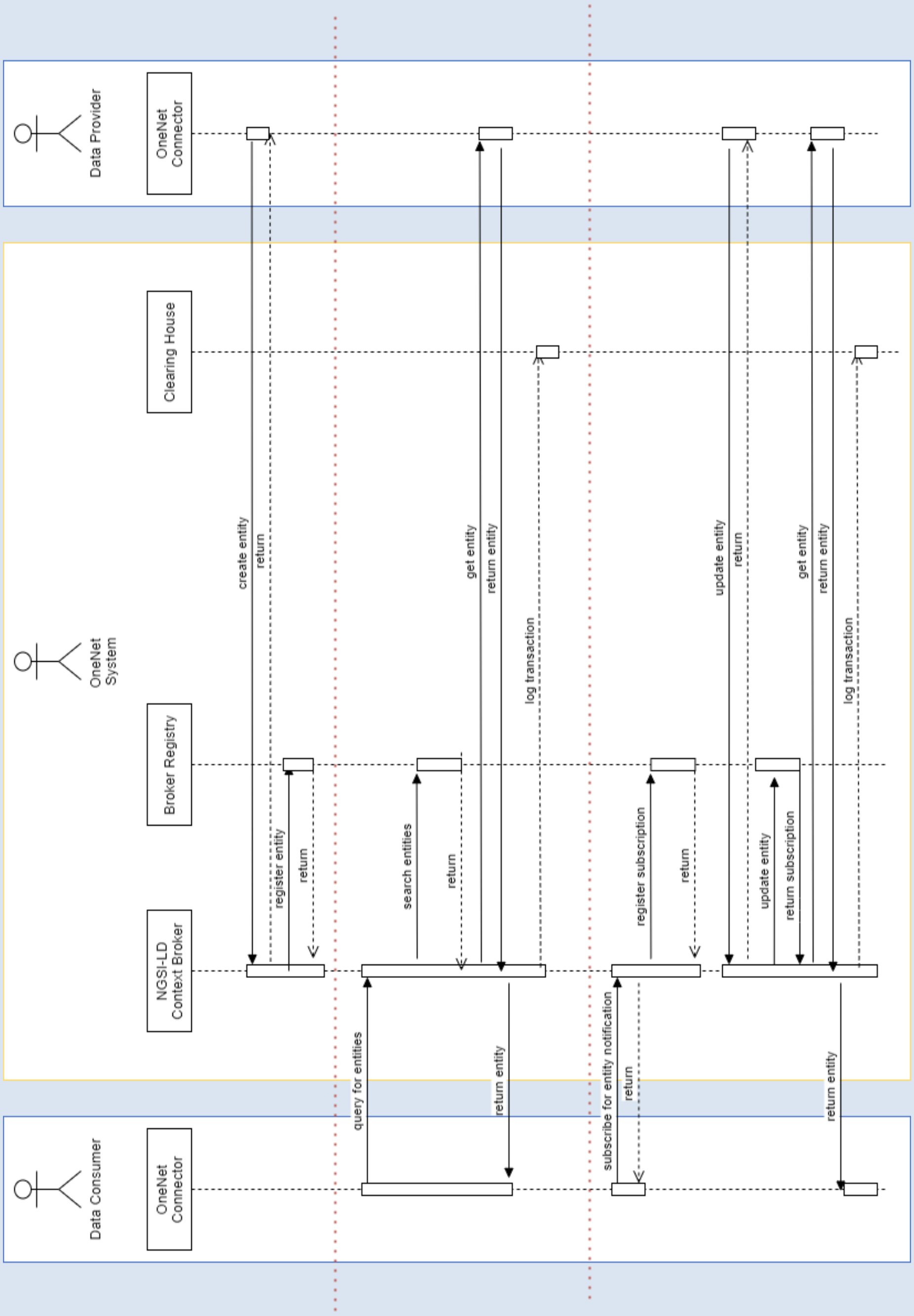
- Clearing House

**Sequence diagrams**

**Scenario 2 – Data Provider and Consumer**





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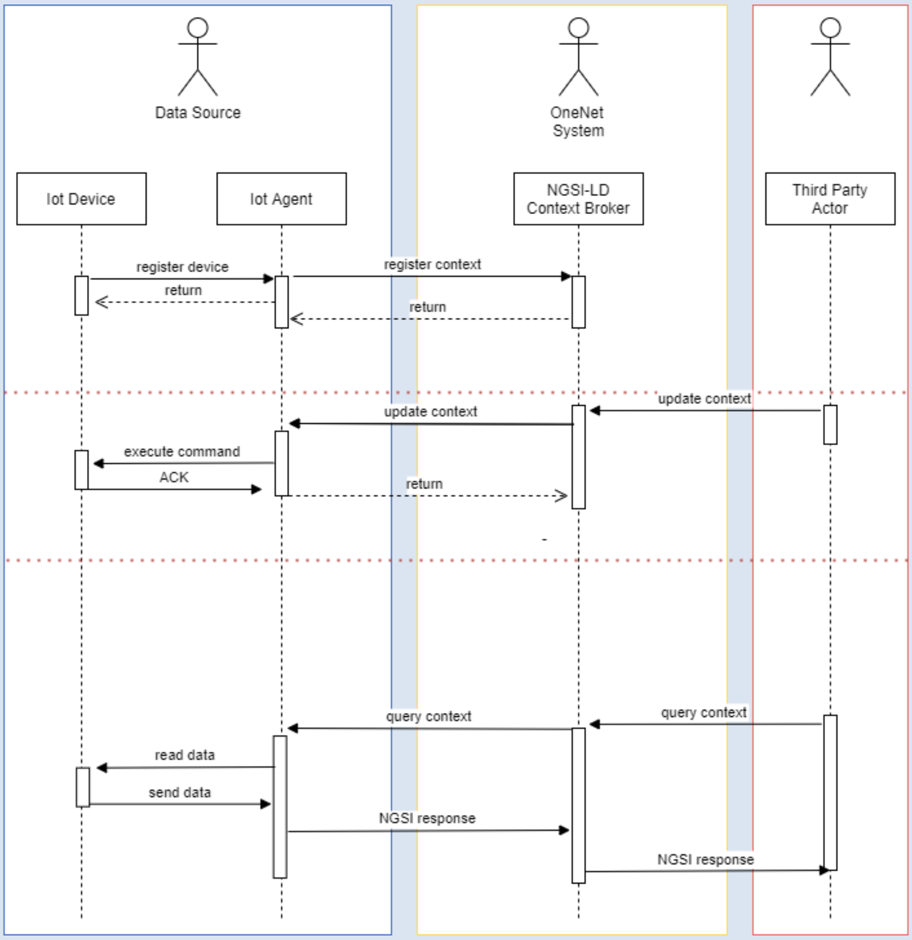
**Scenario 3 – IoT Devices integration**



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# 5 Conceptual description of the OneNet System

This chapter, building upon on the work presented in the previous ones, first introduces the conceptual description of the OneNet System and its envisioned functionalities. Afterwards, the FUR and NFR of the OneNet system are derived which set the basis for the in-depth definition of the OneNet architecture and its components.

## 5.1 OneNet concept

One of the main objectives of OneNet project is to design an open conceptual architecture, the **OneNet Framework**, that will enable the European electrical system to operate as a single system in which a diversity of markets, network technical operations, energy platforms allow global participation of stakeholders regardless of their physical location, at all levels, from TSOs to DSOs, from small consumers to large producers.

The **OneNet Framework facilitates the platforms integration and cooperation** offering a secure, scalable and well documented solution to enable the participation not only of the platforms, but also to create a complete ecosystem in which energy stakeholders can participate.

The key feature of the OneNet Framework is to make available a **data interoperability mechanism** to all platforms to support data exchange for **facilitating market and network operations** and the cooperation between network operators, like TSOs and DSOs as well as the involvement of other players like prosumers and aggregators.

From a technological point of view, the integration and homogenization mechanisms will be implemented at both data and service levels and will leverage on most used and promising Data and Smart Energy open architectures (FIWARE Smart Energy grid Reference Architecture, IDS Reference Architecture Model) and implementing standardized components for the platform integration (e.g., NGSI Standard Context broker).

In addition, OneNet Framework will focus on:

- the adoption of **open standards and interfaces** to allow the seamless participation of various users,
- **data privacy control and data access** according to regulations for each stakeholder,
- definition of **standard models and protocols for data exchange,**
- **the provision of data management features like data harmonization, data quality assessment, semantic annotation,**
- **dataflow monitoring and logging,**
- **Identification, Authentication and Authorization mechanisms for ensuring secure and trusted data exchange and platforms integration.**


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The core component that will enable this secure, standard and scalable cross-platform data exchange is the OneNet Decentralized Middleware.

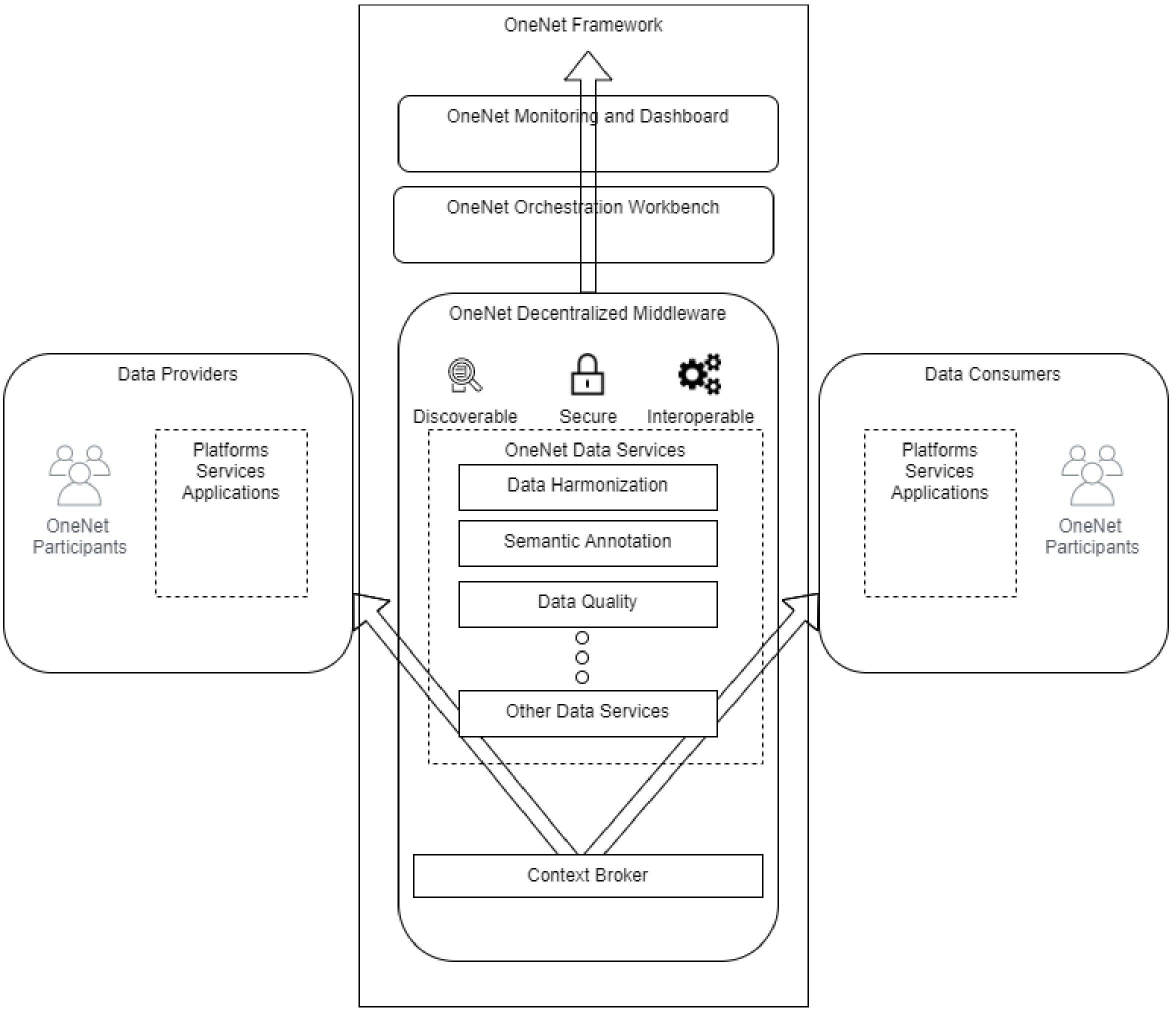


*Figure 5.1: OneNet Framework Concept and OneNet Decentralized Middleware.*

The implementation of the OneNet Middleware leverages on a **decentralized solution** in which specific **OneNet Connectors** enable the interaction within the OneNet ecosystem. **A OneNet Connector is a specific instance of the OneNet Decentralized Middleware, will be placed inside each platform** and will allow an easy integration and cooperation among the platforms, maintaining the data ownership and preserving access to the data sources. The decentralized approach will ensure **the necessary scalability for the near real-time data integration and management enabling** multi-country and multi-stakeholder near real-time decision-making services.


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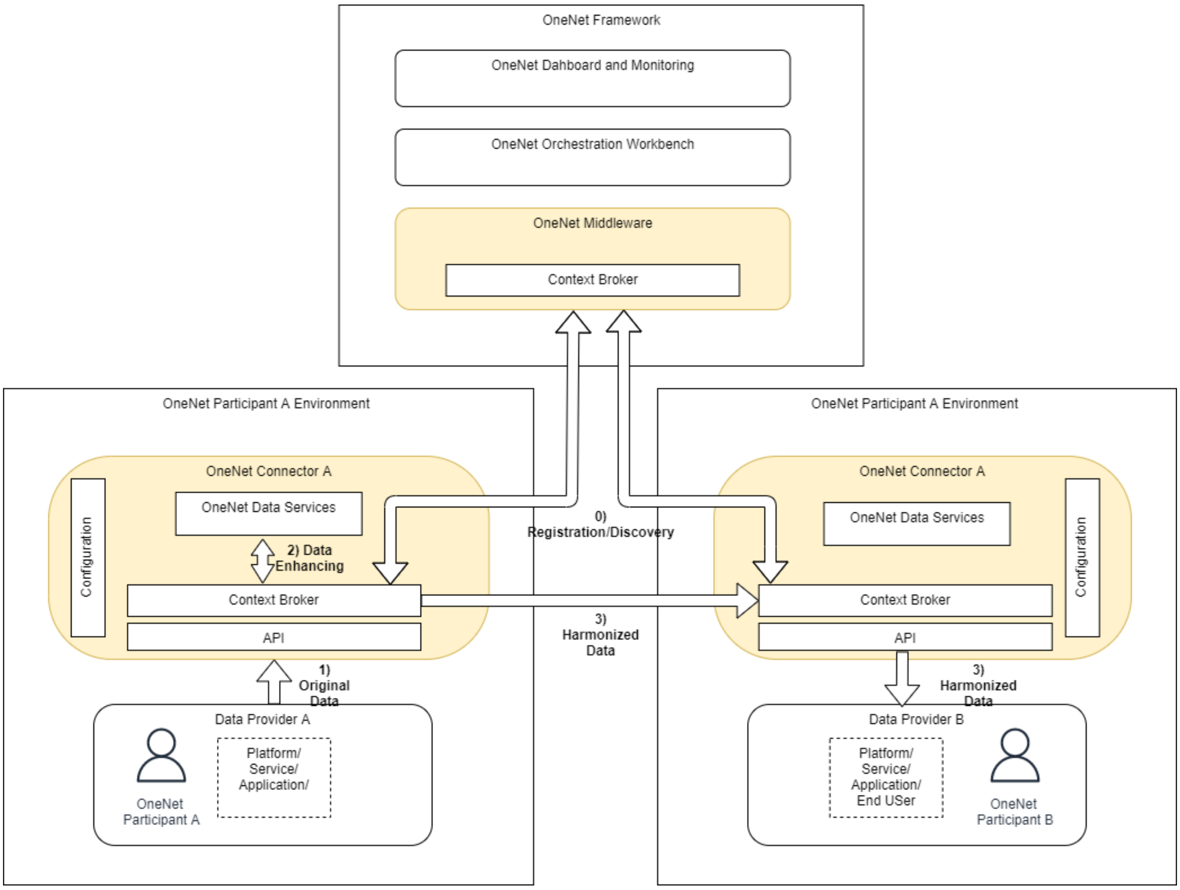


*Figure 5.2: OneNet Decentralized approach.*

The OneNet Framework will constitute the backbone for all demonstrators in which all the platforms and tools developed within the OneNet project could be integrated for **implementing secure and trusted data exchanges** and **operate specific cross-platform services for market and grid operations**.

Following the OneNet main concept, the analysis conducted in existing and relevant projects as well as the Use Cases provided by the OneNet demonstrators, a list of functional and non-functional requirements was identified. The requirements will be the base for defining all the specification of the OneNet Solution, that will be better detailed in the D5.2 – OneNet Reference architecture and in other deliverables of this WP.

## 5.2 OneNet Functional Requirements

FUR are the requirements that the end-users, i.e., partners from demonstrators, specifically demand as basic facilities that the OneNet system should offer. In order to create a list with the FUR of the OneNet system, the mapping of the data exchanges and the corresponding services, identified from the Demo SUCs, was conducted


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and included in 4.2.5 (full list is presented in Appendix 2). Furthermore, the General SUCs, introduced in section 4.3, are further utilized in order to extend the list of the OneNet FUR to cover OneNet system's functionalities that have not been envisioned by demonstrators to be used, until this point of the project.

*Table 5-1: OneNet FUR.*

| Requirement ID | Requirement Name | Description | Reference |
|---|---|---|---|
| OneNet_FUR_01 | The OneNet system must enable exposure of list of data/ services from vertical WPs to third parties | System of the OneNet Participant has many features/roles and data. Those can be accessed through API's by third party. The list of services/data and their properties can be retrieved automatically by special API - "Catalogue service". This list can be provided by API to OneNet system, in order to be exposed to potential third parties. | Northern Cluster, General SUC_01, General SUC_02 |
| OneNet_FUR_02 | The OneNet system must enable role-based access for data/service to authenticated users. | Every data/service responds to authenticated requests only. In case third party need the access then the authentication/secure channel needs to be established. | Northern Cluster |
| OneNet_FUR_03 | The OneNet system must provide visualisation and analysis tools for activity logs. | User activity trace logs, technical performance or problem related logs are generated and could be exposed from demonstrator's implementation to third parties, through the OneNet system | Northern Cluster, GSUC_01 |
| OneNet_FUR_04 | The OneNet system must facilitate the communication of the SO's flexibility needs to external interested stakeholders | The SOs, i.e., DSO and TSO, shall be able to make available to stakeholders their flexibility needs in different timeframes, e.g., Day-ahead and Intra-day, through the utilization of the OneNet system. | DSUC_WE_PT_02 |
| OneNet_FUR_05 | The OneNet system must facilitate market results to be disseminated to external interested stakeholders | The local market platform publishes collected market results through OneNet system to external interested parties. | DSUC_SP_01 |
| OneNet_FUR_06 | The OneNet system must facilitate data exchange amongst SOs, MOs, and FSPs participating in the market-based flexibility procurement process, for prequalification, market clearing, evaluation and real-time control purposes. | Prequalified limits in the interface between the HV/MV (TSO) and MV/LV (DSO) that FSPs exist are sent to the market (TSO market or local DSO market) in order to be taken into consideration by the market operator in the allocation of the awarded bids to the FSPs. In addition, MO publishes the awarded bids to the operators through the OneNet. After the activation of the flexibility, evaluation report of the FSP's performance is sent to the market operator through the OneNet platform. Finally, communication between the DSO control centre (ABCM-D platform is develop in the context of Cypriot Demonstrator) and the local FSPs connected to the distribution grid through the OneNet system | DSUC_SO_CY_02, DSUC_SO_CY_03, DSUC_SO_CY_04 |
| OneNet_FUR_07 | The OneNet system must connect the involved in the | TSO/DSO coordination process takes place through the utilization of OneNet. This | DSUC_EA_HU_01 |





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|---|---|---|---|
| | Demo parties to external actors responsible for TSO-DSO coordination | specifically includes: DSO demand finalization, flexibility registration, bid prequalification and market result broadcasting | DSUC_EA_HU_02<br>DSUC_EA_HU_03 |
| OneNet_FUR_08 | OneNet system must be able to manage and certificate the identity of each OneNet Participant | OneNet system manage the identities of all the OneNet participants offering an Identity Provider | GSUC_01<br>GSUC_02<br>GSUC_03 |
| OneNet_FUR_09 | OneNet system must be able to register/unregister a OneNet connector | OneNet Connector need to register itself before starting any data exchange process | |
| OneNet_FUR_10 | Each OneNet Participant must be uniquely identified using certification | OneNet Participants are uniquely identified within the OneNet ecosystem, using certification process and establishing trust among all participants. | |
| OneNet_FUR_11 | Each OneNet Connector have a unique certificate and identifier | | |
| OneNet_FUR_12 | Each OneNet Connector is able to verify the identity of the other OneNet Connectors | | |
| OneNet_FUR_13 | OneNet participant must be able to run the OneNet connector in its own environment | OneNet Middleware leverage on the IDS decentralized approach. The OneNet Connector provided by OneNet must be deployable in any environment | |
| OneNet_FUR_14 | The OneNet Participant must be able to configure its own OneNet Connector | OneNet connectors are configurable by the OneNet participants using specific interfaces | |
| OneNet_FUR_15 | The OneNet connector must be able to send metadata of a data source to one or more Brokers | Once the connector is configured it is able to connect the Brokers for starting data exchange. The connector is able to provide and/or search metadata as well as discover for new data sources and participants. | |
| OneNet_FUR_16 | The OneNet Participant must be able to search and discover other OneNet Participants | | |
| OneNet_FUR_17 | The OneNet Connector must be able to search for metadata connecting to a Broker | | |
| OneNet_FUR_18 | The OneNet Connector must be able to exchange data with other connectors using pull and/or push mechanisms | The data exchange process happens end-to-end exploiting pull or push mechanisms. | |
| OneNet_FUR_19 | The OneNet system must be able to support the creation, management and usage of vocabularies | A feature provided by OneNet system is the Vocabulary Provider. It manages and offers vocabularies (i.e., ontologies, reference data models, or metadata elements) that can be used to annotate and describe datasets. | |
| OneNet_FUR_20 | The OneNet participant could use vocabularies for | | |


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| | | | |
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| | creating and structuring its metadata | | |
| OneNet_FUR_21 | The OneNet system should offer data services/apps for data processing and transformation | One of the main features of the OneNet system is the possibility to enrich, transform, validate and harmonize the data processed. In addition, the OneNet allow to log all the data transaction. | |
| OneNet_FUR_22 | The OneNet system should be able to log any data transaction between any OneNet participant | | |
| OneNet_FUR_23 | The OneNet system should be able to assess the quality of data processed | | |
| OneNet_FUR_24 | The OneNet system should be able to perform a semantic validation of the data processed | | |
| OneNet_FUR_25 | The OneNet system could use AI mechanism for empowering Data services | For improving the Data Services offered by the OneNet system, some AI mechanism could be implemented. | |
| OneNet_FUR_26 | The OneNet system should be able to integrate any kind of data sources using Context Broker | The usage of the FIWARE context broker could facilitate the integration of any kind of data source, using a standard API based approach. | GSUC_03 |
| OneNet_FUR_27 | The OneNet Orchestration Workbench must be able to manage data and service orchestration | The OneNet Orchestration Workbench aims to support the data orchestration for the evaluation of the performance and scalability of the AI, IoT and Big Data cross-platform services for market and grid operations.<br>The OneNet Orchestration Workbench allows to integrate data coming from the OneNet middleware and implement a data pipeline orchestration.<br>It also should include:<br>Job Scheduling<br>App/Service registry and discovery<br>Error/Retries management<br>SLAs tracking, alerting and notification | GSUC_02 |
| OneNet_FUR_28 | The OneNet Orchestration Workbench must be able to integrate data using the OneNet Middleware | | |
| OneNet_FUR_29 | The Service Provider must be able to register its service in the OneNet Orchestration Workbench | | |
| OneNet_FUR_30 | The Service Provider must be able to create a data workflow using the Orchestration Workbench | | |
| OneNet_FUR_31 | The Service Provider must be able to evaluate the performance of its own service | | |
| OneNet_FUR_32 | The OneNet Orchestration Workbench should provide a service catalogue to the OneNet Participants | | |



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| | | | |
|---|---|---|---|
| OneNet_FUR_33 | The OneNet system should offer a UI dashboard to OneNet Participants for monitoring and analytics | The OneNet system should implement a GUI for facilitating the OneNet Participants in the management, monitoring and analytics of the data transactions. | |

## 5.3 OneNet Non-Functional Requirements

In this section, the complete set of NFR that were elicited based on the information analysed from the Demonstrators and the objectives of the OneNet system, is given. Based on the IEEE, the definition of the non-functional requirements is as follows [36]:

*"non-functional requirement- in software system engineering, a software requirement that described not what software will do, but how the software will do it, for example, software performance requirements, software external interface requirements, design constraints, and software quality attributes. Non-functional requirements are difficult to test; therefore, they are usually evaluated subjectively."*

The ISO/IEC 25010 [37], as a part of the Software Quality Requirements and Evaluation (SQuaRE) series of International Standards (ISO 25000) [38], comprises eight quality characteristics, which define the product quality model for Systems and Software. Based on those categories, the NFR are grouped, defining the following attributes:

- **Functional suitability:** The degree to which the system, i.e., OneNet, provides functions that meet stated and implied needs when used under specified conditions. This can be further decomposed into:
  - ✓ **Functional completeness:** Degree to which the set of functions covers all the specified tasks and user objectives.
  - ✓ **Functional correctness:** Degree to which the system provides the correct results with the needed degree of precision.
  - ✓ **Functional appropriateness**: Degree to which the functions facilitate the accomplishment of specified tasks and objectives.
- **Reliability/ Availability:** The ability of the system to behave consistently in a user-acceptable manner when acceptable manner when operating within the environment for which the system was intended. This can be further decomposed into:
  - ✓ **Maturity:** Degree to which the system meets needs for reliability under normal operation.
  - ✓ **Availability:** Degree to which the system is operational and accessible when required for use.
  - ✓ **Fault tolerance:** Degree to which a system, product or component operates as intended despite the presence of hardware or software faults.
  - ✓ **Recoverability:** Degree to which, in the event of an interruption or a failure, the system can recover the data directly affected and re-establish the desired state of the system.



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- **Performance Efficiency:** This characteristic represents the performance relative to the number of resources used under stated conditions. This can be further decomposed into:
  - ✓ **Time behaviour:** Degree to which the response and processing times and throughput rates of a product or system, when performing its functions, meet requirements.
  - ✓ **Resource utilization:** Degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements.
  - ✓ **Capacity:** Degree to which the maximum limits of the system parameter meet requirements.
- **Usability:** The degree to which the product has attributes that enable it to be understood, learned, used and attractive to the user, when used under specified conditions. This can be further decomposed into:
  - ✓ **Appropriateness recognizability:** Degree to which users can recognize whether a product or system is appropriate for their needs.
  - ✓ **Learnability:** Degree to which a product or system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use.
  - ✓ **Operability**: Degree to which a product or system has attributes that make it easy to operate and control.
  - ✓ **User error protection:** Degree to which a system protects users against making errors.
  - ✓ **User interface aesthetics:** Degree to which a user interface enables pleasing and satisfying interaction for the user.
  - ✓ **Accessibility:** Degree to which a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.
- **Security:** The degree of protection of information and data so that unauthorized persons or systems cannot read or modify them, and authorized persons or systems are not denied access to them. This can be further decomposed into:
  - ✓ **Confidentiality:** Degree to which the system ensures that data are accessible only to those authorized to have access.
  - ✓ **Integrity:** Degree to which the system prevents unauthorized access to, or modification of, computer programs or data.
  - ✓ **Non-repudiation:** Degree to which actions or events can be proven to have taken place so that the events or actions cannot be repudiated later.
  - ✓ **Accountability:** Degree to which the actions of an entity can be traced uniquely to the entity.


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- ✓ **Authenticity:** Degree to which the identity of a subject or resource can be proved to be the one claimed.

- **Compatibility:** The degree to which two or more systems or components can exchange information and/or perform their required functions while sharing the same hardware or software environment. This can be further decomposed into:
  - ✓ **Co-existence:** Degree to which the platform can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product.
  - ✓ **Interoperability:** Degree to which the platforms with external platform or stakeholders can exchange information and use the information that has been exchanged.
- **Maintainability:** The degree of effectiveness and efficiency with which the product can be modified. This can be further decomposed into:
  - ✓ **Modularity:** Degree to which the system is composed of discrete components such that a change to one component has minimal impact on other components.
  - ✓ **Reusability**: Degree to which an asset can be used in more than one system, or in building other assets.
  - ✓ **Analyzability:** Degree of effectiveness and efficiency with which it is possible to assess the impact on a product or system of an intended change to one or more of its parts, or to diagnose a product for deficiencies or causes of failures, or to identify parts to be modified.
  - ✓ **Modifiability:** Degree to which a product or system can be effectively and efficiently modified without introducing defects or degrading existing product quality.
  - ✓ **Testability:** Degree of effectiveness and efficiency with which test criteria can be established for a system and its components component, and tests can be performed to determine whether those criteria have been met.
- **Portability:** The degree to which a system or component can be effectively and efficiently transferred from one hardware, software or other operational or usage environment to another. This can be further decomposed into:
  - ✓ **Adaptability:** Degree to which a product or system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments.
  - ✓ **Installability:** Degree of effectiveness and efficiency with which a product or system can be successfully installed and/or uninstalled in a specified environment.
  - ✓ **Replaceability:** Degree to which a product can replace another specified software product for the same purpose in the same environment.


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Based on the above-mentioned categories, the NFR are defined. Some of the categories are not included in the NFR of the OneNet system, either due to the lack of applicability, e.g., usability refers mainly to the implementation of the Users' interfaces, or Reusability of the OneNet platform which is going to be explicitly decided in the next months of the project.

*Table 5-2: OneNet NFR.*

| Requirement ID | Requirement Name | Category | Subcategory | Description |
|---|---|---|---|---|
| OneNet_NFR_01 | Coverage of objectives | Functional Suitability | Completeness | The OneNet system shall at least cover all the objectives and envisioned utilization of it from the demonstrators. |
| OneNet_NFR_02 | Correctness level | Functional Suitability | Correctness | The OneNet system shall implement the functionalities envisioned in the proper way. |
| OneNet_NFR_03 | Regulation update compatibility | Reliability | Maturity | The OneNet system shall be compatible regarding the updates in energy data security according to EU and national EU members' regulation. |
| OneNet_NFR_04 | System failure | Reliability | Fault tolerance | The OneNet system shall ensure a low level of system failure. |
| OneNet_NFR_05 | Recovery ability | Reliability | Recoverability | The OneNet system should be able to recover the data that have been directly affected by an undesirable interruption. |
| OneNet_NFR_06 | Timing execution errors | Performance Efficiency | Time behaviour | The OneNet system shall be able to monitor and alert for timing execution errors. |
| OneNet_NFR_07 | Resource Utilization issues | Performance Efficiency | Resource utilization | The OneNet system is able to monitor and alert for resources utilization issues. |


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| OneNet_NFR_08 | Capacity limitations | Performance Efficiency | Capacity | The OneNet system is able to monitor and alert for capacity limitations. |
| OneNet_NFR_09 | Documentation for the integration | Usability | Learnability | The OneNet system shall provide a comprehensive documentation for the integration of the platform/services. |
| OneNet_NFR_10 | Documentation for the operations | Usability | Operability | The OneNet system shall provide a comprehensive documentation for all the envisioned operations. |
| OneNet_NFR_11 | User initialization error | Usability | User error protection | The OneNet system shall be resilient to user initialization error. |
| OneNet_NFR_12 | Privacy of grid data | Security | Confidentiality | The OneNet system must ensure the privacy and the security of grid data. |
| OneNet_NFR_13 | Privacy of customer's personal data | Security | Confidentiality | The OneNet system must ensure the privacy and the security of customers' personal data. |
| OneNet_NFR_14 | Secure integration to critical energy infrastructure | Security | Integrity | Secure one point of connection between the OneNet platform and the legacy systems of the energy domain stakeholders. |
| OneNet_NFR_15 | Penetration testing | Security | Integrity | Penetration security test should be performed before the final release of the OneNet system of platform in order to identify potential security branches and fix them before the final release. |
| OneNet_NFR_16 | Data flow tracking | Security | Non-repudiation | The OneNet system shall track all the data and process flows. |



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| OneNet_NFR_17 | Link data to user | Security | Accountability | The OneNet system shall link all the data and process flows to a specific user. |
| OneNet_NFR_18 | User Authentication | Security | Authenticity | The OneNet system must identify uniquely the involved users in the system. |
| OneNet_NFR_19 | Facilitation of connection to multiple external platforms and stakeholders | Compatibility | Co-existence | Existence of several connections simultaneously to OneNet system should be considered, without deteriorating the system overall performance |
| OneNet_NFR_20 | Interoperability of OneNet solution | Compatibility | Interoperability | Interoperability of the solution should be considered towards avoiding the risk of creating a closed environment that does not allow integration of other technologies and the expansion of the pan-European energy marketplace. |
| OneNet_NFR_21 | Connection to the platform of multiple stakeholders at the same simultaneously | Maintainability | Modularity | OneNet System shall be able to service multiple connections at the same by having multiple connections to the external platforms and stakeholders, without deteriorating the performance overall. |
| OneNet_NFR_22 | Modification capability | Maintainability | Modifiability | The OneNet system shall be modifiable based on the feedback collected during the evaluation phase of the demonstrations. |
| OneNet_NFR_23 | Testing process | Maintainability | Testability | The OneNet system shall be testable and evaluable within the demonstrators' architecture. |


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| OneNet_NFR_24 | Agnostic | Portability | Adaptability | The OneNet system must be platform and environment agnostic. |
| OneNet_NFR_25 | Deployability | Portability | Installability | The OneNet system must be deployable in any environment (e.g., using Docker container or similar approach) |


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# 6 Conclusion and next steps

The outcome of this deliverable and the contribution to other tasks mainly concerns:

- Identification of the necessary regulatory and ICT requirements for scaling up coordination models amongst the SOs, i.e., TSOs and DSOs., with a view to provide near-real services,
- Presentation of the requirements from a consumer-centric perspective regarding the coordination amongst the operators and presentation of game changing technologies, such as DLTs and Blockchain, and how can be leveraged in the new era of power systems,
- Information collection and reporting of the SUCs developed in the context of the cluster campaigns and their demonstrators, by utilizing the IEC 62559 template. Particularly, the narrative of the each SUC, along with the overall goals, the engaged actors and developed platforms, and corresponding sequence diagrams were identified,
- Identification of the data exchange and services in two dimensions:
    - Internally: within the demonstrators between the actors and the corresponding platforms that will be/are developed in the context of the demonstrator activities,
    - Externally between the demonstrators' and the OneNet system.
- Definition of three General OneNet SUCs for the implementation of the OneNet Framework, as a decentralized system that allows the secure and scalable cross-platform cooperation and integration, leveraging on the more used and promising standard interfaces and interoperability mechanisms like IDS components and FIWARE context broker. Similar to the Demo SUCs, the objectives, Narrative, Steps, involved actors and platforms and sequence diagrams were thoroughly presented,
- Initial conceptual framework of the OneNet System, which has as a key feature to make available a data interoperability mechanism to all platforms to support data exchange for facilitating market and network operations and the cooperation between network operators, like TSOs and DSOs as well as the involvement of other players like prosumers and aggregators, and
- Definition of FUR and NFR as follows:
    - FUR are the requirements that the partners from cluster campaigns, specifically demand as basic facilities that the OneNet system should offer, defined conducting two processes; First, by leveraging the above-mentioned mapping of the data exchanges and corresponding services, identified from the Demo SUCs; Second, by using the General SUCs, in order to cover OneNet system's functionalities that have not been envisioned by demonstrators to be used, until this point of the project,
    - A complete set of NFR that were elicited based on the information analysed from the Demonstrators and the objectives of the OneNet system. As a methodology, the ISO/IEC


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25010, which defines eight product quality characteristics for Systems and Software, was leveraged. Hence, NFR have been initially grouped based on those eight attributes, and further decomposed into additional subcategories.

- Building upon on the outcome presented comprehensively in the above bullet points, other tasks in WP5 will continue the in-depth definition of the OneNet architecture and its components. Particularly, T5.2, 5.3 and 5.6 will leverage the initial conceptual framework of the OneNet, along with the FUR and NFR, in order to define the OneNet Open Reference Architecture, the data Platform assets functional specifications and data quality compliance, and the interoperability for data and services, respectively. Moreover, WP4 will utilize the results of this deliverable for the definition of the integrated system operation for OneNet.


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# 8 Appendix A: Demo BUCs

This section briefly presents the Demo BUCs defined in the context of D2.3, in order to facilitate the reader of this deliverable.

## 8.1 Northern cluster

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

## 8.2 Southern cluster

| BUC ID | SOCL-GR-01 |
|---|---|
| BUC Name | Enhanced Active/ Reactive Power Management for TSO-DSO coordination |
| Scope | Improved identification of the available flexibility resources, focused on a DSO voltage level, together with the improved identification of the power system flexibility needs, focused on a TSO voltage level grid, on a longer time span and wider geographical scope than the one being utilised today, through a simultaneous DSO and TSO and grid simulations backed up by AI based calculation engines |
| Objectives | ○ Frequency stability;<br>○ Load flow and contingency monitoring and predictions;<br>○ Predictive congestion management for maintaining secure and stable power system operation;<br>○ Cost-effective operation of the system<br>○ Early warning on hazardous power system regimes;<br>○ Better FSPs planning and managing flexibility resources;<br>○ Better energy predictions and power system state predictions;<br>○ Improved identification of the available flexibility resources on all power system levels;<br>○ Improved prediction of the system flexibility needs. |
| Services | mFRR, RR, predictive reactive power products for VC, and predictive active power products for CM |
| Type of coordination | Technical based TSO-DSO coordination |

| BUC ID | SOCL-GR-02 |
|---|---|
| BUC Name | Enhanced severe weather condition management and outage management for TSO, DSO and micro grid operator |
| Scope | Enhanced severe weather condition management with predictive maintenance algorithms with the enhanced storm and icing predictions in order to preserve power system from running into dangerous topological or operational states. |
| Objectives | ○ Predictive maintenance and outage management;<br>○ Enhanced severe weather condition management;<br>○ Outage management optimisation for increased system adequacy;<br>○ Early warning on a potentially hazardous power system topology and regimes; |



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| | |
|---|---|
| | ○ Avoidance of damages caused by the severe weather conditions. |
| **Services** | Adequacy |
| **Type of coordination** | Technical based TSO-DSO coordination |

| **BUC ID** | **SOCL-CY-01** |
|---|---|
| **BUC Name** | Active power flexibility |
| **Scope** | Enhance of active power flexibility (i.e., ramping, droop control and power regulation) through the use of distributed flexible resources (energy storage and PV systems) |
| **Objectives** | ○ Frequency stability;<br>○ Congestion management for maintaining capacity limits of the grid;<br>○ Cost-effective operation of the system. |
| **Services** | Inertia, aFRR, mFRR and corrective active power management for CM |
| **Type of coordination** | Market-based TSO-DSO coordination |

| **BUC ID** | **SOCL-CY-02** |
|---|---|
| **BUC Name** | Reactive power flexibility and power quality |
| **Scope** | Enhance of reactive power flexibility and power quality (i.e., voltage support, congestion management, phase balancing) by using distributed flexible resources (energy storage and PV systems) |
| **Objectives** | ○ Voltage stability;<br>○ Congestion management for maintaining capacity limits of the grid;<br>○ Power quality enhancement. |
| **Services** | Corrective reactive power management for VC and CM |
| **Type of coordination** | Market-based TSO-DSO coordination |

## 8.3 Western cluster

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

| **BUC ID** | **WECL-ES-02** |
|---|---|
| **BUC Name** | Short-term congestion management |
| **Scope** | Demonstration of the short-term local congestion management procurement of local flexibility by the DSO. Flexibility providers at both LV and MV will be able to participate. Two-time frame markets will be considered: Day ahead and intraday. |
| **Objectives** | ○ To apply market procedures to obtain flexibility services attending short term DSO requirements; |





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| | |
|---|---|
| | ○ To implement flexibility provision/usage through a market platform;<br>○ To use consumer's demand-response in efficient flexibility services; |
| **Services** | Corrective and predictive active power management for CM |
| **Type of coordination** | Market-based DSO coordination |

| **BUC ID** | **WECL-FR-01** |
|---|---|
| **BUC Name** | Improved monitoring of flexibility for congestion management |
| **Scope** | Simplify and optimize the management of renewable production curtailments |
| **Objectives** | 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. |
| **Services** | Corrective active power management for CM |
| **Type of coordination** | Technical based TSO-DSO coordination |

| **BUC ID** | **WECL-FR-02** |
|---|---|
| **BUC Name** | Improved TSO-DSO information exchange for DER activation |
| **Scope** | Enhanced information exchange between TSO and DSO |
| **Objectives** | 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 (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 that can be used without further prior approval, the so-called "tunnels of warranty". The aim of such a 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. |
| **Services** | Service agnostic |
| **Type of coordination** | Technical based TSO-DSO coordination |

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


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| BUC ID | WECL-PT-02 |
|---|---|
| BUC Name | Exchange of information for long-term CM |
| Scope | Information exchanges and rules between DSO and TSO in order to procure congestion management products for long-term (more than annually) |
| Objectives | ○ Design and detail each process phase of ASM report so that it can serve as a basis for future developments.<br>○ Coordination of the use of flexibility for different voltage levels.<br>○ 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.<br>○ Develop information exchange mechanisms to enable market-based procurement of flexibility products. |
| Services | Predictive active power management for CM |
| Type of coordination | Technical based TSO-DSO coordination |

| BUC ID | WECL-PT-03 |
|---|---|
| BUC Name | Exchange of information for operational planning |
| 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. |
| Objectives | ○ Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of DSO operation.<br>○ Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of TSO operation.<br>○ Anticipate and solve distribution grid constraints.<br>○ Anticipate and solve transmission grid constraints.<br>○ Develop information exchange mechanisms to share the identified information. |
| Services | Service agnostic |
| Type of coordination | Technical based TSO-DSO coordination |

## 8.4 Eastern cluster

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

| BUC ID | EACL-CZ-02 |
|---|---|
| BUC Name | Reactive power overflow management |
| Scope | Describe an interaction amongst FSP (aggregators/other flexibility providers), DSOs and IT platform in terms of provision of given service (Reactive power overflow management) |





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| | |
|---|---|
| **Objectives** | Identify relevant way of service procurement to control flow of reactive power between TSO and DSO in order to keep reactive power flows in given limits. The test is expected to deliver knowledge on how to specify bids/offer (data format for bid announcement, specific parameters of bid, transparent market environment) |
| **Services** | Predictive reactive power management for VC |
| **Type of coordination** | Market-based DSO coordination |

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

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

| **BUC ID** | **EACL-HU-02** |
|---|---|
| **BUC Name** | HV/MV transformer overload |
| **Scope** | Increasing renewable penetration causes overloading of HV/MV transformers. The main scope of EACL-HU-02 is to mitigate overloading of HV/MV transformers by activating flexibility services. |
| **Objectives** | The objective of the use case is to avoid overloading of HV/MV transformers in all operational states of the power system. |
| **Services** | Predictive active and reactive power management for VC |
| **Type of coordination** | Market-based DSO coordination |

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


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| BUC ID | EACL-PL-02 |
|---|---|
| BUC Name | Managing active power and/or active energy delivered by DER to provide balancing services to TSO and support CM and VC in DSO grid in Polish demonstration |
| Scope | Bring the flexibility provided by resources connected to the distribution network in the form of active power and/or active energy to the Polish TSO balancing market and for supporting congestion management and voltage control in the DSO network. |
| Objectives | ○ Ensure that the energy system is balanced, and frequency is kept within the permitted range.<br>○ Open a balancing market for resources connected to the distribution network.<br>○ Ensure flexibility services for DSO to support congestion management and voltage control.<br>○ Develop rules for coordination between TSO and DSO when using flexibility services.<br>○ Create revenue opportunities for market participants for providing flexibility services. |
| Services | mFRR, aFRR, RR and predictive active power management for CM and CV |
| Type of coordination | Market-based TSO-DSO coordination |

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

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

| BUC ID | EACL-SL-01 |
|---|---|
| BUC Name | Congestion management in distribution grids under market conditions |
| Scope | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process in which managing flexibility in the distribution grid (e.g., switching of heat pumps) can prevent that distribution grid overreaches its physical limits (e.g., transformer overheating, line congestion). It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| Objectives | ○ Deferral of grid reinforcement investments (defer or avoid secondary substation replacement);<br>○ Improve security of supply;<br>○ Validate demand response mechanism to prevent congestion in the distribution grid; |



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|---|---|
| | ○ Test flexibility products to prevent congestion in the distribution grid under market conditions. |
| **Services** | Corrective active power management for congestion management |
| **Type of coordination** | Market-based DSO coordination |

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



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# 9 Appendix B: Data exchanges identified in the Demo SUCs

This section includes the identified data exchanges in the Demo SUCs between the data producers and consumers.

| ID | SUC_ID | Service | Data Producer | Data Consumer |
|---|---|---|---|---|
| **OneNet_North_01** | DSUC_NO_01 | Register contract to flexibility register | FSP | Flexibility Register (FR) |
| **OneNet_North_02** | DSUC_NO_01 | Reject Flexibility contract | FR | FSP |
| **OneNet_North_03** | DSUC_NO_01 | Receive Flexibility contract termination request | FSP, Datahub (DH) | FR |
| **OneNet_North_04** | DSUC_NO_01 | Confirm Flexibility contract termination | FR | FSP, DH |
| **OneNet_North_05** | DSUC_NO_01 | Reject Flexibility contract termination | FR | FSP, DH |
| **OneNet_North_06** | DSUC_NO_01 | Receive product specification | MO | FR |
| **OneNet_North_07** | DSUC_NO_01 | Confirm product registration | FR | MO |
| **OneNet_North_08** | DSUC_NO_01 | Register as Flexibility service provider in Flexibility Register | FSP | FR |
| **OneNet_North_09** | DSUC_NO_01 | Confirm FSP registration | FR | FSP |
| **OneNet_North_10** | DSUC_NO_01 | Publish flexibility need (optional) | SO | FR |
| **OneNet_North_11** | DSUC_NO_01 | Confirm need registration | FR | SO |
| **OneNet_North_12** | DSUC_NO_01 | Publish flexibility resource | FSP | FR |
| **OneNet_North_13** | DSUC_NO_01 | Confirm resource registration | FR | FSP |
| **OneNet_North_14** | DSUC_NO_01 | Update existing resource information | FSP | FR |
| **OneNet_North_15** | DSUC_NO_01 | Send information for grid impact assessment | FR | T&D CP |
| **OneNet_North_16** | DSUC_NO_01 | Receive qualification results | T&D CP | FR |
| **OneNet_North_17** | DSUC_NO_01 | Send confirmation request to MO (optional) | FR | MO |
| **OneNet_North_18** | DSUC_NO_01 | Publish the results of prequalification | FR | FSP, SO, MO |



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| **OneNet_North_19** | DSUC_NO_01 | Receive request for prequalification FSP, product and grid | MO | FR |
| **OneNet_North_20** | DSUC_NO_02 | Receive Market Outcome | MO | FR, T&D CP, SO |
| **OneNet_North_21** | DSUC_NO_02 | Receive activation confirmation | T&D CP | FR |
| **OneNet_North_22** | DSUC_NO_02 | Gather information about procured flexibility, reserved capacity | FR | T&D CP |
| **OneNet_North_23** | DSUC_NO_02 | Receive activation request information | T&D CP | FR |
| **OneNet_North_24** | DSUC_NO_02 | Receive production/consumption plans | FSP | FR |
| **OneNet_North_25** | DSUC_NO_02 | Receive real-time metering | FSP | FR |
| **OneNet_North_26** | DSUC_NO_02 | Inform about under or overdelivered flexibilities in real-time (conditional) | FR | FSP, SO |
| **OneNet_North_27** | DSUC_NO_03 | Receive metering data | MDR | FR |
| **OneNet_North_28** | DSUC_NO_03 | Send invoicing data (Optional) | FR | SO |
| **OneNet_North_29** | DSUC_NO_03 | Forward adjusted volumes to imbalance settlement (Optional) | FR | Imbalance Settlement Responsible (ISR) |
| **OneNet_North_30** | DSUC_NO_07 | Manage resource provider's consent | RP | CA |
| **OneNet_North_31** | DSUC_NO_07 | Receive Resource Provider's consent | CA | T&D CP |
| **OneNet_North_32** | DSUC_NO_07 | Collect information about flexibility needs and resources | FR | T&D CP |
| **OneNet_North_33** | DSUC_NO_07 | Request grid information | T&D CP | SO |
| **OneNet_North_34** | DSUC_NO_07 | Collect grid information | SO | T&D CP |
| **OneNet_North_35** | DSUC_NO_07 | Forward input information for grid qualification | T&D CP | SO |
| **OneNet_North_36** | DSUC_NO_07 | Collect grid qualification results | SO | T&D CP |
| **OneNet_North_37** | DSUC_NO_07 | Publish grid qualification results | T&D CP | FR |
| **OneNet_North_38** | DSUC_NO_07 | Collect information about flexibility bids | MO | T&D CP |





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| **OneNet_North_39** | DSUC_NO_07 | Collect information about flexibility information request | SO | T&D CP |
| **OneNet_North_40** | DSUC_NO_08 | Forward relevant bids to European platform (e.g. MARI) | T&D CP | (EU) MO |
| **OneNet_North_41** | DSUC_NO_08 | Withdraw bids to European platform (e.g., MARI) | T&D CP | (EU) MO |
| **OneNet_North_42** | DSUC_NO_08 | Request flexibility purchase offers (Conditional) | T&D CP | SO |
| **OneNet_North_43** | DSUC_NO_08 | Get flexibility purchase offers | SO | T&D CP |
| **OneNet_North_44** | DSUC_NO_08 | Publication of optimisation (matching flexibility bids and offers) results | T&D CP | SO, MO |
| **OneNet_North_45** | DSUC_NO_09 | Notify the market outcome | MO | T&D CP |
| **OneNet_North_46** | DSUC_NO_09 | Forward the market outcome | T&D CP | SO, FR |
| **OneNet_North_47** | DSUC_NO_09 | Request information about whether counter action should be taken (Conditional) | T&D CP | SO |
| **OneNet_North_48** | DSUC_NO_09 | Receive information about whether counter action should be taken | SO | T&D CP |
| **OneNet_North_49** | DSUC_NO_09 | Forward request for activation | T&D CP | FSP |
| **OneNet_North_50** | DSUC_NO_09 | Receive activation request confirmation | FSP | T&D CP |
| **OneNet_North_51** | DSUC_NO_09 | Receive activation confirmation | FSP | T&D CP |
| **OneNet_North_52** | DSUC_NO_09 | Inform about activation confirmation | T&D CP | FR |
| **OneNet_North_53** | DSUC_NO_09 | Notify activation requests | T&D CP | SO, MO, FR |
| **OneNet_North_54** | DSUC_NO_10 | Request to open the flexibility call for tender | SO | T&D CP |
| **OneNet_North_55** | DSUC_NO_10 | Publish information about calls for tender | T&D CP | SO, MO |
| **OneNet_North_56** | DSUC_NO_10 | Request information about calls for tender | MO | T&D CP |
| **OneNet_North_57** | DSUC_NO_10 | Send information about calls for tender | T&D CP | MO |


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| **OneNet_North_58** | DSUC_NO_04 | Check the existing product | SO | MO |
| **OneNet_North_59** | DSUC_NO_04 | Create and send product information (Conditional) | SO | MO |
| **OneNet_North_60** | DSUC_NO_04 | Inform MO decision whether wants to offer the product | MO | SO |
| **OneNet_North_61** | DSUC_NO_04 | Send product specifications | MO | FR |
| **OneNet_North_62** | DSUC_NO_04 | Send consent to FR for sharing data with MO | CA | FR, MO |
| **OneNet_North_63** | DSUC_NO_05 | Inform about opening the flexibility call for tenders | MO | FSP |
| **OneNet_North_64** | DSUC_NO_05 | Submit a flexibility bid | FSP | MO |
| **OneNet_North_65** | DSUC_NO_05 | Request for prequalification FSP, product and grid | MO | FR |
| **OneNet_North_66** | DSUC_NO_05 | Receive reply on prequalification request | FR | MO |
| **OneNet_North_67** | DSUC_NO_05 | Send compliant flexibility bids for grid impact assessment | MO | T&D CP |
| **OneNet_North_68** | DSUC_NO_05 | Receive optimisation (optimum matching flexibility bids and offers) results | T&D CP | MO |
| **OneNet_North_69** | DSUC_NO_05 | Notify market outcome | MO | FSP, FR, T&D CP |
| **OneNet_North_70** | DSUC_NO_05 | Receive verified amount of flexibility delivered for each product/ FSP | FR | MO |
| **OneNet_North_71** | DSUC_NO_06 | FSP inform the need for trading in the secondary market | FSP | MO |
| **OneNet_North_72** | DSUC_NO_06 | MO publishes the need for a take-over of the contract | MO | (Others) FSP |
| **OneNet_North_73** | DSUC_NO_06 | Bid for contract | (Others) FSP | MO |
| **OneNet_North_74** | DSUC_NO_06 | Send contract bids for grid impact assessment | MO | T&D CP |
| **OneNet_North_75** | DSUC_NO_06 | Receive grid impact assessment results | T&D CP | MO |
| **OneNet_North_76** | DSUC_NO_06 | Notification of the market results | MO | FSP |

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| **OneNet_North_77** | DSUC_NO_06 | Notification to SO of new contract holder | MO | T&D CP /SO, FR |
| **OneNet_Spanish_01** | DSUC_SP_01 | FSP sign-up to the LMP | FSP | LMP |
| **OneNet_Spanish_02** | DSUC_SP_01 | LMP validates new account | LMP | FSP |
| **OneNet_Spanish_03** | DSUC_SP_01 | FSP requests to be pre-qualified | FSP | LMP |
| **OneNet_Spanish_04** | DSUC_SP_01 | LMP sends a confirmation that the pre-qualification request was made | LMP | FSP |
| **OneNet_Spanish_05** | DSUC_SP_01 | LMP notifies the IMO that a pre-qualification was requested | LMP | IMO |
| **OneNet_Spanish_06** | DSUC_SP_01 | IMO registers at the LMP that additional information is necessary | IMO | LMP |
| **OneNet_Spanish_07** | DSUC_SP_01 | LMP notifies FSP that additional information is required | LMP | FSP |
| **OneNet_Spanish_08** | DSUC_SP_01 | FSP provides the requested information | FSP | LMP |
| **OneNet_Spanish_09** | DSUC_SP_01 | LMP notifies the IMO that the data on the pre-qualification request was updated | LMP | IMO |
| **OneNet_Spanish_10** | DSUC_SP_01 | IMO registers the successful resource pre-qualification to the LMP | IMO | LMP |
| **OneNet_Spanish_11** | DSUC_SP_01 | The LMP informs the DSO that a technical pre-qualification was requested | LMP | DSO |
| **OneNet_Spanish_12** | DSUC_SP_01 | The DSO conducts the technical pre-qualification process | DSO | FSP |
| **OneNet_Spanish_13** | DSUC_SP_01 | DSO concludes technical pre-qualification and registers the information into the LMP | DSO | LMP |
| **OneNet_Spanish_14** | DSUC_SP_01 | The LMP creates an FSP register on the Flexibility Resources Register | LMP | LMP: Flexibility Resources Register |
| **OneNet_Spanish_15** | DSUC_SP_01 | IMO, DSO and FSP are able to consult the | IMO, DSO, FSP | LMP: Flexibility Resources Register |

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|---|---|---|---|---|
| | | register at the Flexibility Resources Register | | |
| **OneNet_Spanish_16** | DSUC_SP_01 | The LMP returns the consultation | LMP: Flexibility Resources Register | IMO, DSO, FSP |
| **OneNet_Spanish_17** | DSUC_SP_01 | The FSP updates information | FSP | LMP |
| **OneNet_Spanish_18** | DSUC_SP_01 | The IMO and the DSO validate the update | IMO, DSO | LMP |
| **OneNet_Spanish_19** | DSUC_SP_01 | The LMP updates the Flexibility registry | LMP | LMP: Flexibility Resources Register |
| **OneNet_Spanish_20** | DSUC_SP_01 | The LMP confirms the update | LMP | FSP |
| **OneNet_Spanish_21** | DSUC_SP_01 | The DSO requests the creation of a Market Session | DSO | LMP |
| **OneNet_Spanish_22** | DSUC_SP_01 | The LMP sends a confirmation that the market session was requested | LMP | DSO |
| **OneNet_Spanish_23** | DSUC_SP_01 | The IMO is notified that a market session was requested | LMP | IMO |
| **OneNet_Spanish_24** | DSUC_SP_01 | The IMO may consult the Flexible Resources Registry in order to evaluate the market session request | IMO | LMP: Flexibility Resources Registry |
| **OneNet_Spanish_25** | DSUC_SP_01 | The LMP returns the consultation | LMP | IMO |
| **OneNet_Spanish_26** | DSUC_SP_01 | The IMO validates the market session and registers it into the LMP | IMO | LMP |
| **OneNet_Spanish_27** | DSUC_SP_01 | A new market session is created within the LMP | LMP | LMP: Market Session |
| **OneNet_Spanish_28** | DSUC_SP_01 | The LMP confirms to the IMO that a Market Session was created | LMP | IMO, DSO |
| **OneNet_Spanish_29** | DSUC_SP_01 | Market session becomes active | LMP: Market Session | LMP |
| **OneNet_Spanish_30** | DSUC_SP_01 | IMO, DSO and FSPs are notified on the opening of a Market Session | LMP | IMO, DSO, FSP |
| **OneNet_Spanish_31** | DSUC_SP_01 | The IMO and the DSO consult the Flexibility Resources Register | IMO, DSO | LMP: Flexibility Resources Register |




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| **OneNet_Spanish_32** | DSUC_SP_01 | The Flexibility Resources Register returns the consultation | LMP: Flexibility Resources Register | IMO, DSO |
| **OneNet_Spanish_33** | DSUC_SP_01 | The IMO registers into the LMP the results of the market qualification | IMO | FSP |
| **OneNet_Spanish_34** | DSUC_SP_01 | The DSO registers into the LMP the results of the technical qualification | DSO | LMP |
| **OneNet_Spanish_35** | DSUC_SP_01 | The LMP creates a list of qualified FSPs for the Market Session | LMP | LMP : Market Session, Flexibility Resources Register |
| **OneNet_Spanish_36** | DSUC_SP_01 | The LMP publishes the qualified FSPs for the Market Session | LMP | IMO, DSO, FSP |
| **OneNet_Spanish_37** | DSUC_SP_01 | FPSs enter bids for the Market Session | FSP | LMP : Market Session |
| **OneNet_Spanish_38** | DSUC_SP_01 | The LMP gets all bids submitted to the Market Session | LMP | LMP: Market Session |
| **OneNet_Spanish_39** | DSUC_SP_01 | IMO and DSO are notified on the preliminary market results | LMP | IMO, DSO |
| **OneNet_Spanish_40** | DSUC_SP_01 | The IMO & DSO validate the market results and confirm it on the LMP | IMO, DSO | LMP |
| **OneNet_Spanish_41** | DSUC_SP_01 | The LMP register to the Market Session the consolidated market results | LMP | LMP : Market Session |
| **OneNet_Spanish_42** | DSUC_SP_01 | The LMP publishes the market results. IMO, DSO and relevant FSPs are notified | LMP | IMO, DSO, FSP |
| **OneNet_Spanish_43** | DSUC_SP_01 | The Local Market Platform sends short-term market results to the TSO | LMP | TSO |
| **OneNet_Spanish_44** | DSUC_SP_01 | The LMP sends the collected market results to the OneNet system | LMP | OneNet System |
| **OneNet_French_01** | DSUC_FR_01 | Registration to MA perimeters | TSO | STAR platform |
| **OneNet_French_02** | DSUC_FR_01 | Registration of offers and production forecasts | FSP | STAR platform |
| **OneNet_French_03** | DSUC_FR_01 | Automated order | TSO | DSO (or directly producer) |



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| **OneNet_French_04** | DSUC_FR_01 | Automated order end | TSO | DSO (or directly producer) |
| **OneNet_French_05** | DSUC_FR_01 & 02 | Order registration | TSO, DSO | STAR platform |
| **OneNet_French_06** | DSUC_FR_01 & 02 | Order reception registration | DSO, TSO | STAR platform |
| **OneNet_French_07** | DSUC_FR_01 & 02 | Limitation order | DSO, TSO | Producer |
| **OneNet_French_08** | DSUC_FR_01 & 02 | Limitation order end | DSO, TSO | Producer |
| **OneNet_French_09** | DSUC_FR_01 & 02 | Order reception log | Producer | STAR platform |
| **OneNet_French_10** | DSUC_FR_01 & 02 | Order execution log | Producer | STAR platform |
| **OneNet_French_11** | DSUC_FR_01 & 02 | End of Order reception log | Producer | STAR platform |
| **OneNet_French_12** | DSUC_FR_01 & 02 | End of order execution log | Producer | STAR platform |
| **OneNet_French_13** | DSUC_FR_01 & 02 | Estimated curtailed energy | DSO, TSO | STAR platform |
| **OneNet_French_14** | DSUC_FR_01 & 02 | Production Metering | DSO, TSO | STAR platform |
| **OneNet_French_15** | DSUC_FR_01 & 02 | Consultation | DSO, TSO, FSP, Producer | STAR platform |
| **OneNet_French_16** | DSUC_FR_01 & 02 | Return | STAR platform | DSO, TSO, FSP, Producer |
| **OneNet_French_17** | DSUC_FR_02 | Production forecasts registration | FSP | STAR platform |
| **OneNet_Portuguese_01** | DSUC_PT_01 | Send FSP Product Prequalification Result | DSO/TSO | Data exchange Platform |
| **OneNet_Portuguese_02** | DSUC_PT_01 | FSP information for Grid Prequalification | DSO/TSO | Data exchange Platform |
| **OneNet_Portuguese_03** | DSUC_PT_01 | Request FSP's Network information | Data exchange Platform | TSO/DSO |
| **OneNet_Portuguese_04** | DSUC_PT_01 | FSP information for Product and Grid Prequalification | TSO | Data exchange Platform |
| **OneNet_Portuguese_05** | DSUC_PT_02 | Request the generation and the consumption forecast | TSO/DSO Forecast System | Energy Forecasting |
| **OneNet_Portuguese_06** | DSUC_PT_02 | Generation and the consumption forecast | Energy Forecasting | DSO/TSO Forecast System |
| **OneNet_Portuguese_07** | DSUC_PT_02 | Network information request | DSO/TSO Forecast System | Network Model Management |



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| **OneNet_Portuguese_08** | DSUC_PT_02 | Network information | Network Model Management | DSO/TSO Forecast System |
| **OneNet_Portuguese_09** | DSUC_PT_02 | Amount of flexibility needed | DSO/TSO Forecast System | OneNet System |
| **OneNet_Portuguese_10** | DSUC_PT_03 | Request the generation and the consumption forecast | TSO/DSO Forecast System | Energy Forecasting |
| **OneNet_Portuguese_11** | DSUC_PT_03 | Generation and the consumption forecast | Energy Forecasting | DSO/TSO Forecast System |
| **OneNet_Portuguese_12** | DSUC_PT_03 | Network information request | DSO/TSO Forecast System | Network Model Management |
| **OneNet_Portuguese_13** | DSUC_PT_03 | Network information | Network Model Management | DSO/TSO Forecast System |
| **OneNet_Portuguese_14** | DSUC_PT_03 | Amount of flexibility needed | DSO/TSO Forecast System | Data exchange Platform |
| **OneNet_Portuguese_15** | DSUC_PT_04 | Bids forward | SO | Data exchange Platform |
| **OneNet_Portuguese_16** | DSUC_PT_04 | Request Network information | SO | Network Model Management |
| **OneNet_Portuguese_17** | DSUC_PT_04 | Network information | Network Model Management | SO managing constraints |
| **OneNet_Portuguese_18** | DSUC_PT_04 | Validation Result | SO affected | Data exchange Platform/ SO managing constraints |
| **OneNet_Portuguese_19** | DSUC_PT_04 | Final Bids Selection | SO managing constraints | Data exchange Platform |
| **OneNet_Portuguese_20** | DSUC_PT_05 | Send final selected bids | SO managing constraints | Data exchange Platform |
| **OneNet_Portuguese_21** | DSUC_PT_05 | Request Network information | SO affected | Network Model Management |
| **OneNet_Portuguese_22** | DSUC_PT_05 | Send Bids network characteristics information | Network Model Management | SO affected |
| **OneNet_Portuguese_23** | DSUC_PT_05 | Send Grid Evaluation Results | SO affected | Data exchange Platform |
| **OneNet_Portuguese_24** | DSUC_PT_06 | Request (external) of Planned works | Work Management | Data exchange Platform |
| **OneNet_Portuguese_25** | DSUC_PT_06 | Request(internal) of Planned works | Data exchange Platform | Work validation System |




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| **OneNet_Portuguese_26** | DSUC_PT_06 | Maintenance and expansion planned works (internal) information | Work Validation System | Data exchange Platform |
| **OneNet_Portuguese_27** | DSUC_PT_06 | Request (internal) the Network characteristics information | Work Management | Network model Management |
| **OneNet_Portuguese_28** | DSUC_PT_06 | Network characteristics (internal) information | Network Model Management | Work Management |
| **OneNet_Portuguese_29** | DSUC_PT_06 | Request (internal) the Consumption and production forecast | Work Management | Energy Forecasting |
| **OneNet_Portuguese_30** | DSUC_PT_06 | Consumption and production forecast (internal) information | Energy Forecasting | Work Management |
| **OneNet_Portuguese_31** | DSUC_PT_06 | TSO/DSO Planned works (external) information | Work Management | Data exchange Platform |
| **OneNet_Portuguese_32** | DSUC_PT_06 | TSO/DSO Planned works (internal) information | Work Management | System Planning |
| **OneNet_Portuguese_33** | DSUC_PT_07 | Request (internal) the Network characteristics information | Pre-Operation Planning | Network Model Management |
| **OneNet_Portuguese_34** | DSUC_PT_07 | Network characteristics (internal) information | Network Model Management | Pre-Operation Planning |
| **OneNet_Portuguese_35** | DSUC_PT_07 | Request (internal) the Consumption and production forecast | Pre-Operation Planning | Energy Forecasting |
| **OneNet_Portuguese_36** | DSUC_PT_07 | Consumption and production forecast (internal) information | Energy Forecasting | Pre-Operation Planning |
| **OneNet_Portuguese_37** | DSUC_PT_07 | Consumption and production forecast for operational planning purposes | Pre-Operation Planning | Data exchange platform |
| **OneNet_Portuguese_38** | DSUC_PT_08 | Request (internal) the Network characteristics information | Pre-Operation Planning | Network Model Management |
| **OneNet_Portuguese_39** | DSUC_PT_08 | Network characteristics (internal) information | Network Model Management | Pre-Operation Planning |
| **OneNet_Portuguese_40** | DSUC_PT_08 | Request (internal) the Consumption and production forecast | Pre-Operation Planning | Energy Forecasting |
| **OneNet_Portuguese_41** | DSUC_PT_08 | Consumption and production forecast (internal) information | Energy Forecasting | Pre-Operation Planning |




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| **OneNet_Portuguese_42** | DSUC_PT_08 | Short-Circuit power forecast | Pre-Operation Planning | Data exchange platform |
| **OneNet_Cypriot_01** | DSUC_CY_01 | PMU measurement forwarding | PMU | TSO, PDC |
| **OneNet_Cypriot_02** | DSUC_CY_01 | Conventional measurement forwarding | P/Q measurement devices | TSO, SCADA |
| **OneNet_Cypriot_03** | DSUC_CY_01 | PMU measurement transfer and time alignment to the control center | PDC | TSO/ABCM-T platform/real time monitoring scheme |
| **OneNet_Cypriot_04** | DSUC_CY_01 | P/Q measurement transfer to the control center | SCADA | TSO/ABCM-T platform/real time monitoring scheme |
| **OneNet_Cypriot_05** | DSUC_CY_01 | Monitoring | TSO/ABCM-T platform/real time monitoring scheme | TSO, TSO/ABCM-T platform/ Evaluation of the FSPs response, Prequalification |
| **OneNet_Cypriot_06** | DSUC_CY_01 | Smart meter measurements forwarding | Smart meter | DSO, AMI |
| **OneNet_Cypriot_07** | DSUC_CY_01 | Conventional measurement forwarding | P/Q measurement devices | DSO, SCADA |
| **OneNet_Cypriot_08** | DSUC_CY_01 | Smart meter measurement transfer to the control center | AMI | DSO/ABCM-D platform/real time monitoring scheme |
| **OneNet_Cypriot_09** | DSUC_CY_01 | P/Q measurements transfer to the control center | SCADA | DSO/ABCM-T platform/real time monitoring scheme |
| **OneNet_Cypriot_10** | DSUC_CY_01 | Monitoring | DSO/ABCM-D platform/real time monitoring scheme | DSO, DSO/ABCM-D platform/ Evaluation of the FSPs response, Prequalification, Coordination of the FSPs |
| **OneNet_Cypriot_11** | DSUC_CY_02 | Receive real time data for the current operating condition | TSO, DSO/ABCM-T, ABCM-D/real time monitoring | TSO, DSO/ABCM-T, ABCM-D/Prequalification |
| **OneNet_Cypriot_12** | DSUC_CY_02 | Receive historical data | Database with historical data | TSO, DSO/ABCM-T, ABCM-D/Prequalification |
| **OneNet_Cypriot_13** | DSUC_CY_02 | Extraction and publication of prequalification limits | TSO, DSO/ ABCM-T, | Market operator |




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| | | | ABCM-D/ Prequalification | |
| **OneNet_Cypriot_14** | DSUC_CY_02<br>DSUC_CY_04 | Publication of awarded bids | Market Operator | TSO, DSO, FSPs |
| **OneNet_Cypriot_15** | DSUC_CY_02<br>DSUC_CY_04 | Provision of services | FSP | TSO, DSO |
| **OneNet_Cypriot_16** | DSUC_CY_03 | Monitoring of FSP response | ABCM-T/ Real-time Monitoring<br>ABCM-D/ Real-time Monitoring | TSO and ABCM-T/ Evaluation of FSPs response DSO and ABCM-d/ Evaluation of FSPs response |
| **OneNet_Cypriot_17** | DSUC_CY_03 | FSPs response assessment | TSO through the ABCM-T/ Evaluation of FSPs response<br>DSO through the ABCM-D/ Evaluation of FSPs response | Market Operator, and FSPs |
| **OneNet_Cypriot_18** | DSUC_CY_04 | Grid monitoring | DSO (ABCM-D/ Real-time Monitoring) | DSO (ABCM-D/ Coordination of distributed flexible resources) |
| **OneNet_Cypriot_19** | DSUC_CY_04 | Coordination signals for FSPs | DSO (ABCM-D/ Coordination of distributed flexible resources) | FSPs |
| **OneNet_Hungarian_01** | EACL_HU_01<br>EACL_HU_02 | Prequalification request | FSP | DSO |
| **OneNet_Hungarian_02** | EACL_HU_01<br>EACL_HU_02 | Approval of prequalification | DSO | FSP |
| **OneNet_Hungarian_03** | EACL_HU_01<br>EACL_HU_02 | Prequalification results | DSO | MO (Flexi register) |
| **OneNet_Hungarian_04** | EACL_HU_01<br>EACL_HU_02 | DSO informs TSO on flexibility needs | DSO | TSO |
| **OneNet_Hungarian_05** | EACL_HU_01<br>EACL_HU_02 | DSO delivers flexibility needs | DSO | MO (W-1 & D-1 order book, market interface) |
| **OneNet_Hungarian_06** | EACL_HU_01<br>EACL_HU_02 | Flexibility market opening, DSO needs announced | 1)Market Operator (MO)<br>2) MO (market interface) | 1) MO (order book)<br>2) FSP |
| **OneNet_Hungarian_07** | EACL_HU_01<br>EACL_HU_02 | FSPs submit bids | FSP | MO (flexi register) |





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| | | | | |
|---|---|---|---|---|
| **OneNet_Hungarian_08** | EACL_HU_01<br>EACL_HU_02 | FSP bids delivered | MO (flexi register) | MO (W-1 & D-1 order book) |
| **OneNet_Hungarian_09** | EACL_HU_01 | Results of the clearing are transferred and announced | MO | MO (market interface) |

# 10 Appendix C: Demo SUCs definition based on IEC 62559

This section contains the extensive description of the Demo SUCs reported based on IEC62559-2 by the responsible partners of WP7 to WP10. The Demo SUCs are documented based on the cluster and country (if applicable) they belong to.

## 10.1 Northern Cluster

### 10.1.1.1 DSUC_NO_01

#### 10.1.1.1.1 Description of the use case

##### *10.1.1.1.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSCUC_NO_01 | Flexibility market, Flexibility Register | Preparation to flexibility trading |

##### *10.1.1.1.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 19.4.2021 | Jukka Rinta-Luoma, Taneli Leiskamo | First draft | Discussed in task 7.2 meeting on 19 April |
| 2 | 17.5.202 | Jukka Rinta-Luoma, Taneli Leiskamo | Second draft based on discussion and comments provided in task 7.2 meeting | Discussed in task 7.2 meeting on 20 May |
| 3 | 31.5.202 | Jukka Rinta-Luoma | Updates and additions from discussions between WP7 parties and previous task meeting | Discussed in task 7.2 meeting on 22 June |

##### *10.1.1.1.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Role of Flexibility Register in process phases prior to flexibility trading is described. The processes include managing flexibility contracts, registering FSPs and their resources and doing product prequalification. |
| ***Objective(s)*** | The objective of this use case is to enable the preparation of FSPs and their resources for flexibility trading in the context of OneNet Northern demonstration scope. Prequalification process is a prerequisite for the following process steps of multilateral flexibility trading and coordinated flexibility procurement by SOs. |
| ***Related business case(s)*** | Northern regional flexibility market |

##### *10.1.1.1.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| In order to prepare FSP for flexibility trading, firstly, it's contracted resources must be managed in the FR. This information makes it possible for the FSP to start prequalifying its resources. This use case includes also the steps for registering new |


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| |
|---|
| products sent by the market operator, registration of the FSP and the SO flexibility need. These are needed later by the overall processes including flexibility trading and TSO-DSO coordination.<br>After these steps the resource information can be registered by the FSP, which initiates the prequalification process. Information is sent to T&D CP for grid impact assessment for which the results are stored in the FR. Next, the resource or a group of resources is product prequalified by comparing their characteristics to the product requirements. In some cases, the product prequalification is confirmed by the market operator or system operator. Again, these results are stored in the FR and shared to parties when needed. |
| ***Complete description*** |
| |

##### *10.1.1.1.1.5 Use case conditions*

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | Flexibility market framework and its components described by the OneNet Northern Demonstrator are in place usable by the actors |
| 2 | Solutions for consent management for sharing private data are in place in all countries of the region. |
| ***Prerequisites*** | |
| 1 | Cross-border acknowledgement of consents is enabled. |
| 2 | Access to metering data and BRP information |

#### 10.1.1.1.2 Technical details

##### *10.1.1.1.2.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access. | Based on BRIDGE proposal for Flexibility Register Operator definition. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE.<br>Includes also TSOs and DSOs performing the role of MO. |
| Resource Provider (RP) | Business | A role that manages a resource and provides production/consumption schedules for it, if required. | HEMRM definition. |



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| | | | |
|---|---|---|---|
| Consent Administrator (CA) | Business | A party responsible for administrating a register of consents for a domain. The Consent Administrator makes this information available on request for entitled parties in the sector. | HEMRM definition. |
| Datahub (DH) | Business | | |

### 10.1.1.1.3 Step by step analysis of use case

#### *10.1.1.1.3.1 Steps – Scenarios*

##### *10.1.1.1.3.1.1 Scenario name #1: Flexibility contract Management*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 1. Flexibility contract 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*** |
| 1.1 | | Register contract to flexibility register | Send information of a flexibility contract between FSP and RP. This information makes it possible for an FSP to offer the resource to markets. | | FSP | FR | Flex Cont[1] | |
| 1.2 | | Receive flexibility contract | | | FR | FR | FlexCont | |
| 1.3 | | Validate flexibility contract | Validation includes contract period, customer consent and technical validity | | FR | FR | FlexCont | |
| 1.4 | | Register flexibility contract | Store information about the contract between an FSP and customer if validation and consent check are successful | | FR | FR | FlexCont | |
| 1.5 | | Reject flexibility contract | If validation fails, information is sent to FSP | | FR | FSP | Response | |
| 1.6 | | Receive Flexibility contract termination request | End flexibility contract between FSP and RP triggered externally (RP ending contract via FSP, FSP ending contract, contract expiration, customer move-out (from Datahub)) | | FSP, DH | FR | FlexCont | |
| 1.7 | | Terminate Flexibility contract | | | FR | FR | FlexCont | |
| 1.8 | | Confirm Flexibility contract termination | If termination was successful | | FR | FSP, DH | Response | |
| 1.9 | | Reject Flexibility contract termination | If termination was not successful | | FR | FSP, DH | Response | |

##### *10.1.1.1.3.1.2 Scenario name #2: Prequalification phase*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 2. Prequalification phase | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.1.1 | | Receive product specification | Specification must include qualification, verification and remuneration information | | MO | FR | ProdSpec | |
| 2.1.2 | | Validate new product | Technical check of data content | | FR | FR | ProdSpec | |
| 2.1.3 | | Register new product | If validation is successful. | | FR | FR | ProdSpec | |
| 2.1.4 | | Reject product | If validation failed | | FR | FR | ProdSpec | |
| 2.1.5 | | Confirm product registration | Inform MO whether the product was registered successfully or not. | | FR | MO | Response | |
| 2.2 | | Register as Flexibility service provider in Flexibility Register | | | FSP | FR | FSPInfo | |
| 2.2.1 | | Validate new FSP | Make sure that required information is included… | | FR | FR | FSPInfo | |
| 2.2.2 | | Register new FSP | Store information if validation is successful | | FR | FR | FSPInfo | |
| 2.2.3 | | Reject FSP | If validation fails | | FR | FR | Response | |
| 2.2.4 | | Confirm FSP registration | Inform FSP whether the registration was successfully or not. | | FR | FSP | Response | |
| 2.3 | | Publish flexibility need (optional) | SO communicates its (short-term) flexibility needs so that FSPs can more accurately answer to the location-specific demand | | SO | FR | FlexNeed | |
| 2.3.1 | | Receive flexibility need | | | FR | FR | FlexNeed | |
| 2.3.2 | | Validate flexibility need | | | FR | FR | FlexNeed | |
| 2.3.3 | | Register flexibility need | | | FR | FR | FlexNeed | |
| 2.3.3 | | Confirm need registration | Inform SO whether the need registration was successfully or not. | | FR | SO | Response | |
| 2.4 | | Publish flexibility resource | Each Flexibility Service Provider registers its flexible resources | | FSP | FR | ResInfo | |
| 2.4.1 | | Receive resource information | | | FR | FR | ResInfo | |
| 2.4.2 | | Validate resource information | Make sure that required information is provided including a valid flexibility contract. | | FR | FR | ResInfo | |
| 2.4.3 | | Register resource to FR database | Store information if validation is successful | | FR | FR | ResInfo | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.4.4 | | Confirm resource registration | Confirm whether the need validation was successfully or not | | FR | FSP | Response | |
| 2.4.6 | | Update existing resource information | Repeat steps 2.4.1-2.4.5 | | FSP | FR | ResInfo | |
| 2.5 | | Send information for grid impact assessment | Information about flexibility resource | | FR | T&D CP | ResInfo | |
| 2.8 | | Receive qualification results | | | T&D CP | FR | GridRest | |
| 2.8.1 | | Register qualification results | | | FR | FR | GridRest | |
| 2.8.2 | | Assign restrictions to respective resources | | | FR | FR | GridRest | |
| 2.9 | | Prequalify resourc es for products | Based on the information submitted in FPS's flexibility resources, FRO prequalifies the ability of the resource to deliver flexibility with respect to product specifications | | FR | FR | - | |
| 2.9.1 | | Compare the characteristics of resources to respective product requirements | | | FR | FR | ProdSpec ResInfo | |
| 2.9.2 | | Send confirmation request to MO (Optional) | Need of this is specified by the MO. For some products the SOs might require manual checks to resources (e.g., TSO markets) and includes for example an activation test | | FR | SO | ProdQual | |
| 2.9.3 | | Receive product qualification confirmation | | | SO, | FR | ProdQual | |
| 2.9.4 | | Register product qualification confirmation | | | FR | FR | ProdQual | |
| 2.9.4 | | Assign product qualification result to the respective resources | After assigning the product qualification results, the contracted FSP can offer it to the qualified marketplaces | | FR | FR | ProdQual | |
| 2.10 | | Publish the results of prequalification with additional restrictions information | Information available for FSP | | FR | FSP | ProdQual | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.11 | | Publish the results of prequalification with additional restrictions information | Information available for SO | | FR | SO | ProdQual | |
| 2.12 | | Receive request fo r prequalification of FSP, product and grid | | | MO | FR | PreQualReq | |
| 2.12.1 | | Publish the results of prequalification | | | FR | MO | FSPInfo<br>ProdQual | |

##### 10.1.1.1.4 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| FlexCont | Flexibility contract | Information about the contract between an FSP and RP. Information doesn't contain commercial agreements of the parties, but rather the existence of such contract, which is relevant for offering the resource to the markets. | |
| Confirmation | Confirmation | Positive reply to a request. | |
| ProdSpec | Product specification | Information about product's characteristics including requirements for product qualification. | |
| FSPInfo | Flexibility service provider information | Information about FSP, which is needed to register to the flexibility register | |
| ResInfo | Resource information | Information about resources characteristics, which is used to describe the capabilities of the resource to enable grid and product qualification | |
| FlexNeed | Flexibility Need | System operator's future need for flexibilities. | |
| GridRest | Grid Restrictions | Constraints assigned to flexibilities which cannot be (fully or partially) activated without causing congestions in the grid. | |
| ProdQual | Product qualification information | Information needed to perform product qualification for a (pool of) resource(s) | |
| PreQualReq | Pre-Qualification Request | FSP, product and grid Prequalification info | |
| Rejection | Rejection | Rejection response including rejection reason. | |


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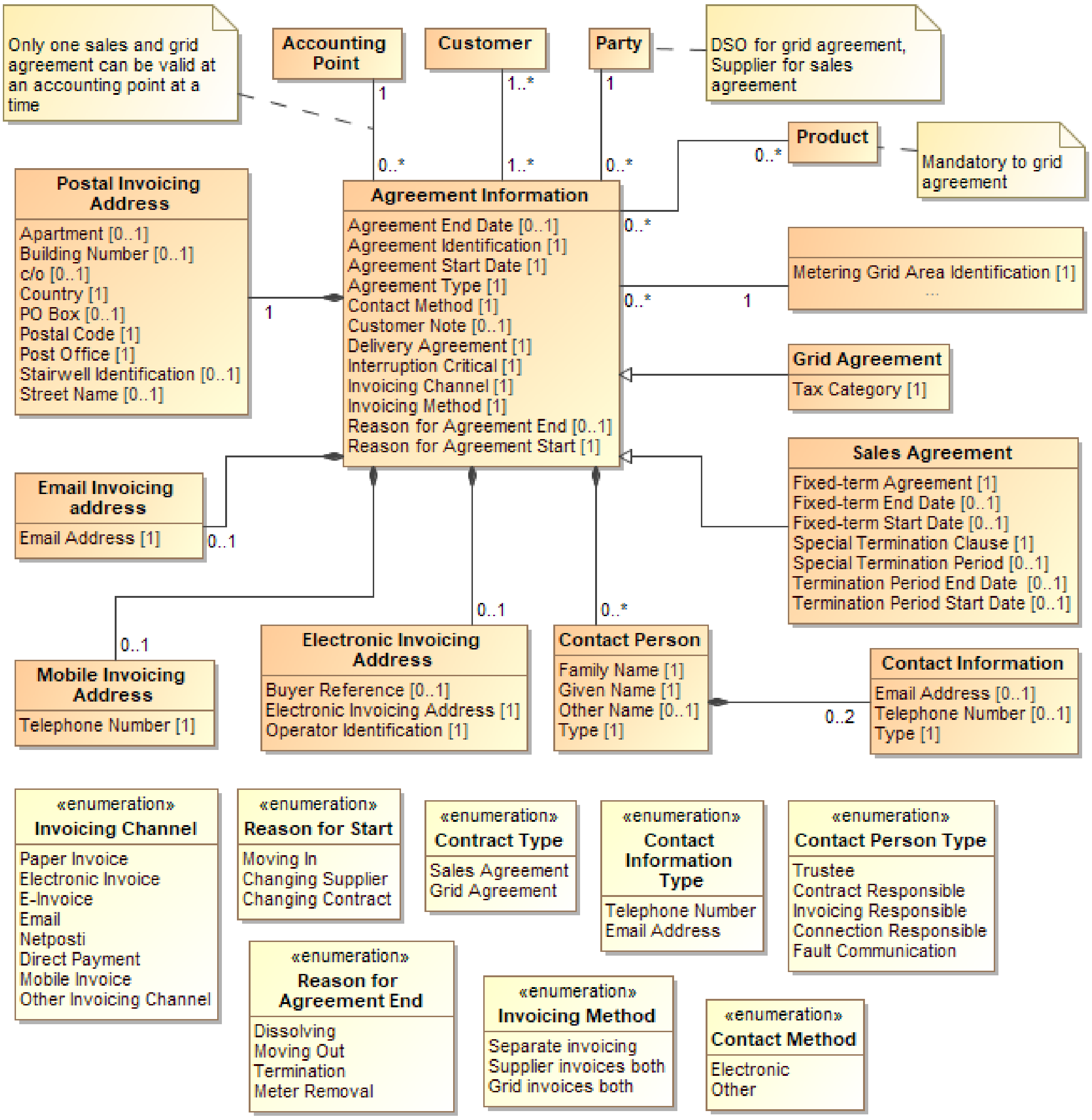
### 10.1.1.1.5 Appendix




## 10.1.1.2 DSUC_NO_02

### 10.1.1.2.1 Description of the use case

#### *10.1.1.2.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| 7.4.1 | Flexibility market, Flexibility Register | Procurement and delivery support |



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##### 10.1.1.2.1.2 Version management

| Version management | | | | |
|---|---|---|---|---|
| *Version No.* | *Date* | *Name of author(s)* | *Changes* | *Approval status* |
| 1 | 19.4.2021 | Jukka Rinta-Luoma, Taneli Leiskamo | First draft | Discussed in task 7.2 meeting |
| 2 | 17.5.2021 | Jukka Rinta-Luoma, Taneli Leiskamo | Second draft based discussion and comments provided in task 7.2 meeting | Discussed in task 7.2 meeting on 20 May |
| 3 | 31.5.2021 | Jukka Rinta-Luoma | Updates and additions from discussions between WP7 parties and previous task meeting | Discussed in task 7.2 meeting on 22 June |

##### 10.1.1.2.1.3 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| *Scope* | Role of Flexibility Register in process phases during flexibility trading and delivery is described. |
| *Objective(s)* | Enable the FSPs efficiently offer their resources on different markets and the SOs to procure and monitor the flexibilities in the context of OneNet Northern demonstration scope. This process is a prerequisite for the settlement and verification phases. |
| *Related business case(s)* | Northern regional flexibility market |

##### 10.1.1.2.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| *Short description* |
| In the procurement phase the role of the FR is to support the MO and T&D CP by sharing relevant information and receiving the outcome of the procurement to later enable the verification and settlement. The FR is also used to provide real-time visibility for the SOs regarding the activated flexibility. |

##### 10.1.1.2.1.5 Use case conditions

| Use case conditions | |
|---|---|
| **Assumptions** | |
| 1 | Flexibility market framework and its components described by the OneNet Northern Demonstrator are in place usable by the actors |
| 2 | Solutions for consent management for sharing private data are in place in all countries of the region. |
| **Prerequisites** | |
| 1 | Prequalification process is concluded successfully |
| 2 | Cross-border acknowledgement of consents is enabled |

#### 10.1.1.2.2 Technical details

##### 10.1.1.2.2.1 Actors

| Actors | | | |
|---|---|---|---|
| *Grouping* | | *Group description* | |
| | | | |
| *Actor name* | *Actor type* | *Actor description* | *Further information specific to this use case* |



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| | | | |
|---|---|---|---|
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access | Based on BRIDGE proposal for Flexibility Register Operator definition. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |
| Resource Provider (RP) | Business | A role that manages a resource and provides production/consumption schedules for it, if required. | HEMRM definition. |
| Consent Administrator (CA) | Business | A party responsible for administrating a register of consents for a domain. The Consent Administrator makes this information available on request for entitled parties in the sector. | HEMRM definition. |

###### *10.1.1.2.2.2 References*

| ***References*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Reference Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
| | | ASM report | | | | |
| | | INTERRFACE use cases | | | | |
| | | CoordiNet use cases | | | | |
| | | EU-SysFlex SUCs | | | | |
| | | /other projects reviewed/ | | | | |

##### 10.1.1.2.3 Step by step analysis of use case

###### *10.1.1.2.3.1 Steps – Scenarios*

*10.1.1.2.3.1.1 Scenario name #1: Flexibility procurement support and data storing*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 1. Flexibility procurement support and data storing | | | | | | | |
| ***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 | | Receive request for the list of registered FSPs | MO need to have the list of the FSP to inform them about the call opening | | MO | FR | FSPInfo | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.1.1 | | Send the list of FSPs | | | FR | MO | FSPInfo | |
| 1.2 | | Receive request for prequalification of FSP, product and grid | | | MO | FR | PreQualReq | |
| 1.2.1 | | Send prequalification information | | | FR | MO | | |
| 1.2 | | Receive market outcome | | | MO | FR, T&D CP, SO | MarOut | |
| 1.2.1 | | Register market outcome | | | FR | FR | MarOut | |
| | | Receive information about activation requests | Products that are separately activated need this step to initiate the verification process. | | T&D CP | FR | FlexActReq | |
| | | Register information about activation requests | | | FR | FR | FlexActReq | |
| 1.3 | | Receive activation confirmation | | | T&D CP | FR | ActFlex | |
| 1.3.1 | | Register activation confirmation | | | FR | FR | ActFlex | |
| 1.4 | | Receive new contract holder | In case of secondary trading | | MO | FR | MarOut | |
| 1.4.1 | | Register new contract holder | | | FR | FR | MarOut | |

*10.1.1.2.3.1.2 Scenario name #2: Activation*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 2. Activation (in case a separate activation after "3. Flexibility procurement" is needed) | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 2.1 | | Gather information about procured flexibility, reserved capacity | This informs the SOs through T &D CP which kind of contracted capacity is available for the SOs at any given time | | FR | T&D CP | MarOut | |
| 2.2 | | Receive production/consumption plans | Submit production/consumption plans in cases where it is used for verification | | FSP | FR | Schedule | |
| 2.3 | | Receive activation confirmation information | Deliver the information of activation requests | | T&D CP | FR | ActFlex | |

*10.1.1.2.3.1.3 Scenario name #2: Delivery and real-time monitoring*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 3. Delivery and real-time monitoring | | | | | | | |
| ***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 | | Receive real-time metering data | If the product in question requires this. | | FSP | FR | MetData | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3.2 | | Conditional: Determine reference level for metering data | In cases here ex-ante schedule is known, it can be used as a reference against which the performance of the resource is evaluated. | | FR | FR | Schedule | |
| 3.3 | | Conditional: Visualize real-time metering and reference level on FR UI | To help SOs follow the activation in real-time | | FR | FR | MetData, Schedule | |
| 3.3 | | Conditional: Calculate the deviation from real-time baseline in real-time | Calculation of difference between the metered data and the real-time baseline during delivery | | FR | FR | Deviation | |
| 3.4 | | Conditional: Inform about under or overdelivered flexibilities in real-time | | | FR | FSP, SO | Deviation | |

#### 10.1.1.2.4 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| MarOut | Market outcome | The results of matching the offers and bids by MO. | |
| ProdPlan | Production plan | A plan sent by the market party operating a production unit | |
| ConsPlan | Consumption plan | A plan sent by the market party operating a consumption unit | |
| MetData | Metering data | | |
| ActFlex | Activated flexibility | FSP's response to activation request. Includes the amount which the FSP manage to activate | |
| Baseline | Baseline | Estimation of the behaviour of a resource which can be compared to the metered data. | |
| Deviation | Deviation | Difference between metered data and baseline | |
| FSPInfo | Flexibility service provider information | Information about FSP, which is needed to register to the flexibility register | |
| PreQualReq | Pre-Qualification Request | FSP, product and grid Prequalification info | |
| All contracts that fulfil SO request | All contracts that fulfil SO request | | |


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### 10.1.1.3 DSUC_NO_03

#### 10.1.1.3.1 Description of the use case

##### *10.1.1.3.1.1 Name of use case*

| **Use case identification** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_NO_03 | Flexibility market, Flexibility Register | Flexibility verification and settlement |

##### *10.1.1.3.1.2 Version management*

| **Version management** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 19.4.2021 | Jukka Rinta-Luoma, Taneli Leiskamo | First draft | Discussed in task 7.2 meeting |
| 2 | 17.5.2021 | Jukka Rinta-Luoma, Taneli Leiskamo | Second draft based discussion and comments provided in task 7.2 meeting | Discussed in task 7.2 meeting on 20 May |
| 3 | 31.5.2021 | Jukka Rinta-Luoma | Updates and additions from discussions between WP7 parties and previous task meeting | Discussed in task 7.2 meeting on 22 June |

##### *10.1.1.3.1.3 Scope and objectives of use case*

| **Scope and objectives of use case** | |
|---|---|
| ***Scope*** | Role of Flexibility Register in process phases after flexibility trading is described. The verification process quantifies the delivered flexibility and settlement process this information to conclude financial and imbalance settlement done outside FR. |
| ***Objective(s)*** | Enable quantifying the delivered flexibility volumes and support the financial and imbalance settlement based on the results in the context of OneNet Northern demonstration scope. |
| ***Related business case(s)*** | Northern regional flexibility market |

##### *10.1.1.3.1.4 Narrative of Use Case*

| **Narrative of use case** |
|---|
| ***Short description*** |
| One of the core functionalities of the FR is to conduct the verification and settlement of the flexibility bids being traded. Verification means the quantification of the delivered flexibility. This is done by gathering metering data and comparing it to either a calculated baseline or predefined plans. The product in question specifies which method is to be used. After the verification, the results are shared to parties involved in the trades. The FR can also in some cases determine the remuneration and penalties if these are described within the product specification. The FR also communicates possible adjustments to BRPs' balance position to the Imbalance Settlement Responsible. |

##### *10.1.1.3.1.5 Use case conditions*

| **Use case conditions** | |
|---|---|
| ***Assumptions*** | |
| 1 | Flexibility market framework and its components described by the OneNet Northern Demonstrator are in place usable by the actors |
| 2 | Solutions for consent management for sharing private data are in place in all countries of the region. |
| ***Prerequisites*** | |

| | |
|---|---|
| 1 | Prequalification phase is concluded successfully |
| 2 | Procurement phase is concluded successfully |
| 3 | Cross-border acknowledgement of consents is enabled. |

##### *10.1.1.3.1.1 Further information to the use case for classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to TSO-DSO coordination, Flexibility Register, Customer onboarding and Market Operator |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

#### 10.1.1.3.2 Diagrams of use case

#### 10.1.1.3.3 Technical details

##### *10.1.1.3.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access | Based on BRIDGE proposal for Flexibility Register Operator definition. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in |



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| | | | |
|---|---|---|---|
| | | | bold) proposed by BRIDGE.<br>Includes also TSOs and DSOs performing the role of MO. |
| Resource Provider (RP) | Business | A role that manages a resource and provides production/consumption schedules for it, if required. | HEMRM definition. |
| Consent Administrator (CA) | Business | A party responsible for administrating a register of consents for a domain. The Consent Administrator makes this information available on request for entitled parties in the sector. | HEMRM definition. |
| Metered Data Responsible (MDR) | Business | A party responsible for the establishment and validation of metered data based on the collected data received from the Metered Data Collector. The party is responsible for the history of metered data for a Metering Point. | HEMRM definition |
| | | | |

###### *10.1.1.3.3.1 References*

| ***References*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Reference Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
| | | ASM report | | | | |
| | | INTERRFACE use cases | | | | |
| | | CoordiNet use cases | | | | |
| | | EU-SysFlex SUCs | | | | |
| | | /other projects reviewed/ | | | | |

#### 10.1.1.3.4 Step by step analysis of use case

###### *10.1.1.3.4.1 Steps – Scenarios*

*10.1.1.3.4.1.1 Scenario name #1: Verification and settlement*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7. Verification and settlement | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 7.1 | | Receive metering data | Receive generation and consumption data measured by certified meters data and sub-meters | | MDR | FR | MetData | |
| 7.1.1 | | Validate metering data | Technical validation | | FR | FR | MetData | |
| 7.1.2 | | Register metering data | Store information if validation is successful | | FR | FR | MetData | |
| 7.1.3 | | Inform sender if validation fails | If validation fails | | FR | MD~~A~~R / SO | MetData | |
| 7.2 | | Gather trading data | Volumes of traded flexibilities previously stored in FR | | FR | FR | MarOut | |
| 7.3 | | Gather activation data | Volumes of activated flexibilities previously stored in FR | | FR | FR | ActFlex | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7.4 | | Determine verification method | The verification method depends on the product. | | FR | FR | Baseline | |
| 7.4.1 | | Alt 1: Calculate baseline | In case the product requires FR to calculate a baseline with the baseline model used by the respective product. | | FR | FR | Baseline | |
| 7.4.2 | | Alt 2: determine reference value from other data | Based on product definition, this can include plan sent beforehand etc. | | FR | FR | Baseline | |
| 7.5 | | Determine the delivered flexibility quantities | Calculation of the delivered amount by comparing baseline/reference value to metering data. | | FR | FR | DelivFlex | |
| 7.5.2 | | Register possible deviation per trade | Register the result for each trade separately. In some cases deviation per resource might be needed | | FR | FR | Deviation | |
| 7.5.3 | | Communicate verification results to entitled parties | | | FR | FSP / SO / MO | Baseline/ DelivFlex/ Deviation | |
| 7.6 | | Optional: Determine remuneration and penalties | Calculation of penalties for the over/under delivered flexibilities based on the specification of the respective product. Done only if the respective product requires. | | FR | FR | Remun, Penalty | |
| 7.7 | | Optional: Send invoicing data | Send results from step 7.6 to the buying party, which conducts the actual billing | | FR | SO | InvoiceData | |
| 7.9 | | (Optional) Forward adjusted volumes to imbalance settlement | Report adjusted volumes to imbalance settlement if the respective product requires this. (For example, not needed when offering from own portfolio, or if product doesn't have energy component) | | FR | Imbalance Settlement Responsible (ISR) | AdjVol | |

#### 10.1.1.3.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| MarOut | Market outcome | The results of matching the offers and bids by MO. | |
| MetData | Metering data | | |
| ActFlex | Activated flexibility | FSP's response to activation request. Includes the amount which the FSP manage to activate | |
| Baseline | Baseline | Calculated behaviour of a resource without an activation event | |
| DelivFlex | Delivered flexibility amount | Difference between baseline/reference value and metering data | |
| Deviation | Deviation | Difference between requested flexibility and delivered flexibility | |
| Remun | Remuneration | Monetary compensation for the traded amount of flexibility | |
| Penalty | Penalty | Monetary compensation for non-delivery of FSPs obligation | |




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| | | | |
|---|---|---|---|
| InvoiceData | Invoicing data | Data that includes information about the parties the remuneration amounts | |
| AdjVol | Adjusted imbalance volumes (transfer of energy) | Energy amount that affects the open supplier of the resource, which is communicated to imbalance settlement to compensate the energy effect to the BRP. | |

### 10.1.1.4 DSUC_NO_04

#### 10.1.1.4.1 Description of the use case

##### *10.1.1.4.1.1 Name of use case*

| Use case identification | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| 7.3.1 | Flexibility market, Market operation and trading | Add New Product |

##### *10.1.1.4.1.2 Version management*

| Version management | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 07.05.2021 | Poria Divshali, Sirpa Repo | First draft | For T7.3 discussion |
| 2 | 01.06.2021 | Poria Divshali | Changed based on May 21st and 31st and comment provided until Jun 1st. Complete some missing description. | For T7.3 partner review |

##### *10.1.1.4.1.3 Scope and objectives of use case*

| Scope and objectives of use case | |
|---|---|
| ***Scope*** | Prequalification of a new flexibility product from MO perspective |
| ***Objective(s)*** | Creating a new product in the market |
| ***Related business case(s)*** | Northern regional flexibility market |

##### *10.1.1.4.1.4 Narrative of Use Case*

| Narrative of use case |
|---|
| ***Short description*** |
| In order to have any trade between a Flexibility provider and system operator, at least a market needs to offer the flexibility product. Here the process of adding a product to a market will be reviewed.<br>The process starts from the need for a system operator (SO). When a SO need any type of flexibility, contact market operators (MO) to find which product is suitable for its need. If there is no product, which is suitable for the need of the SO, it needs to define the product properties and send it to MO. Here, MO will decide whether wants to offer this product in its market or not.<br>If MO wants to offer the product, it will publish the description and inform the flexibility register to start the prequalification process. |

##### *10.1.1.4.1.5 Key performance indicators (KPI)*

| Key performance indicators | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| | Cover SO needs | The amount of unsatisfied flexibility need<br>Target Value: 0 | Providing the flexibility product for all needs of different SOs |



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| | | | |
|---|---|---|---|
| | Avoidance of similar products | The number of products having any overlap<br>Target Value: 0 | |

*10.1.1.4.1.1 Further information to the use case classification/mapping)*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to Market Operator, TSO-DSO coordination, Flexibility Register, and Customer onboarding |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

*10.1.1.4.1.2 Use case conditions*

10.1.1.4.2 Technical details

*10.1.1.4.2.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Flexibility Register (FR) | System | A system that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information and the results of the settlement as well as aggregates flexibility information as well as allocates access rights to the various actors and controls the level of access. | Based on the BRIDGE proposal for Flexibility Register Operator definition. |
| TSO-DSO coordination platform (T&D CP) | System | A system that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation | |





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| | | | |
|---|---|---|---|
| | | (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |
| Consent Administrator (CA) | Business | A party responsible for administrating a register of consents for a domain. The Consent Administrator makes this information available on request for entitled parties in the sector. | HEMRM definition. |

#### 10.1.1.4.3 Step by step analysis of use case

##### *10.1.1.4.3.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 7.3.1.1 | MO steps in add new product | | MO | | | |

##### *10.1.1.4.3.2 Steps – Scenarios*

*10.1.1.4.3.2.1 Scenario name #1: MO steps in add new product*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | | MO steps in add new product | | | | | | |
| ***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 | | Check the existing product. | SO contact relevant MO to Identify whether there is an existing product for flexibility need | | SO | MO | ProdNam | |
| 2 | | Conditional: Create and Send product information | If there is no existing product, SO need to define a new product specification | | SO | MO | ProdSpec | |
| 3 | | Decide whether MO wants to offer this product in its market | implement a product based on SO flexibility need | | MO | MO | MODec | |
| 4 | | Inform MO decision whether wants to offer the product | MO inform SO regarding the decision | | MO | SO | MODec | |
| 5 | | Send product specifications | Publish product specifications and requirements in case of a positive decision in 1.4 | | MO | FR | ProdSpec | |
| 6 | | Send consent to FR for sharing data with MO | FSP need to give consent to FR to share its data with MO | | CA | FR, MO | Consent | |

#### 10.1.1.4.4 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| ProdNam | Product Name | The name of the existing Flexibility product | |


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| | | | |
|---|---|---|---|
| ProdSpec | Product Specification | The technical specification of the flexibility product (technical parameters, validation, requirements) | |
| MODec | Market Operator Decision | The decision of the market operator regarding whether interested to provide a specific flexibility product | |
| Consent | Customer Consent | Permission of data owner to use its private data. | |

### 10.1.1.5 DSUC_NO_05

#### 10.1.1.5.1 Description of the use case

##### *10.1.1.5.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| 7.3.1 | Flexibility market, Market operation and trading | Procurement |

##### *10.1.1.5.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 07.05.2021 | Poria Divshali, Sirpa Repo | First draft | For T7.3 discussion |
| 2 | 01.06.2021 | Poria Divshali | Changed based on May 21st and 31st and comment provided until Jun 1st. Complete some missing description. | For T7.3 partner review |

##### *10.1.1.5.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Procurement of flexibility products from MO perspective |
| ***Objective(s)*** | Product procurement in the market |
| ***Related business case(s)*** | Northern regional flexibility market |

##### *10.1.1.5.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| The procurement process of flexibility products in a market can be divided into four main processes: opening the market, trading, matching and closing the market. In the opening scenario, the market will be open and the availability of trading will be informed to all relevant parties. In trading, flexibility service providers submit their bids and system operators publish their purchasing need. In the matching scenario, the market operator in cooperation with the TSO & DSO coordination platform match the bid and offer and find the optimum solution. finally, the market operator informs the results to the relevant parties in the closing scenario. |

##### *10.1.1.5.1.5 Key performance indicators (KPI)*

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| | Cover SO needs | The amount of unsatisfied flexibility need<br>Target Value: 0 | Providing the flexibility product for all needs of different SO |


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| | | | |
|---|---|---|---|
| | Procurement performance | Per unit cost of purchased flexibility<br>Target Value: TBD | |

##### 10.1.1.5.1.6 Use case conditions

| **Use case conditions** | |
|---|---|
| **Assumptions** | |
| 1 | Solutions for consent management for sharing private data are in place in all countries of the region. |
| 2 | TSO & DSO coordination platform and Flexibility register as described by the OneNet Northern Demonstrator are in place usable by the actors |

##### 10.1.1.5.1.7 Further information to the use case classification/mapping

| **Classification information** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to Market Operator, TSO-DSO coordination, Flexibility Register, and Customer onboarding |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

#### 10.1.1.5.2 Technical details

##### 10.1.1.5.2.1 Actors

| **Actors** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and | Based on BRIDGE proposal for Flexibility |


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| | | | |
|---|---|---|---|
| | | settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access. | Register Operator definition. |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process).<br>It is a system under optimisation operator (OO). | |
| Imbalance Settlement Responsible (ISR) | Business | A party that is responsible for settlement of the difference between the contracted quantities with physical delivery and the established quantities of energy products for the Balance Responsible Parties in a Scheduling Area. | HEMRM definition. |

#### 10.1.1.5.3 Step by step analysis of use case

##### *10.1.1.5.3.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 7.3.2.1 | Opening of the procurement process | | MO | | | |
| 7.3.2.2 | Trading | | MO | | | |
| 7.3.2.3 | Matching | | MO | | | |
| 7.3.2.4 | Closing | | MO | | | |
| 7.3.2.5 | Settlement | | MO | | | |

##### *10.1.1.5.3.2 Steps – Scenarios*

###### *10.1.1.5.3.2.1 Scenario name #1: Opening of the procurement process*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.3.2.1. Opening of the procurement process | | | | | | | |
| ***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.a | | Alt. 1 – Publish information about calls for tender | T&D CP publish a new call for a specific product and MO check published information (Unless it is continuous trading) | | T&D CP | MO | FCT | |
| 1.b | | Alt. 2 – Send request | MO request from T&D CP about ongoing calls | | MO | T&D CP | FCT | |
| 1.c | | Alt. 2 – Receive the request reply | T&D CP reply to the request by sending | | T&D CP | MO | FCT | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | the information about ongoing calls | | | | | |
| 2 | | Request the list of registered FSP | MO need to have the list of the FSP to inform them about the call opening | | MO | FR | FSPInfo | |
| 3 | | Receive the reply of request the list of registered FSP | MO need to have the list of the FSP to inform them about the call opening | | FR | MO | FSPInfo | |
| 4 | | Opening of the flexibility call | if MO decide to continue | | MO | MO | FCT | |
| 5 | | Inform about opening of the flexibility call for tenders | FSPs should receive information about call for tenders opening. | | MO | FSP | FCT | |

*10.1.1.5.3.2.2 Scenario name #2: Trading*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | | 7.3.2.2. Trading | | | | | | |
| ***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 | | Submit a flexibility bid | Bid information should include resource/location information if flexibility is provided for the products where location matters. | | FSP | MO | FlexBid | |
| 2.a | | Request for prequalification of FSP, product and grid | MO needs to make sure that FSP, product and grid are prequalified by FR.<br>Alt 1 (Default): This request send once a while, e.g. daily, and MO update its list<br>Alt : MO send request for each bid<br>(FSP need give the consents for MO, T&D CP, …) | | MO | FR | PreQualReq | |
| 2.b | | Receive reply on prequalification request | FR will reply to the MO request on prequalification | | FR | MO | FSPInfo<br>ProdQual | |
| 2.c | | Check bids and Register compliant bids | MO check the general properties of the bid, e.g.,<br>Bid format, valid consent,<br>whether the call is | | MO | MO | BidLis | New |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ongoing and also check FSP, product and grid are prequalified by FR (According to steps 2.a and 2.b.) | | | | | |
| 3 | | Close the flexibility call for tenders | Gate closure, the info will be displayed in MO webpage | | MO | MO | --- | |
| 4 | | Send compliant flexibility bids for grid impact assessment | All the attributes associated to FlexBid should be forwarded | | MO | T&D CP | BidLis | |

*10.1.1.5.3.2.3 Scenario name #3: Matching*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.3.2.3. Matching | | | | | | | |
| ***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 | | Receive optimisation (optimim matching flexibility bids and offers) results | T&D CP optimise the bid by matching flexibility bids and purchase offers, which directly received from SO, in most economic way taking into account synergies (value-stacking). Then it send the results to MO. | | T&D CP | MO | OptRes | |
| 2 | | Confirm availability of flexibility bid | Check if the bid is still available (apply only to locational Intraday market) | | MO | MO | FlexAv | |
| 3 | | Finalise trade according to the market rules | MO will finalise the trade and the payment according to the market rules (e.g. pay as bid or pay as cleared) | | MO | MO | MarOut | |
| 4 | | Register market outcome | | | MO | MO | MarOut | New |

*10.1.1.5.3.2.4 Scenario name #4: Closing*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.3.2.4. Closing | | | | | | | |
| ***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 | | Notify market outcome | | | MO | FSP | MarOut | |
| 2 | | Notify market outcome | Submission of information about the matching of bids and offers on the marketplaces. | | MO | FR, T&D CP | MarOut | |


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##### 10.1.1.5.3.2.5 Scenario name #5: Settlement

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.3.2.5. 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*** |
| 1 | | Receive verified amount of flexibility delivered for each product/FSP | FR calculate and validate the actual flexibility delivered by each FSP in each product | | FR | MO | Baseline/ DelivFlex/ Deviation | |
| 2 | | Calculate remuneration for each FSP | | | MO | ~~FSP~~MO | | |
| | | Send invoices the parties involved in the bid being settled | | | MO | T&D CP, FSP | | |

#### 10.1.1.5.4 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| FCT | Flexibility Call for Tender | Flexibility call specification for a specific product | |
| PreQualReq | Pre-Qualification Request | FSP, product and grid Prequalification info | |
| FlexBid | Flexibility Bid | Offer made by Flexibility Service Provider for selling flexibility. | |
| BidLis | Bid list | the list of compliant bids | |
| OptRes | Optimisation results | Optimisation of Merit Order List taking into account the possible synergies of using the same bid for more than one service and/or buyer. | |
| FlexAv | Flexibility Availability | Confirmation of availability of the flexibility | |
| MarOut | Market Outcome | the results of matching the offers/bid by MO | |
| DelivFlex | Delivered flexibility amount | Difference between baseline/reference value and metering data | |
| FSPInfo | Flexibility service provider information | Information about FSP, which is needed to register to the flexibility register | |
| ProdQual | Product qualification information | Information needed to perform product qualification for a (pool of) resource(s) | |
| Baseline | Baseline | Estimation of the behaviour of a resource which can be compared to the metered data. | |
| Deviation | Deviation | Difference between metered data and baseline | |


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#### 10.1.1.6 DSUC_NO_06

##### 10.1.1.6.1 Description of the use case

###### *10.1.1.6.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| 7.3.1 | Flexibility market, Market operation and trading | Secondary trading |

###### *10.1.1.6.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 07.05.2021 | Poria Divshali, Sirpa Repo | First draft | For T7.3 discussion |
| 2 | 04.06.2021 | Poria Divshali | Changed based on May 21st and 31st and comment provided until Jun 4th. Complete some missing description. | For T7.3 partner review |

###### *10.1.1.6.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Selecting a new FSP to replace a FSP cannot provide the promised product |
| ***Objective(s)*** | Replacing FSP, which failed to provide flexibility |
| ***Related business case(s)*** | Northern regional flexibility market |

###### *10.1.1.6.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| When an FSP, which have a bidding contract for providing a flexibility product for future, realises that cannot fulfil the contract, it can inform and ask market operator to find a replacement for it. This process called secondary trading and it is quite similar to the normal trading, but the process trigged by sending a request from the FSP, which is not capable to fulfil the contract. |

###### *10.1.1.6.1.5 Key performance indicators (KPI)*

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| | Secondary trading performance | The rate of output contract to requested.<br>Target Value: 1 | Providing the flexibility product for all needs of different SO |

###### *10.1.1.6.1.6 Use case conditions*

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | Solutions for consent management for sharing private data are in place in all countries of the region. |
| 2 | TSO & DSO coordination platform and Flexibility register as described by the OneNet Northern Demonstrator are in place usable by the actors |

###### 10.1.1.6.1.7 Further information to the use case classification/mapping

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to Market Operator, TSO-DSO coordination, Flexibility Register, and Customer onboarding |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

#### 10.1.1.6.2 Technical details

###### 10.1.1.6.2.1 Actors

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |
| System Operator (SO) | system | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information as well as perform flexibility verification and settlement, aggregates flexibility information, allocates access rights to the various actors and controls the level of access. | Based on BRIDGE proposal for Flexibility Register Operator definition. |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |

#### 10.1.1.6.3 Step by step analysis of use case

##### *10.1.1.6.3.1 Overview of scenarios*

| *Scenario conditions* | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 7.3.1.1 | MO steps in New Product prequalification | | MO | | | |

##### *10.1.1.6.3.2 Steps – Scenarios*

###### *10.1.1.6.3.2.1 Scenario name #1:*

| *Scenario* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | CONDITIONAL Secondary Trading | | | | | | | |
| ***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 | | FSP inform the need for trading in the secondary market | FSP, who is not capable to fulfil the contract need to inform MO. | | FSP | MO | FSPReg | new |
| 2 | | Validation of the trade needs (Contract) | MO need to check the condition of trade needs (contract of mot capable FSP). For example, is this request for secondary trading happen well in advance of delivery time | | MO | MO | --- | new |
| 3 | | Request the list of registered FSP | MO need to have the list of the FSP to inform them about the call opening | | MO | FR | | |
| 4 | | Receive the reply of request the list of registered FSP | MO need to have the list of the FSP to inform them about the call opening | | FR | MO | | |
| 5 | | MO publishes the need for a take-over of the contract | The need (contract) of the FSP, which is not capable to fulfil the contract, is published in MO platform and other registered FSP get the information. | | MO | (other)FSP | FlexCont | |
| 6 | | Bid for contract | Other registered FSP can view contract up for trade and bid through the MO to take over that contract | | (other)FSP | MO | FlexBid | |
| 7 | | Send contract bids for grid impact assessment | All the attributes associated to FlexBid should be forwarded | | MO | T&D CP | BidLis | new |
| 8 | | Receive grid impact assessment results | T&D CP analyse the bids and find the optimum solution | | T&D CP | MO | OptRes | new |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | | Notification of the market results | MO inform the new FSP | | MO | FSP | MarOut | |
| 10 | | Notification to SO of new contract holder | Once FSP's have agreed to trade the MO must notify the SO to activate the correct asset and the right FSP is verified and paid. | | MO | T&D CP, FR | MarOut | |

### 10.1.1.6.4 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| FSPReg | FSP Registration | Required information to register FSP | |
| FlexCont | Flexibility Contract | The Obligation of the flexibility contractual that the original FSP cannot provide | |
| FlexBid | Flexibility Bid | Offer made by Flexibility Service Provider for selling flexibility. | |
| BidLis | Bid list | the list of compliant bids | |
| OptRes | Optimisation results | Optimisation of Merit Order List taking into account the possible synergies of using the same bid for more than one service and/or buyer. | |
| MarOut | Market Outcom | the results of matching the offers/bid by MO | |

## 10.1.1.7 DSUC_NO_07

### 10.1.1.7.1 Description of the use case

#### *10.1.1.7.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| 7.4.1 | Flexibility market, TSO-DSO coordination | Grid Qualification of Resource |

#### *10.1.1.7.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 5.05.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | First draft | For T7.4 discussion |
| 2 | 26.05.2021 | Kalle Kukk | Changes based of 6 May T7.4 discussion and comments provided until 26 May; further missing information added (short description, KPIs, conditions, references, requirements) | For T7.4 partners' review |
| 3 | 29.06.2021 | Kalle Kukk | Changes based of 29 June T7.4 discussion and comments provided until 29 June | For T7.4 partners' review before inclusion in MS report |
| 4 | 9.07.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | Updated diagrams, 'complete description' added | For inclusion in milestone report |



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#### 10.1.1.7.1.3 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| ***Scope*** | Qualification of flexibility resources from grid capacity perspective in different phases – prequalification, procurement, activation. |
| ***Objective(s)*** | Tool and algorithm developed to facilitate multilateral flexibility market through improved TSO-DSO coordination, also enabling cross-border marketplace. The objective of grid impact assessment is to avoid congestions by setting restrictions on the activation of flexibilities which would cause congestion in grids. |
| ***Related business case(s)*** | Northern regional flexibility market |

#### 10.1.1.7.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| ***Short description*** |
| Grid qualification of a flexibility resource may take place in prequalification, procurement and activation phases. Grid impact assessment is central activity of grid qualification process. Two alternatives are possible in each phase. First, concerned System Operator identifies grid restrictions (constraints) by itself and provide the results to coordination platform. Second alternative is that restrictions are calculated by TSO-DSO Coordination Platform.<br>For second alternative a dedicated algorithm is needed which calculates the grid restrictions based on input information (depending on the phase – flexibility need and resource information or flexibility bid or flexibility activation request; and grid information either as grid model, grid topology or simple grid constraints). If both alternatives are applied to the same resource, these need to be merged into single result by updating the algorithm.<br>The impact assessment is a continuous process. In prequalification phase normally structural congestions should be considered, while in procurement and activation phases also dynamic congestions. Resource Provider's consent is needed by TSO-DSO Coordination Platform to have access to private information like Resource Information and Flexibility Bid. |
| ***Complete description*** |
| 7.4.1.1 Grid qualification of resource in prequalification phase<br>• 1.a. Manage Resource Provider's consent: Resource Provider can give consent through Consent Administrator.<br>• 1.b. Receive Resource Provider's consent: T&D CP needs consent to have access to RP's private data on resource information.<br>• 2.a. Collect information about flexibility needs and resources: See precondition #5.<br>• 2.b. Identify impacted System Operators: List of SOs who should send the grid information and be addressed in grid qualification process. (TBD: some kind of algorithm to be developed for identification or rather an assumption?)<br>• 2.c. Request grid information: Grid information from impacted SOs.<br>• 2.d. Collect grid information: Grid information from impacted SOs.<br>• 3.a. Alt. 1 – Forward input information for grid qualification: If SO conducts grid impact assessment it needs information about concerned resources.<br>• 3.b. Alt. 1 – Collect grid qualification results: Identification of grid restrictions (constraints) provided by SO.<br>• 3.c. Alt. 2 – Update algorithm for grid qualification with flexibility need and resource information: Inserting flexibility need and resource information as input into the algorithm.<br>• 3.d. Alt. 2 – Update algorithm for grid qualification with grid information: Inserting grid model / topology / constraints as input into the algorithm.<br>• 3.e. Alt. 2 – Run algorithm for grid qualification to identify grid restrictions: Identification of grid restrictions (constraints) as calculated by T&D CP algorithm based on grid impact assessment of resource.<br>• 3.f. Merge results from Alt. 1 and Alt. 2 (CONDITIONAL): If both alternatives 1 and 2 were applied to the same resource, these need to be merged into single result by updating the algorithm.<br>• 4.a. Publish qualification results<br><br>7.4.1.2 Grid qualification of resource in procurement phase |


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- 1.a. Manage Resource Provider's consent: Resource Provider can give consent through Consent Administrator.
- 1.b. Receive Resource Provider's consent: T&D CP needs consent to have access to RP's private data on flexibility bid.
- 2.a. Collect information about flexibility bids
- 2.b. Identify impacted System Operators: List of SOs who should send the grid information and be addressed in grid qualification process.
- 2.c. Request grid information: Grid information from impacted SOs.
- 2.d. Collect grid information: Grid information from impacted SOs.
- 3.a. Alt. 1 – Forward input information for grid qualification: If SO conducts grid impact assessment it needs information about concerned flexibility bids.
- 3.b. Alt. 1 – Collect grid qualification results: Identification of grid restrictions (constraints) provided by SO.
- 3.c. Alt. 2 – Update algorithm for grid qualification with flexibility bid: Inserting flexibility bid as input into the algorithm.
- 3.d. Alt. 2 – Update algorithm for grid qualification with grid information: Inserting grid model / topology / constraints as input into the algorithm.
- 3.e. Alt. 2 – Run algorithm for grid qualification to identify grid restrictions: Identification of grid restrictions (constraints) as calculated by T&D CP algorithm based on grid impact assessment of flexibility bid.
- 3.f. Merge results from Alt. 1 and Alt. 2 (CONDITIONAL): If both alternatives 1 and 2 were applied to the same resource, these need to be merged into single result by updating the algorithm.

7.4.1.3 Grid qualification of resource in activation phase

- 1.a. Manage Resource Provider's consent: Resource Provider can give consent through Consent Administrator.
- 1.b. Receive Resource Provider's consent: T&D CP needs consent to have access to RP's private data on flexibility bid.
- 2.a. Collect information about flexibility bids: Bids need to be sent again because may be replaced with new bids from secondary market after matching initial bids and offers.
- 2.b. Collect information about flexibility activation requests: Flexibility activation requests are needed in order to complete grid impact assessment only for those bids which are needed to answer the requests.
- 2.c. Identify impacted System Operators: List of SOs who should send the grid information and be addressed in grid qualification process.
- 2.d. Request grid information: Grid information from impacted SOs.
- 2.e. Collect grid information: Grid information from impacted SOs.
- 3.a. Alt. 1 – Forward input information for grid qualification: If SO conducts grid impact assessment it needs information about concerned flexibility bids.
- 3.b. Alt. 1 – Collect grid qualification results: Identification of grid restrictions (constraints) provided by SO.
- 3.c. Alt. 2 – Update algorithm for grid qualification with bid and activation request: Inserting flexibility bid and activation request as input into the algorithm.
- 3.d. Alt. 2 – Update algorithm for grid qualification with grid information: Inserting grid model / topology / constraints as input into the algorithm.
- 3.e. Alt. 2 – Run algorithm for grid qualification to identify grid restrictions: Identification of grid restrictions (constraints) as calculated by T&D CP algorithm.
- 3.f. Merge results from Alt. 1 and Alt. 2 (CONDITIONAL): If both alternatives 1 and 2 were applied to the same resource, these need to be merged into single result by updating the algorithm.

###### *10.1.1.7.1.5 Key performance indicators (KPI)*

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


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| | | | |
|---|---|---|---|
| | Grid qualification algorithm | Performance of grid qualification algorithm<br>Target value: tbd | Improve TSO-DSO coordination in flexibility market. |
| | Grid qualification tool | Performance of TSO-DSO Coordination Platform<br>Target value: tbd | Improve TSO-DSO coordination in flexibility market. |
| | Avoidance of congestions | Maximum number of congestions<br>Target value: tbd | Avoid congestions by setting appropriated restrictions. |

###### *10.1.1.7.1.6 Use case conditions*

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | Solutions for consent management for sharing private data are in place in all countries of the region. |
| 2 | TSO-DSO Coordination Platform is integrated with other relevant systems of the concerned stakeholders and countries (e.g. Flexibility Register). |
| 3 | It is evident that congestions occur in a concerned grid area. |
| ***Prerequisites*** | |
| 1 | Cross-border acknowledgement of consents is enabled. |
| 2 | The grid qualification in all phases follows only if 'product prequalification' of the concerned resource had been successful. This is checked by the Flexibility Register. |
| 3 | The concerned System Operators for grid impact assessment need to be identified. |
| 4 | Information about concerned flexibility needs and resources, flexibility bids and flexibility activation requests as well as relevant grid information is available. |
| 5 | If the 'Flexibility Need' is not available, then product information (attributes) should be considered instead of this. However, knowing the flexibility needs of system operators is useful because: (a) grid impact assessment would be completed for those flexibility resources only for which there is actual need; (b) it reveals the quantity and direction of expected activation – if the need is only in the direction or remains below quantity not implying the congestions then the resources could still be qualified. |

###### *10.1.1.7.1.7 Further information to the use case classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to TSO-DSO coordination, Flexibility Register, Customer onboarding and Market Operator |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |



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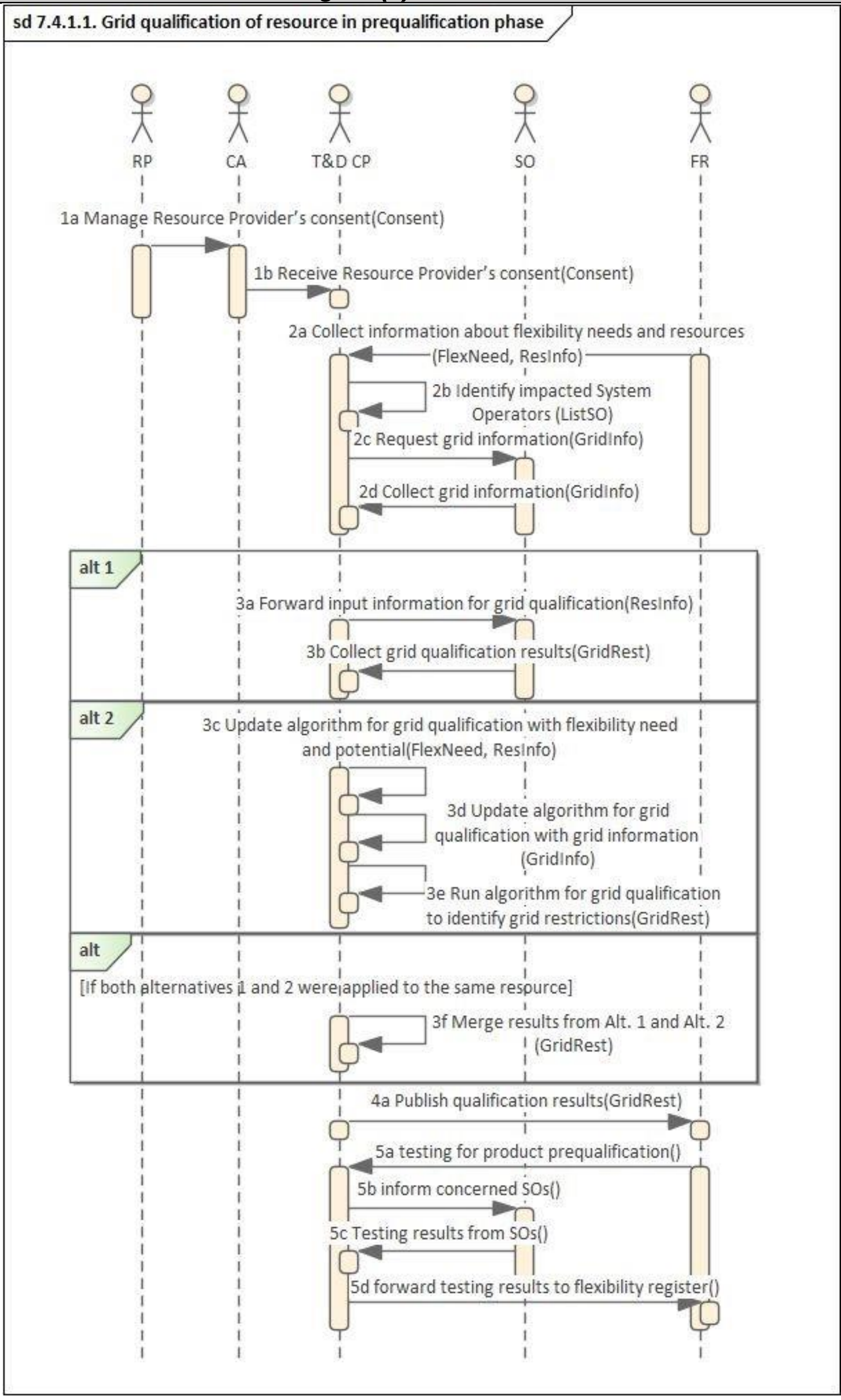
10.1.1.7.2 Diagrams of use case

| Diagram(s) of use case |
| --- |

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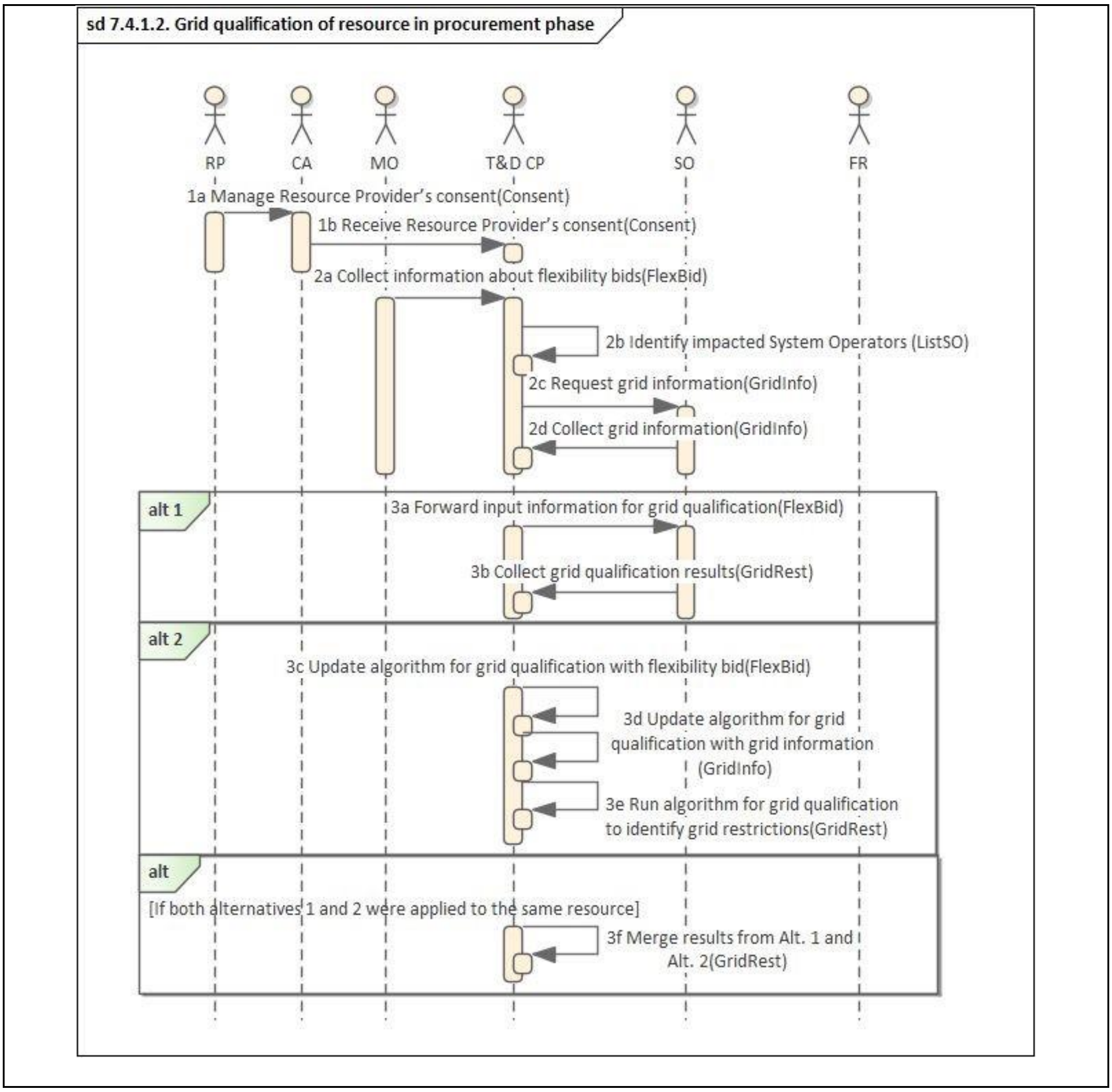




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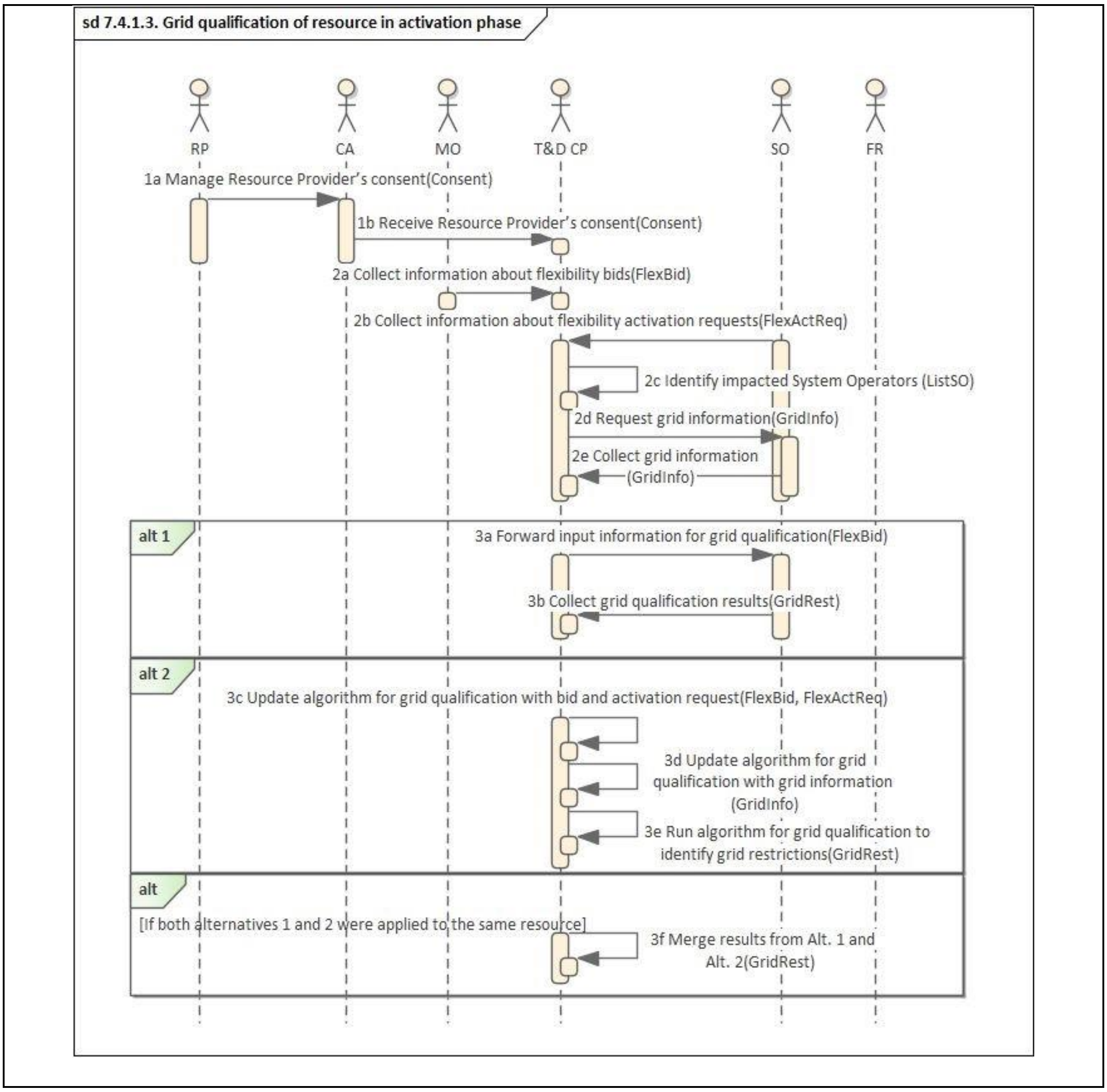


### 10.1.1.7.3 Technical details

#### *10.1.1.7.3.1 Actors*

| *Actors* | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |

| | | | |
|---|---|---|---|
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information and the results of the settlement as well as aggregates flexibility information as well as allocates access rights to the various actors and controls the level of access. | Based on BRIDGE proposal for Flexibility Register Operator definition. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |
| Resource Provider (RP) | Business | A role that manages a resource and provides production/consumption schedules for it, if required. | HEMRM definition. |
| Consent Administrator (CA) | Business | A party responsible for administrating a register of consents for a domain. The Consent Administrator makes this information available on request for entitled parties in the sector. | HEMRM definition. |

###### *10.1.1.7.3.1 References*

| ***References*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No*** | ***Reference Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
| 1 | Report | EU-SysFlex deliverable 5.2 | | Investigation of relevant use cases | Horizon2020 project EU-SysFlex | https://eu-sysflex.com/wp-content/uploads/2020/10/EU-SysFlex-Task-5.2-D5.2-FINAL.pdf |
| 2 | | INTERRFACE task 5.3 | | Investigation of relevant use cases | Horizon2020 project INTERRFACE | |
| 3 | Report | CoordiNet deliverable 1.5 | | Investigation of relevant use cases | Horizon2020 project CoordiNet | https://private.coordinet-project.eu//files/documentos/5d724207ca982Coordinet_Deliverable_1.5.pdf |
| 4 | | TDX-ASSIST | | Investigation of relevant use cases | Horizon2020 project TDX-ASSIST | |
| 5 | Report | SmartNet deliverable 1.3 | | Investigation of relevant use cases | Horizon2020 project SmartNet | http://smartnet-project.eu/wp-content/uploads/2016/12/D1.3_20161202_V1.0.pdf |
| 6 | Report | Overview of energy flexibility services | | Investigation of relevant use cases | ebIX® | https://mwgstorage1.blob.core.windows.net/public/Ebix/ebIX%20Overview%20of%20energy%20flexibility%20services%20-%20v1r0A%2020200106.pdf |
| 7 | Report | An integrated approach to Active System Management | | Investigation of relevant use cases | CEDEC, E.DSO, ENTSO-E, Eurelectric, GEODE | https://www.entsoe.eu/Documents/Publications/Position%20papers%20and%20reports/TSO-DSO_ASM_2019_190416.pdf |





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#### 10.1.1.7.4 Step by step analysis of use case

##### 10.1.1.7.4.1 Overview of scenarios

| Scenario conditions | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Scenario name** | **Scenario description** | **Primary actor** | **Triggering event** | **Pre-condition** | **Post-condition** |
| 7.4.1.1 | Grid qualification of resource in prequalification phase | | T&D CP | | | |
| 7.4.1.2 | Grid qualification of resource in procurement phase<br>(This scenario can potentially be merged with 'Bid ranking and optimisation' SUC. To be decided after work on algorithms has progressed.) | | T&D CP | | | |
| 7.4.1.3 | Grid qualification of resource in activation phase | | T&D CP | | | |

##### 10.1.1.7.4.2 Steps – Scenarios

###### 10.1.1.7.4.2.1 Scenario name #1:

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scenario name** | 7.4.1.1. Grid qualification of resource in prequalification 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.a | | Manage Resource Provider's consent | Resource Provider can give consent through Consent Administrator. | | RP | CA | Consent | ConsMan<br>DataSec |
| 1.b | | Receive Resource Provider's consent | T&D CP needs consent to have access to RP's private data on resource information. | | CA | T&D CP | Consent | ConsMan<br>ConnectCA<br>DataSec |
| 2.a | | Collect information about flexibility needs and resources | See precondition #5. | | FR | T&D CP | FlexNeed<br>ResInfo | ConnectFR<br>DataSec |
| 2.b | | Identify impacted System Operators | List of SOs who should send the grid information and be addressed in grid qualification process.<br>(TBD: some kind of algorithm to be developed for identification or rather an assumption?) | | T&D CP | T&D CP | ListSO | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.c | | Request grid information | Grid information from impacted SOs. | | T&D CP | SO | GridInfo | ConnectSO DataSec |
| 2.d | | Collect grid information | Grid information from impacted SOs. | | SO | T&D CP | GridInfo | ConnectSODataSec |
| 3.a | | Alt. 1 – Forward input information for grid qualification | If SO conducts grid impact assessment it needs information about concerned resources. | | T&D CP | SO | ResInfo | ConnectSO DataSec |
| 3.b | | Alt. 1 – Collect grid qualification results | Identification of grid restrictions (constraints) provided by SO. | | SO | T&D CP | GridRest | ConnectSO DataSec |
| 3.c | | Alt. 2 – Update algorithm for grid qualification with flexibility need and resource information | Inserting flexibility need and resource information as input into the algorithm. | | T&D CP | T&D CP | FlexNeed<br>ResInfo | QualAlg |
| 3.d | | Alt. 2 – Update algorithm for grid qualification with grid information | Inserting grid model / topology / constraints as input into the algorithm. | | T&D CP | T&D CP | GridInfo | QualAlg |
| 3.e | | Alt. 2 – Run algorithm for grid qualification to identify grid restrictions | Identification of grid restrictions (constraints) as calculated by T&D CP algorithm based on grid impact assessment of resource. | | T&D CP | T&D CP | GridRest | QualAlg DataStore |
| 3.f | | Merge results from Alt. 1 and Alt. 2 (CONDITIONAL) | If both alternatives 1 and 2 were applied to the same resource, these need to be merged into single result by updating the algorithm. | | T&D CP | T&D CP | GridRest | QualAlg DataStore |
| 4.a | | Publish qualification results | | | T&D CP | FR | GridRest | ConnectFR DataSec |
| 5.a | | Tbc – testing for product prequalification | (TBD:<br>a) Is SO testing actually required while FSPs connect to FR, MO and TD C&P?<br>b) If still required should be probably separate SUC) | | FR | T&D CP | | |
| 5.b | | Tbc – inform concerned SOs | | | T&D CP | SO | | |
| 5.c | | Tbc – testing results from SOs | | | SO | T&D CP | | |
| 5.d | | Tbc – forward testing results to flexibility register | | | T&D CP | FR | | |

### 10.1.1.7.4.2.2 Scenario name #2: *Grid qualification of resource in procurement phase*

| ***Scenario*** | |
|---|---|
| ***Scenario name*** | 7.4.1.2. Grid qualification of resource in procurement phase |



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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.a | | Manage Resource Provider's consent | Resource Provider can give consent through Consent Administrator. | | RP | CA | Consent | ConsMan DataSec |
| 1.b | | Receive Resource Provider's consent | T&D CP needs consent to have access to RP's private data on flexibility bid. | | CA | T&D CP | Consent | ConsMan ConnectCA DataSec |
| 2.a | | Collect information about flexibility bids | | | MO | T&D CP | FlexBid | ConnectMO DataSec |
| 2.b | | Identify impacted System Operators | List of SOs who should send the grid information and be addressed in grid qualification process. | | T&D CP | T&D CP | ListSO | |
| 2.c | | Request grid information | Grid information from impacted SOs. | | T&D CP | SO | GridInfo | ConnectSO DataSec |
| 2.d | | Collect grid information | Grid information from impacted SOs. | | SO | T&D CP | GridInfo | ConnectSO DataSec |
| 3.a | | *Alt. 1* – Forward input information for grid qualification | If SO conducts grid impact assessment it needs information about concerned flexibility bids. | | T&D CP | SO | FlexBid | ConnectSO DataSec |
| 3.b | | *Alt. 1* – Collect grid qualification results | Identification of grid restrictions (constraints) provided by SO. | | SO | T&D CP | GridRest | ConnectSO DataSec |
| 3.c | | *Alt. 2* – Update algorithm for grid qualification with flexibility bid | Inserting flexibility bid as input into the algorithm. | | T&D CP | T&D CP | FlexBid | QualAlg |
| 3.d | | *Alt. 2* – Update algorithm for grid qualification with grid information | Inserting grid model / topology / constraints as input into the algorithm. | | T&D CP | T&D CP | GridInfo | QualAlg |
| 3.e | | *Alt. 2* – Run algorithm for grid qualification to identify grid restrictions | Identification of grid restrictions (constraints) as calculated by T&D CP algorithm based on grid impact assessment of flexibility bid. | | T&D CP | T&D CP | GridRest | QualAlg DataStore |
| 3.f | | Merge results from Alt. 1 and Alt. 2 (CONDITIONAL) | If both alternatives 1 and 2 were applied to the same resource, these need to be merged | | T&D CP | T&D CP | GridRest | QualAlg DataStore |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | into single result by updating the algorithm. | | | | | |

10.1.1.7.4.2.3 Scenario name #3: *Grid qualification of resource in activation phase*

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.4.1.3. Grid qualification of resource in activation 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.a | | Manage Resource Provider's consent | Resource Provider can give consent through Consent Administrator. | | RP | CA | Consent | ConsMan DataSec |
| 1.b | | Receive Resource Provider's consent | T&D CP needs consent to have access to RP's private data on flexibility bid. | | CA | T&D CP | Consent | ConsMan ConnectCA DataSec |
| 2.a | | Collect information about flexibility bids | Bids need to be sent again because may be replaced with new bids from secondary market after matching initial bids and offers. | | MO | T&D CP | FlexBid | ConnectMO DataSec |
| 2.b | | Collect information about flexibility activation requests | Flexibility activation requests are needed in order to complete grid impact assessment only for those bids which are needed to answer the requests. | | SO | T&D CP | FlexActReq | ConnectSO DataSec |
| 2.c | | Identify impacted System Operators | List of SOs who should send the grid information and be addressed in grid qualification process. | | T&D CP | T&D CP | ListSO | |
| 2.d | | Request grid information | Grid information from impacted SOs. | | T&D CP | SO | GridInfo | ConnectSO DataSec |
| 2.e | | Collect grid information | Grid information from impacted SOs. | | SO | T&D CP | GridInfo | ConnectSO DataSec |
| 3.a | | *Alt. 1* – Forward input information for grid qualification | If SO conducts grid impact assessment it needs information about | | T&D CP | SO | FlexBid | ConnectSO DataSec |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | concerned flexibility bids. | | | | | |
| 3.b | | *Alt. 1* – Collect grid qualification results | Identification of grid restrictions (constraints) provided by SO. | | SO | T&D CP | GridRest | ConnectSO DataSec |
| 3.c | | *Alt. 2* – Update algorithm for grid qualification with bid and activation request | Inserting flexibility bid and activation request as input into the algorithm. | | T&D CP | T&D CP | FlexBid FlexActReq | QualAlg |
| 3.d | | *Alt. 2* – Update algorithm for grid qualification with grid information | Inserting grid model / topology / constraints as input into the algorithm. | | T&D CP | T&D CP | GridInfo | QualAlg |
| 3.e | | *Alt. 2* – Run algorithm for grid qualification to identify grid restrictions | Identification of grid restrictions (constraints) as calculated by T&D CP algorithm. | | T&D CP | T&D CP | GridRest | QualAlg DataStore |
| 3.f | | Merge results from Alt. 1 and Alt. 2 (CONDITIONAL) | If both alternatives 1 and 2 were applied to the same resource, these need to be merged into single result by updating the algorithm. | | T&D CP | T&D CP | GridRest | QualAlg DataStore |

### 10.1.1.7.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Consent | Customer Consent | Permission of data owner to use its private data. | |
| FlexNeed | Flexibility Need | System operator's future need for flexibilities. | |
| ResInfo | Resource Information | FSP's future potential to provide the flexibility. | |
| GridInfo | Grid Information | The depth of Grid Information may be different case-by-case ranging from full grid model to some information about grid topology to simple grid constraints as reported by SOs. | |
| GridRest | Grid Restrictions | Constraints assigned to flexibilities which cannot be (fully or partially) activated without causing congestions in the grid. | |
| FlexBid | Flexibility Bid | Offer made by Flexibility Service Provider for selling flexibility. | |
| FlexActReq | Flexibility Activation Request | Request made by SO to activate required flexibility. | |
| ListSO | List of impacted System Operators | List of SOs who should send the grid information and be addressed in grid qualification process | |

### 10.1.1.7.6 Requirements

| ***Requirements (optional)*** | | |
|---|---|---|
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| FUNCTIONAL | Functional requirements | |


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| Requirement R-ID | Requirement name | Requirement description |
|---|---|---|
| ConsMan | Consent management | The ability to give, obtain, process and store Resource Providers' consents |
| ConnectCA | Data exchange with Consent Administrator | The ability to exchange data with Consent Administrator's relevant system(s) |
| ConnectFR | Data exchange with Flexibility Register | The ability to exchange data with Flexibility Register |
| ConnectSO | Data exchange with System Operator | The ability to exchange data with System Operator's relevant system(s) |
| ConnectMO | Data exchange with Market Operator | The ability to exchange data with Market Operator's relevant system(s) |
| DataSec | Security of data exchange | Exchange of sensitive data needs to be protected |
| DataStore | Storing of relevant data | Storing capability of grid qualification results needs to be ensured |
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| NON-FUNCTIONAL | Non-functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| QualAlg | Grid qualification algorithm | Algorithm to perform required number of calculations within required period of time with required accuracy |
| ConnectXX | Connection conditions with other system | API, speed of data exchange and other relevant parameter to be defined |
| OpenSource / EUPL | Access to source code | Access to source code, unlimited rights to manage and further develop any system components. European Union public licence: Introduction to the EUPL licence \| Joinup (europa.eu) |

### 10.1.1.8 DSUC_NO_08

#### 10.1.1.8.1 Description of the use case

##### *10.1.1.8.1.1 Name of use case*

| Use case identification | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_NO_08 | Flexibility market, TSO-DSO coordination | Bid Ranking and Optimisation |

##### *10.1.1.8.1.2 Version management*

| Version management | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 5.05.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | First draft | For T7.4 discussion |
| 2 | 26.05.2021 | Kalle Kukk | Changes based of 6 May T7.4 discussion and comments provided until 26 May; further missing information added (short description, KPIs, conditions, references, requirements) | For T7.4 partners' review |
| 3 | 29.06.2021 | Kalle Kukk | Changes based of 29 June T7.4 discussion and comments provided until 29 June | For T7.4 partners' review before inclusion in MS report |



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| | | | | |
|---|---|---|---|---|
| 4 | 9.07.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | Updated diagram, 'complete description' added | For inclusion in milestone report |

#### 10.1.1.8.1.3 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| **Scope** | Ranking of qualified bids based on 'relative price' and optimising the bids based on value-stacking. |
| **Objective(s)** | Tool and algorithm developed for ranking and optimising flexibility bids to facilitate multilateral flexibility market through improved TSO-DSO coordination, also enabling cross-border marketplace. |
| **Related business case(s)** | Northern regional flexibility market |

#### 10.1.1.8.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| **Short description** |
| An algorithm performs bid ranking and bid optimisation processes. Grid model or grid topology or grid constraints are needed as input into the algorithm. Bid ranking means listing the flexibility bids for each product according to their economic value. Ranking should not be based on the price but on the 'relative price' which takes into account grid information, i.e. total costs for the System Operator(s). Several merit order lists can be produced if the ranking depends on the availability of a bid for different services. This step is repeated continuously.<br>Inserting purchase offers as input into the algorithm enables to perform bid optimisation. Optimising means matching flexibility bids and purchase offers in most economic way which takes into account synergies (value-stacking). This step is repeated continuously.<br>Bids for balancing need to be shared with relevant EU platform (MARI, PICASSO). If bids were meanwhile activated for congestion management purposes, it should be possible to withdraw the respective bids from EU platform. |
| **Complete description** |
| 1.a. Get qualified bids for selection (from SUC 7.4.1.2): Only bids which were fully or partly qualified are considered here.<br>2.a. Identify bids which should be shared with relevant EU platform: EU platforms like MARI, TERRA, PICASSO<br>2.b. Forward relevant bids to European platform. Bids for balancing need to be sent to relevant EU platform at right time.<br>2.c. Withdraw bids from European platform: Balancing bids can be withdrawn from EU platform at any time before activation.<br>3.a. Update algorithm for bid ranking with bid information: Inserting bids as input into the algorithm.<br>3.b. Update algorithm for bid ranking with grid information : Inserting grid model / topology / constraints as input into the algorithm. (Grid Information was collected in SUC 7.4.1.2.)<br>3.c. Run algorithm for bid ranking (Potentially to be merged with procurement phase qualification and with optimisation step): Ranking of bids based on the 'relative price' which takes into account grid information. This step is repeated continuously.<br>4.a. Request flexibility purchase offers (CONDITIONAL): Purchase offers need to be requested if these are not made available automatically (pushed)<br>4.b. Get flexibility purchase offers<br>5.a. Update algorithm for bid ranking with purchase offers information: Inserting purchase offers as input into the algorithm.<br>5.b. Optimise flexibility bids and flexibility purchase offers: Optimising bid by matching flexibility bids and purchase offers in most economic way taking into account synergies (value-stacking). This step is repeated continuously.<br>6.a. Publication of optimisation results: Sending relevant information to SOs<br>6.b. Publication of optimisation results: Sending relevant information to MOs |

#### 10.1.1.8.1.5 Key performance indicators (KPI)

| Key performance indicators | | | |
|---|---|---|---|
| **ID** | **Name** | **Description** | **Reference to mentioned use case objectives** |
| | Bid ranking and optimisation algorithm | Performance of bid ranking and optimisation algorithm<br>Target value: tbd | Improve TSO-DSO coordination in flexibility market. |





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| | | | |
|---|---|---|---|
| | Bid ranking and optimisation tool | Performance of TSO-DSO Coordination Platform<br>Target value: tbd | Improve TSO-DSO coordination in flexibility market. |
| | Optimisation of bids | Maximum efficiency of bids<br>Target value: tbd | Minimise total costs by optimising the bid selection |

##### 10.1.1.8.1.6 Use case conditions

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | Balancing bids can be withdrawn from EU platform at any time before activation. |
| 2 | Value-stacking is allowed in legislation, i.e., same resources and bids can be used simultaneously for more than on flexibility service and/or for more than one System Operator. |
| 3 | Timing allows value-stacking while sharing the concerned bids also with EU platform. |
| 4 | Secondary trading is enabled. |
| 5 | TSO-DSO Coordination Platform is integrated with other relevant systems of the concerned stakeholders and countries (e.g., Flexibility Register). |
| 6 | Location of the issue in the grid and location of the flexibility resource matters from the total cost perspective. |
| ***Prerequisites*** | |
| 1 | Flexibility bids have been previously qualified (grid qualification). This is checked by the TSO-DSO Coordination Platform. |
| 2 | The grid ranking and optimisation follows only if ‘product prequalification’ of the concerned resource had been successful. This is checked by the Flexibility Register. |
| 3 | Information about concerned flexibility bids and flexibility purchase offers as well as relevant grid information is available. |

##### 10.1.1.8.1.7 Further information to the use case classification/mapping

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to TSO-DSO coordination, Flexibility Register, Customer onboarding and Market Operator |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

#### 10.1.1.8.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|


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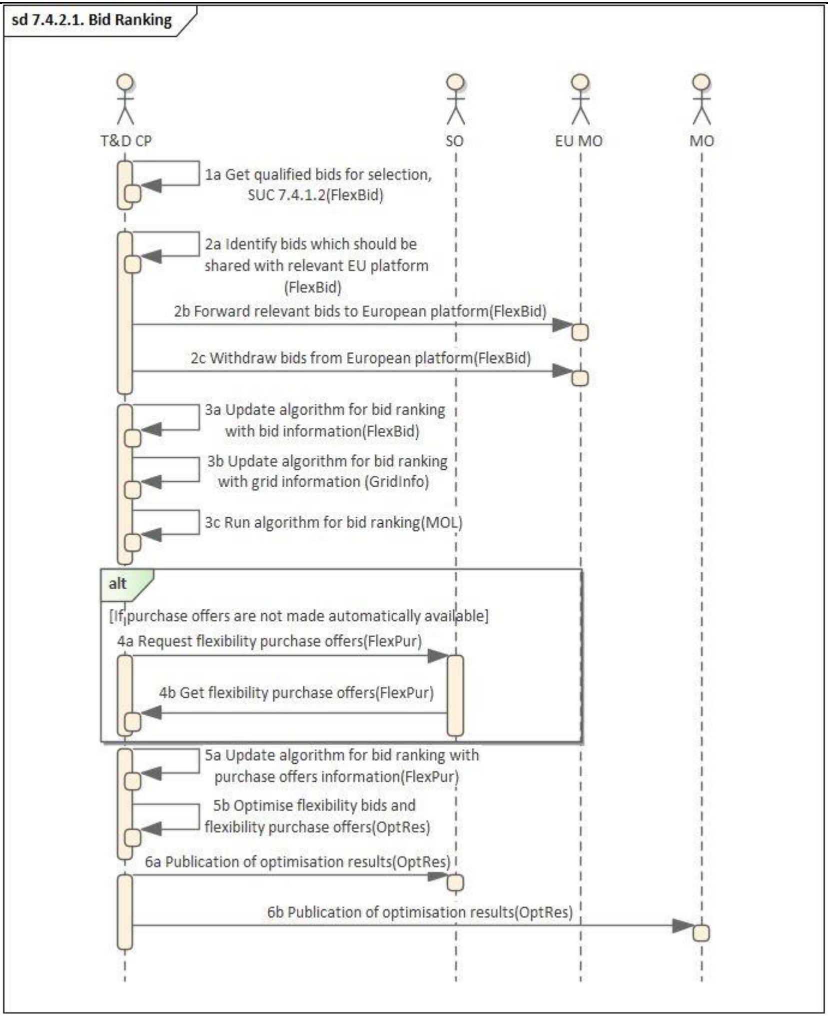


### 10.1.1.8.3 Technical details

#### *10.1.1.8.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |





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| | | | |
|---|---|---|---|
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity **or electricity flexibility** are matched with bids to buy electricity **or electricity flexibility**. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |

*10.1.1.8.3.1 References*

| References | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Reference Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
| 1 | Report | EU-SysFlex deliverable 5.2 | | Investigation of relevant use cases | Horizon2020 project EU-SysFlex | https://eu-sysflex.com/wp-content/uploads/2020/10/EU-SysFlex-Task-5.2-D5.2-FINAL.pdf |
| 2 | | INTERRFACE task 5.3 | | Investigation of relevant use cases | Horizon2020 project INTERRFACE | |
| 3 | Report | CoordiNet deliverable 1.5 | | Investigation of relevant use cases | Horizon2020 project CoordiNet | https://private.coordinet-project.eu//files/documentos/5d724207ca982Coordinet_Deliverable_1.5.pdf |
| 4 | | TDX-ASSIST | | Investigation of relevant use cases | Horizon2020 project TDX-ASSIST | |
| 5 | Report | SmartNet deliverable 1.3 | | Investigation of relevant use cases | Horizon2020 project SmartNet | http://smartnet-project.eu/wp-content/uploads/2016/12/D1.3_20161202_V1.0.pdf |
| 6 | Report | Overview of energy flexibility services | | Investigation of relevant use cases | ebIX® | https://mwgstorage1.blob.core.windows.net/public/Ebix/ebIX%20Overview%20of%20energy%20flexibility%20services%20-%20v1r0A%2020200106.pdf |
| 7 | Report | An integrated approach to Active System Management | | Investigation of relevant use cases | CEDEC, E.DSO, ENTSO-E, Eurelectric, GEODE | https://www.entsoe.eu/Documents/Publications/Position%20papers%20and%20reports/TSO-DSO_ASM_2019_190416.pdf |

## 10.1.1.8.4 Step by step analysis of use case

*10.1.1.8.4.1 Overview of scenarios*

| Scenario conditions | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 7.4.2.1 | Bid Ranking | | T&D CP | | | |

*10.1.1.8.4.2 Steps – Scenarios*

*10.1.1.8.4.2.1 Scenario name #1: Bid Ranking*

| Scenario | |
|---|---|
| ***Scenario name*** | 7.4.2.1. Bid Ranking |


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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.a | | Get qualified bids for selection (from SUC 7.4.1.2) | Only bids which were fully or partly qualified are considered here. | | T&D CP | T&D CP | FlexBid | |
| 2.a | | Identify bids which should be shared with relevant EU platform | EU platforms like MARI, TERRA, PICASSO | | T&D CP | T&D CP | FlexBid | |
| 2.b | | Forward relevant bids to European platform | Bids for balancing need to be sent to relevant EU platform at right time. | | T&D CP | (EU) MO | FlexBid | ConnectMO DataSec |
| 2.c | | Withdraw bids from European platform | Balancing bids can be withdrawn from EU platform at any time before activation. | | T&D CP | (EU) MO | FlexBid | ConnectMO DataSec |
| 3.a | | Update algorithm for bid ranking with bid information | Inserting bids as input into the algorithm. | | T&D CP | T&D CP | FlexBid | QualAlg |
| 3.b | | Update algorithm for bid ranking with grid information | Inserting grid model / topology / constraints as input into the algorithm. (Grid Information was collected in SUC 7.4.1.2.) | | T&D CP | T&D CP | GridInfo | QualAlg |
| 3.c | | Run algorithm for bid ranking (Potentially to be merged with procurement phase qualification and with optimisation step) | Ranking of bids based on the **'relative price'** which takes into account grid information. This step is repeated continuously. | | T&D CP | T&D CP | MOL | QualAlg DataStore |
| 4.a | | Request flexibility purchase offers (CONDITIONAL) | Purchase offers need to be requested if these are not made available automatically (pushed) | | T&D CP | SO | FlexPur | ConnectSO DataSec |
| 4.b | | Get flexibility purchase offers | | | SO | T&D CP | FlexPur | ConnectSO DataSec |
| 5.a | | Update algorithm for bid ranking with purchase offers information | Inserting purchase offers as input into the algorithm. | | T&D CP | T&D CP | FlexPur | QualAlg |
| 5.b | | Optimise flexibility bids and flexibility purchase offers | Optimising bid by matching flexibility bids and purchase offers in most economic way taking into account synergies (value-stacking). This step is repeated continuously. | | T&D CP | T&D CP | OptRes | QualAlg DataStore |
| 6.a | | Publication of optimisation results | Sending relevant information to SOs | | T&D CP | SO | OptRes | ConnectSO DataSec |
| 6.b | | Publication of optimisation results | Sending relevant information to MOs | | T&D CP | MO | OptRes | ConnectMO DataSec |

#### 10.1.1.8.5 Information exchanged

| Information exchanged |
|---|


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| *Information exchanged, ID* | *Name of information* | *Description of information exchanged* | *Requirement, R-IDs* |
|---|---|---|---|
| FlexBid | Flexibility Bid | Offer made by Flexibility Service Provider for selling flexibility. | |
| MOL (Will be removed if bid ranking merged with optimisation) | Merit Order List | Rank of Flexibility Bids based on predefined criteria. | |
| GridInfo | Grid Information | The depth of Grid Information may be different case-by-case ranging from full grid model to some information about grid topology to simple grid constraints as reported by SOs. | |
| FlexPur | Flexibility Purchase Offer | Offer made by System Operator for buying flexibility. | |
| OptRes | Optimisation Results | Optimisation of Merit Order List taking into account the possible synergies of using the same bid for more than one service and/or buyer. | |

#### 10.1.1.8.6 Requirements

| *Requirements (optional)* | | |
|---|---|---|
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| FUNCTIONAL | Functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| ConnectSO | Data exchange with System Operator | The ability to exchange data with System Operator's relevant system(s) |
| ConnectMO | Data exchange with Market Operator | The ability to exchange data with Market Operator's relevant system(s), incl. with European platforms |
| DataSec | Security of data exchange | Exchange of sensitive data needs to be protected |
| DataStore | Storing of relevant data | Storing capability of merit order lists and optimisation results needs to be ensured |
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| NON-FUNCTIONAL | Non-functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| QualAlg | Bid ranking and optimisation algorithm | Algorithm to perform required number of calculations within required period of time with required accuracy |
| ConnectXX | Connection conditions with other system | API, speed of data exchange and other relevant parameters to be defined |
| OpenSource / EUPL | Access to source code | Access to source code, unlimited rights to manage and further develop any system components. European Union public licence: Introduction to the EUPL licence \| Joinup (europa.eu) |



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#### 10.1.1.9 DSUC_NO_09

##### 10.1.1.9.1 Description of the use case

###### *10.1.1.9.1.1 Name of use case*

| **Use case identification** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_NO_09 | Flexibility market, TSO-DSO coordination | Bid Selection for Activation |

###### *10.1.1.9.1.2 Version management*

| **Version management** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 5.05.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | First draft | For T7.4 discussion |
| 2 | 26.05.2021 | Kalle Kukk | Changes based of 6 May T7.4 discussion and comments provided until 26 May; further missing information added (short description, KPIs, conditions, references, requirements) | For T7.4 partners' review |
| 3 | 29.06.2021 | Kalle Kukk | Changes based of 29 June T7.4 discussion and comments provided until 29 June | For T7.4 partners' review before inclusion in MS report |
| 4 | 9.07.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | Updated diagram, 'complete description' added | For inclusion in milestone report |

###### *10.1.1.9.1.3 Scope and objectives of use case*

| **Scope and objectives of use case** | |
|---|---|
| ***Scope*** | Selection of bids for activation, activating the bids, counter actions for imbalance corrections. |
| ***Objective(s)*** | Tool developed for flexibility activation to facilitate multilateral flexibility market through improved TSO-DSO coordination, also enabling cross-border marketplace. |
| ***Related business case(s)*** | Northern regional flexibility market |

###### *10.1.1.9.1.4 Narrative of Use Case*

| **Narrative of use case** |
|---|
| ***Short description*** |
| Bids not to be activated directly after matching of bids and offers by Market Operator should first pass grid impact assessment and optimisation. Flexibility activation requests were collected from system operators in the optimisation process and will be forwarded to selected FSPs. FSPs send back to TSO-DSO Coordination Platform confirmation about receiving the activation request as well as confirmation about actual activation.<br>Counter Action is needed if activation of would cause imbalance in system. Three alternative options are possible: TSO-DSO Coordination Platform selects automatically bid for counter action, System Operator sends information to coordination platform about whether counter action should be taken, or no action for counter action is taken by coordination platform. |
| ***Complete description*** |
| 1.a. Notify the market outcome: Submission of information about the matching of bids and offers on the marketplaces. |



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| |
|---|
| 1.b. Identify concerned system operators for market outcome: Identification of system operators who were involved as flexibility byers (according to flexibility purchase offers).<br>1.c. Forward the market outcome: Informing the system operators involved in buying specific flexibility about the market outcome. Sending the same information to flexibility register.<br>2.a. Alt. 1 – Identify bids for direct activation (Alt. 1 and 2 potentially to be merged into single approach): Identification of bids to be activated for the products where direct activation follows matching of bids and offers.<br>2.b. Alt. 2 – Select bids for activation based on grid impact assessment (Alt. 1 and 2 potentially to be merged into single approach): Bids not to be activated directly after matching should first pass grid impact assessment (SUC 7.4.1.3) and optimisation (SUC 7.4.2.1). This includes bids from secondary market.<br>3.a. Identify the need for counter action: Counter Action is needed if activation of would cause imbalance in system.<br>3.b. Alt. 1 – Select bid for counter action: Automatic selection of bid for counter action if SO involvement is not required. The selection of this alternative needs to be defined in advance.<br>3.c. Alt. 2 – Request information about whether counter action should be taken (CONDITIONAL): The selection of this requirement needs to be defined in advance. This information needs to be requested if not made available automatically (pushed)<br>3.d. Alt. 2 – Receive information about whether counter action should be taken: The selection of this requirement needs to be defined in advance.<br>3.e. Alt. 3 – No action for counter action by T&D CP: Counter actions are taken by SOs or by other mechanisms. The selection of this requirement needs to be defined in advance.<br>4.a. Forward request for activation<br>4.b. Register request for activation<br>4.c. Receive activation request confirmation: If no answer or denial received from FSP, back to step 2.a/2.b<br>4.d. Register activation request confirmation<br>5.a. Receive activation confirmation<br>5.b. Register activation confirmation<br>5.c. Inform about activation confirmation: For monitoring purposes FR (and/or SO?) should be informed whether and how much flexibility was activated based on FSP answer.<br>5.d. Select next bid for corrective action (back to step 2.b): If the actual activation is not sufficient or in wrong location, another bid needs to be selected and activation requested from FSP.<br>6.a. Notify activation requests<br>6.b. Notify activation requests: MO should be informed for the sake of transparency.<br>6.c. Notify activation requests |

#### 10.1.1.9.1.5 Key performance indicators (KPI)

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| | Flexibility activation tool | Performance of TSO-DSO Coordination Platform<br>Target value: tbd | Improve TSO-DSO coordination in flexibility market. |

#### 10.1.1.9.1.6 Use case conditions

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | TSO-DSO Coordination Platform is integrated with other relevant systems of the concerned stakeholders and countries (e.g. Flexibility Register). |
| 2 | Communication between TSO-DSO Coordination Platform and FSP is in place. |
| 3 | Automated activation of flexible resources is possible. |
| 4 | System Operator is informed about actual activations in real time through its SCADA solution. |
| ***Prerequisites*** | |
| 1 | Bid optimisation has been completed. |
| 2 | It needs to be identified on product level which bids are to be activated directly following matching of bids and offers by Market Operator and which bids will pass optimisation |
| 3 | The preferred option for counter balancing is defined. |


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##### 10.1.1.9.1.7 Further information to the use case classification/mapping

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to TSO-DSO coordination, Flexibility Register, Customer onboarding and Market Operator |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

#### 10.1.1.9.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|


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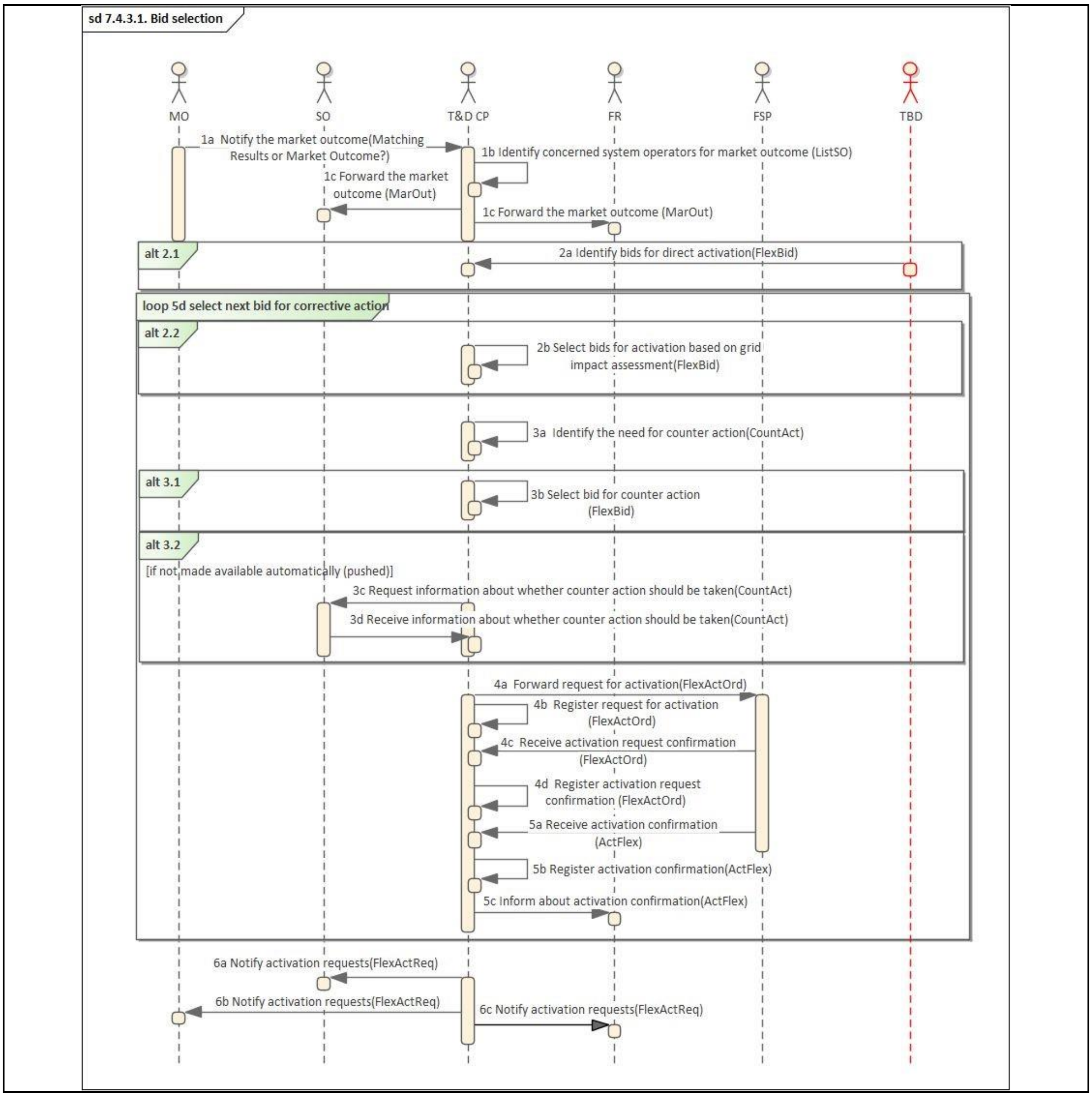


### 10.1.1.9.3 Technical details

#### *10.1.1.9.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |



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| | | | |
|---|---|---|---|
| Flexibility Register (FR) | System | System that stores information about flexibility assets, results of qualification (both product and grid), market results, grid information and the results of the settlement as well as aggregates flexibility information as well as allocates access rights to the various actors and controls the level of access. | Based on BRIDGE proposal for Flexibility Register Operator definition. |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |
| Flexibility Service Provider (FSP) | Business | A party providing flexibility services to energy stakeholders via bilateral agreements or flexibility markets. FSP offer services potentially to all the system operators, directly or through market operators. | BRIDGE definition. According to BRIDGE, FSP is an HEMRM extension of Balancing Service Provider |

##### *10.1.1.9.3.1 References*

| ***References*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Reference Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
| 1 | Report | EU-SysFlex deliverable 5.2 | | Investigation of relevant use cases | Horizon2020 project EU-SysFlex | https://eu-sysflex.com/wp-content/uploads/2020/10/EU-SysFlex-Task-5.2-D5.2-FINAL.pdf |
| 2 | | INTERRFACE task 5.3 | | Investigation of relevant use cases | Horizon2020 project INTERRFACE | |
| 3 | Report | CoordiNet deliverable 1.5 | | Investigation of relevant use cases | Horizon2020 project CoordiNet | https://private.coordinet-project.eu//files/documentos/5d724207ca982Coordinet_Deliverable_1.5.pdf |
| 4 | | TDX-ASSIST | | Investigation of relevant use cases | Horizon2020 project TDX-ASSIST | |
| 5 | Report | SmartNet deliverable 1.3 | | Investigation of relevant use cases | Horizon2020 project SmartNet | http://smartnet-project.eu/wp-content/uploads/2016/12/D1.3_20161202_V1.0.pdf |
| 6 | Report | Overview of energy flexibility services | | Investigation of relevant use cases | ebIX® | https://mwgstorage1.blob.core.windows.net/public/Ebix/ebIX%20Overview%20of%20energy%20flexibility%20services%20-%20v1r0A%2020200106.pdf |
| 7 | Report | An integrated approach to Active System Management | | Investigation of relevant use cases | CEDEC, E.DSO, ENTSO-E, Eurelectric, GEODE | https://www.entsoe.eu/Documents/Publications/Position%20papers%20and%20reports/TSO-DSO_ASM_2019_190416.pdf |



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###### 10.1.1.9.4 Step by step analysis of use case

###### *10.1.1.9.4.1 Overview of scenarios*

| Scenario conditions | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 7.4.3.1 | Bid selection | | T&D CP | | | |

###### *10.1.1.9.4.2 Steps – Scenarios*

*10.1.1.9.4.2.1 Scenario name #1: Bid selection*

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.4.3.1. Bid selection | | | | | | | |
| ***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.a | | Notify the market outcome | Submission of information about the matching of bids and offers on the marketplaces. | | MO | T&D CP | MarOut | ConnectMO DataSec |
| 1.b | | Identify concerned system operators for market outcome | Identification of system operators who were involved as flexibility byers (according to flexibility purchase offers). | | T&D CP | T&D CP | FlexPur | |
| 1.c | | Forward the market outcome | Informing the system operators involved in buying specific flexibility about the market outcome. Sending the same information to flexibility register. | | T&D CP | SO, FR | MarOut | ConnectMO DataSec |
| 2.a | | Alt. 1 – Identify bids for direct activation (Alt. 1 and 2 potentially to be merged into single approach) | Identification of bids to be activated for the products where direct activation follows matching of bids and offers. | | tbd. | T&D CP | FlexBid | |
| 2.b | | Alt. 2 – Select bids for activation based on grid impact assessment (Alt. 1 and 2 potentially to be merged into single approach) | Bids not to be activated directly after matching should first pass grid impact assessment (SUC 7.4.1.3) and optimisation (SUC 7.4.2.1). This includes bids from secondary market. | | T&D CP | T&D CP | FlexBid | |
| 3.a | | Identify the need for counter action | Counter Action is needed if activation of would cause imbalance in system. | | T&D CP | T&D CP | CountAct | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3.b | | *Alt. 1* – Select bid for counter action | Automatic selection of bid for counter action if SO involvement is not required. The selection of this alternative needs to be defined in advance. | | T&D CP | T&D CP | FlexBid | |
| 3.c | | *Alt. 2* – Request information about whether counter action should be taken (CONDITIONAL) | The selection of this requirement needs to be defined in advance. This information needs to be requested if not made available automatically (pushed) | | T&D CP | SO | CountAct | ConnectSO DataSec |
| 3.d | | *Alt. 2* – Receive information about whether counter action should be taken | The selection of this requirement needs to be defined in advance. | | SO | T&D CP | CountAct | ConnectSO DataSec |
| 3.e | | *Alt. 3* – No action for counter action by T&D CP | Counter actions are taken by SOs or by other mechanisms. The selection of this requirement needs to be defined in advance. | | | | | |
| 4.a | | Forward request for activation | | | T&D CP | FSP | FlexActOrd | ConnectFSP DataSec |
| 4.b | | Register request for activation | | | T&D CP | T&D CP | FlexActOrd | DataStore |
| 4.c | | Receive activation request confirmation | If no answer or denial received from FSP, back to step **2.a/2.b** | | FSP | T&D CP | FlexActOrd | ConnectFSP DataSec |
| 4.d | | Register activation request confirmation | | | T&D CP | T&D CP | FlexActOrd | DataStore |
| 5.a | | Receive activation confirmation | | | FSP | T&D CP | ActFlex | ConnectFSP DataSec |
| 5.b | | Register activation confirmation | | | T&D CP | T&D CP | ActFlex | DataStore |
| 5.c | | Inform about activation confirmation | For monitoring purposes FR (and/or SO?) should be informed whether and how much flexibility was activated based on FSP answer. | | T&D CP | FR | ActFlex | ConnectFR DataSec |
| 5.d | | Select next bid for corrective action (back to step 2.b) | If the actual activation is not sufficient or in wrong location, another bid needs to be selected and activation requested from FSP. | | T&D CP | T&D CP | FlexBid | |
| 6.a | | Notify activation requests | | | T&D CP | SO | FlexActReq | ConnectSO DataSec |
| 6.b | | Notify activation requests | MO should be informed for the sake of transparency. | | T&D CP | MO | FlexActReq | ConnectMO DataSec |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6.c | | Notify activation requests | | | T&D CP | FR | FlexActReq | ConnectFR DataSec |

#### 10.1.1.9.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| FlexBid | Flexibility Bid | Offer made by Flexibility Service Provider for selling flexibility. | |
| CountAct | Counter Action | Action to correct imbalance caused by any flexibility (other than balancing activation. | |
| FlexActReq | Flexibility Activation Request | Request made by SO to activate required flexibility. | |
| FlexActOrd | Flexibility Activation Order | Flexibility Activation Request forwarded to specific FSP. | |
| ActFlex | Activated Flexibility | Amount of flexibility activated according to Flexibility Activation Order. | |
| MarOut | Market Outcome | The results of matching the offers and bids by MO. | |
| FlexPur | Flexibility Purchase Offer | Offer made by System Operator for buying flexibility. | |

#### 10.1.1.9.6 Requirements

| ***Requirements (optional)*** | | |
|---|---|---|
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| FUNCTIONAL | Functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| ConnectSO | Data exchange with System Operator | The ability to exchange data with System Operator's relevant system(s) |
| ConnectMO | Data exchange with Market Operator | The ability to exchange data with Market Operator's relevant system(s) |
| ConnectFR | Data exchange with Flexibility Register | The ability to exchange data with Flexibility Register's relevant system(s) |
| ConnectFSP | Data exchange with Flexibility Service Provider | The ability to exchange data with FSP's relevant system(s) |
| DataSec | Security of data exchange | Exchange of sensitive data needs to be protected |
| DataStore | Storing of relevant data | Storing capability of activation requests, activation request confirmations, activation confirmation needs to be ensured |
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| NON-FUNCTIONAL | Non-functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| ConnectXX | Connection conditions with other system | API, speed of data exchange and other relevant parameters to be defined |
| OpenSource / EUPL | Access to source code | Access to source code, unlimited rights to manage and further develop any system components. European Union public licence: Introduction to the EUPL licence \| Joinup (europa.eu) |

### 10.1.1.10 DSUC_NO_10



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#### 10.1.1.10.1 Description of the use case

##### *10.1.1.10.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_NO_10 | Flexibility market, TSO-DSO coordination | Flexibility Call for Tender Opening |

##### *10.1.1.10.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2.06.2021 | Kalle Kukk | First draft | For T7.4 partners' review |
| 2 | 9.07.2021 | Kalle Kukk, Kaja Trees, Kristjan Kuhi | Diagram and 'complete description' added | For inclusion in milestone report |

##### *10.1.1.10.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Opening flexibility call for tender and sharing information about ongoing calls with market and system operators. |
| ***Objective(s)*** | Facilitate coordinated trading by centralising information about active calls for tender. |
| ***Related business case(s)*** | Northern regional flexibility market |

##### *10.1.1.10.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| A call for tender of flexibility services relies on specific products and can cover in addition to product specifications specific periods (week ahead, day ahead, intraday, etc.), location, quantity. The call for tender is initiated by the System Operator who needs the flexibility. Information about all calls is collected and stored centrally at TSO-DSO Coordination Platform and made available to concerned market operators and system operators. Call for tender applies to all one-time auctions (e.g. long-term procurement), regular auctions (e.g. mFRR) and continuous bidding (e.g. bids from intraday market). In case of regular and continuous trading the call is opened only once for all subsequent delivery periods. |
| ***Complete description*** |
| • 1.a. Request to open the flexibility call for tender<br>• 1.b. Register flexibility calls for tender<br>• 2.a. Publish information about calls for tender: This information helps other system operators to understand if they would like to open similar call.<br>• 2.b. Alt.1 – Publish information about calls for tender: Information can be published to all subscribed market operators<br>• 2.c. Alt.2 – Request information about calls for tender: If market operator has not previously subscribed it can request the information<br>• 2.d. Alt.2 – Send information about calls for tender |

##### *10.1.1.10.1.5 Further information to the use case classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| Other system use cases related to TSO-DSO coordination, Flexibility Register, Customer onboarding and Market Operator |



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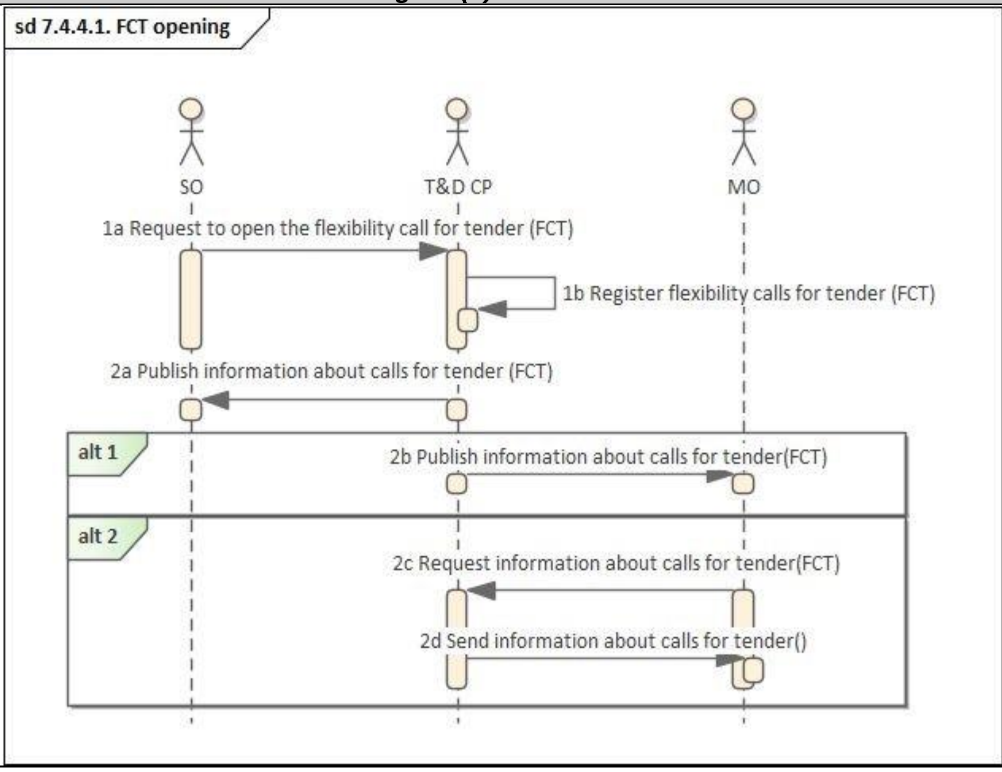
| *Level of depth* |
|---|
| |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| |
| ***Nature of use case*** |
| System use case |
| ***Further keywords for classification*** |
| |

### 10.1.1.10.2 Diagrams of use case

**Diagram(s) of use case**




### 10.1.1.10.3 Technical details

#### *10.1.1.10.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| TSO-DSO coordination platform (T&D CP) | System | System that is designed to avoid, through grid impact assessment, activation of flexibilities which either do not contribute to solving system needs or even worsen the situation | |



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| | | | |
|---|---|---|---|
| | | (constraint setting process) as well as to find the best value-stack of available flexibilities to be activated (optimization process). | |
| System Operator (SO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. | HEMRM definition. |
| Market Operator (MO) | Business | A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility. | HEMRM definition with extensions (in bold) proposed by BRIDGE. Includes also TSOs and DSOs performing the role of MO. |

##### *10.1.1.10.3.1 References*

| ***References*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No*** | ***Reference Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
| 1 | Report | EU-SysFlex deliverable 5.2 | | Investigation of relevant use cases | Horizon2020 project EU-SysFlex | https://eu-sysflex.com/wp-content/uploads/2020/10/EU-SysFlex-Task-5.2-D5.2-FINAL.pdf |
| 2 | | INTERRFACE task 5.3 | | Investigation of relevant use cases | Horizon2020 project INTERRFACE | |
| 3 | Report | CoordiNet deliverable 1.5 | | Investigation of relevant use cases | Horizon2020 project CoordiNet | https://private.coordinet-project.eu//files/documentos/5d724207ca982Coordinet_Deliverable_1.5.pdf |
| 4 | | TDX-ASSIST | | Investigation of relevant use cases | Horizon2020 project TDX-ASSIST | |
| 5 | Report | SmartNet deliverable 1.3 | | Investigation of relevant use cases | Horizon2020 project SmartNet | http://smartnet-project.eu/wp-content/uploads/2016/12/D1.3_20161202_V1.0.pdf |
| 6 | Report | Overview of energy flexibility services | | Investigation of relevant use cases | ebIX® | https://mwgstorage1.blob.core.windows.net/public/Ebix/ebIX%20Overview%20of%20energy%20flexibility%20services%20-%20v1r0A%2020200106.pdf |
| 7 | Report | An integrated approach to Active System Management | | Investigation of relevant use cases | CEDEC, E.DSO, ENTSO-E, Eurelectric, GEODE | https://www.entsoe.eu/Documents/Publications/Position%20papers%20and%20reports/TSO-DSO_ASM_2019_190416.pdf |

#### 10.1.1.10.4 Step by step analysis of use case

##### *10.1.1.10.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 7.4.4.1 | FCT opening | | T&D CP | | | |



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#### 10.1.1.10.4.2 Steps – Scenarios

##### 10.1.1.10.4.2.1 Scenario name #1: FCT opening

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | 7.4.4.1. FCT opening | | | | | | | |
| ***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.a | | Request to open the flexibility call for tender | | | SO | T&D CP | FCT | ConnectSO DataSec |
| 1.b | | Register flexibility calls for tender | | | T&D CP | T&D CP | FCT | DataStore |
| 2.a | | Publish information about calls for tender | This information helps other system operators to understand if they would like to open similar call. | | T&D CP | SO | FCT | ConnectSO DataSec |
| 2.b | | *Alt.1* – Publish information about calls for tender | Information can be published to all subscribed market operators | | T&D CP | MO | FCT | ConnectMO DataSec |
| 2.c | | *Alt.2* – Request information about calls for tender | If market operator has not previously subscribed it can request the information | | MO | T&D CP | FCT | ConnectMO DataSec |
| 2.d | | *Alt.2* – Send information about calls for tender | | | T&D CP | MO | FCT | ConnectMO DataSec |

### 10.1.1.10.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| FCT | Flexibility Call for Tender | Flexibility call specification for a specific product. | |

### 10.1.1.10.6 Requirements

| ***Requirements (optional)*** | | |
|---|---|---|
| ***Categories ID*** | ***Category name for requirements*** | ***Category description*** |
| FUNCTIONAL | Functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| ConnectSO | Data exchange with System Operator | The ability to exchange data with System Operator's relevant system(s) |
| ConnectMO | Data exchange with Market Operator | The ability to exchange data with Market Operator's relevant system(s) |
| DataSec | Security of data exchange | Exchange of sensitive data needs to be protected |
| DataStore | Storing of relevant data | Storing capability of activation requests, activation request confirmations, activation confirmations needs to be ensured |



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| *Categories ID* | *Category name for requirements* | *Category description* |
|---|---|---|
| NON-FUNCTIONAL | Non-functional requirements | |
| ***Requirement R-ID*** | ***Requirement name*** | ***Requirement description*** |
| ConnectXX | Connection conditions with other system | API, speed of data exchange and other relevant parameters to be defined |
| OpenSource / EUPL | Access to source code | Access to source code, unlimited rights to manage and further develop any system components. European Union public licence: Introduction to the EUPL licence \| Joinup (europa.eu) |

## 10.2 Southern Cluster

### 10.2.1GREEK DEMO

#### 10.2.1.1 DSUC_SO_GR_01

##### 10.2.1.1.1 Description of the use case

###### *10.2.1.1.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | GR | Improved production and consumption prediction for DSO and microgrid voltage levels |

###### *10.2.1.1.1.2 Version management*

| *Version management* | | | | |
|---|---|---|---|---|
| *Version No.* | *Date* | *Name of author(s)* | *Changes* | *Approval status* |
| 1 | 28/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |
| 2 | 21/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |

###### *10.2.1.1.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Improved production and consumption prediction, focused on a DSO voltage level, on a longer time span and wider geographical scope than the one being utilised today, through a simultaneous DSO and TSO grid simulations backed up by AI based calculation engines. |
| ***Objective(s)*** | • Frequency stability<br>• Cost-effective operation of the system<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| ***Related business case(s)*** | Enhanced Active Power Management for TSO-DSO coordination |



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#### 10.2.1.1.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| ***Short description*** |
| Improved production and consumption prediction for DSO and microgrid voltage levels that will allow for better identification of the available flexibility resources, from residential prosumers to the centralised WPPs and SPPs connected to the distribution grid or any local micro-grid (local energy community), through improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration and its presentation with the improved observability on a higher operational control and monitoring levels, including regional, RSC level. |
| ***Complete description*** |
| F-channel application, that will be developed under WP8 - southern cluster (Greece) will be capable of identifying flexibility resources more precisely and simultaneously for both DSO and TSO grid levels, mainly under OneNet focusing on the lover voltage levels prosumers, that are usually not being covered with that detailed energy predictions, in a much more precise manner and longer time horizons than it is being done today, covering wider geographical scope than it is being covered today by national control centres, and/or RSCs... The aim is to improve a production/consumption predictions for a different voltage level entities, from residential prosumers to the centralized WPPs and SPPs connected to the distribution grid or any local micro grid (local energy communities), through improved forecasting efficiency from increased spatial resolution NWPs and AI integration into the short to mid-term power system planning simulations.<br><br>The application itself will not depend on the exact product being utilized within the market, or the market model itself (it will be possible to use it for different services and products, and different market models). It will focus on a predictive management of a products and need for those products. Possibility for products from a micro grid and DSO levels to be recognised and available for utilisation on higher voltage levels (TSOs, RSCs…) as well as on the administrative aggregator's level:<br>• identification of the flexibility resources to procure grid services |

#### 10.2.1.1.1.5 Key performance indicators (KPI)

| Key performance indicators | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Energy production prediction error | | • Frequency stability<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| 2 | Load prediction error | | • Frequency stability<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |

#### 10.2.1.1.1.6 Use case conditions

| Use case conditions |
|---|
| ***Assumptions*** |


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

###### *10.2.1.1.1.7 Actors*

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



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| | | | |
|---|---|---|---|
| | | short term, mid term and long term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis. |
| Production Forecasting operator (TSO/Aggregator); | Information receiver/provider | TSO/Aggregator Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid term and long term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | Production forecasts (in the case of F-channel, wind and solar parks production forecasts) are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis. |
| Load Forecasting operator (TSO/Aggregator); | Information receiver/provider | TSO/Aggregator Short term planning department load forecasting operator is responsible for consumption short term, mid term and long term forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | Load forecasts are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis. |
| Flexibility Register Operator (FRO); | Information receiver | | |
| Production scheduling operator (market operator); | Information receiver | | |

### 10.2.1.2 DSUC_SO_GR_02

#### 10.2.1.2.1 Description of the use case

##### *10.2.1.2.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | GR | DSO, DG and microgrid POI management |

##### *10.2.1.2.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 28/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |
| 2 | 21/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |

##### *10.2.1.2.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** |
|---|


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| | |
|---|---|
| ***Scope*** | Register of POIs - Point of Interest with necessary regular periodic updates, technical data, historic data, forecasted data archiving and analysis for AI applications… |
| ***Objective(s)*** | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Cost-effective operation of the system<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| ***Related business case(s)*** | Enhanced Active Power Management for TSO-DSO coordination |

##### *10.2.1.2.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| Register of POIs - Point of Interest with necessary regular periodic updates, technical data, historic data, forecasted data archiving and analysis for AI applications… |
| ***Complete description*** |
| |

##### *10.2.1.2.1.5 Use case conditions*

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


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### 10.2.1.2.2 Technical details

#### *10.2.1.2.2.1 Actors*

| *Actors* | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| | | | |
| Load Forecasting operator (DSO/Micro-grid operator); | Information provider | DSO/Short term planning department load forecasting operator is responsible for consumption short term, mid term and long term forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | Load forecasts are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis. |
| Production Forecasting operator (DSO/Micro-grid operator); | Information provider | DSO/Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid term and long term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | Production forecasts (in the case of F-channel, wind and solar parks production forecasts) are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis. |
| Production Forecasting operator (TSO/Aggregator); | Information receiver/provider | TSO/Aggregator Short term planning department production forecasting operator is responsible for wind, solar and hydro, short term, mid term and long term production forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | Production forecasts (in the case of F-channel, wind and solar parks production forecasts) are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f-channel platform as and input for further simulations, calculations and analysis. |
| Load Forecasting operator (TSO/Aggregator); | Information receiver/provider | TSO/Aggregator Short term planning department load forecasting operator is responsible | Load forecasts are using weather forecasts as an input and as an output provide further inputs for various functionalities inside of the f- |




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| | | | |
|---|---|---|---|
| | | for consumption short term, mid term and long term forecasts, later on used for TSO level modelling under f-channel platform coordination: IGM updates, DACF and 2DACF procedures, Contingency Analysis and Capacity Calculations. | channel platform as and input for further simulations, calculations and analysis. |
| Flexibility Register Operator (FRO); | Information receiver | | |
| Production scheduling operator (market operator); | Information receiver | | |
| DACF operator (TSO and corresponding expert in DSO); | Information receiver/provider | An expert from TSO/Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures...If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power system and first neighbouring systems. | DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the IGM - Individual Grid Model, and perform n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models. |
| 2DACF operator (TSO and corresponding expert in DSO); | Information receiver/provider | The same as previous | The same as previous |
| IGM manager (TSO and corresponding expert in DSO); | Information receiver/provider | TSO/Short term planning department Expert/s responsible for development, maintenance and regular updates of a Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis. | IGM is being produced using production forecasts, load forecasts and condition forecasts outputs.. |
| ATC calculator (TSO and RSC); | Information receiver/provider | TSO/Short term planning department Expert in charge of short to long term available capacity calculations, flow based, or ATC based (bilateral or composite values). | IGM is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs. IGM is than being transferred back to TSO main server and processed by ATC calculator for further available capacity calculations or |





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| | | | |
|---|---|---|---|
| | | | simulations are done in a virtual f-channel grid environment. |
| Power system control expert (TSO/DSO); | Information receiver | TSO Operational personnel working on intraday - real time power system control and operations in a dispatching room, using DACF, 2DACF, Outage schedules, production schedules and Contingency Analysis outputs that are prepared on a 2day-ahead, or day-ahead basis. Also, these experts are using SCADA/EMS in order to perform intraday 5-15 min simulations and contingency analysis in order to update of the same analysis in a real time.... | IGM, with 2-4 per day updates, is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs, covered by EUROPAN forecasting tool. IGM is than being transferred back to TSO main server and processed by operational personnel. |
| Balancing mechanism operator (TSO) | Information receiver | | |
| RES Scheduling operator (TSO based); | Information receiver | | |
| Losses calculator (TSO) | Information receiver | Improved forecasting of grid losses and available future capacities | |
| Regional DACF operator (RSC) | Information receiver | An expert from RSC-Regional Security Center, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of proposed mitigation measures...If the DACF is performed by a RSC than targeted, analysed system is usually regional, CCR based network model (CGM - Common Grid Model). | RSC's DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the CGM - Common Grid Model, and performed n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models, in this case covering its CCR. |
| Regional 2DACF operator (RSC) | Information receiver | The same as previous | The same as previous |
| CGM manager (RSC) | Information receiver | TSO/Short term planning department or and RSC's Expert/s responsible for development, maintenance and regular updates of a Common Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, | CGM is being produced using production forecasts, load forecasts and condition forecasts submodule outputs. CGM in the case of the EUROPAN platform represents an interface between a simulation/calculation/analysis tools that already exist in the RSC and/or TSO Energy Management Systems. |



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| | | | |
|---|---|---|---|
| | | assumed power exchanges with the neighbouring systems...CGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis. | |
| ATC coordinated calculator (TSO or RSC) | Information receiver | RSC's Expert in charge of short to long term available capacity calculations, flow based or ATC based (bilateral or composite values), calculated in a coordinated manner for all regional borders simultaneously or at least during the same calculation process. | CGM is being processed under EUROPAN platform, being updated with the new production, load and capacity/rating values for selected POIs, covered by EUROPAN forecasting tool. CGM is than being transferred back to RSC main server and processed by ATC calculator for further available capacity calculations. |
| Production Forecasting/Scheduling operator (Regional RES coordinator) | Information receiver | Future regional RES production coordinators...Still does not exist, but is foreseen by CEP...It will have a coordination role for all RES units, not only national/system located but all regional RES production will be run from this body. The role and relationship with the EUROPAN will be similar to what is now being used by TSOs for this same functionality which covers production forecasts... | |

### 10.2.1.3 DSUC_SO_GR_03

#### 10.2.1.3.1 Description of the use case

##### *10.2.1.3.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | GR | Change View - different aggregation level simulations |

##### *10.2.1.3.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 28/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |
| 2 | 21/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |

##### *10.2.1.3.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** |
|---|


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| | |
|---|---|
| ***Scope*** | User defined domain of DSO/Microgrid and TSO voltage level area of interest for which simulation of a power production, consumption and load flow (contingency analysis) is being performed. |
| ***Objective(s)*** | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Cost-effective operation of the system<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| ***Related business case(s)*** | Enhanced Active Power Management for TSO-DSO coordination |

##### *10.2.1.3.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| Energy predictions and system state predictions for different aggregation levels of DSO grid and local microgrid: unit level (distributed gen. unit, OHL tower/section), plant level (solar park, wind park, OHL, substation), local microgrid level (part of the DSO grid), DSO/TSO grid level simulations/calculations depending on a selected area of interest by the end-user. |
| ***Complete description*** |

##### *10.2.1.3.1.5 Key performance indicators (KPI)*

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Energy production prediction error for the selected domain | | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| 2 | Load prediction error for the selected domain | | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes, |




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| | | | |
|---|---|---|---|
| | | | • Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| 3 | Load flow prediction error for the selected domain | | | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| 4 | Capacity prediction error for the selected domain | | | • Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation |
| 5 | Transmission losses prediction error for the selected domain | | | • Cost-effective operation of the system |
| 6 | Contingency identification rate for the selected domain | | | • Better energy predictions and power system state predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes |
| 7 | Early warning on a hazardous power system regimes rate for the selected domain | | | • Better energy predictions and power system state predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes |

##### *10.2.1.3.1.6 Use case conditions*

| ***Use case conditions*** |
|---|
| ***Assumptions*** |
| • The use case will be developed and demonstrated in a non-invasive, offline environment using the power system simulation models,<br>• Aggregators and prosumers will be simulated in the demonstration. |


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

### 10.2.1.3.2 Technical details

#### *10.2.1.3.2.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| DACF operator (TSO and corresponding expert in DSO); | Information receiver/provider | An expert from TSO/Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures...If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power system and first neighbouring systems. | DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the IGM - Individual Grid Model, and perform n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models. |
| 2DACF operator (TSO and corresponding expert in DSO); | Information receiver/provider | The same as previous | The same as previous |
| IGM manager (TSO and corresponding expert in DSO); | Information receiver/provider | TSO/Short term planning department Expert/s responsible for development, | IGM is being produced using production forecasts, load forecasts and condition forecasts outputs.. |



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| | | | |
|---|---|---|---|
| | | maintenance and regular updates of a Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis. | |
| ATC calculator (TSO and RSC); | Information receiver/provider | TSO/Short term planning department Expert in charge of short to long term available capacity calculations, flow based, or ATC based (bilateral or composite values). | IGM is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs. IGM is than being transferred back to TSO main server and processed by ATC calculator for further available capacity calculations or simulations are done in a virtual f-channel grid environment. |
| Power system control expert (TSO/DSO); | Information receiver | TSO Operational personnel working on intraday - real time power system control and operations in a dispatching room, using DACF, 2DACF, Outage schedules, production schedules and Contingency Analysis outputs that are prepared on a 2day-ahead, or day-ahead basis. Also, these experts are using SCADA/EMS in order to perform intraday 5-15 min simulations and contingency analysis in order to update of the same analysis in a real time.... | IGM, with 2-4 per day updates, is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs, covered by EUROPAN forecasting tool. IGM is than being transferred back to TSO main server and processed by operational personnel. |
| Regional DACF operator (RSC) | Information receiver | An expert from RSC-Regional Security Center, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of proposed mitigation measures...If the DACF is performed by a RSC than targeted, analysed system is usually regional, CCR based network model (CGM - Common Grid Model). | RSC's DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the CGM - Common Grid Model, and performed n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models, in this case covering its CCR. |
| Regional 2DACF operator (RSC) | Information receiver | The same as previous | The same as previous |



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| | | | |
|---|---|---|---|
| CGM manager (RSC) | Information receiver | TSO/Short term planning department or and RSC's Expert/s responsible for development, maintenance and regular updates of a Common Grid Models containing consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...CGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis. | CGM is being produced using production forecasts, load forecasts and condition forecasts submodule outputs. CGM in the case of the EUROPAN platform represents an interface between a simulation/calculation/analysis tools that already exist in the RSC and/or TSO Energy Management Systems. |
| Production Forecasting/Scheduling operator (Regional RES coordinator) | Information receiver | Future regional RES production coordinators...Still does not exist, but is foreseen by CEP...It will have a coordination role for all RES units, not only national/system located but all regional RES production will be run from this body. The role and relationship with the EUROPAN will be similar to what is now being used by TSOs for this same functionality which covers production forecasts... | |

### 10.2.1.4 DSUC_SO_GR_04

#### 10.2.1.4.1 Description of the use case

##### *10.2.1.4.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | GR | Improved congestion management process on TSO and RSC side |

##### *10.2.1.4.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 28/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |
| 2 | 21/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |

##### ***10.2.1.4.1.3*** *Scope and objectives of use case*

| ***Scope and objectives of use case*** |
|---|

| | |
|---|---|
| ***Scope*** | Improved short term forecasts, contingency analysis and capacity calculations through utilisation of the information from DSO and/or local microgrid operators. |
| ***Objective(s)*** | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Cost-effective operation of the system<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| ***Related business case(s)*** | Enhanced Active Power Management for TSO-DSO coordination |

##### 10.2.1.4.1.4 Narrative of Use Case

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| Improved power system state estimation in order to better predict system flexibility needs, with the wider geographical observability and longer "look into the future". through improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration and its presentation with the improved observability on a higher operational control and monitoring levels, including regional, RSC level. |
| ***Complete description*** |
| |

##### 10.2.1.4.1.5 Key performance indicators (KPI)

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 3 | Load flow prediction error | | • Frequency stability<br>• Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes,<br>• Better FSPs planning and managing flexibility resources.<br>• Better energy predictions and power system state predictions<br>• Improved identification of the available flexibility resources on all power system levels.<br>• Improved prediction of the system flexibility needs. |
| 4 | Capacity prediction error | | • Load flow and contingency monitoring and predictions<br>• Predictive congestion management for maintaining secure and stable power system operation |
| 5 | Transmission losses prediction error | | • Cost-effective operation of the system |
| 6 | Contingency identification rate | | • Better energy predictions and power system state predictions |


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

##### 10.2.1.4.1.6 Use case conditions

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

##### 10.2.1.4.1.7 Further information to the use case for classification/mapping

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| • |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| *High* |
| ***Generic, regional or national relation*** |
| |



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| Nature of the use case |
| --- |
| |
| ***Further keywords for classification*** |
| Predictive congestion management, Power system forecasts, Energy predictions, Load forecast, Flexibility resources identification, Flexibility system needs predictions… |

### 10.2.1.4.2 Technical details

#### *10.2.1.4.2.1 Actors*

| Actors | | | |
| --- | --- | --- | --- |
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| DACF operator (TSO and corresponding expert in DSO); | Information receiver/provider | An expert from TSO/Short term planning department, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of possible mitigation measures…If the DACF is performed by a national TSO than targeted, analysed system is usually only a national power system and first neighbouring systems. | DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the IGM - Individual Grid Model, and perform n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models. |
| 2DACF operator (TSO and corresponding expert in DSO); | Information receiver/provider | The same as previous | The same as previous |
| IGM manager (TSO and corresponding expert in DSO); | Information receiver/provider | TSO/Short term planning department Expert/s responsible for development, maintenance and regular updates of a Individual Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...IGM models are further used by DACF, 2DACF and ATC calculator for further simulations, calculations and analysis. | IGM is being produced using production forecasts, load forecasts and condition forecasts outputs.. |
| ATC calculator (TSO and RSC); | Information receiver/provider | TSO/Short term planning department Expert in charge of short to long term available capacity calculations, flow | IGM is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs. IGM is than being transferred back |





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| | | | |
|---|---|---|---|
| | | based or ATC based (bilateral or composite values). | to TSO main server and processed by ATC calculator for further available capacity calculations or simulations are done in a virtual f-channel grid environment.. |
| Power system control expert (TSO/DSO); | Information receiver | TSO Operational personnel working on intraday - real time power system control and operations in a dispatching room, using DACF, 2DACF, Outage schedules, production schedules and Contingency Analysis outputs that are prepared on a 2day-ahead, or day-ahead basis. Also, these experts are using SCADA/EMS in order to perform intraday 5-15 min simulations and contingency analysis in order to update of the same analysis in a real time.... | IGM, with 2-4 per day updates, is being processed under f-channel platform, being updated with the new production, load and capacity/rating values for selected POIs, covered by EUROPAN forecasting tool. IGM is than being transferred back to TSO main server and processed by operational personnel. |
| Losses calculator (TSO) | Information receiver | Improved forecasting of grid losses and available future capacities | |
| Regional DACF operator (RSC) | Information receiver | An expert from RSC-Regional Security Center, responsible for day ahead congestion forecast simulation and analysis which as an output gives the list of critical elements and critical outages with the list of proposed mitigation measures...If the DACF is performed by a RSC than targeted, analysed system is usually regional, CCR based network model (CGM - Common Grid Model). | RSC's DACF operator uses production forecasts, load forecasts and capacity forecasts, all already modelled inside of the CGM - Common Grid Model, and performed n-1 analysis, so called contingency analysis on CGM - Common Grid Model, which is previously merged from IGM and all surrounding system models, in this case covering its CCR. |
| Regional 2DACF operator (RSC) | Information receiver | The same as previous | The same as previous |
| CGM manager (RSC) | Information receiver | TSO/Short term planning department or and RSC's Expert/s responsible for development, maintenance and regular updates of a Common Grid Models containing: consumption nodes (active and reactive power), production nodes (active power and voltage set), overall voltage profile, assumed power exchanges with the neighbouring systems...CGM models are further used by DACF, 2DACF and ATC calculator for further | CGM is being produced using production forecasts, load forecasts and condition forecasts submodule outputs. CGM in the case of the EUROPAN platform represents an interface between a simulation/calculation/analysis tools that already exist in the RSC and/or TSO Energy Management Systems. |





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

#### 10.2.1.5 DSUC_SO_GR_05

##### 10.2.1.5.1 Description of the use case

###### *10.2.1.5.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | GR | Storm and Icing predictive maintenance process in TSO, DSO grid and local microgrid |

###### *10.2.1.5.1.2 Version management*

| *Version management* | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 28/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |
| 2 | 21/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |

###### *10.2.1.5.1.3 Scope and objectives of use case*

| *Scope and objectives of use case* | |
|---|---|
| ***Scope*** | DGs, Microgrid OHLs DSO grid OHLs predictive maintenance and protection with the enhanced storm and icing predictions |
| ***Objective(s)*** | • Predictive congestion management for maintaining secure and stable power system operation<br>• Cost-effective operation of the system<br>• Early warning on a hazardous power system regimes, |
| ***Related business case(s)*** | Enhanced severe weather condition management and outage management |



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##### 10.2.1.5.1.4 Narrative of Use Case

| **Narrative of use case** |
|---|
| **Short description** |
| Identification of the severe weather conditions that can cause tripping of the lines or DG outages and as a consequence partial or full blackouts in the region of interest. |
| **Complete description** |
| The main foreseen benefits/functionalities related to this particular use case are as follows:<br>• Improved System adequacy on DSO and TSO side<br>• Improved Islanded operation on DSO and TSO side |

##### 10.2.1.5.1.5 Key performance indicators (KPI)

| **Key performance indicators** | | | |
|---|---|---|---|
| **ID** | **Name** | **Description** | **Reference to mentioned use case objectives** |
| 1 | Contingency identification rate | | • Better energy predictions and power system state predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes |
| 2 | Early warning on a hazardous power system regimes rate | | • Better energy predictions and power system state predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes |

##### 10.2.1.5.1.6 Use case conditions

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



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

#### 10.2.1.5.2 Technical details

##### *10.2.1.5.2.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Weather forecast provider; | Information provider | Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid. | POI weather forecasts are used as an input data for energy predictions, as well as for AI base PS state forecast. |
| Maintenance and asset management operator (TSO/DSO) | Information receiver | | |
| Outage scheduler (TSO/DSO) | Information receiver | | |

### 10.2.1.6 DSUC_SO_GR_06

#### 10.2.1.6.1 Description of the use case

##### *10.2.1.6.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | GR | Outage management process in TSO/DSO grid and local micro grid |

##### *10.2.1.6.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 28/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |
| 2 | 21/06/2021 | Nenad Sijakovic and Aleksandar Terzic | | |

##### *10.2.1.6.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** |
|---|


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| | |
|---|---|
| ***Scope*** | DSO/TSO grid, local micro grid outage management that takes into account improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration. |
| ***Objective(s)*** | • Predictive congestion management for maintaining secure and stable power system operation<br>• Cost-effective operation of the system<br>• Early warning on a hazardous power system regimes, |
| ***Related business case(s)*** | Enhanced severe weather condition management and outage management |

#### *10.2.1.6.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| DSO/TSO grid, local micro grid outage management that takes into account improved predictions and forecasting efficiency from increased spatial resolution NWPs and AI integration. |
| ***Complete description*** |
| The main foreseen benefits/functionalities related to this particular use case are as follows:<br>• Improved System adequacy on DSO and TSO side<br>• Improved Islanded operation on DSO and TSO side |

#### *10.2.1.6.1.5 Key performance indicators (KPI)*

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Contingency identification rate | | • Better energy predictions and power system state predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes |
| 2 | Early warning on a hazardous power system regimes rate | | • Better energy predictions and power system state predictions<br>• Predictive congestion management for maintaining secure and stable power system operation<br>• Early warning on a hazardous power system regimes |

#### *10.2.1.6.1.6 Use case conditions*

| ***Use case conditions*** | | |
|---|---|---|
| ***Assumptions*** | | |
| • The use case will be developed and demonstrated in a non-invasive, offline environment using the power system simulation models,<br>• Aggregators and prosumers will be simulated in the demonstration.<br>• Additional DERs will be simulated if necessary, in order to represent the near future conditions | | |
| ***Prerequisites*** | | |
| 1 | Availability of the network and market data | • Network models (in raw or uct file exchange format) data: IPTO and HEDNO network models (400 kV, 220 kV, 150 kV, 110 kV, 35 kV and 20 kV) voltage levels), |



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| | | |
|---|---|---|
| | | • Geospatial data: GPS coordinates, locations of considered RES production POIs and other power system elements of interest, including detailed routing and positions of each tower for the analysed WPPs and OHLs.<br>• Technical data: Technical data on wind turbines, solar parks, OHLs<br>• Historic weather and energy data: historic measured and forecasted data related to the weather and energy production/consumption of the analysed points of interest in Greece (Crete and Peloponnese).<br>• Information on the current practice and state of the art with the tools used for the forecasting, congestion management and balancing in TSO, DSO and producer/aggregator.<br>• Energy policy information: Information on applicable EU Directives and Regulations that are of interest for TSO DSO coordination. |
| 2 | Active participation of the primary users (TSO, DSO, aggregator) | TSO, DSO and aggregator's departments for short term planning as well as departments for system operations and control should be deeply involved in the simulations and testing of the platform. |

### 10.2.1.6.2 Technical details

#### *10.2.1.6.2.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Weather forecast provider; | Information provider | Unit inside the TSO/DSO, or contracted outsourced weather forecast provider company responsible for weather forecasts for selected weather parameters and selected locations in the grid. | POI weather forecasts are used as an input data for energy predictions, as well as for AI base PS state forecast. |
| Maintenance and asset management operator (TSO/DSO) | Information receiver | | |
| Outage scheduler (TSO/DSO) | Information receiver | | |





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## 10.2.2 CYPRIOT DEMO

### 10.2.2.1 DSUC_SO_CY_01

#### 10.2.2.1.1 Description of the use case

##### 10.2.2.1.1.1 *Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | Cyprus | Real time monitoring of the grid |

##### 10.2.2.1.1.2 *Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 18/06/2021 | Markos Asprou and Lenos Hadjidemetriou | Initial definition of the SUC (up to section 1.4) | |
| 2 | 24/08/2021 | Markos Asprou and Lenos Hadjidemetriou | Detailed definition of the SUC (section 1-5) | |

##### 10.2.2.1.1.3 *Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Monitoring of the transmission and distribution system operating condition in real time using real time measurements |
| ***Objective(s)*** | • Provide fast, accurate, and reliable visualization of the Cyprus power system operating condition<br>• Enhance the situational awareness of the TSO and DSO |
| ***Related business case(s)*** | • BUC1: Active power flexibility<br>• BUC2: Reactive power flexibility and power quality services |

##### 10.2.2.1.1.4 *Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| This SUC deals with the monitoring schemes that will be used for obtaining in real time the operating condition of the transmission and distribution system. The monitoring system of the transmission grid will run to the ABCM-T platform and to the ABCM-D platform for the distribution grid. The real time monitoring system will provide in real time crucial information to the TSO such as: voltage phasors of all the buses, line loadings, frequency, and rate of change of frequency (ROCOF). In the case of the distribution grid the real time monitoring scheme will provide to the DSO the node voltages and line loadings. |


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| Complete description |
| --- |
| The Cyprus power system has 18 PMUs installed in different substations, making the transmission level fully observable by PMUs. The PMU measurements, i.e., voltage phasors of the PMU bus, current phasor of the lines emanating by the PMUs bus, frequency and ROCOF, are concentrated in the TSO control centre through a Phasor Data Concentrator (PDC). The PMU based monitoring system will communicate with the PDC for receiving the PMU measurements and will process them for providing a wide area visualization of the transmission system operation. The monitoring scheme in the transmission grid will also make use of SCADA measurements available in the Cyprus control centre.<br><br>The monitoring scheme of the distribution grid will make use of real time information flow through the smart meters and the SCADA in order to provide in near real time an accurate visualization of the distribution grid operating condition. Specifically, the scheme will provide the voltage of the grid nodes, the loading of the distribution lines, as well as the power flow direction. The visualization will be provided in a three-phase domain in order to facilitate the detection of any loading unbalances in the distribution grid that will be resolved by the phase balancing service. The monitoring scheme will communicate with the AMI and SCADA measurements for collecting the information. The information provided by the real time monitoring systems are directly related to BUC1 and BUC2. |

##### 10.2.2.1.1.5 Key performance indicators (KPI)

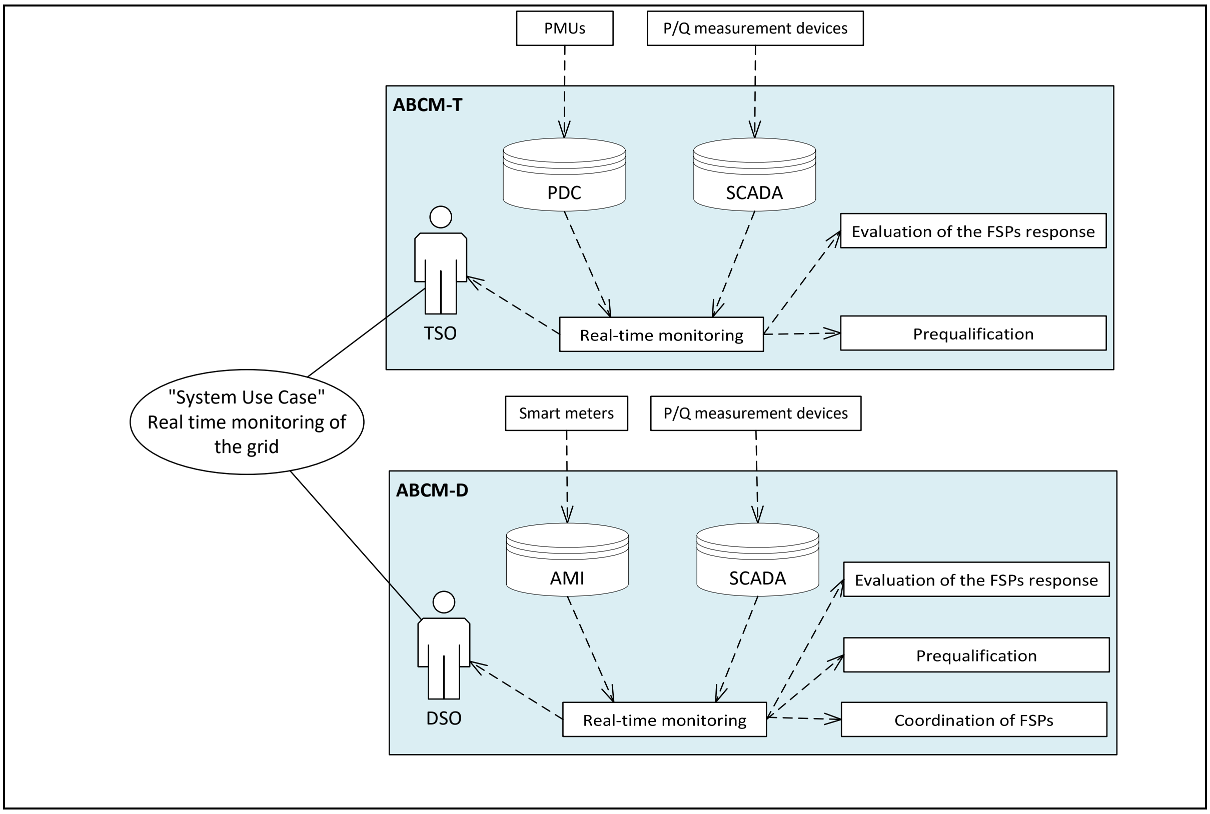
| Key performance indicators | | | |
| --- | --- | --- | --- |
| ID | Name | Description | Reference to mentioned use case objectives |
| 1 | Voltage magnitude and angle error | This indicator will provide information about the estimation accuracy of the real time monitoring scheme. It will be calculated by finding the difference between the actual and the estimated voltage and angle (provided by the monitoring scheme). | Accurate monitoring of transmission and distribution operating condition |

##### 10.2.2.1.1.6 Use case conditions

| Use case conditions |
| --- |
| **Assumptions** |
| • The system use case will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system.<br>• The monitoring schemes will be located inside the ABCM-T and ABCM-D platform<br>• The transmission grid will be fully observable by PMUs and SCADA measurements<br>• The distribution grid will be fully observable by smart meters and conventional SCADA measurements |
| **Prerequisites** |
| • Provision of PMU and SCADA measurements from the transmission system<br>• Provision of SCADA data and/or smart meter data from the distribution grid |

#### 10.2.2.1.2 Diagrams of use case

| Diagram(s) of use case |
| --- |




### 10.2.2.1.3 Technical details

#### *10.2.2.1.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g., domains, zones)*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Transmission system Operator | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the transmission grid to meet reasonable demands for the transmission of electricity. | Transmission system Operator will receive information regarding the operation of the transmission grid through this SUC |
| Distribution system operator | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, for ensuring the long-term ability of the distribution grid to meet reasonable demands for the distribution of electricity. | Transmission system Operator will receive information regarding the operation of the distribution grid through this SUC |
| PMUs | Device | The Phasor Measurement Unit (PMU) is an advanced measurement device that provide synchronized voltage and current phasor | The PMU measurements will be used in the real time monitoring scheme that will |



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| | | | |
|---|---|---|---|
| | | measurements, frequency and ROCOF measurements in real time. | be included in the ABCM-T platform |
| PDC | Device | The Phasor Data Concentrator (PDC) collects and time aligns the PMU measurements (from different PMUs) that are transferred to the TSO control centre. | The PDC will provide the time aligned PMU measurements to the grid monitoring scheme of the transmission grid |
| P/Q measurement devices | Device | Conventional measurement devices that measure the real and reactive (P and Q) power flow and injection in a particular bus/line | The P/Q measurements will be used in the monitoring scheme of both the transmission and distribution system. |
| SCADA | Device/Database | Supervisory Control and Data Acquisition (SCADA) system acts as the data acquisition entity for the conventional measurements (P/Q) | The SCADA will be used for forwarding the conventional measurements to both transmission and distribution monitoring schemes. |
| Smart meter | Device | Smart meter provides voltage magnitude and power measurements from distribution system end-users (i.e. households, industrial buildings, etc). | Smart meter measurements will be used in the monitoring scheme of the distribution grid |
| AMI | Device/Database | Advanced metering infrastructure (AMI) will be used for collecting the smart meter measurements from the smart meter located at the low and medium voltage distribution grid | The AMI will forward the smart meter measurements to the distribution grid monitoring. |

### 10.2.2.1.4 Step by step analysis of use case

#### *10.2.2.1.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Real time monitoring of the transmission grid operating condition | PMU and conventional measurement devices located in specific locations at the transmission system capture and send the measurements to the TSO control centre. The PMU measurements are collected from the PDC while the conventional power measurements from the SCADA system. Measurements are then processed through the monitoring scheme that is within the ABCM-T platform in order and provide in real time the voltage magnitude | TSO, PMUs, PDC, SCADA | Continuous event | Existence of adequate measurement devices in the system for full observability. Telecommunication infrastructure to support the transfer of measurements from the substation to the control center. | Accurate and real time monitoring of the transmission system operating condition |



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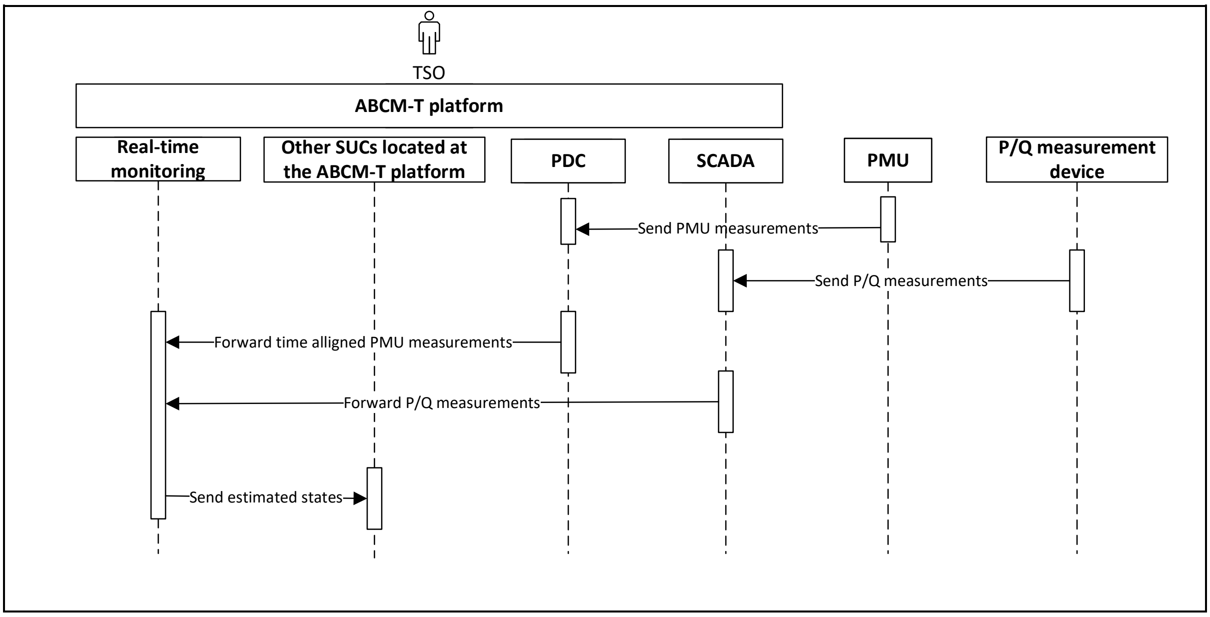
| | | | | | | |
|---|---|---|---|---|---|---|
| | | and angle and the system frequency to the TSO. | | | | |
| 2 | Real time monitoring of the distribution grid operating condition | Smart meter and conventional power measurement devices located in specific locations at the distribution system capture and send the measurements to the DSO control center. The smart meter measurements are collected in the Advanced Metering Infrastructure (AMI), while the conventional power measurements are collected from the SCADA system. Measurements are then processed through the monitoring scheme that is within the ABCM-D platform in order and provide in real time the voltage magnitude and angle to the DSO. | DSO, smart meter, SCADA | Continuous event | Existence of adequate measurement devices in the system for full observability. Telecommunication infrastructure to support the transfer of measurements from the substation and the prosumers/FSPs to the control center. | Accurate and real time monitoring of the distribution system operating condition |

### 10.2.2.1.5 Steps – Scenarios

#### *10.2.2.1.5.1.1 Scenario name #1: Real time monitoring of the transmission grid operating condition*

Scenario #1 description




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

| ***Scenario*** |
|---|

| Scenario name | Real time monitoring of the transmission grid operating condition | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***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 measurements from the PMUs | PMU measurement forwarding | PMUs situated at the transmission level substations measures the voltage and current waveforms and send the measurements to the PDC at the ABCM-T platform (TSO control center) | CAPTURE | PMU | TSO, PDC | I1-01 | |
| 1.2 | Send measurements from the conventional power measurement device | Conventional measurement forwarding | Conventional power measurement devices situated at the transmission level substations measures the real and reactive power injection and power flow measurements and send them to the SCADA at the TSO control center | CAPTURE | P/Q measurement devices | TSO, SCADA | I1-02 | |
| 1.3 | PMU measurements time alignment and forwarding to the monitoring scheme | PMU measurement transfer and time alignment to the control center | PDC receives the measurement from the PMUs and time aligns them according to their timestamp. The set of time aligned measurement is forwarded to the monitoring scheme situated at the ABCM-T platform | FORWARD | PDC | TSO/ABCM-T platform/real time monitoring scheme | I1-03 | |
| 1.4 | Conventional measurements forwarding to the monitoring scheme | P/Q measurement transfer to the control center | SCADA receives the measurement from the P/Q measurement devices and forwards them to the monitoring scheme situated at the ABCM-T platform | FORWARD | SCADA | TSO/ABCM-T platform/real time monitoring scheme | I1-04 | |
| 1.5 | Monitoring transmission system operating condition | Monitoring | Real time monitoring scheme processes the PMU and conventional power measurements and sends the estimated states (voltage magnitude, angle) and frequency to the TSO as | PROCESS | TSO/ABCM-T platform/real time monitoring scheme | TSO, TSO/ABCM-T platform/ Evaluation of the FSPs response, Prequalification | I1-05 | |



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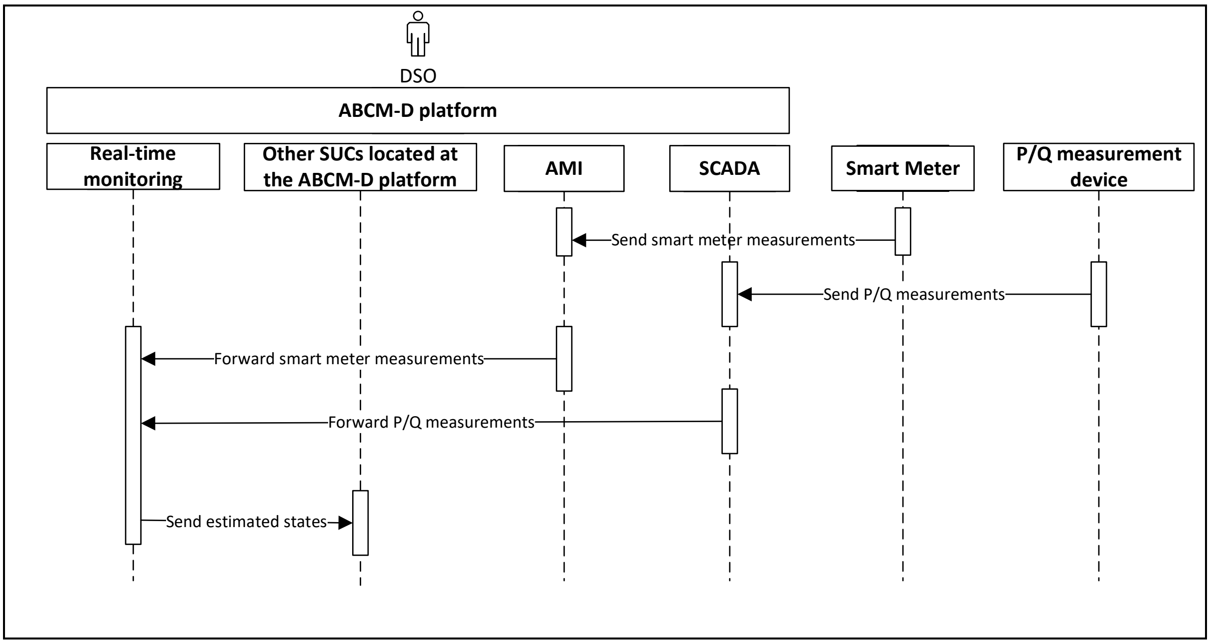
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | well as to other SUCs namely “Evaluation of the FSPs response”, and “Prequalification” | | | | | | |

#### *10.2.2.1.5.1.2 Scenario name #2 Real time monitoring of the distribution grid operating condition*

Scenario #2 description




## Scenario step by step analysis

| ***Scenario*** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | | Real time monitoring of the distribution grid operating condition | | | | | | | |
| ***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 measurements from the smart meters | Smart meter measurements forwarding | Smart meters situated at the medium and low voltage end-users measures the voltage magnitude and the real power and send them to the AMI at the ABCM-D platform (DSO control centre) | CAPTURE | Smart meter | DSO, AMI | I2-01 | | |
| 1.2 | Send measurements from the conventiona | Conventional measurement forwarding | Conventional power measurement devices situated at the distribution level | CAPTURE | P/Q measurement devices | DSO, SCADA | I2-02 | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | l power measurement device | | substations measures the real and reactive power injection and power flow measurements and send them to the SCADA at the DSO control center | | | | | |
| 1.3 | Smart meter measurements forwarding to the monitoring scheme | Smart meter measurement transfer to the control center | AMI receives the smart meter measurements from the smart meters The set of smart meter measurements are forwarded to the monitoring scheme situated at the ABCM-D platform | FORWARD | AMI | DSO/ABCM-D platform/real time monitoring scheme | I2-03 | |
| 1.4 | Conventional measurements forwarding to the monitoring scheme | P/Q measurements transfer to the control center | SCADA receives the measurement from the P/Q measurement devices and forwards them to the monitoring scheme situated at the ABCM-D platform | FORWARD | SCADA | DSO/ABCM-T platform/real time monitoring scheme | I2-04 | |
| 1.5 | Monitoring distribution system operating condition | Monitoring | Real time monitoring scheme processes the smart meter and conventional power measurements and sends the estimated states (voltage magnitude, angle) to the DSO as well as to other SUCs namely "Evaluation of the FSPs response", "Coordination of FSPs and "Prequalification" | PROCESS | DSO/ABCM-D platform/real time monitoring scheme | DSO, DSO/ABCM-D platform/ Evaluation of the FSPs response, Prequalification, Coordination of the FSPs | I2-05 | |

#### 10.2.2.1.6 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| I1-01 | PMU measurements | PMU measurements are sent from the substations to the TSO control center where they are received by the PDC | Communication of the PMUs with the control center with IEEE C37-118 protocol |
| I1-02 | P/Q measurements | Conventional power measurements are sent from the substations to the TSO control center where they are received by the SCADA | Communication of the RTUs with the control center |

| | | | |
|---|---|---|---|
| I1-03 | Time aligned PMU measurements | PDC sends the measurements to the real time monitoring scheme | Communication of the monitoring scheme with the PDC through TCP/IP protocol |
| I1-04 | Conventional P/Q measurements | SCADA sends the conventional power measurements to the real time monitoring scheme | Communication of the monitoring scheme with the SCADA through IEC 60870-5-104 |
| I1-05 | Estimated states | Real time monitoring scheme sends the estimated states to other SUCs located at the ABCM-T platform | Communication of the monitoring scheme with the other SUCs. |
| I2-01 | Smart measurements | Smart measurements sent from the MV/LV end-users to the DSO control center where they are received by the AMI | Communication of the Smart meters with the control center with TCP/IP, PLC, MQTT, or GPRS. |
| I2-02 | P/Q measurements | Conventional power measurements sent from the substations to the DSO control center where they are received by the SCADA | Communication of the RTUs with the control center |
| I2-03 | Smart meter measurements | AMI sends the smart meter measurements to the real time monitoring scheme | Communication of the monitoring scheme with the AMI through TCP/IP protocol |
| I2-04 | Conventional P/Q measurements | SCADA sends the conventional power measurements to the real time monitoring scheme | Communication of the monitoring scheme with the SCADA through IEC 60870-5-104 |
| I2-05 | Estimated states | Real time monitoring scheme sends the estimated states to other SUCs located at the ABCM-D platform | Communication of the monitoring scheme with the other SUCs. |

### 10.2.2.2 DSUC_SO_CY_02

#### 10.2.2.2.1 Description of the use case

##### *10.2.2.2.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_SO_CY_02 | Cyprus | Prequalification of the location-based limit of each market product |

##### *10.2.2.2.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 18/06/2021 | Markos Asprou and Lenos Hadjidemetriou | Initial definition of the SUC (up to section 1.4) | |


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| | | | | |
|---|---|---|---|---|
| 2 | 24/08/2021 | Markos Asprou and Lenos Hadjidemetriou | Detailed definition of the SUC (section 1-5) | |

#### 10.2.2.2.1.3 Scope and objectives of use case

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | TSO and DSO will calculate location-based limits at the HV/MV and MV/LV accordingly in order to ensure that the awarded products by the market will not compromise the operation of the system |
| ***Objective(s)*** | • Ensure the safe operation of the system by prequalifying certain operational limits for transmission and distribution grid |
| ***Related business case(s)*** | • BUC1: Active power flexibility<br>• BUC2: Reactive power flexibility and power quality services |

#### 10.2.2.2.1.4 Narrative of Use Case

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| This system use case (SUC) deals with the calculation of certain operational limits in consecutive time intervals (before the clearing of the market) that should be respected by the TSO and local DSO market when the market is cleared. This SUC will be included both in the ABCM-T and ABCM-D platform and will be helpful for both operators for maintaining the operation of the grid in admissible limits. |
| ***Complete description*** |
| This SUC will use available monitoring information (from SCADA, PMUs, smart meters) and historical data to determine the location-based limits. In the case of the transmission grid the location-based limit will be determined at the primary substation (HV/MV interface) while in the distribution grid the limits will be calculated at the secondary substation (MV/LV interface). The prequalification of the limits will be done for a specific time interval ahead (this will be determined according to the market time frame). This SUC will communicate with the SUC1 (real time monitoring) for receiving information as well as with the TSO and DSO. The operators will provide the prequalified limits to the market operator through the OneNet System. The SUC is directly related to both BUC1 and BUC2 of the Cyprus demo. |

#### 10.2.2.2.1.5 Key performance indicators (KPI)

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Calculated limits deviation | This indicator will provide information about the calculation accuracy of the limits that will be extracted by the SUC. As an indicator for the accuracy, the deviation (in percentage) that the calculated limits have from the actual limits in the HV/MV and MV/LV interface will be extracted. | Ensure the safe operation of the system |



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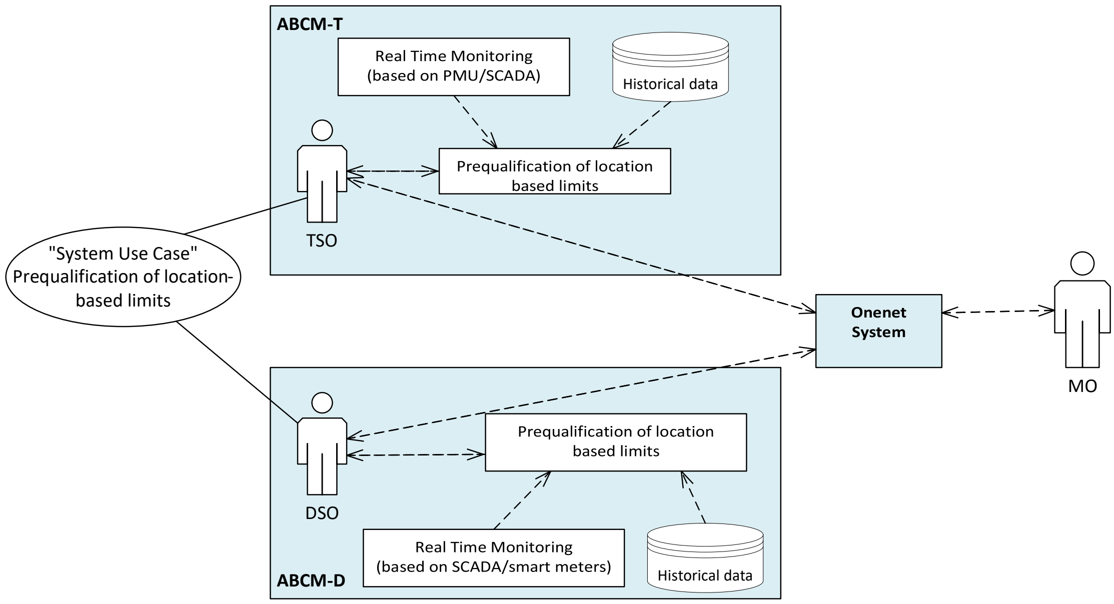
#### 10.2.2.2.1.6 Use case conditions

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| ○ | The SUC will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system. |
| ○ | The routine for calculating the prequalified limits will be located inside the ABCM-T and ABCM-D platform |
| ○ | The transmission grid will be fully observable by PMUs |
| ○ | The distribution grid will be fully observable by smart meters and conventional SCADA measurements |
| ***Prerequisites*** | |
| ○ | Provision of PMU data from the transmission system |
| ○ | Provision of SCADA data and/or smart meter data from the distribution grid |
| ○ | Provision of historical data for the operation of the transmission and distribution grid are available |

### 10.2.2.2.2 Diagrams of use case

***Diagram(s) of use case***





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### 10.2.2.2.3 Technical details

#### *10.2.2.2.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Transmission system Operator | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the transmission grid to meet reasonable demands for the transmission of electricity. | Transmission system Operator will receive information from this SUC regarding the admissible limits that the system should be operated in the next market time framework |
| Distribution system operator | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, for ensuring the long-term ability of the distribution grid to meet reasonable demands for the distribution of electricity. | Distribution system Operator will receive information from this SUC regarding the admissible limits that the system should be operated in the next market time framework |
| Market operator | Business | A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility. | The market operator will receive the prequalified limits for the transmission and distribution system and will ensure the allocation of awarded bids to the FSPs according to these limits |
| Database with historical data | Database | Database that contains historical data related to the operation of the system | The SUC will use the historical data in order to determine the prequalified limits |

### 10.2.2.2.4 Step by step analysis of use case

#### *10.2.2.2.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Prequalification of operational limits | The TSO or DSO monitors the grid operation through the real time monitoring system. In order to ensure that the operation of the system that will remain within the admissible limits even after the provision of some services by the FSPs, they calculate prequalified limits in the | TSO, DSO and Market Operator | Consecutive event before the clearing of the market | Provision of accurate monitoring information for the real time monitoring scheme. Availability of historical data | Accurate and calculation of the limits that ensure the safe operation of the system upon the provision of services from FSPs |


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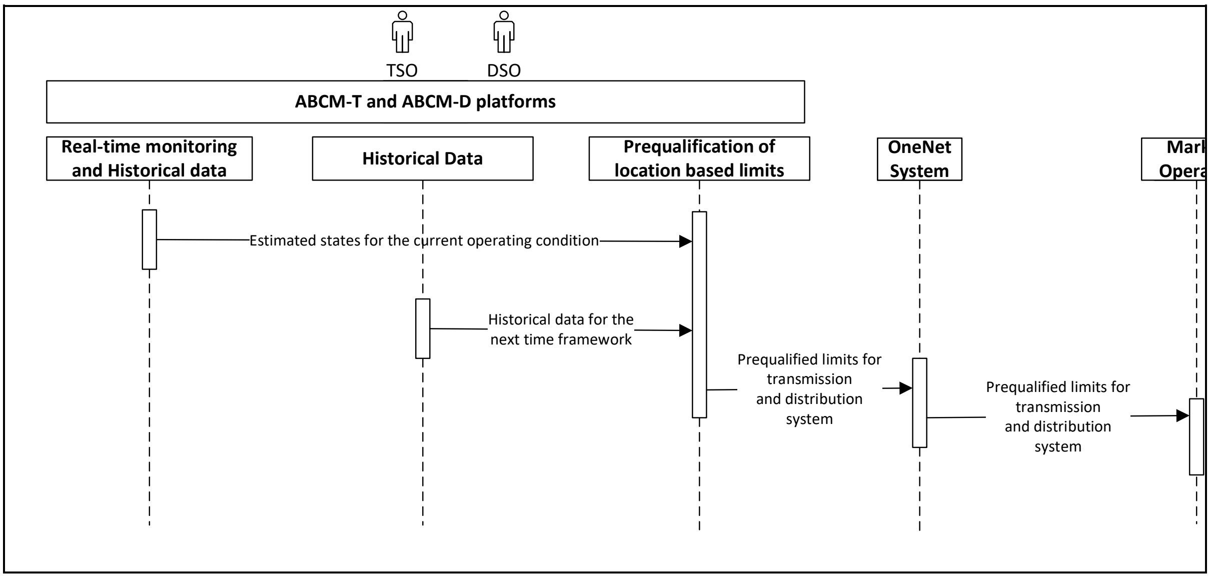
| | | | | | | |
|---|---|---|---|---|---|---|
| | | interface between the HV/MV (TSO) and MV/LV (DSO) that FSPs exist. The limits are sent to the market (TSO market or local DSO market) in order to be taken into consideration by the market operator in the allocation of the awarded bids to the FSPs. | | | | |

###### 10.2.2.2.4.2 Steps - Scenarios

###### 10.2.2.2.4.2.1 Scenario name #1: Prequalification of operational limits

Scenario #1 description




Scenario step by step analysis

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | | Prequalification of operational limits | | | | | | |
| ***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 | Real time monitoring sends estimated states to the block for limit prequalification | Receive real time data for the current operating condition | The SUC receive real time information for the current operating condition by the real time monitoring in order to be able | CAPTURE | TSO, DSO/ABCM-T, ABCM-D/real time monitoring | TSO, DSO/ABCM-T, ABCM-D/Prequalification | I-01 | |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | to determine the prequalification limits | | | | | |
| 1.2 | Retrieve historical data for the current and next time instants (until the market clearing) | Receive historical data | Historical data related to the operation of the system for the current as well as for the next time instants (until the market is cleared) are received | CAPTURE | Database with historical data | TSO, DSO/ABCM-T, ABCM-D/Prequalification | I-02 | |
| 1.3 | Prequalification limits are calculated and sent to the market operator | Extraction and publication of prequalification limits | The prequalification limits are calculated through the algorithm for the prequalification that is situated to the ABCM-T and ABCM-D platform. The TSO and DSO forward the limits through the OneNet system to the Market Operator (TSO and local DSO market) | CREATE | TSO, DSO/ ABCM-T, ABCM-D/ Prequalification | Market operator | I-03 | |

### 10.2.2.2.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| I-01 | Estimated states | Real time monitoring scheme sends the estimated states to the limit prequalification algorithm located at the ABCM-T and ABCM-D platform | Communication of the monitoring scheme with the SUC. |
| I-02 | Historical data | Historical data for the grid operation are sent to the limit prequalification algorithm. The historical data are related to the current and future time instants (until the clearing of the market). | Communication of the historical data database with the SUC. |

| | | | |
|---|---|---|---|
| I-03 | Prequalification limits | TSO and DSO send the prequalification limits to the Market Operator through the OneNet system | Communication between TSO/DSO with the Market |

### 10.2.2.3 DSUC_SO_CY_03

#### 10.2.2.3.1 Description of the use case

##### *10.2.2.3.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_SO_CY_03 | Cyprus | Evaluation of the Flexible Service Providers response |

##### *10.2.2.3.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 18/06/2021 | Markos Asprou and Lenos Hadjidemetriou | Initial definition of the SUC (up to section 1.4) | |
| 2 | 23/08/2021 | Markos Asprou and Lenos Hadjidemetriou | Detailed definition of the SUC (section 1-5) | |

##### *10.2.2.3.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | This SUC will use available monitoring information (from SCADA, smart meters, PMUs) to evaluate the response of the FSPs located at the transmission and the distribution grid after the provision of grid services. The objective of the SUC is to determine if the response of the FSPs corresponds to the awarded bids cleared by the TSO and local DSO market respectively. |
| ***Objective(s)*** | • Real time monitoring or estimation of the FSPs response under different operating conditions.<br>• Evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market |
| ***Related business case(s)*** | • BUC1: Active power flexibility<br>• BUC2: Reactive power flexibility and power quality services |

##### *10.2.2.3.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |


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| |
|---|
| This SUC deals with the evaluation of the response of the FSPs according to the awarded bids cleared by the electricity market. Real-time information will be used to monitor the FSPs response regarding the provision of flexibility services, and an evaluation report will be produced to determine if the response of the FSPs corresponds to the activation bids awarded by the market. |
| ***Complete description*** |
| Real time measurement will be obtained by TSO and DSO to evaluate the response of the FSPs. For large-scale FSPs connected to the transmission grid, SCADA and PMU measurements will be obtained to monitor if the FSPs are operate according to the awarded bids cleared by the market. For the small-to medium-scale FSPs connected to the distribution grid, smart meter and SCADA measurements will be utilized to monitor or estimate the performance of FSP considering aggregation and location-based clustering. An evaluation report will be produced by each operator (TSO and DSO) to assess if the FSPs connected to each system operate according to the market awards. This evaluation report will be published to both the FSPs and the market operators. |

##### *10.2.2.3.1.5 Key performance indicators (KPI)*

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Deviation of the FSP response compared to the awarded bids | This is an indicator to assess if the response of the FSPs corresponds to the awarded bids by the market. The indicator will provide a percentage of how much each FSP response is in line with its market obligation. | This KPI is related to objective regarding the evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market |

##### *10.2.2.3.1.6 Use case conditions*

| ***Use case conditions*** |
|---|
| ***Assumptions*** |
| This system use case will be based on the following assumptions:<br>• The use case will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system.<br>• The TSO, DSO control centre and the energy market will be emulated in the demo architecture.<br>• The energy market will be based on a generic market setup in the absence of an energy market in Cyprus<br>• Additional PVs and energy storage systems will be installed to represent near future conditions.<br>• Aggregators and prosumers will be emulated in the demonstration considering online coordination capabilities by system operators. |
| ***Prerequisites*** |
| This system use case has the following prerequisites:<br>• Provision of PMU data and SCADA measurements from the transmission system operation<br>• Provision of smart meter and SCADA measurements from the distribution grid<br>• Provision of direct SCADA measurements from large and medium scale FSPs. |

#### 10.2.2.3.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|



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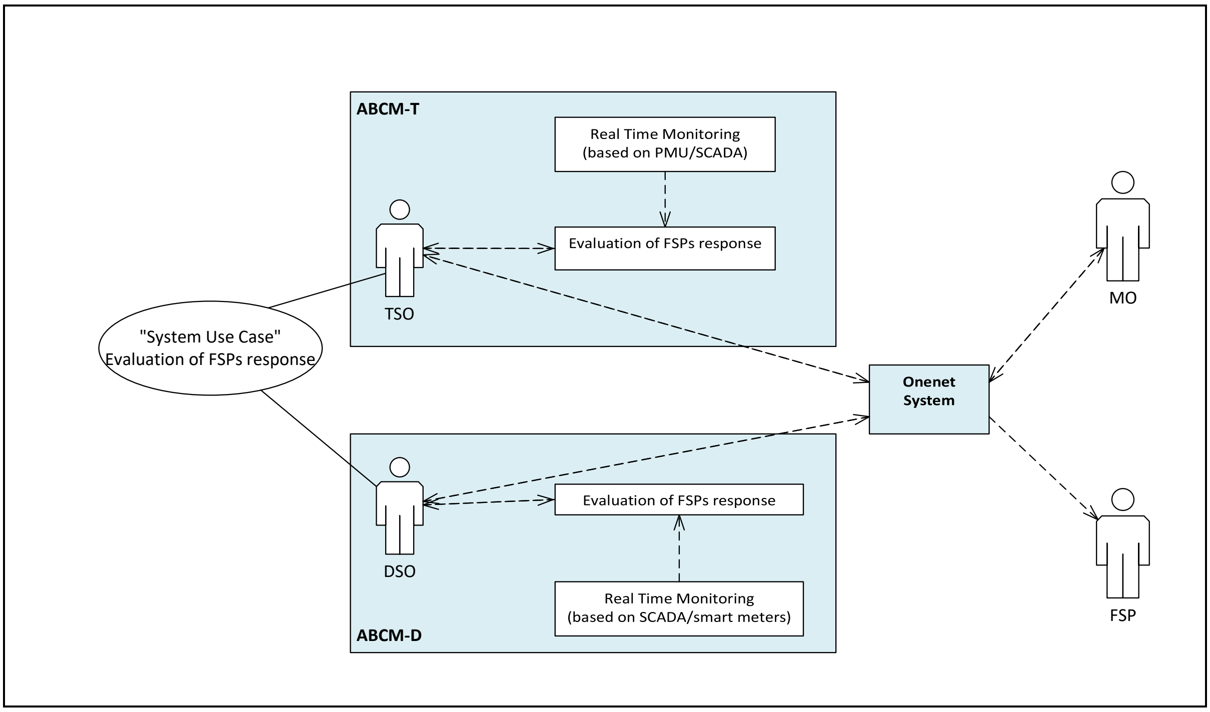


### 10.2.2.3.3 Technical details

#### *10.2.2.3.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Transmission System Operator (TSO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the transmission grid to meet reasonable demands for the transmission of electricity. | TSO will use real-time measurements to monitor and evaluate the response of large-scale FSPs, connected to the transmission grid, considering the cleared awards by the market. TSO will produce evaluation reports for the FSPs response and will publish this report to both the FSPs and the market operator. |
| Distribution System Operator (DSO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, for ensuring the long-term ability of the distribution grid to meet reasonable demands for the distribution of electricity. | DSO will use real-time measurements to monitor, estimate and evaluate the response of small- and medium FSPs, connected to the distribution grid, considering the cleared awards by the market. DSO will produce evaluation reports for the FSPs response and will publish this report to both the FSPs and the market operator. |
| Market operator | Business | A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility. | After clearing the market, the market operator publishes the cleared awarded bids to the FSPs (responsible for the provision of related services) and to the system operators (TSO and DSO to monitor FSPs and evaluate their proper response. |


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| | | | |
|---|---|---|---|
| | | | Market operator will also receive the evaluation report by the system operator to be informed if the FSPs operated according to the cleared market decisions. |
| Flexibility Service Provider (FSP) | Business | A party providing flexibility services to energy stakeholders via bilateral agreements or flexibility markets. | FSP will provide frequency support (i.e., frequency droop control and synthetic inertia) or location-based congestion management services (i.e., reactive support, phase balancing, etc.) according to the awarded bids cleared by the market and the coordination signals (if applicable) by the system. |

### 10.2.2.3.4 Step by step analysis of use case

#### *10.2.2.3.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Assessment of FSPs response | This scenario examines the assessment of the appropriate response of the FSPs according to the awarded bids in the market. The TSO and DSO will manually trigger this SUC by the end of the examined period through the ABCM-T and ABCM-D platform respectively. For the period under assessment, the SUC will use monitoring and estimation techniques to evaluate if the response of the FSPs for providing grid services (i.e., frequency support, congestion management, etc.) corresponds to the awarded bids cleared by the market. The SUC in ABCM-T platform will produce an evaluation report for the large-scale FSPs connected to the transmission grid while the SUC in ABCM-D will produce the report for the small- and medium-scale FSPs connected at the distribution grid. Both platform will publish the evaluation report to both the FSPs and the corresponding market (TSO market and local DSO market) through the OneNet system. | -FSP<br>-TSO<br>-DSO<br>-Market operators | TSO and DSO will manually trigger this SUC in the corresponding ABCM-T and ABCM-D platforms respectively, after the end of the examined period. | -The market clears the awarded bids for the provision of grid services by the FSPs<br>-FSPs are informed about the awarded bids that are obligated for the examined period (hours-ahead or day-ahead)<br>-Real-time measurements from PMU, SCADA and smart meters are received by the operators to be able to monitor and estimate the performance of the FSPs | - The evaluation report generated by Evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market |


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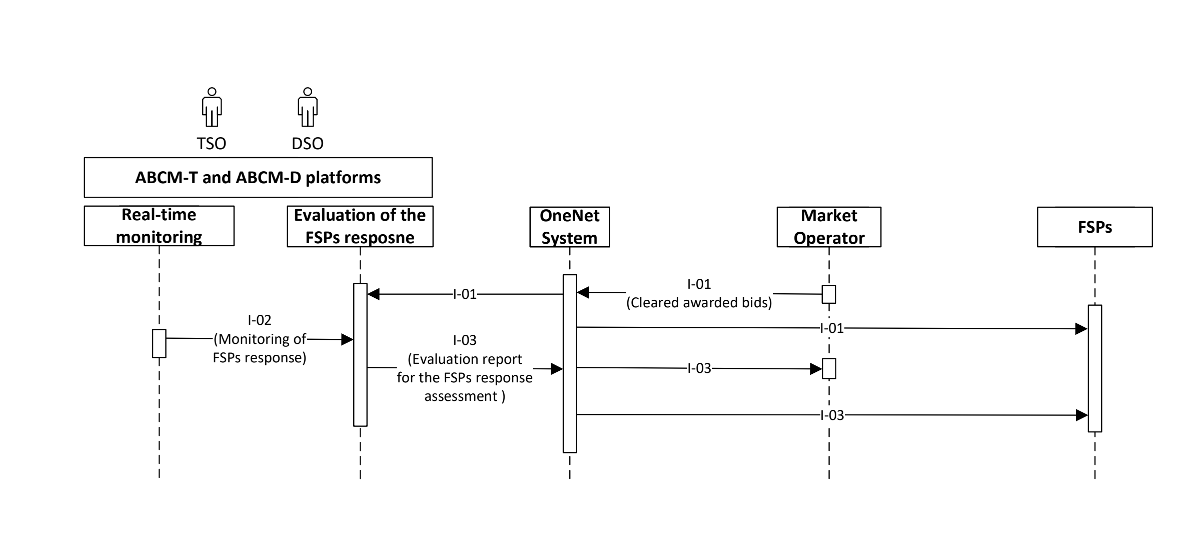
#### 10.2.2.3.4.2 Steps - Scenarios

##### 10.2.2.3.4.2.1 Scenario name #1

Scenario #1 description




Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Assessment of FSPs response | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 1.1 | The market operator publishes the cleared awarded bids. | Publication of awarded bids | Market operator published the cleared awarded bids to the operators and to the FSPs through the OneNet system | CREATE | Market Operator | TSO, DSO, FSPs | I-01 | |
| 1.2 | Provision of grid services by the FSPs | Provision of services | The FSP has received the cleared awarded bids by the market and, during the operation, the FSPs provide the related grid services according to the operators coordination signal or according to the event characteristics | EXECUTE | FSP | TSO, DSO | No information exchange | |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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.3 | Monitoring the operation of FSPs | Monitoring of FSP response | The real-time monitoring SUC of both the transmission and distribution grid are running in the ABCM-T and ABCM-D platforms respectively. The real-time monitoring considers PMU, SCADA and smart meters measurements to identify the response of the FSP. The information generated by this is used by the TSO and DSO to monitor their system operation and by the evaluation of FSPs response to assess their operation. | CREATE | ABCM-T/ Real-time Monitoring<br><br>ABCM-D/ Real-time Monitoring | TSO and<br>ABCM-T/ Evaluation of FSPs response<br><br>DSO and<br>ABCM-d/ Evaluation of FSPs response | I-02 | |
| 1.4 | Assess the FSPs response during the examined period | FSPs response assessment | The real-time monitoring results are used to evaluate if the FSPs response corresponds to the awarded bids cleared by the market. The FSP evaluation report is produced by the TSO and DSO, and it is published to the Market Operators and the FSPs through the OneNet system | CREATE | TSO through the ABCM-T/ Evaluation of FSPs response<br><br>DSO through the ABCM-D/ Evaluation of FSPs response | Market Operator, and FSPs | I-03 | |

### 10.2.2.3.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| I-01 | Cleared awarded bids | Market operators send the awarded bids to the qualified FSPs in both transmission and distribution level and to the TSO and DSO though the OneNet system | Communication between Market Operators and the TSO, DSO and the FSPs through OneNet system |
| I-02 | Monitoring of FSPs | This information includes the real-time monitoring of the FSPs response. The information is generated by the real-time monitoring use case and will be used by the evaluation of the FSPs response use case to assess the FSP operation. | Communication between the real-time monitoring and the evaluation of the FSPs response system use cases within the ABCM-T and ABCM-D platform |





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| | | | |
|---|---|---|---|
| I-03 | Evaluation report for FSPs | This report includes the assessment of each FSP considering its response according to the cleared awarded bids. The report is published by the operators platform (ABCM-T and ABCM-D) and is send to the market operators and the FSPs through the OneNet system. | Communication between TSO/DSO and the Market Operators and the FSPs through OneNet system |

### 10.2.2.4 DSUC_SO_CY_04

#### 10.2.2.4.1 Description of the use case

##### *10.2.2.4.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_SO_CY_04 | Cyprus | Coordination of the distributed flexible resources |

##### *10.2.2.4.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 18/06/2021 | Markos Asprou and Lenos Hadjidemetriou | Initial definition of the SUC (up to section 1.4) | |
| 2 | 24/08/2021 | Markos Asprou and Lenos Hadjidemetriou | Detailed definition of the SUC (section 1-5) | |

##### *10.2.2.4.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | This SUC will use available monitoring information (from SCADA, smart meters, PMUs) to evaluate the response of the FSPs located at the transmission and the distribution grid after the provision of grid services. The objective of the SUC is to determine if the response of the FSPs corresponds to the awarded bids cleared by the TSO and local DSO market respectively.<br><br>On-line coordination of the services provided by the distributed flexible resources to avoid operational limit violations and ensure the reliable, stable, efficient and high-quality operation of distribution grids. This SUC will be integrated within the ABCM-D platform to coordinate the operation of the available flexible resources (according to the market clearing) by considering the monitoring information (from SCADA and smart meters). The coordination signal will be sent by the DSO to the flexible resources to maintain the proper operation. |
| ***Objective(s)*** | ○ Coordinate (on-line) the available flexible resources according to the grid operating conditions<br>○ Relieve congestions and achieve an efficient, stable and high-quality operation of the power grid by coordinating the flexibility resource located in the distribution grid |


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| Related business case(s) | ○ BUC1: Active power flexibility<br>○ BUC2: Reactive power flexibility and power quality services |
|---|---|

##### 10.2.2.4.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| **Short description** |
| This SUC allows the DSO to online coordinate the flexible resources connected to the distribution grid to achieve the stable, efficient and high-quality operation of the power grid. In this coordination scheme, the flexibility services related to the location-based awarded bids cleared by the local DSO market and the real-time grid operating conditions are considered to maintain an appropriate operation of the distribution grid by the DSO. |
| **Complete description** |
| The coordination of the distributed flexible resources aims to maintain a high-quality, stable and efficient operation of the grid by exploiting the location-based flexibility services. This system use case will consider as input the information regarding the real-time operating conditions of the distribution grid as indicated by the real-time monitoring use case of the ABCM-D platform. Furthermore, information for the awarded bids for location-based flexibility as cleared by the local DSO market is also required for the execution of the use case. Considering the real-time monitoring of the distribution grid and the available flexibility of the Flexible Services Providers (FSPs), sophisticated algorithms will be integrated within the ABCM-D platform to allow this use case to online coordinate the overall operation of the distribution grid. As a result, the DSO will be able to explore the flexibility services provided by the local FSPs to maximize the efficiency, stability and quality of its system. |

##### 10.2.2.4.1.5 Key performance indicators (KPI)

| Key performance indicators | | | |
|---|---|---|---|
| **ID** | **Name** | **Description** | **Reference to mentioned use case objectives** |
| 1 | Overloading | This indicator will provide information for the duration and the intensity of the overloading conditions occurs at the distribution grid | This KPI is related to the relief of congestions while achieving an appropriate and stable operation of the distribution grid |
| 2 | Voltage limits violations | This indicator will provide information for the duration and the intensity of the over/under-voltage conditions occurs at the distribution grid | This KPI is related to the relief of congestions while achieving an appropriate and stable operation of the distribution grid |
| 3 | Energy losses | This indicator will assess the energy losses and the efficiency of the distribution grid. | This KPI is related to the efficient operation of the distribution grid |
| 4 | Loading asymmetries | This indicator will provide information about the loading asymmetry among the three phases for the distribution grid. | This KPI is related to the high-quality operation of the distribution grid. |

##### 10.2.2.4.1.6 Use case conditions

| Use case conditions |
|---|
| **Assumptions** |
| This system use case will be based on the following assumptions: |


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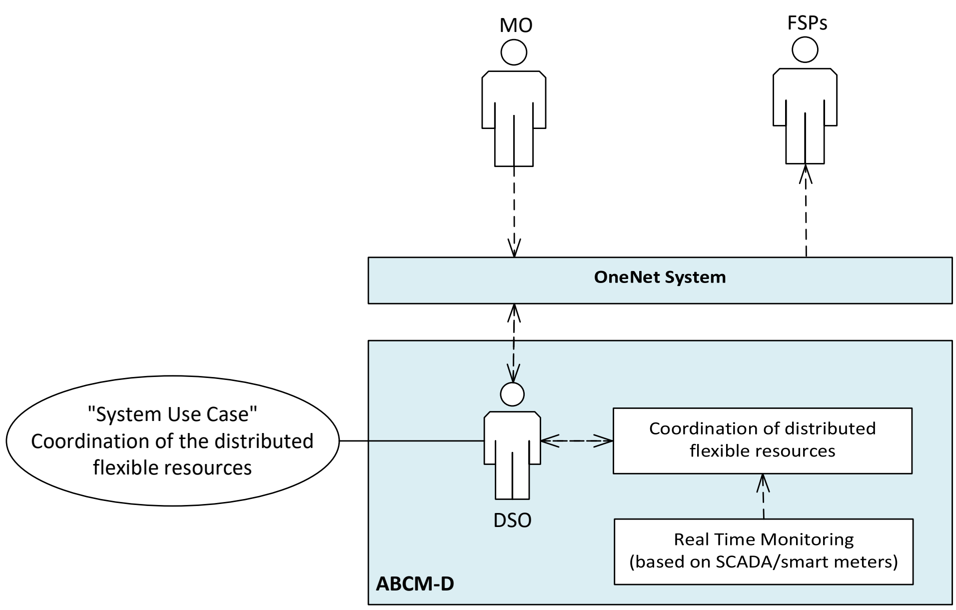
| |
|---|
| • The use case will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system.<br>• The TSO, DSO control centre and the energy market will be emulated in the demo architecture.<br>• The energy market will be based on a generic market setup in the absence of an energy market in Cyprus<br>• Additional PVs and energy storage systems will be installed to represent near future conditions.<br>• Aggregators and prosumers will be emulated in the demonstration considering online coordination capabilities by system operators. |
| ***Prerequisites*** |
| This system use case has the following prerequisites:<br>• Provision of PMU data and SCADA measurements from the transmission system operation<br>• Provision of smart meter and SCADA measurements from the distribution grid<br>• Communication between the DSO control centre (ABCM-D platform) and the local FSPs connected to the distribution grid through the OneNet system. |

#### 10.2.2.4.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|
|  |



#### 10.2.2.4.3 Technical details

##### *10.2.2.4.3.1 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*** |
| Transmission System Operator (TSO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the transmission grid to meet reasonable demands for the transmission of electricity. | TSO will use real-time measurements to monitor and evaluate the response of large-scale FSPs, connected to the transmission grid, considering the cleared awards by the market. TSO will produce evaluation reports for the FSPs response and will publish this report to both the FSPs and the market operator. |
| Distribution System Operator (DSO) | Business | A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, for ensuring the long-term ability of the distribution grid to meet reasonable demands for the distribution of electricity. | DSO will use real-time measurements to monitor, estimate and evaluate the response of small- and medium FSPs, connected to the distribution grid, considering the cleared awards by the market. DSO will produce evaluation reports for the FSPs response and will publish this report to both the FSPs and the market operator. |
| Market operator | Business | A market operator is a party that provides a service whereby the offers to sell electricity or electricity flexibility are matched with bids to buy electricity or electricity flexibility. | After clearing the market, the market operator publishes the cleared awarded bids to the FSPs (responsible for the provision of related services) and to the system operators (TSO and DSO to monitor FSPs and evaluate their proper response. Market operator will also receive the evaluation report by the system operator to be informed if the FSPs operated according to the cleared market decisions. |
| Flexibility Service Provider (FSP) | Business | A party providing flexibility services to energy stakeholders via bilateral agreements or flexibility markets. | FSP will provide frequency support (i.e., frequency droop control and synthetic inertia) or location-based congestion management services (i.e., reactive support, phase balancing, etc.) according to the awarded bids cleared by the market and the coordination signals (if applicable) by the system. |

### 10.2.2.4.4 Step by step analysis of use case

#### *10.2.2.4.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Coordination of flexible resources for the appropriate operation of the | This scenario examines the appropriate operation of the distribution grid by exploiting the local flexibilities provide by the FSPs. The market will publish the cleared awarded bids associated with the local flexibility services. During operation, the load and the distributed resources connected to the distribution grid may cause overloading or over/under-voltage contingencies, | -DSO<br>-FSP<br>-Market operator | DSO will activate this SUC through the ABCM-D platform to enable the automatic | -The market clears the location-based awarded bids for the provision of | The appropriate, efficient and high-quality operation of the distribution grid is achieved |



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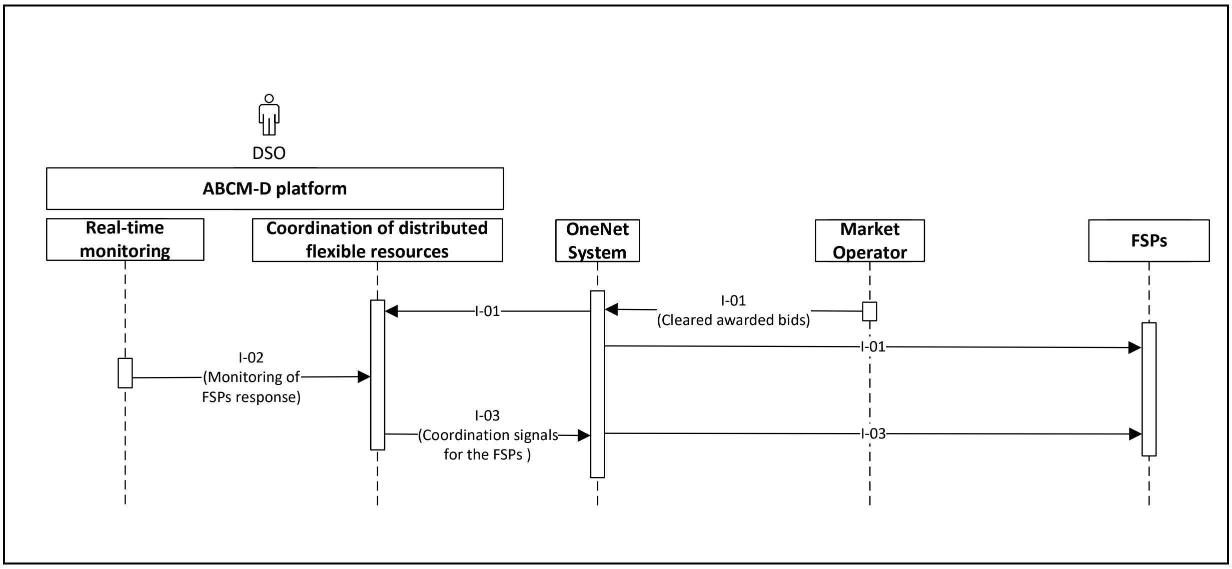
| | | | | | | |
|---|---|---|---|---|---|---|
| | distribution grid | while intense reactive power and asymmetric loading conditions may deteriorate the efficiency and power quality of the distribution grid and thus, a real-time monitoring is required to enhance the situational awareness of the DSO. In this scenario, the DSO will consider the available local flexibility services and the real-time monitoring of the grid operating conditions in order to online coordinate the provision of flexibilities by the local FSPs. The coordination aims to relieve congestions and achieve an efficient, stable and high-quality operation of the distribution grid given an intense penetration of renewable energy. The coordination schemes will be integrated within the ABCM-D platform to allow the DSO to maintain an appropriate operation and the communication between the DSO and the FSPs will be enabled through the OneNet system. | | coordination of the local FSPs to maintain the appropriate operation of the distribution grid. | grid services by the local FSPs<br>-FSPs are informed about the awarded bids that are obligated for the examined period (hours-ahead or day-ahead)<br>-Real-time measurements from PMU, SCADA and smart meters are received by the operators to be able to monitor and online coordinate the local FSPs. | by the DSO through the online coordination of the FSPs (through the ABCM-D platform). |

*10.2.2.4.4.2 Steps - Scenarios*

*10.2.2.4.4.2.1 Scenario name #1*

Scenario #1 description




Scenario step by step analysis

| ***Scenario*** |
|---|





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| *Scenario name* | | Coordination of FSPs | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Step No*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Require ment, R-IDs*** |
| 1.1 | The market operator publishes the cleared awarded bids. | Publication of awarded bids | Market operator publishes the cleared awarded bids for the local flexibility services to the operators and to the FSPs through the OneNet system | CREATE | Market Operator | DSO (ABCM-D/Coordinatio n of flexible r, FSPs | I-01 | |
| 1.2 | Monitoring of the grid operation conditions | Grid monitoring | The real-time monitoring SUC for the distribution grid is running in the ABCM-D, considering live measurements from the SCADA and the smart meters. The grid monitoring information generated by the real-time monitoring is provided as input to the coordination of distributed flexible resources use case. The latter use case, also running within the ABCM-D platform, processes the monitoring information to achieve the coordination of the distribution grid by the DSO. | CREATE | DSO (ABCM-D/ Real-time Monitoring) | DSO (ABCM-D/ Coordination of distributed flexible resources) | I-02 | |
| 1.3 | Coordination of FSPs | Coordination signals for FSPs | This process is related to the coordination of the FSPs by the DSO to maintain the appropriate, stable and efficient operation of the distribution grid. The coordination of distributed flexible resources use case, running within the ABCM-D platform, considers the available location- | CREATE | DSO (ABCM-D/ Coordination of distributed flexible resources) | FSPs | I-03 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | based flexibility resource in combination with the real-time information for the grid operating conditions and sophisticated algorithms are used to define the coordination signals for the local FSPs. These signals are sent to the FSPs, though the OneNet system, to regulate the overall operation of the distribution grid. | | | | | |
| 1.4 | Provision of grid services by the FSPs | Provision of services | The FSP has received the coordination signals by the ABCM-D platform (coordination of distributed flexible resources) and regulate their operation according to those signals. | EXECUTE | FSP | DSO | No information exchange | |

#### 10.2.2.4.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| I-01 | Cleared awarded bids | Market operators send the awarded bids for the location-based services to the qualified FSPs (located at the distribution level) and to the DSO (ABDM-D platform) though the OneNet system | Communication between Market Operators and the DSO and the FSPs through OneNet system |
| I-02 | Grid monitoring | This information includes the real-time monitoring of the distribution grid to enhance the situational awareness of the DSO and to enable online coordination of the FSPs to maintain the appropriate operation of the distribution grid. | Communication between the real-time monitoring and the coordination of distributed flexible resources system use cases within the ABCM-D platform |
| I-03 | Coordination signals for the FSPs | This information includes the coordination signals by the DSO for regulating the provision of location-based flexibilities by the FSPs. These signal are sent by the ABCM-D platform to the DSO, through the OneNet system, to achieve the appropriate, efficient and high-power quality operation of the distribution grid. | Communication between DSO (ABCM-D platform) and the FSPs through OneNet system |



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## 10.3 Western Cluster

### 10.3.1 PORTUGESE DEMO

#### 10.3.1.1 DSUC_WE_PT_01

##### 10.3.1.1.1 Description of the use case

###### *10.3.1.1.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***DSUC_WE_PO_01*** | | SUC 01 - Evaluation of the Product & Grid prequalification requirements |

###### *10.3.1.1.1.2 Version management*

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

###### *10.3.1.1.1.3 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.<br>- Enable FSPs and their resources for flexibility markets, since Prequalification phase is necessary for the following phases that we will approach.<br>- List of requirements for product prequalification for DSO and TSO.<br>- Ensure coordination between system operators for all scenarios.<br>- Receive and send data between system operators in a secure manner. |
| ***Related business case(s)*** | WECL-PT-01 & WECL-PT-02 |



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#### 10.3.1.1.1.4 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 an FSP. We also separate the processes for DSO and TSO when necessary.<br>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.<br>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:<br>Comprehensive grid data -selecting the most efficient combination of flexibilities and switching of topology<br>Partial grid data -using essentially the sensitivities of flexibilities, e.g., Traffic lights system.<br>Simple Rule – Empirical selection<br>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. |

#### 10.3.1.1.1.5 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. |

#### 10.3.1.1.1.6 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*** |





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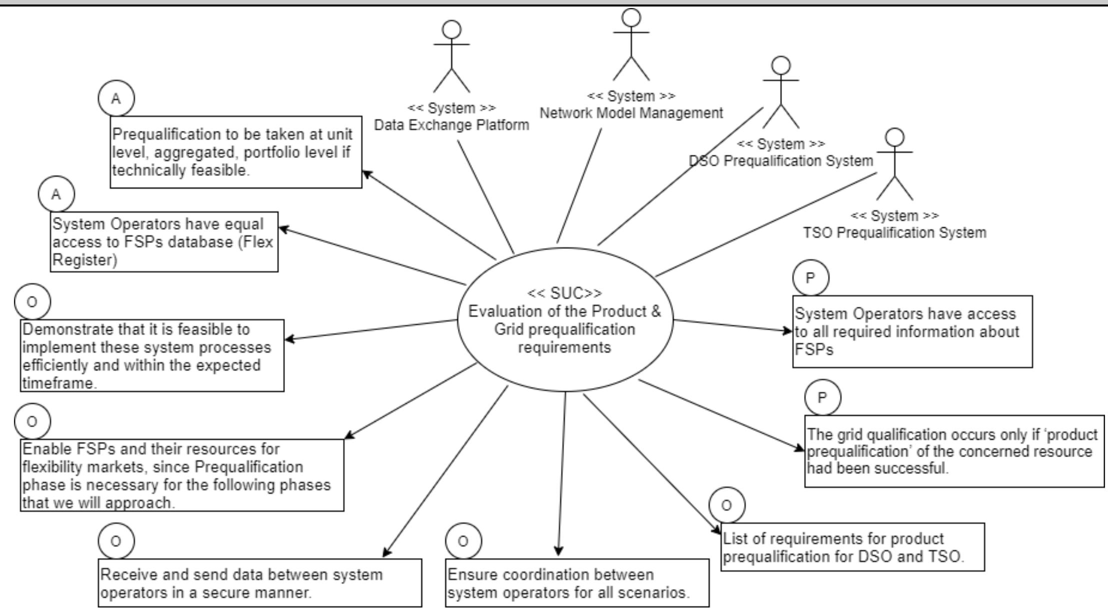
| |
|---|
| National |
| ***Nature of the use case*** |
| |
| ***Further keywords for classification*** |
| Congestion Management; Flexibility; Prequalification |

### 10.3.1.1.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|
|  |



### 10.3.1.1.3 Technical details

#### *10.3.1.1.3.1 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 included in the scheduled data. | |

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| | | | |
|---|---|---|---|
| | | The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales.<br><br>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).<br>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.<br>It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information.<br>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.<br><br>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. | |

### 10.3.1.1.4 Step by step analysis of use case

#### *10.3.1.1.4.1 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 | | |

#### *10.3.1.1.4.2 Steps – Scenarios*

##### *10.3.1.1.4.2.1 Scenario #1: Prequalification for FSPs connected to Distribution Grid*


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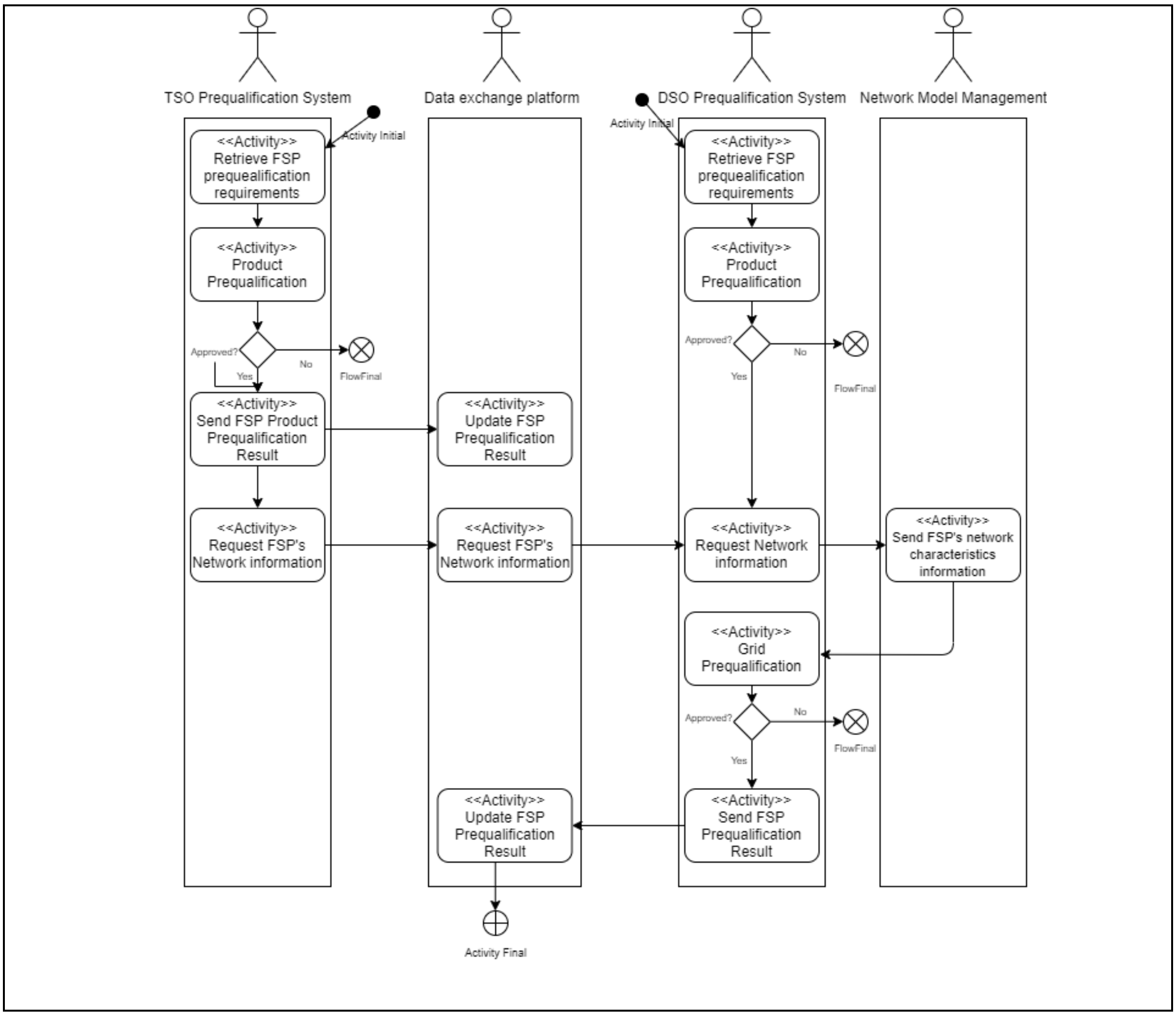


## Scenario step by step analysis

| 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 prequalification requirements | **For FSPs interested in DSO market:** *Prequalification Requirements (Eliminatory):* -Mode of activation (If it is Automatic should be tested) -Minimum Quantity | | DSO Prequalification System | | | |



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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | *Prequalification Requirements (Non-Eliminatory):*<br>-Flexibility direction (load/generation reduction/increase, both)<br>-Locational information and SO connected<br>-Maximum duration of delivery period offer<br>-Single or Aggregated portfolio?<br>-Capacity/Energy<br>-Maximum Full Activation time | | | | | | |
| 1.2 | | Product Prequalification | **For FSPs interested in DSO market:**<br>Requirements to be evaluated in the prequalification of the product:<br>- Mode of activation (If it is Automatic should be tested)<br>-Minimum Quantity (0.01 MW) | | DSO Prequalification System | | | | |
| 1.1 | | Retrieve FSP prequalification requirements | **For FSPs interested in TSO market:**<br>*Prequalification Requirements (Eliminatory):*<br>- Mode of activation (If it is Automatic should be tested)<br>- Minimum Quantity<br>*Prequalification Requirements (Non-eliminatory):*<br>-Flexibility direction (load/generation reduction/increase, both) | | TSO Prequalification System | | | | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | -Locational information and SO connected<br>-Maximum duration of delivery period offer<br>-Single or Aggregated portfolio?<br>-Capacity/Energy<br>- Maximum Full Activation time | | | | | |
| 1.2 | | Product Prequalification | **For FSPs interested in TSO market:**<br>Requirements to be evaluated in the prequalification of the product:<br>-Mode of activation (If it is Automatic should be tested)<br>-Minimum Quantity (1 MW) | | TSO Prequalification System | | | |
| 1.3 | | Send FSP Product Prequalification Result | **If FSP is interested in TSO Market:**<br>Send the Product Prequalification result | | TSO Prequalification System | Data exchange platform | ID-1 | |
| 1.4 | | Update FSP Prequalification Result | **If FSP is interested in TSO Market:**<br>Update the FSP's Product Prequalification result | | Data exchange platform | | | |
| 1.5 | | Request FSP's Network information | **If FSP is connected to Distribution Grid:**<br>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:**<br>Send the requirements from step 1.1 | | Data exchange platform | DSO Prequalification System | ID-2 | |
| 1.5 | | Request Network information | The DSO Flexibility System should request the network information around | | DSO Prequalification System | Network Model Management | ID-3 | |





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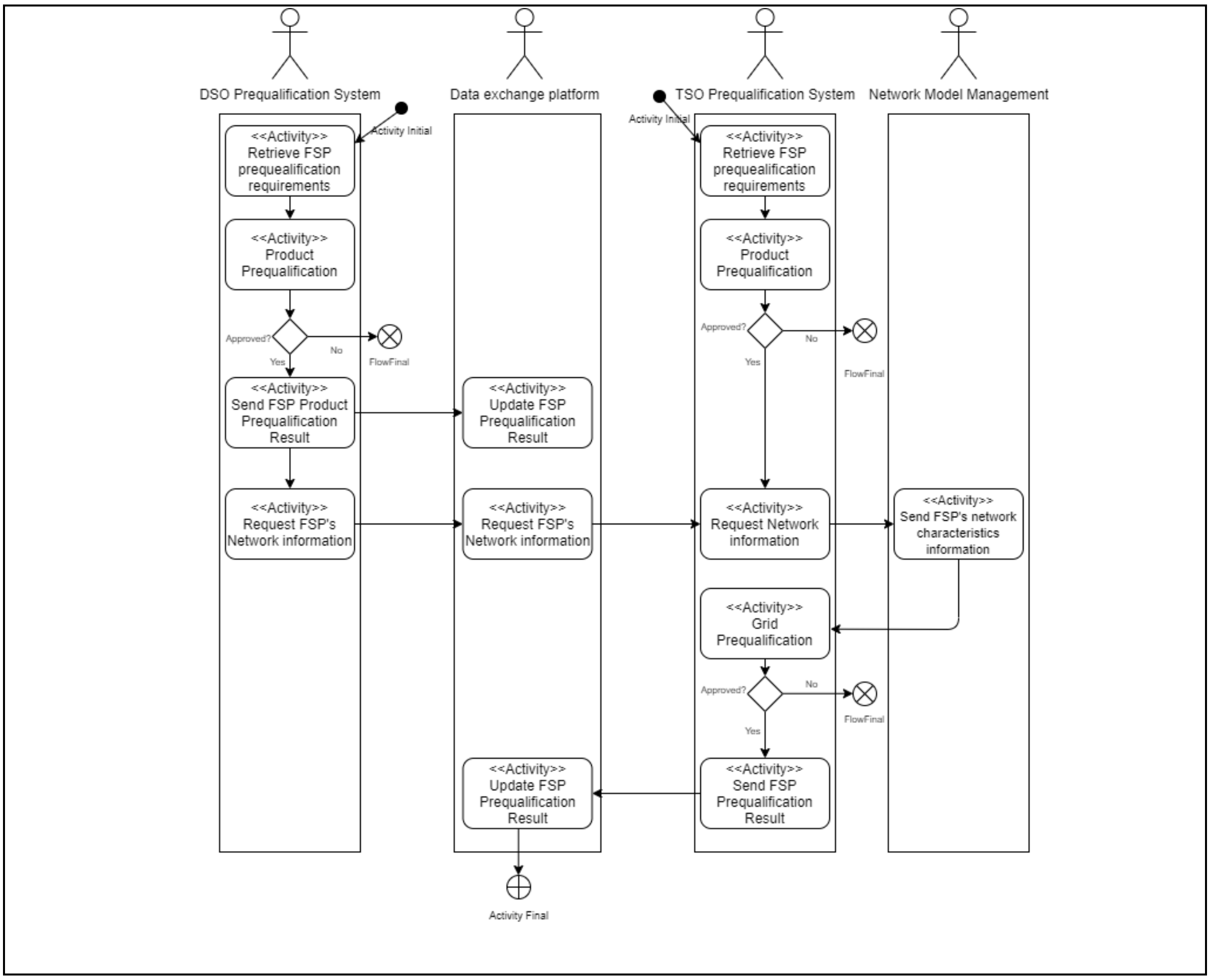
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | the FSP to make the Grid Prequalification | | | | | |
| 1.6 | | Send network information | Provide the required network information | | Network Model Management | DSO Prequalification System | ID-4 (internal information) | |
| 1.7 | | 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. **If FSP is interested in TSO Market:** Send the Grid Prequalification result | | DSO Prequalification System | Data exchange platform | ID-5 | |
| 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 | | | |

#### 10.3.1.1.4.2.2 Scenario #2: Prequalification for FSPs connected to Transmission Grid




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 prequalification requirements | **For FSPs interested in TSO market:** *Prequalification Requirements (Eliminatory):* -Mode of activation (If it is Automatic should be tested) | | TSO Prequalification System | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | - Minimum Quantity<br>*Prequalification Requirements (Non-Eliminatory):*<br>- Flexibility direction (load/generation reduction/increase, both)<br>- Locational information and SO connected<br>- Maximum duration of delivery period offer<br>- Single or Aggregated portfolio?<br>- Capacity/Energy<br>- Maximum Full Activation time | | | | | |
| 1.2 | | Product Prequalification | **For FSPs interested in TSO market:**<br>*Requirements to be evaluated in the prequalification of the product:*<br>- Mode of activation (If it is Automatic should be tested)<br>- Minimum Quantity (1 MW) | | TSO Prequalification System | | | |
| 1.1 | | Retrieve FSP prequalification requirements | **For FSPs interested in DSO market:**<br>*Prequalification Requirements (Eliminatory):*<br>-Mode of activation (If it is Automatic should be tested) | | DSO Prequalification System | | | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | -Minimum Quantity<br>*Prequalification Requirements (Non-Eliminatory):*<br>- Flexibility direction (load/generation reduction/increase, both)<br>- Locational information and SO connected<br>- Maximum duration of delivery period offer<br>- Single or Aggregated portfolio?<br>-Capacity/Energy<br>-Maximum Full Activation time | | | | | |
| 1.2 | | Product Prequalification | **For FSPs interested in DSO market:**<br>*Requirements to be evaluated in the prequalification of the product:*<br>- Mode of activation (If it is Automatic should be tested)<br>- Minimum Quantity (0.1 MW) | | DSO Prequalification System | | | |
| 1.3 | | Send FSP Product Prequalification Result | **If FSP is interested in TSO Market:**<br>Send the Product Prequalification result | | DSO Prequalification System | Data exchange platform | ID-1 | |
| 1.4 | | Update FSP Prequalification Result | **If FSP is interested in TSO Market:**<br>Update the FSP's Product | | Data exchange platform | | | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Prequalification result | | | | | |
| 1.5 | | Request FSP's Network information | **If FSP is connected to Transmission Grid:**<br>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:**<br>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:**<br>Send the Product and Grid prequalification result.<br>**If FSP is interested in DSO Market:**<br>Send the Grid Prequalification result | | TSO Prequalification System | Data exchange platform | ID-5 | |




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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.9 | | Update FSP Prequalification Result | **If FSP is interested in TSO Market:**<br>Update the FSP's Product and Grid prequalification result.<br>**If FSP is interested in DSO Market:**<br>Update the FSP's Grid Prequalification result | | Data exchange platform | | | |

#### 10.3.1.1.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| ID-1 | Product Prequalification Result | ID<br>Name<br>Resource<br>Mode of activation (If it is Automatic should be tested)<br>Minimum Quantity<br>Flexibility direction (load/generation reduction/increase, both)<br>Locational information and SO connected<br>Maximum duration of delivery period offer<br>Single or Aggregated portfolio?<br>Capacity/Energy<br>Maximum Full Activation time<br>Mandatory: Product Prequalification Result: (Approved/Reproved) | |
| ID-2 | FSP information for Grid Prequalification | ID<br>Name<br>Resource<br>Mode of activation (If it is Automatic should be tested)<br>Minimum Quantity<br>Flexibility direction (load/generation reduction/increase, both)<br>Locational information and SO connected<br>Maximum duration of delivery period offer | ID-1 |



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| | | | |
|---|---|---|---|
| | | Single or Aggregated portfolio?<br>Capacity/Energy<br>Maximum Full Activation time<br>Mandatory: Product Prequalification Result: (Approved) | |
| ID-3 | Request the network information | The structural information of the network (lines) characteristics is required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation centre.<br><br>A structural network information request consists of:<br>Int. Request ID<br>Type of request<br>Substation (All grid information from the substation)<br>Transformer (All the information from the transformer)<br>Feeder (All the information from the feeder) | |
| ID-4 | Network information | The structural information of the network (lines) characteristics is required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation centre. Structural network information request:<br>Int. Request ID<br>Substation<br>Power Transformer<br>R<br>L<br><br>Feeder<br>Line<br>R<br>L<br>C<br><br>Each feeder is composed of several lines. | ID-3 |
| ID-5 | FSP information for Product and Grid Prequalification | ID<br>Name<br>Resource<br>Mode of activation (If it is Automatic should be tested)<br>Minimum Quantity<br>Flexibility direction (load/generation reduction/increase, both)<br>Locational information and SO connected<br>Maximum duration of delivery period offer<br>Single or Aggregated portfolio?<br>Capacity/Energy<br>Maximum Full Activation time<br><br>Mandatory: Product Prequalification Result: (Approved)<br><br>Grid Prequalification: (Approved/Reproved) | ID-3, ID-4 |


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#### 10.3.1.2 DSUC_WE_PT_02

##### 10.3.1.2.1 Description of the use case

###### *10.3.1.2.1.1 Name of use case*

| **Use case identification** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | | SUC 02 - Day-Ahead & Intraday Flexibility needs |

###### *10.3.1.2.1.2 Version management*

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

###### *10.3.1.2.1.3 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.<br>- Identify potential network constrains and planning of the grid operation for the next day/hours considering the load and generation forecasts<br>- Promote the participation of flexible resources connected at all voltage levels grids in distribution and transmission networks operation<br>- Ensure coordination between system operators for all scenarios.<br>- Receive and send data between system operators in a secure manner. |
| ***Related business case(s)*** | WECL-PT-01, SUC-07 |

###### *10.3.1.2.1.4 Narrative of Use Case*

| **Narrative of use case** |
|---|
| ***Short description*** |



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| |
|---|
| 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 transmission 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. 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. |

##### *10.3.1.2.1.5 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. |
| ***Prerequisites*** | |
| 1 | Platforms for data exchange between DSO and TSO have to be developed or are already developed. |

##### *10.3.1.2.1.6 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 |
| ***Further keywords for classification*** |
| Congestion Management; Short-term Plan/Forecast Flexibility; |



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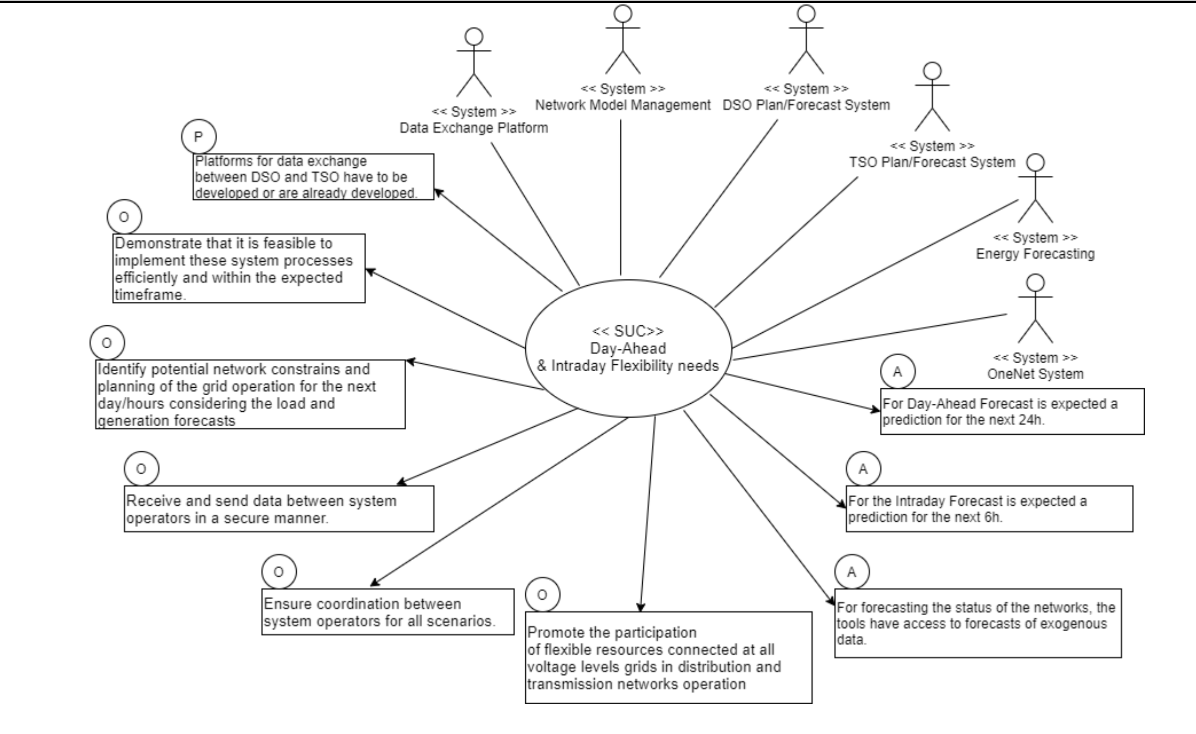
#### 10.3.1.2.2 Diagrams of use case

***Diagram(s) of use case***




#### 10.3.1.2.3 Technical details

##### *10.3.1.2.3.1 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 | |





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| | | | |
|---|---|---|---|
| | | exchange of information related with the markets are included in the scheduled data.<br>The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales.<br>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).<br>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.<br>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 | |

#### 10.3.1.2.4 Step by step analysis of use case

##### *10.3.1.2.4.1 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 exchange 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 exchange data about their flexibility needs. | TSO Plan/Forecast System | | | |



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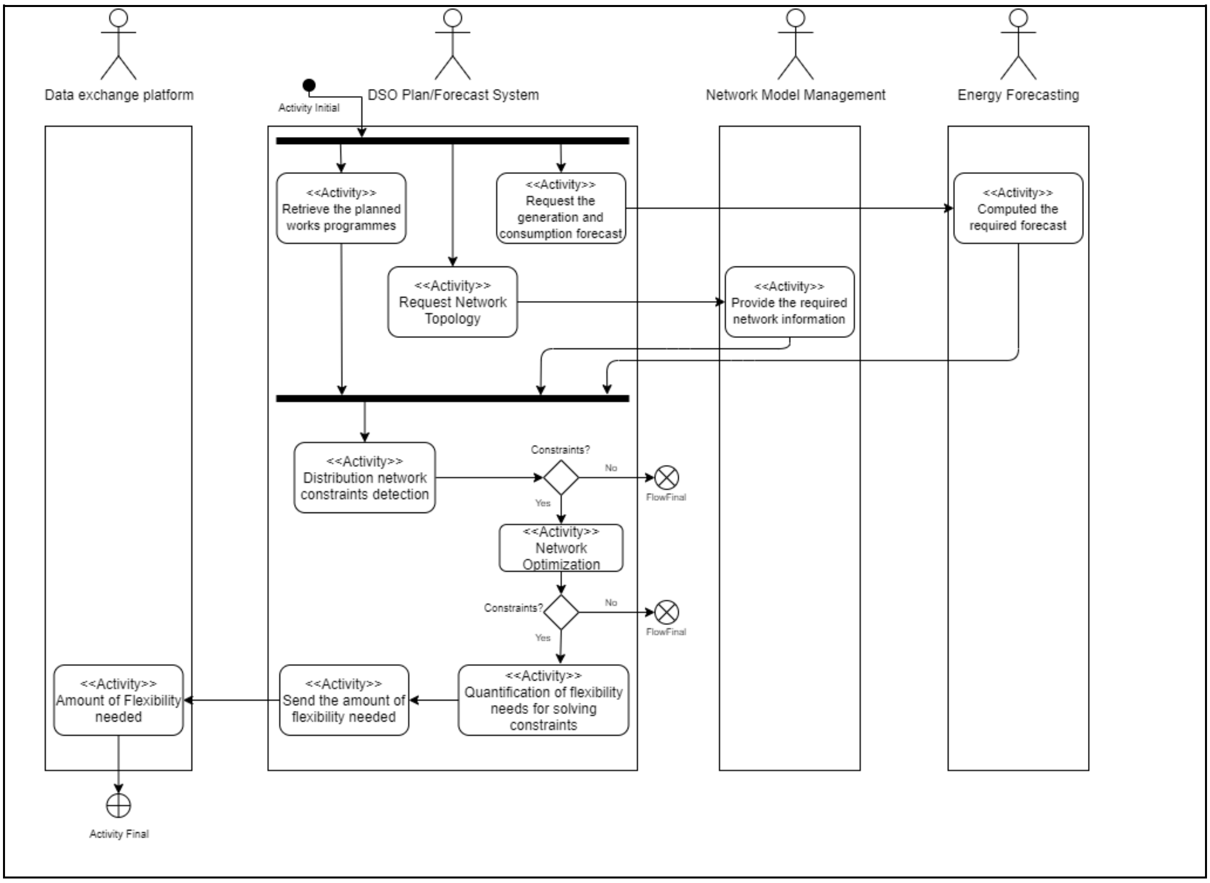
| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Day-Ahead & Intraday Flexibility needs for DSO within OneNet System | Steps that system operators should perform to plan and forecast their grid utilization for the next day or the next 6 hours and to exchange data about their flexibility needs. | DSO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

### 10.3.1.2.5 Steps - Scenarios

#### *10.3.1.2.5.1 Scenario #1: Day-Ahead & Intraday Flexibility needs for DSO*

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.<br><br>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.<br><br>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<br>in distribution network. In case network assets cannot solve all technical restrictions, flexibility from DER will be considered to solve the | | DSO Plan/Forecast System | | | |



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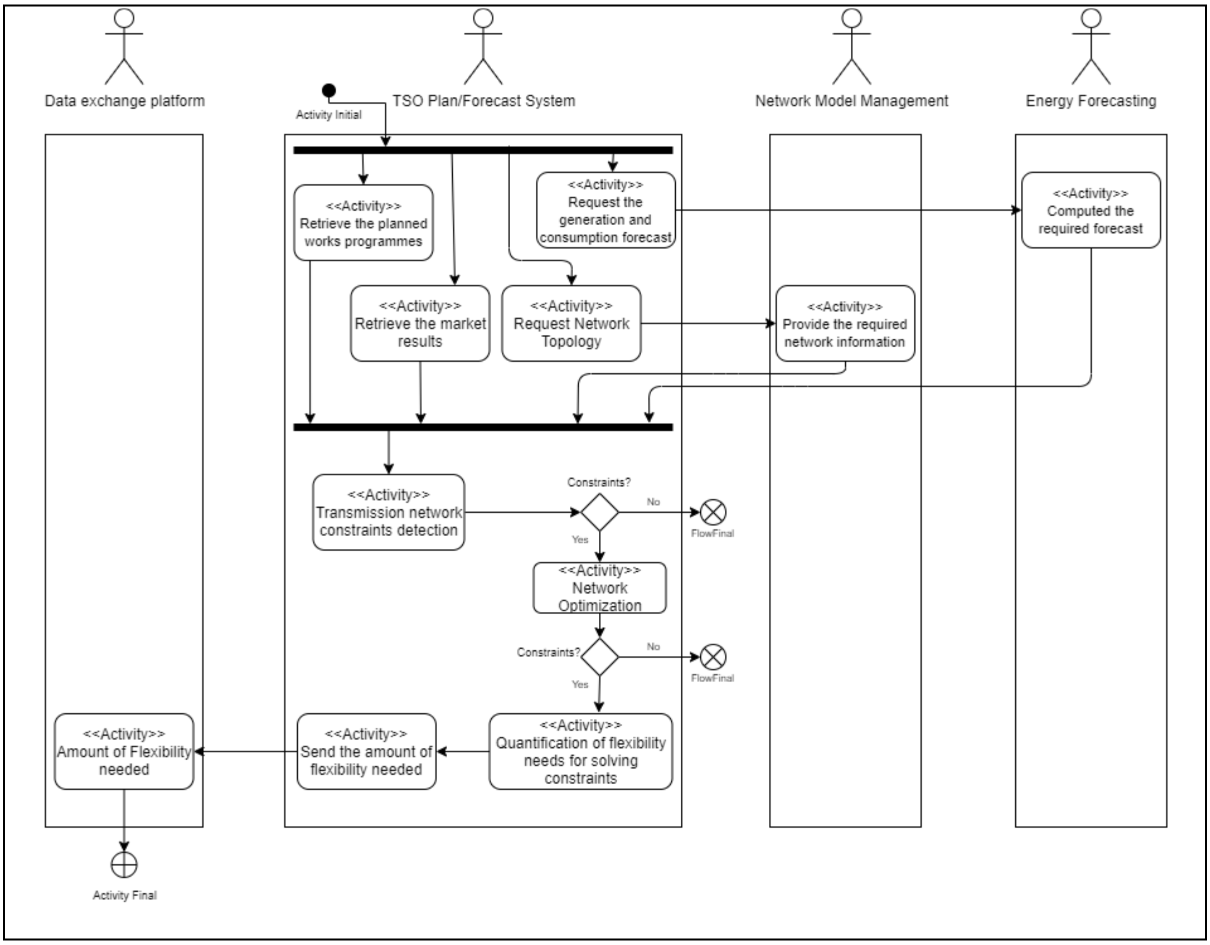
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | problem. Quantify flexibility needed to solve constraints per node/zone. | | | | | |
| 1.9 | | Send the amount of flexibility needed | Send the Quantify flexibility needed to solve constraints per node/zone for the next day or for the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

### 10.3.1.2.5.2 Scenario #2: Day-Ahead & Intraday Flexibility needs for TSO

Scenario #2 description




## Scenario step by step analysis

| Scenario | |
|---|---|
| ***Scenario name*** | Day-Ahead & Intraday Flexibility needs for TSO |



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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 works programmes | To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works.<br><br>This activity is described in the SUC "Maintenance plans information exchange" | | TSO Plan/Forecast System | | | |
| 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.<br><br>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 | | TSO Plan/Forecast System | Network Model Management | ID-3 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | aggregation of information | | | | | | |
| 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 needed to solve constraints per node/zone. | | TSO Plan/Forecast System | | | | |
| 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 | | |





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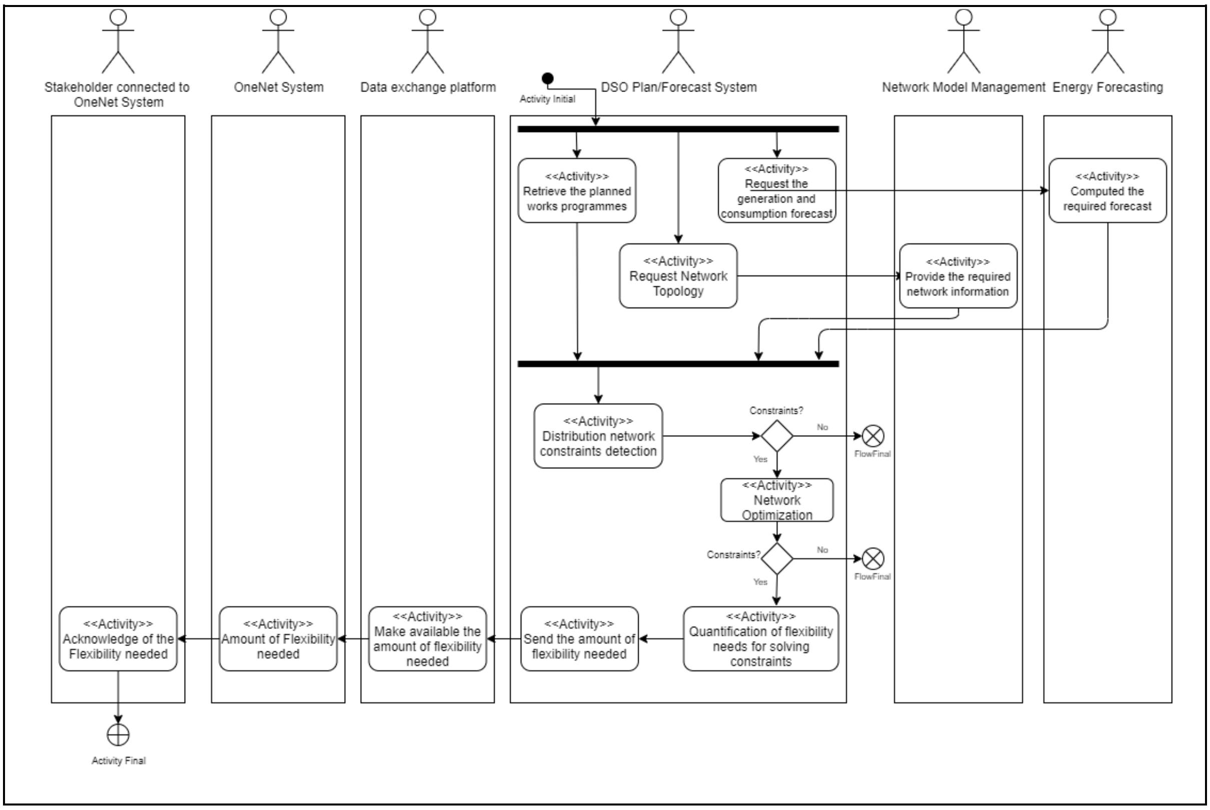
### 10.3.1.2.5.3 Scenario #3 Day-Ahead & Intraday Flexibility needs for DSO within OneNet System

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.<br><br>This activity is described in the SUC "Maintenance plans information exchange" | | DSO Plan/Forecast System | | | |
| 3.2 | | Request the generation and | 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 | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | the consumption forecast | | | | | | |
| 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 | |

###### *10.3.1.2.5.4 Scenario #4: Day-Ahead & Intraday Flexibility needs for TSO within OneNet System*

Scenario #4 description



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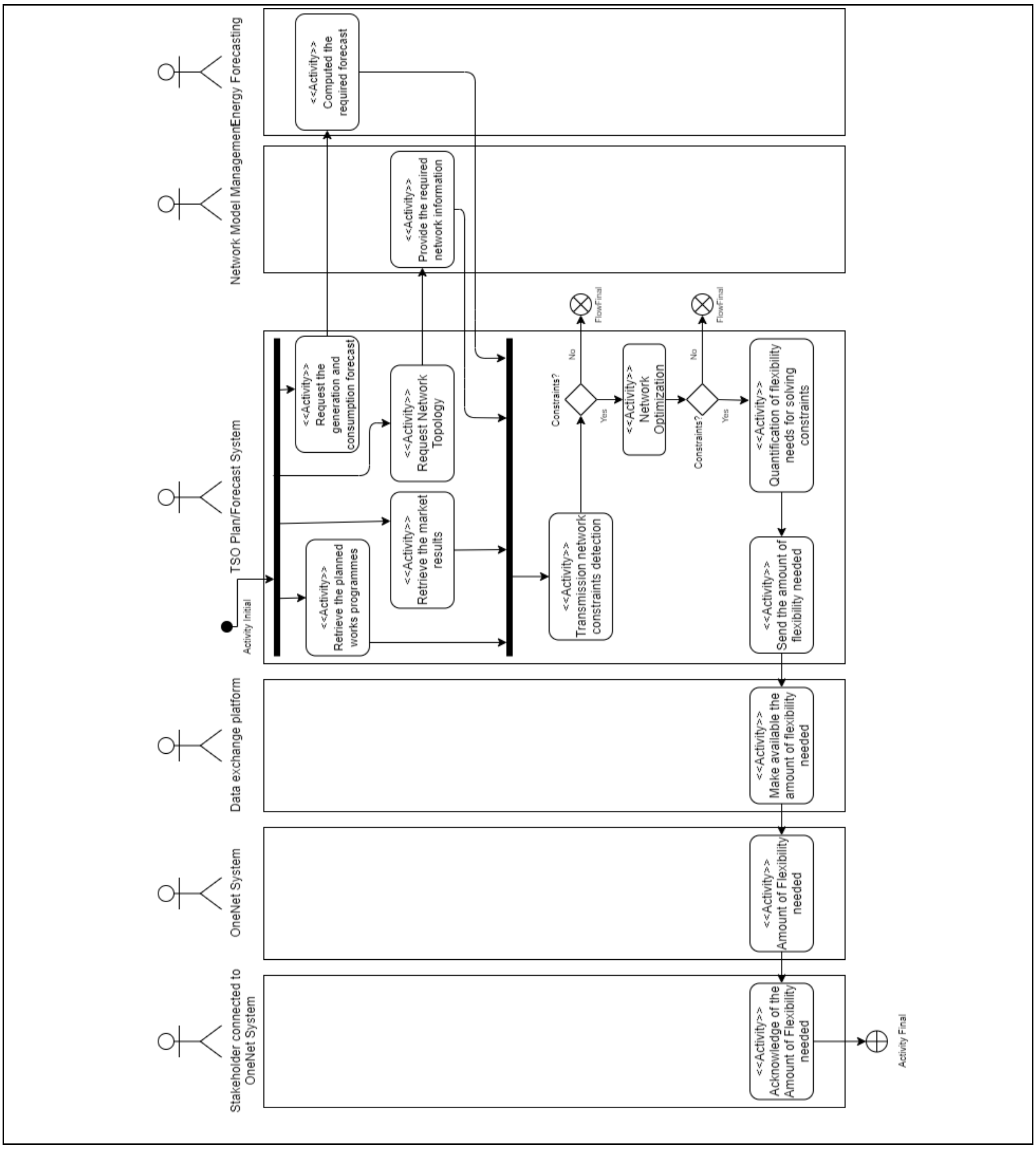


## Scenario step by step analysis

| 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** | **Information** | **Requirement, R-IDs** |



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| | | | | | | receiver (actor) | exchanged (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.<br><br>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 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 | |
| 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 | | TSO Plan/Forecast System | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | to solve the problem. Quantify flexibility needed to solve constraints per node/zone. | | | | | |
| 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 | |

#### 10.3.1.2.6 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<br>Type of Request<br>Substation<br>Transformer<br>Feeder<br>Start Time (day; hour; minute)<br>End Time (day; hour; minute)<br>the time should be done in intervals of 15 minutes. | |
| ID-2 | Generation and the consumption forecast | Request ID<br>Type of Request<br>Substation<br>Quantile<br>Pconso_Substation<br>Pprod_Substation<br>Qconso_Substation<br>Qprod_Substation<br>Transformer<br>Quantile<br>Pconso_Transformer<br>Pprod_Transformer<br>Qconso_Transformer<br>Qprod_Transformer<br>Feeder<br>Quantile<br>Pconso_Feeder<br>Pprod_Feeder<br>Qconso_Feeder<br>Qprod_Feeder<br><br>Start Time (day; hour; minute)<br>End Time (day; hour; minute) | ID-1 |


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| | | | |
|---|---|---|---|
| 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.<br><br>A structural network information request consists of:<br>Int. Request ID<br>Type of request<br>Substation (All grid information from the substation)<br>Transformer (All the information from the transformer)<br>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.<br>Structural network information request:<br>Int. Request ID<br>Substation<br>Power Transformer<br>R<br>L<br><br>Feeder<br>Line<br>R<br>L<br>C<br><br>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.<br><br>Node/Zone<br><br>Quantity (MW) | |

#### 10.3.1.3 DSUC_WE_PT_03

##### 10.3.1.3.1 Description of the use case

###### 10.3.1.3.1.1 Name of use case

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | | SUC 03 - Long-term Flexibility needs |

###### 10.3.1.3.1.2 Version management

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


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| | | | | |
|---|---|---|---|---|
| | 16/06/2021 | E-REDES<br>NESTER<br>REN<br>INESC TEC | | |

##### 10.3.1.3.1.3 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.<br>- Cover grid investment needs through flexibility services.<br>- 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.<br>- Improve network operation security during maintenance actions, using flexibility to minimize the risk of reduced redundancy.<br>- Ensure coordination between system operators for all scenarios.<br>- Receive and send data between system operators in a secure manner. |
| ***Related business case(s)*** | WECL-PT-02 |

##### 10.3.1.3.1.4 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 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. |



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##### 10.3.1.3.1.5 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 |

##### 10.3.1.3.1.6 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 |

#### 10.3.1.3.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|



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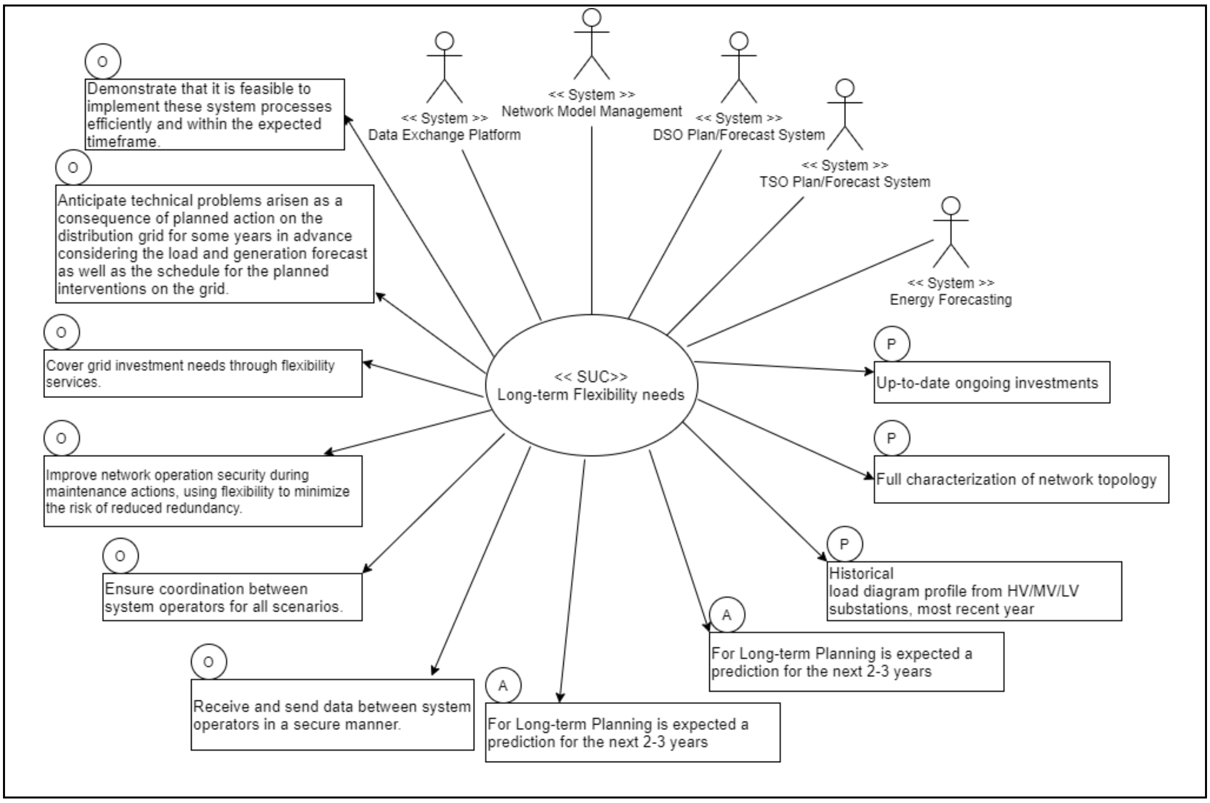


## 10.3.1.3.3 Technical details

### *10.3.1.3.3.1 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 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. | |

### 10.3.1.3.4 Step by step analysis of use case

#### *10.3.1.3.4.1 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 exchange 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 exchange data about their flexibility needs. | | | | |

### 10.3.1.3.5 Steps - Scenarios

*10.3.1.3.5.1.1 Scenario #1: Long-term Flexibility needs for DSO*

Scenario #1 description



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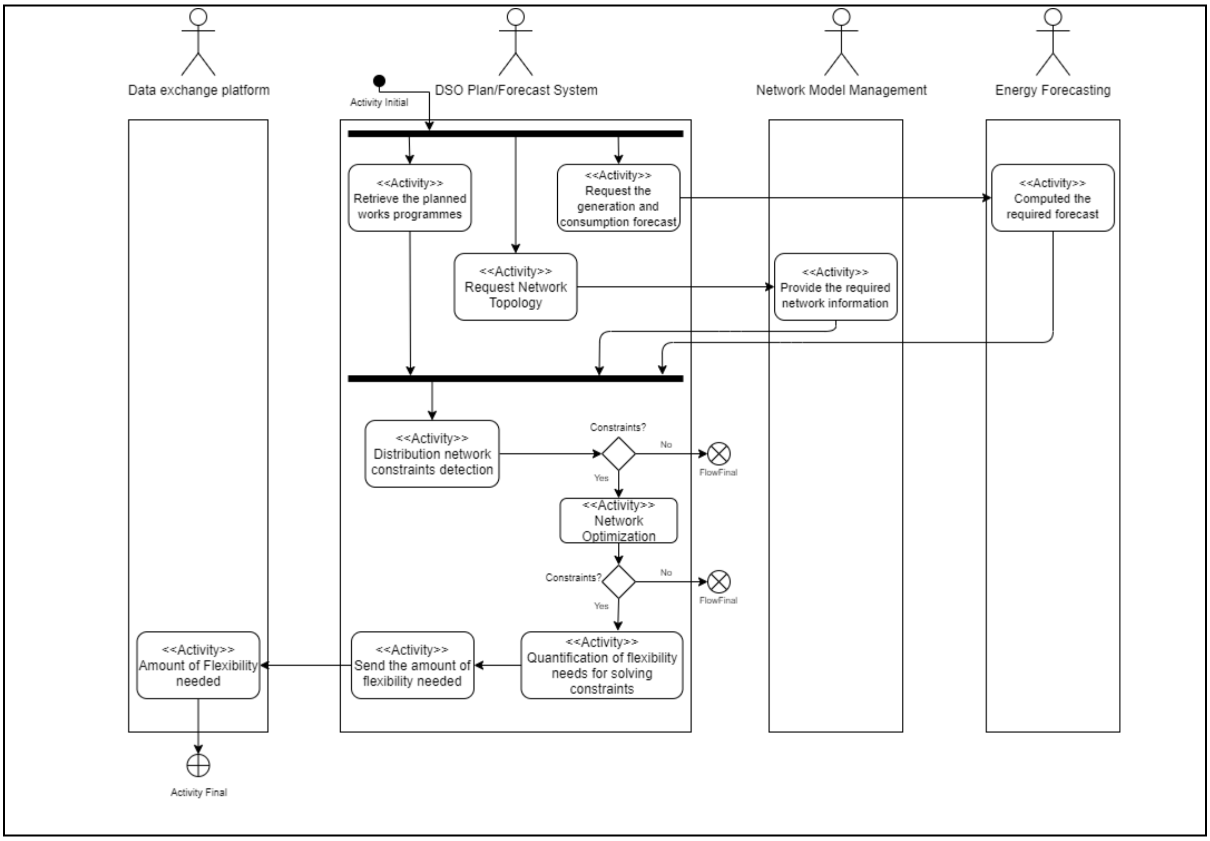


## Scenario step by step analysis

| ***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. 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 2-3 years | | DSO Plan/Forecast System | Energy Forecasting | ID-1 | |



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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1.3 | | Compute the required forecast | The forecast should be computed for the next 2-3 years.<br>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 node/zone for the next 2-3 years | | DSO Plan/Forecast System | Data exchange Platform | ID-5 | | |





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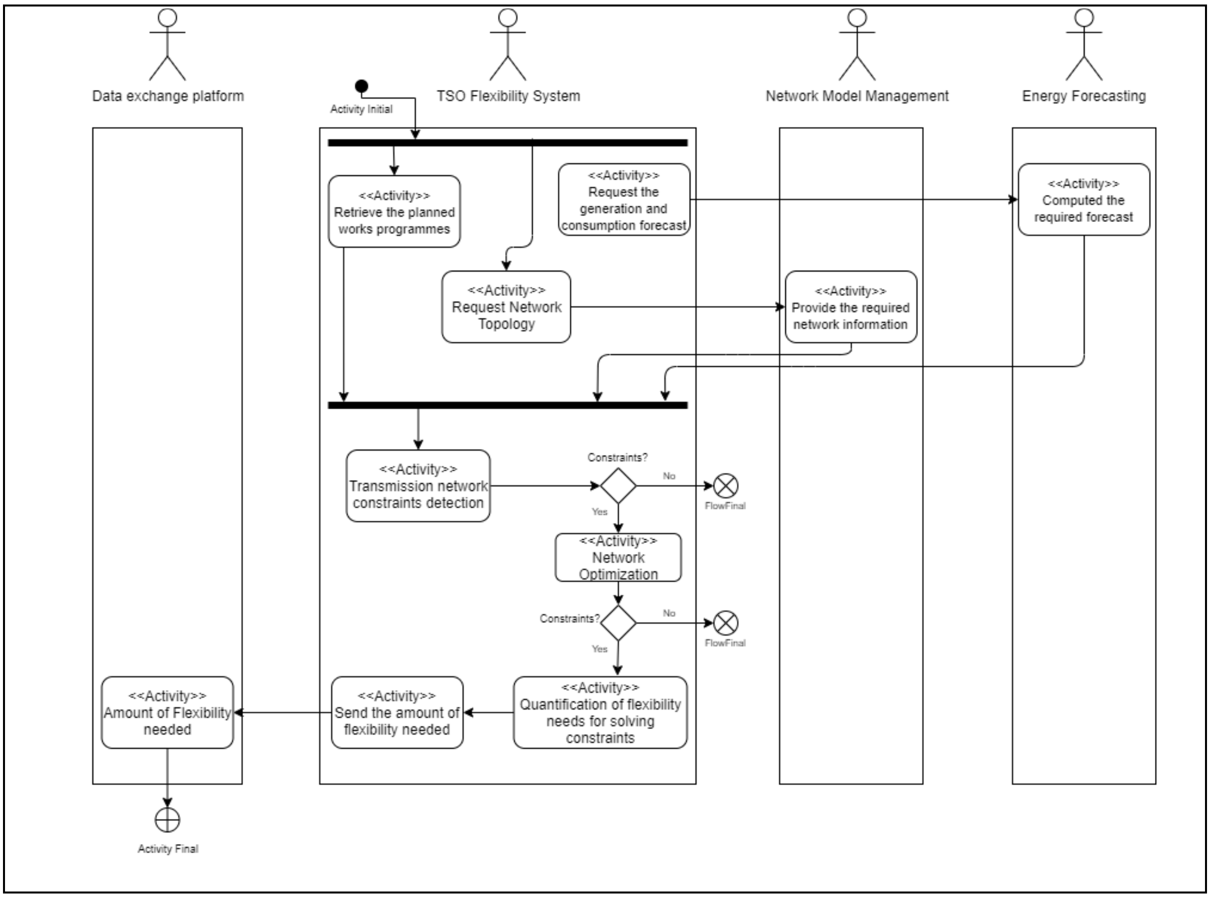
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.10 | | Amount of Flexibility needed | Flexibility needed to solve constraints per node/zone for the next 2-3 years | | Data exchange Platform | | | |

*10.3.1.3.5.1.2 Scenario #2: Long-term Flexibility needs for TSO*

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 works programmes | To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works. | | TSO Plan/Forecast System | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 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.<br>Define planning horizon, define load and distributed energy sources growth rates.<br>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 | | | |
| 2.9 | | Send the amount of | Send the quantify flexibility needed to solve | | TSO Plan/Forecast System | Data exchange Platform | ID-5 | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | flexibility needed | constraints per node/ zone for the next 2-3 years | | | | | |
| 2.10 | | Amount of Flexibility needed | Flexibility needed to solve constraints per node/zone for the next 2-3 years | | Data exchange Platform | | | |

### 10.3.1.3.6 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<br>Type of Request<br>Substation<br>Transformer<br>Feeder<br>Start Time (day; hour; minute)<br>End Time (day; hour; minute) | |
| ID-2 | Generation and the consumption forecast | Request ID<br>Type of Request<br><br>Substation<br>Quantile<br>Pconso_Substation<br>Pprod_Substation<br>Qconso_Substation<br>Qprod_Substation<br><br>Transformer<br>Quantile<br>Pconso_Transformer<br>Pprod_Transformer<br>Qconso_Transformer<br>Qprod_Transformer<br><br>Feeder<br>Quantile<br>Pconso_Feeder<br>Pprod_Feeder<br>Qconso_Feeder<br>Qprod_Feeder<br><br>Start Time (day; hour; minute)<br>End Time (day; hour; minute) | ID-1 |
| ID-3 | Network information request | The structural information of the network (lines) characteristics is required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation centre.<br><br>A structural network information request consists of:<br>Int. Request ID<br>Type of request<br>Substation (All grid information from the substation)<br>Transformer (All the information from the transformer) | |



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| | | | |
|---|---|---|---|
| | | Feeder (All the information from the feeder) | |
| ID-4 | Network information | The structural information of the network (lines) characteristics is required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation centre.<br>Structural network information request:<br>Int. Request ID<br>Substation<br>Power Transformer<br>R<br>L<br><br>Feeder<br>Line<br>R<br>L<br>C<br><br>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.<br><br>Node/Zone<br><br>Quantity (MW) | |

### 10.3.1.4 DSUC_WE_PT_04

#### 10.3.1.4.1 Description of the use case

##### *10.3.1.4.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| DSUC_WE_PO_04 | | SUC04 – Selection of Bids |

##### *10.3.1.4.1.2 Version management*

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


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#### 10.3.1.4.1.3 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.<br>- Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a technical point of view.<br>- Ensure coordination between system operators for all scenarios.<br>- Receive and send data between system operators in a secure manner. |
| **Related business case(s)** | WECL-PT-01 & WECL-PT-02 |

#### 10.3.1.4.1.4 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 considering 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. After the selection of the bids, based on the requirements described above, a merit order list (MOL) of the acquired bids is defined.it 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. |

#### 10.3.1.4.1.5 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 |



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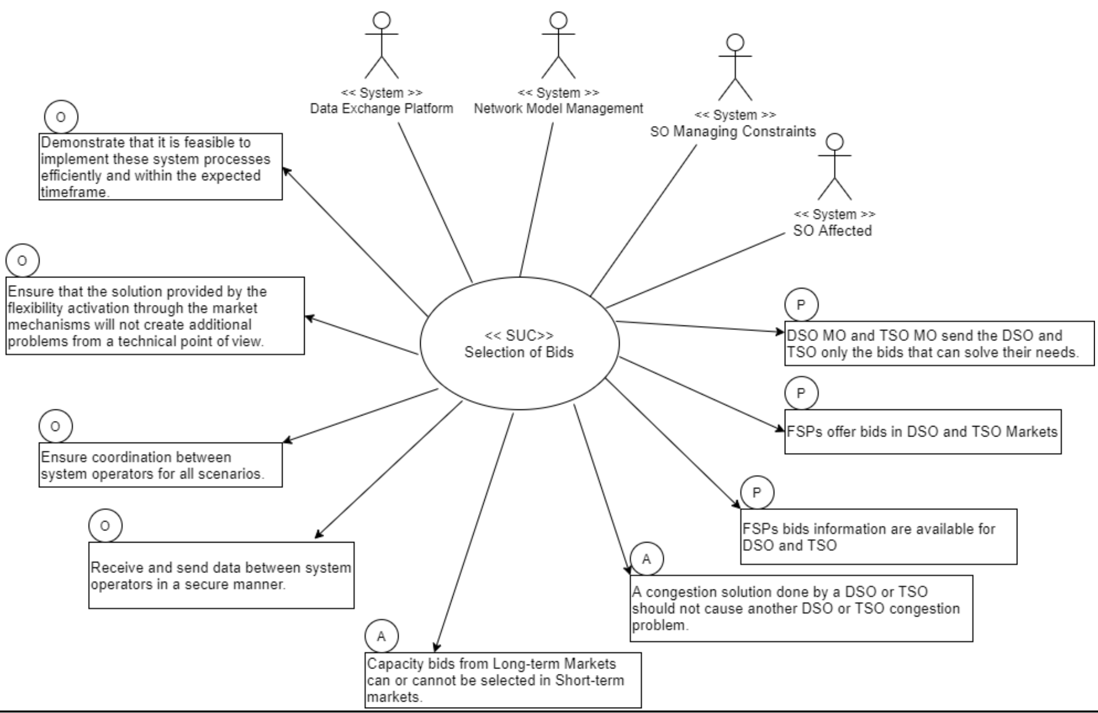
| | |
|---|---|
| | FSPs offer bids in DSO and TSO Markets |
| | DSO MO and TSO MO send the DSO and TSO only the bids that can solve their needs. |

##### *10.3.1.4.1.6 Further information to the use case for classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use case*** |
| 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*** |

#### 10.3.1.4.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|
|  |





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##### 10.3.1.4.3 Technical details

###### *10.3.1.4.3.1 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 neighbouring 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 is included in the scheduled data.<br>The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales.<br>When information reaches this actor, the other SO is automatically notified. | |

##### *10.3.1.4.4* Step by step analysis of use case

###### *10.3.1.4.4.1 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 | | |

###### *10.3.1.4.4.2 Steps - Scenarios*

*10.3.1.4.4.2.1 Scenario #1: Selecting Bids*

Scenario #1 description




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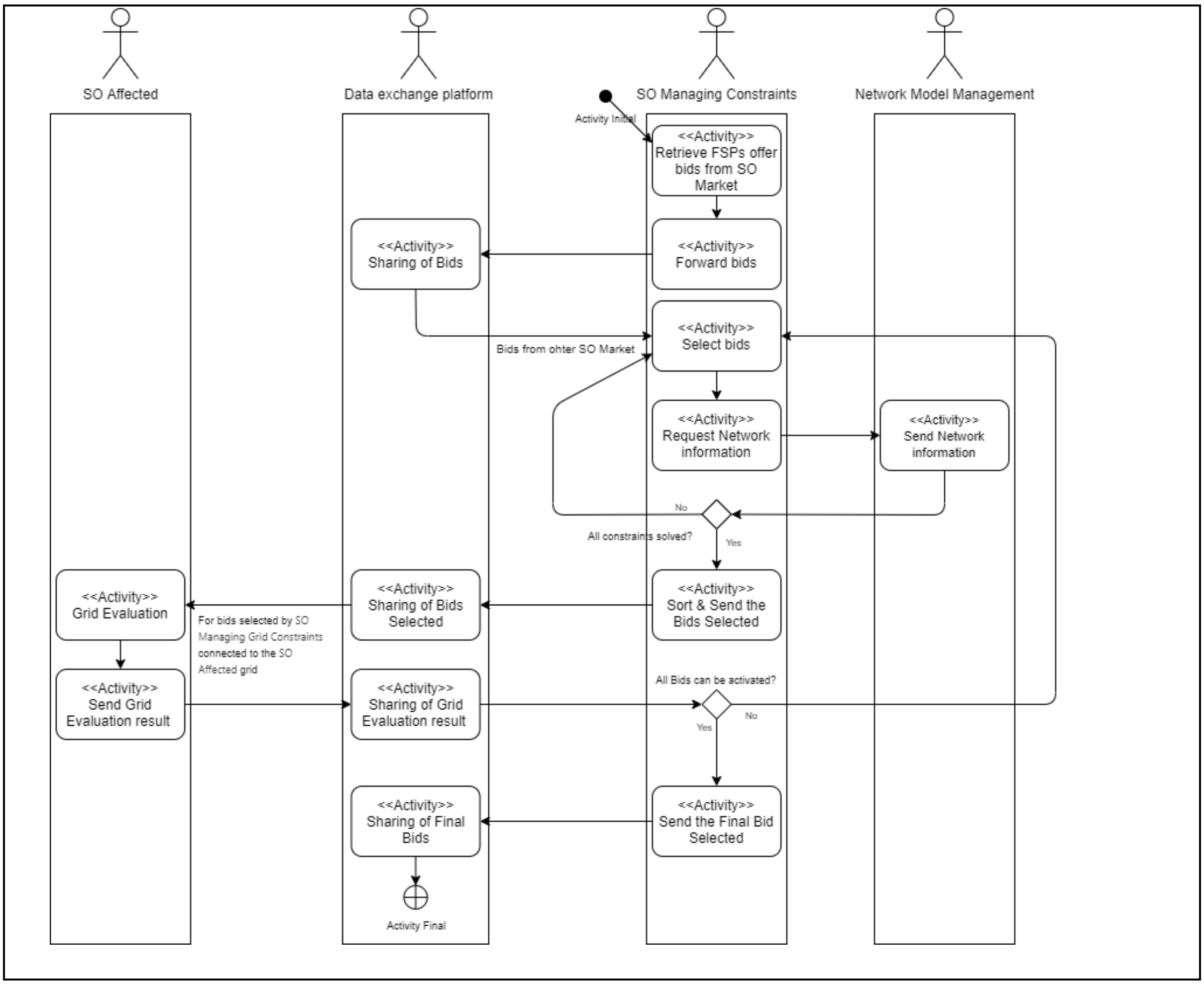


## Scenario step by step analysis

| ***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 neighbouring system operator | | SO Managing Constraints | Data exchange platform | ID-1 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.3 | | Select bids | Select which bids can solve the constraints considering both bids from its own market and from the neighbouring 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 neighbouring network that can solve all constraints. For bids connected to its own network, the grid information (Grid Evaluation) is already being considered. Bids connected to the neighbouring network need to be checked. Sort bids by a merit order list. | | SO Managing Constraints | | | |
| 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 | | | |





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### 10.3.1.4.5 Information exchanged

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



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#### 10.3.1.5 DSUC_WE_PO_05

##### 10.3.1.5.1 Description of the use case

###### *10.3.1.5.1.1 Name of use case*

| Use case identification | | |
|---|---|---|
| **ID** | **Area(s)/Domain(s)/Zone(s)** | **Name of use case** |
| ***DSUC_WE_PO_05*** | | SUC05 – Evaluate Grid Constrains |

###### *10.3.1.5.1.2 Version management*

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

###### *10.3.1.5.1.3 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.<br>- Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a grid point of view.<br>- Ensure coordination between system operators for all scenarios.<br>- Receive and send data between system operators in a secure manner. |
| ***Related business case(s)*** | WECL-PT-01 & WECL-PT-02 & SUC-01 |

###### *10.3.1.5.1.4 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 |



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| |
|---|
| 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. 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. |

###### 10.3.1.5.1.5 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 |

###### 10.3.1.5.1.6 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*** |

#### 10.3.1.5.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|



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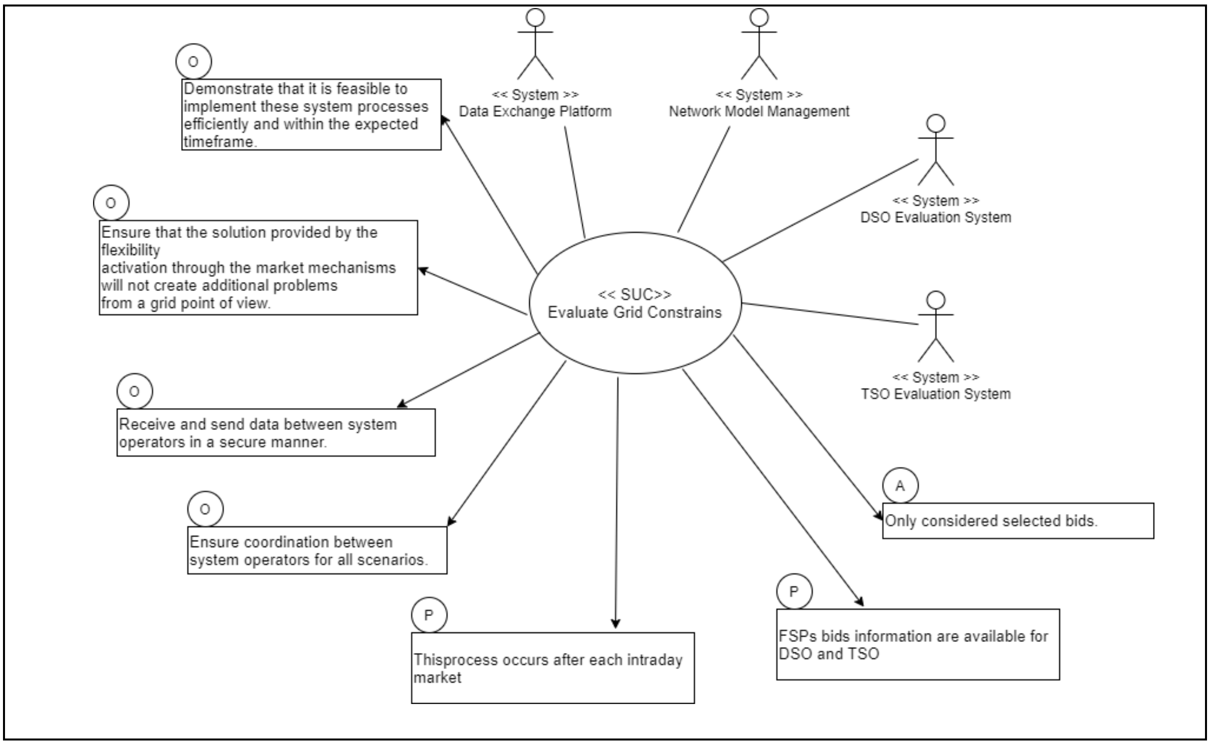


### 10.3.1.5.3 Technical details

#### *10.3.1.5.3.1 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 neighbouring 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 included in the scheduled data.<br>The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales.<br>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. | |

#### 10.3.1.5.4 Step by step analysis of use case

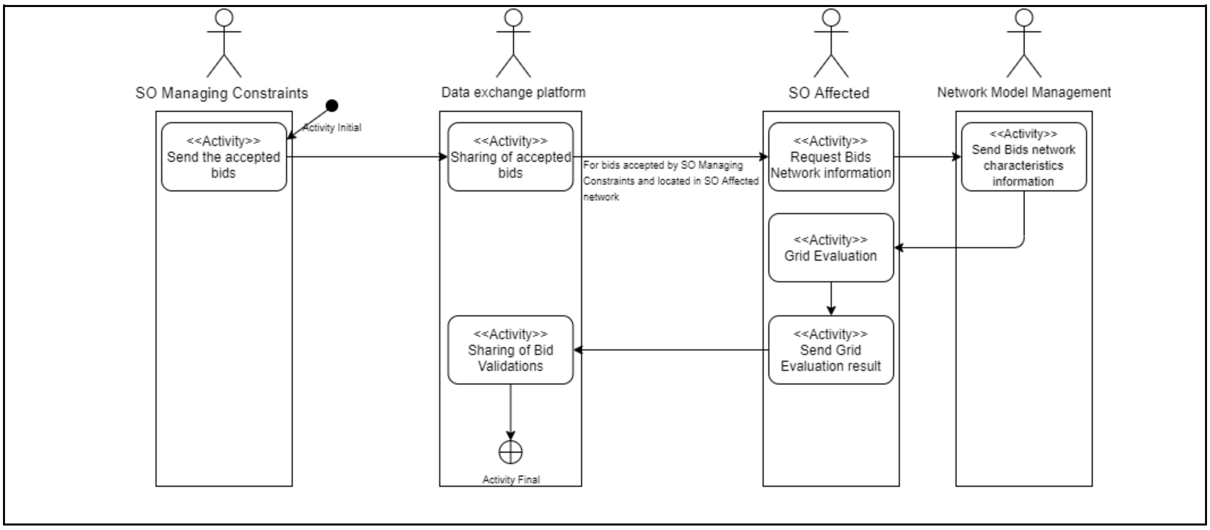
##### *10.3.1.5.4.1 Overview of scenarios*

| *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 | | | |

##### *10.3.1.5.4.2 Steps - Scenarios*

###### *10.3.1.5.4.2.1 Scenario #1: Evaluate Grid Constraints*

Scenario #1 description




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

#### 10.3.1.5.5 Information exchanged

| Information exchanged | | | |
|---|---|---|---|
| **Information exchanged, ID** | **Name of information** | **Description of information exchanged** | **Requirement, R-IDs** |
| ID-1 | Accepted bids | Bid ID<br>Resource<br>Connected SO<br>Day<br>Hour<br>Duration<br>Quantity<br>Flexibility direction<br>Full Activation time | |




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| | | | |
|---|---|---|---|
| ID-2 | Request Bids Network information | The structural information of the network (lines) characteristics is required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation centre.<br>A structural network information request consists of:<br>Int. Request ID<br>Type of request<br>Substation (All grid information from the substation)<br>Transformer (All the information from the transformer)<br>Feeder (All the information from the feeder) | ID-1 |
| ID-3 | Network information | The structural information of the network (lines) characteristics is required to the computation process. This information is exchange between different processes in the DSO's or TSO's operation centre.<br><br>Structural network information request:<br>Int. Request ID<br>Substation<br>Power Transformer<br>R<br>L<br><br>Feeder<br>Line<br>R<br>L<br>C<br><br>Each feeder is composed of several lines. | ID-2 |
| ID-4 | Validation Result | Bid ID<br><br>Grid Result Evaluation: (approved/reproved) | ID-2, ID-4 |

### 10.3.1.6 DSUC_WE_PO_06

#### 10.3.1.6.1 Description of the use case

##### *10.3.1.6.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***DSUC_WE_PO_06*** | | SUC 06 - Maintenance plans information exchange |

##### *10.3.1.6.1.2 Version management*

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



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| | | | | |
|---|---|---|---|---|
| | | NESTER<br>REN<br>INESC TEC | | |

##### 10.3.1.6.1.3 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<br>- 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 |

##### 10.3.1.6.1.4 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 timeframes (medium-term until close to real-time). This implementation is supported by work done in previous H2020 projects. |

##### 10.3.1.6.1.5 Use case conditions

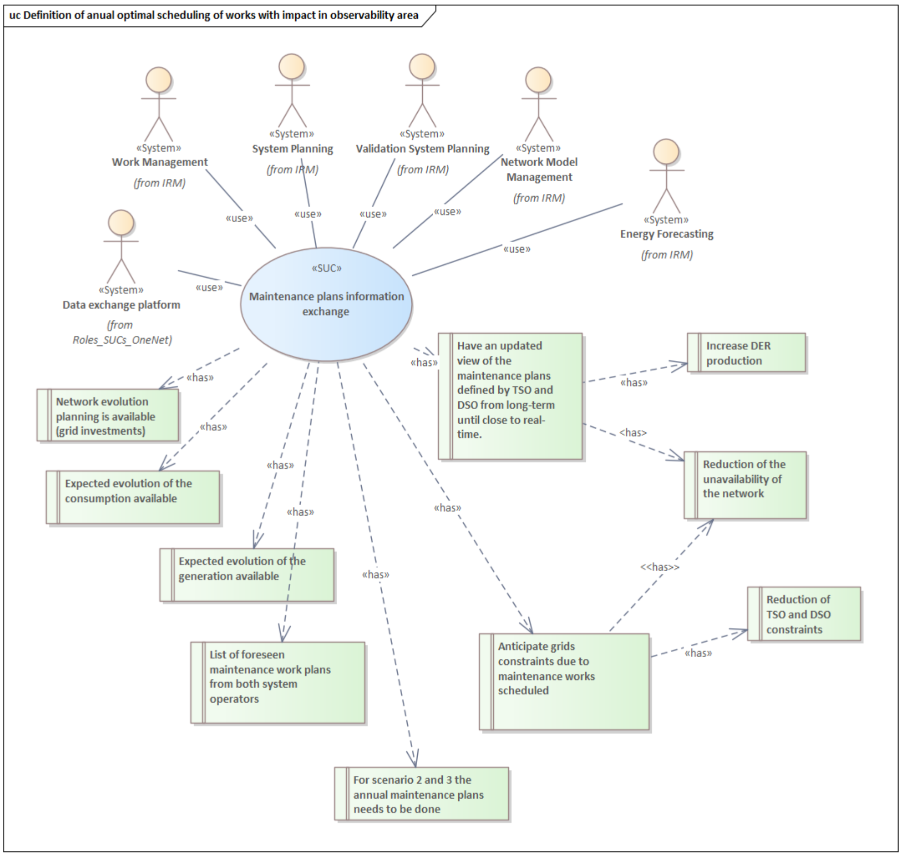
| ***Use case conditions*** | |
|---|---|
| | ***Assumptions*** |
| 1 | Network evolution planning is available (grid investments) |
| 2 | Expected evolution of the consumption available |
| 3 | Expected evolution of the generation available |
| | ***Prerequisites*** |
| 1 | List of foreseen maintenance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

##### 10.3.1.6.1.6 Further information to the use case for classification/mapping

| ***Classification information*** |
|---|

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

### 10.3.1.6.2 Diagrams of use case

| Diagram(s) of use case |
|---|
|  |



### 10.3.1.6.3 Technical details

#### *10.3.1.6.3.1 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*** |
| 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, 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.<br>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).<br>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.<br>It maintains master representations of the power system for network analysis functions, so that all analysis shares the same source information.<br>Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal | |



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| | | | |
|---|---|---|---|
| | | 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. | |

#### 10.3.1.6.4 Step by step analysis of use case

##### *10.3.1.6.4.1 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 | | |

##### *10.3.1.6.4.2 Steps - Scenarios*

###### *10.3.1.6.4.2.1 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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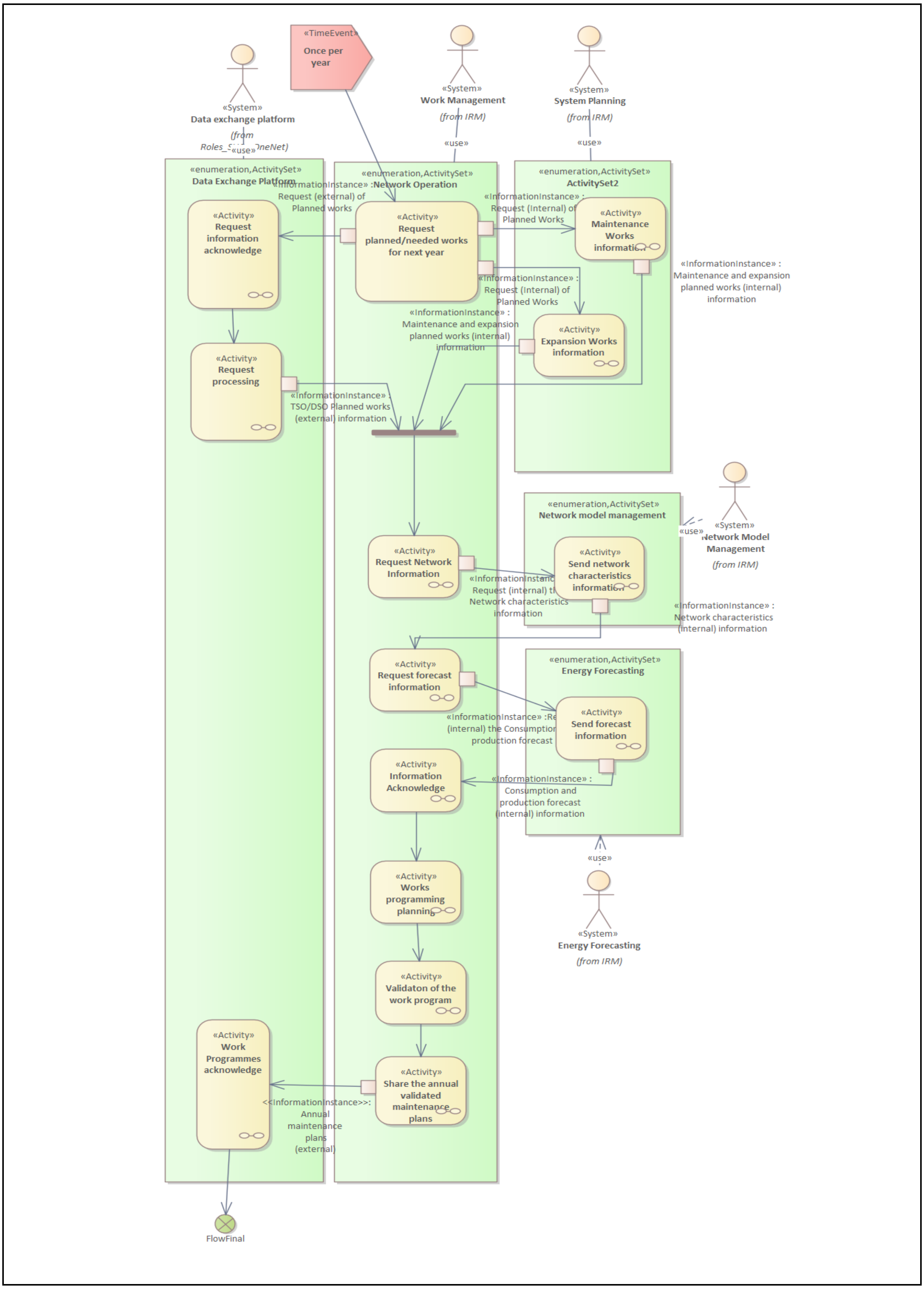


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Scenario step by step analysis

| 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.<br>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.<br>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 | System Planning | Info2- Request (internal) of Planned works | |
| 1.3 | | Request information acknowledge | | | Data exchange platform | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | |
| 1.9 | | Request forecast information | The yearly production and consumption forecast is needed to execute the definition of yearly maintenence 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 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | | | |
| 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 | | | |

*10.3.1.6.4.2.2 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.



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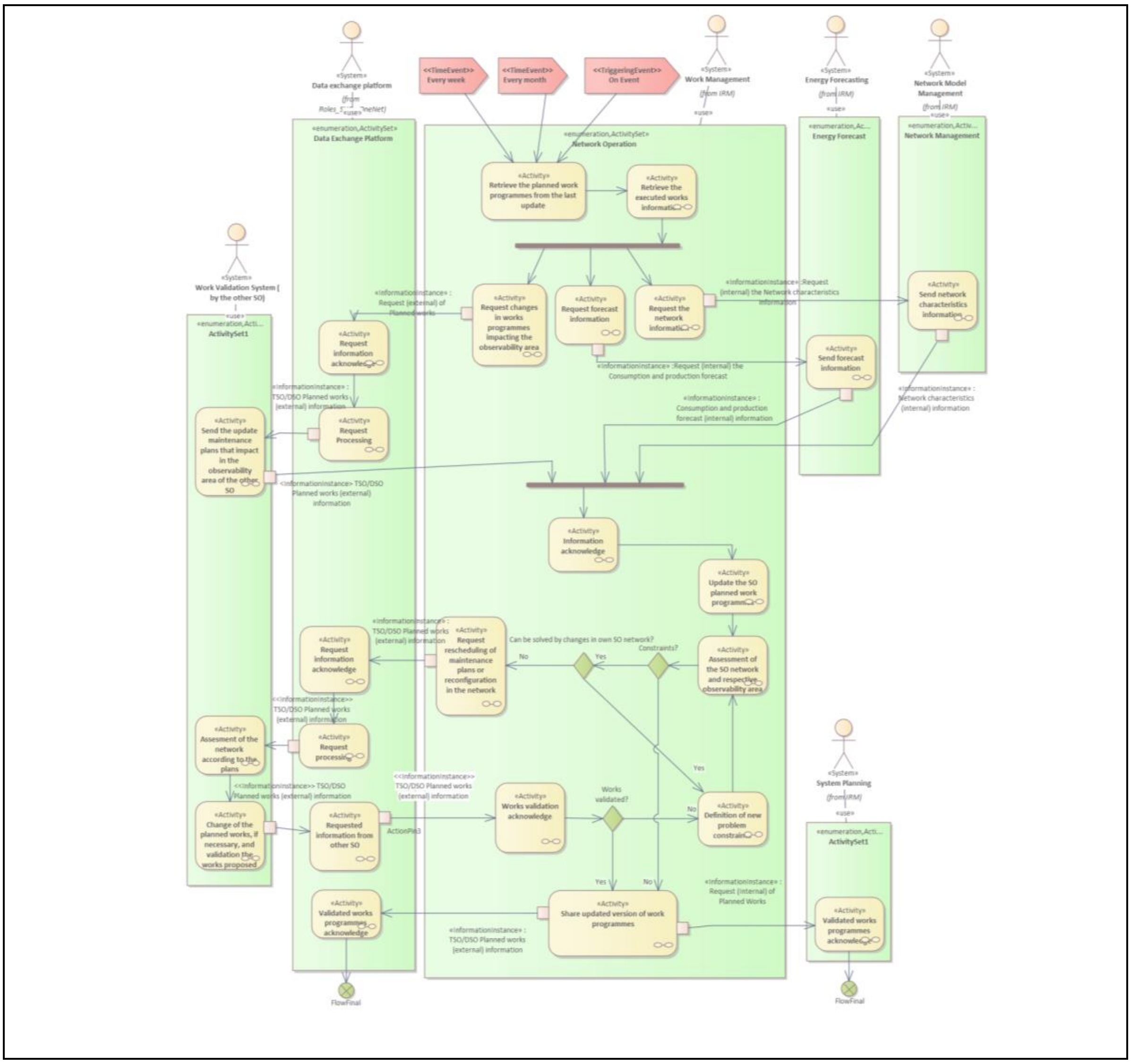

<u>Scenario step by step analysis</u>

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Monthly-ahead, Weekly-ahead or on event update of maintenance plans | | | | | | | |
| ***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 database. | | Work Management | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 database. | | 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. 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. | | Data Exchange Platform | Work Validation System | | |
| 2.6 | | Send the update maintenance plans that impact | The second SO change the planned works, if necessary, and | | Work Validation System | Data Exchange Platform | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | in the observability area of the other SO | validate the works proposed by the first SO that can impact in the observability area. | | | | | |
| 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 | |
| 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 | The time of the works and the sequence of | | Work Management | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | and respective observability area | the operation of each equipment should be defined, as well as the possible network constraints should be evaluated. | | | | | |
| 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 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. | | Data Exchange Platform | Work Validation System | Info9 – TSO/DSO Planned works (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 | | Work Validation System | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | according to the maintenance plans proposed and potential changes or rescheduling of the works | | | | | |
| 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 | | | |
| 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 | |

### 10.3.1.6.5 Information exchanged

| ***Information exchanged*** |
|---|



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| *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.<br>Date<br>Request ID<br>Observability area ID or<br>Bus ID | |
| INFO2 | Request(internal) of Planned works | Request of planned works in the SO system.<br>Date<br>Request ID<br>Year | |
| 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.<br><br>Structural network information request:<br>Int. Request ID<br>Type of request<br>Substation<br>Transformer<br>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<br><br>Structural network information request:<br>Int. Request ID<br>Substation<br><br>Power Transformer<br>R<br>L<br><br>Feeder<br>Line<br>R<br>L<br>C<br><br>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<br><br>Request ID<br>Type of Request | |



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| | | | |
|---|---|---|---|
| | | Substation<br>Transformer<br>Feeder<br><br>Start Time (day;hour;minute)<br>End Time (day;hour;minute)<br><br>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<br><br>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 | |

### 10.3.1.7 DSUC_WE_PO_07

#### 10.3.1.7.1 Description of the use case

##### *10.3.1.7.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***DSUC_WE_PO_07*** | | SUC 07 - Consumption and generation forecast information exchange |

##### *10.3.1.7.1.2 Version management*

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

##### *10.3.1.7.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** |
|---|




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| | |
|---|---|
| ***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.<br>- Improve programming of TSO and DSO operation activities.<br>- Contribute to the improvement of the forecast of technical constraints. |
| ***Related business case(s)*** | WECL-PT-01 & WECL-PT-03 |

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

##### *10.3.1.7.1.5 Use case conditions*

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | Forecast data timespan: 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 are 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.) |



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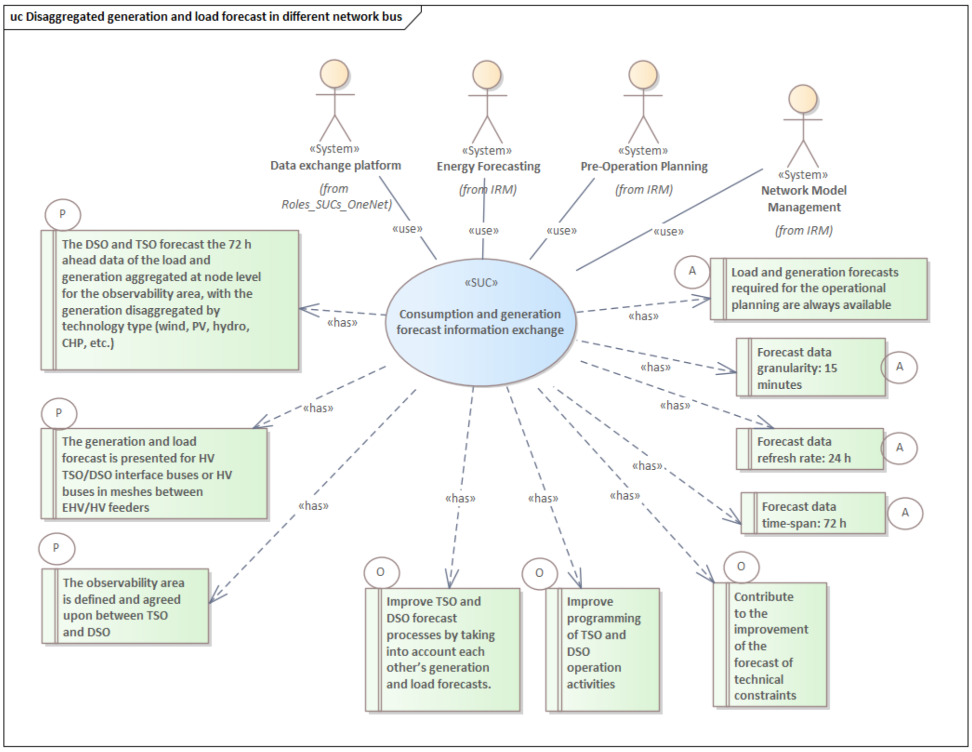
#### 10.3.1.7.1.6 Further information to the use case for classification/mapping

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

### 10.3.1.7.2 Diagrams of use case

| ***Diagram(s) of use case*** |
| --- |







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#### 10.3.1.7.3 Technical details

##### *10.3.1.7.3.1 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 included in the scheduled data.<br>The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales.<br>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. 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).<br>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.<br>It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information.<br>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.<br>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). | |


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### 10.3.1.7.4 Step by step analysis of use case

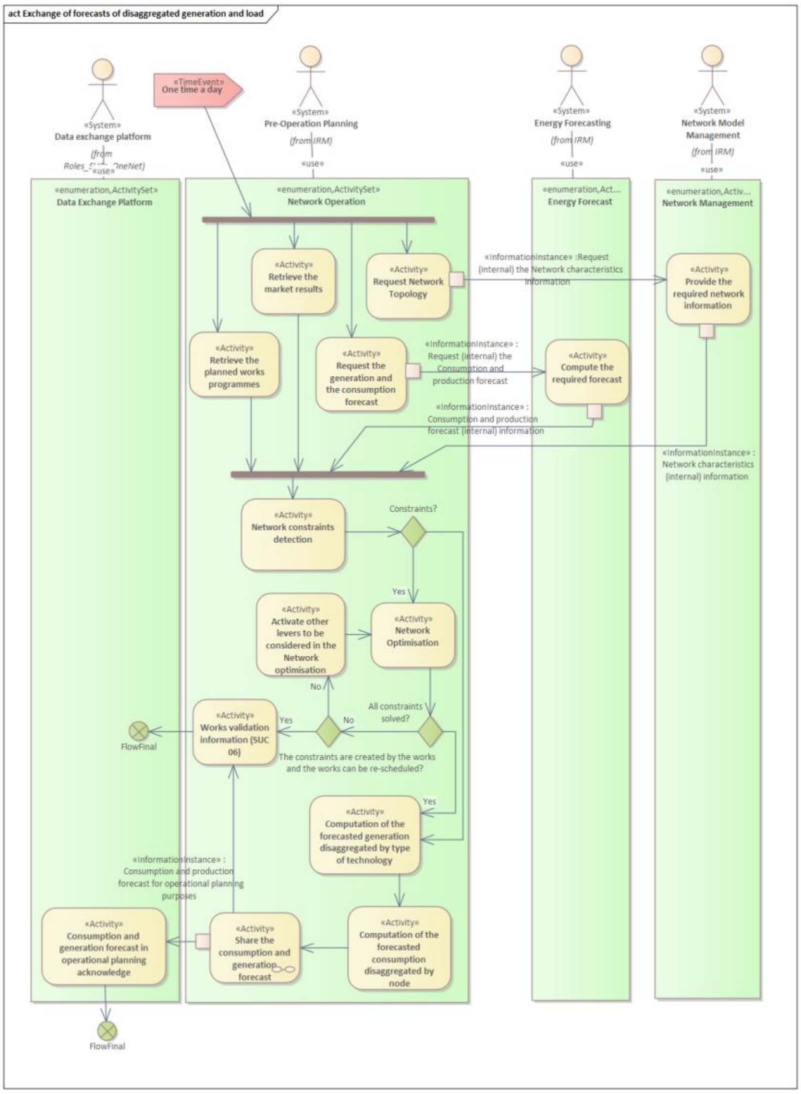
#### *10.3.1.7.4.1 Overview of scenarios*

| 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 | | |

#### *10.3.1.7.4.2 Steps - Scenarios*

##### *10.3.1.7.4.2.1 Exchange forecasts of disaggregated generation and load*

Scenario #1 description





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Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***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 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | |
| 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 | | | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 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. | | Pre-Operation Planning | | | |
| 1.10 | | Works validation information<br><br>(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 | | Pre-Operation Planning | | | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | entities - SUC 06. | | | | | |
| 1.1<br>1 | | 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 | | | |
| 1.1<br>2 | | Computation of the forecasted consumption disaggregated by node | The system should aggregate the forecasts by node in each observability area. | | Pre-Operation Planning | | | |
| 1.1<br>3 | | 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 | |
| 1.1<br>4 | | 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 | | | |

### 10.3.1.7.5 Information exchanged

| ***Information exchanged*** |
|---|



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| *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 is required to the computation process. This information is exchanged between different processes internal to the SO. | |
| 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. | |

### 10.3.1.8 DSUC_WE_PO_08

#### 10.3.1.8.1 Description of the use case

##### *10.3.1.8.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| *ID* | *Area(s)/Domain(s)/Zone(s)* | *Name of use case* |
| *DSUC_WE_PO_08* | | SUC 08 - Short-circuit levels information exchange |

##### *10.3.1.8.1.2 Version management*

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

##### *10.3.1.8.1.3 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). |


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| | |
|---|---|
| ***Objective(s)*** | - Improve TSO and DSO grid planning by taking into account each other's short-circuit contributions in the TSO/DSO interface<br><br>- Improve security of operation and quality of service |
| ***Related business case(s)*** | WECL-PT-03 |

##### *10.3.1.8.1.4 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 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. |

##### *10.3.1.8.1.5 Use case conditions*

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | Only three-phase symmetrical short-circuit transient will be analysed |
| 2 | Timespan: 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 |

##### *10.3.1.8.1.6 Further information to the use case for classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |


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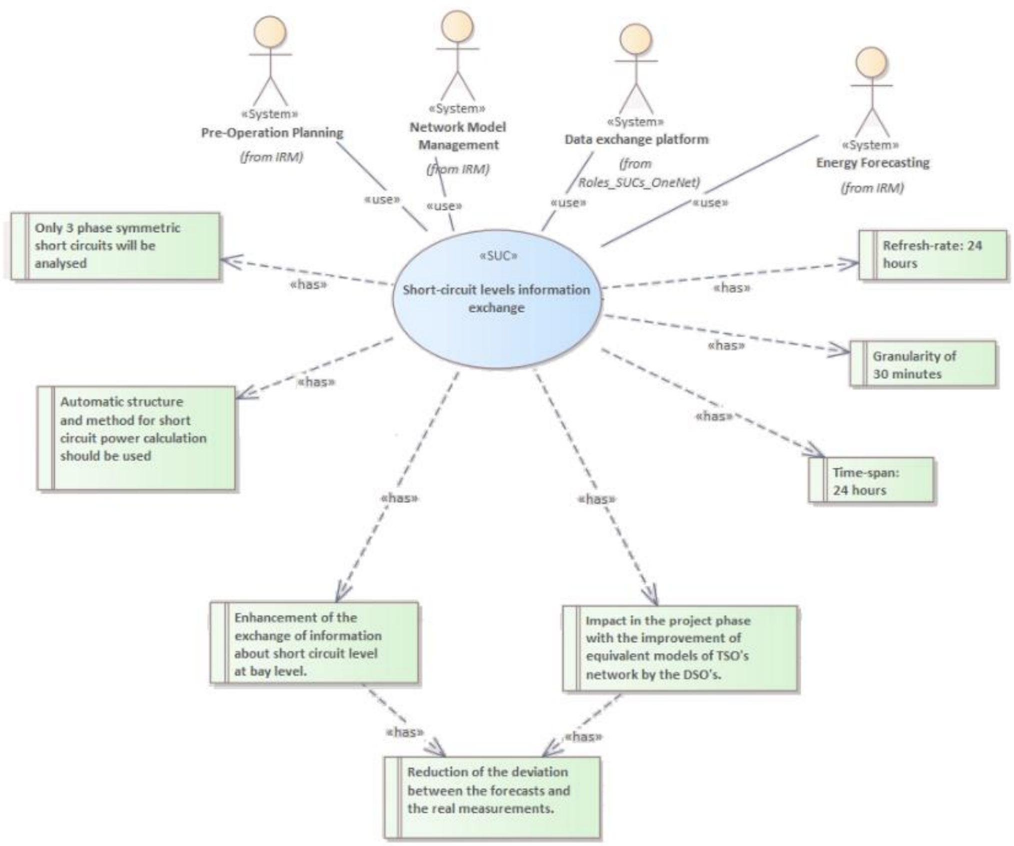
| |
|---|
| WECL-PT-03 |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| High |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| SUC |
| ***Further keywords for classification*** |
| Operational Planning, Short-Circuit Power |

### 10.3.1.8.2 Diagrams of use case

**_Diagram(s) of use case_**







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#### 10.3.1.8.3 Technical details

##### *10.3.1.8.3.1 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. 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 includes 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. | |



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#### 10.3.1.8.4 Step by step analysis of use case

##### *10.3.1.8.4.1 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 information, the DSO compute the short-circuit power also considering the impact of the DER, connected to distribution network. | | 1 time a day | | |

##### *10.3.1.8.4.2 Steps – Scenarios*

###### *10.3.1.8.4.2.1 Scenario name #2: 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.



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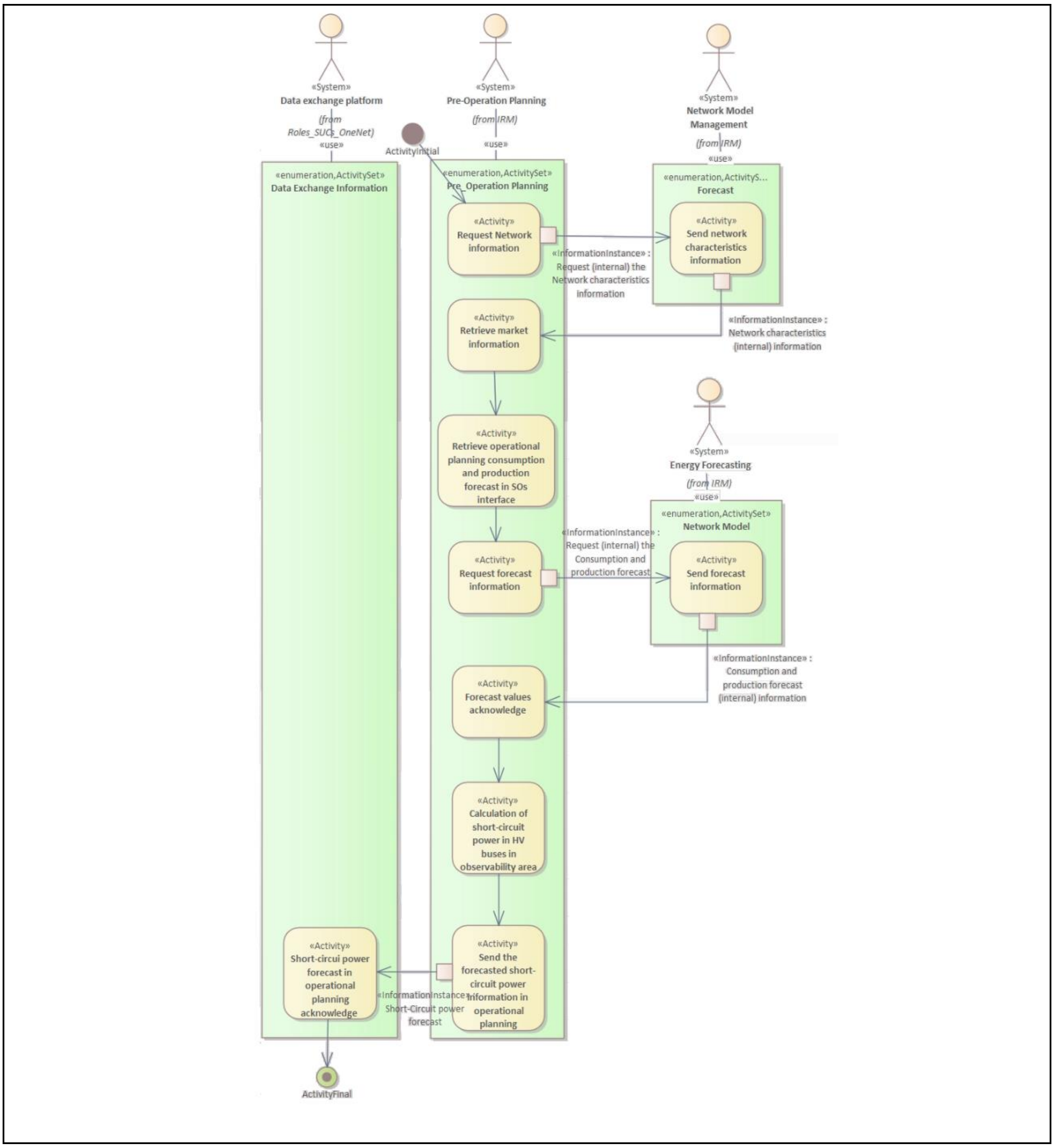


Scenario step by step analysis

| 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*** |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 considered in the method. | | Pre-Operation Planning | | | |
| 1.5 | | Request forecast information | The production and consumption forecast are 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 | |
| 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 | | | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | | | |

*10.3.1.8.4.2.2 Scenario name #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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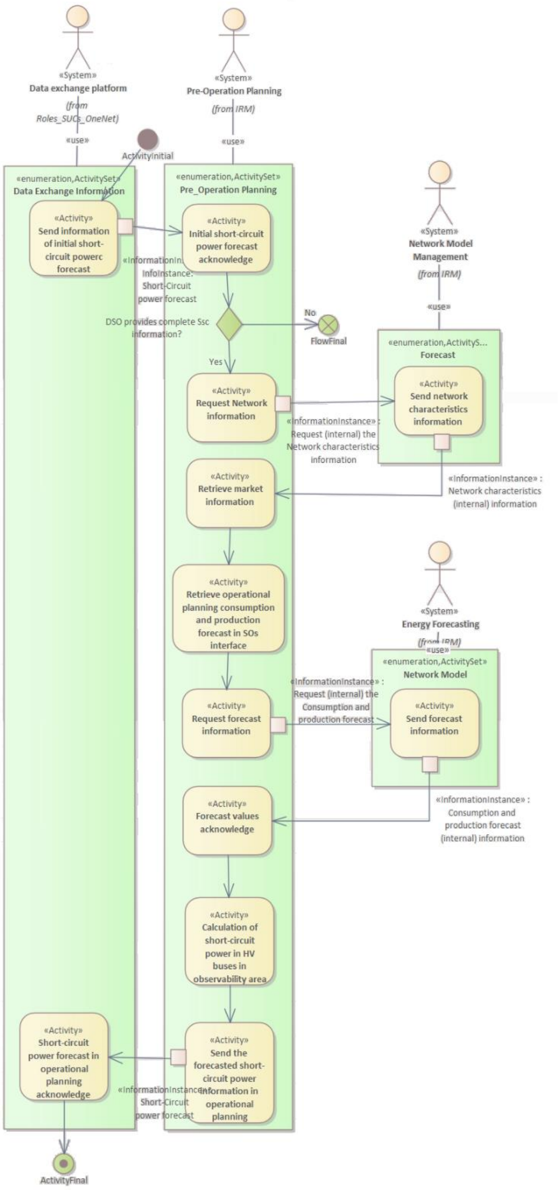


<u>Scenario step by step analysis</u>

| ***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*** | |



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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 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 | | | | |
| 2.7 | | Request forecast information | The production and consumption forecast are needed to execute the method.<br><br>The information should be provided by technology. Some quantiles can be provided if | | Pre-Operation Planning | Energy Forecasting | Info3-Request (internal) the Consumption and production forecast | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | stochastic methods are used | | | | | |
| 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 | | | |

### 10.3.1.8.5 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 is 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 is 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. | |


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## 10.3.2 SPANISH DEMO

### 10.3.2.1 DSUC_WE_SO_01

#### 10.3.2.1.1 Description of the use case

##### *10.3.2.1.1.1 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 |

##### *10.3.2.1.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 21/06/2021 | Leandro Lind | | |

##### *10.3.2.1.1.3 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<br>- Open market sessions at the request of the DSO<br>- Collect bids from market participants<br>- Clear the local flexibility markets<br>- Communicate market results to stakeholders |
| ***Related business case(s)*** | WECL-ES-01 and WECL-ES-02 |

##### *10.3.2.1.1.4 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*** |


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| |
|---|
| 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.<br><br>Three scenarios are defined for this SUC, namely (i) flexibility resource register, (ii) market request, (iii) market session.<br><br>**Scenarios**:<br><br>**1. Flexibility Resource Register:**<br><br>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.<br><br>**2. Market Request:**<br><br>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.<br><br>**3. Market Session:**<br><br>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.<br><br>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). |

###### *10.3.2.1.1.5 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<br><br>-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<br><br>- Open market sessions<br><br>- Clear the local flexibility markets<br><br>- 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<br><br>-Open market sessions |

###### *10.3.2.1.1.6 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 and to use flexibility solutions to secure or restore the network following an expected or unexpected failure if they are appropriate and cost-effective.<br>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<br>FSP engagement |

###### *10.3.2.1.1.7 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 |

##### 10.3.2.1.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|


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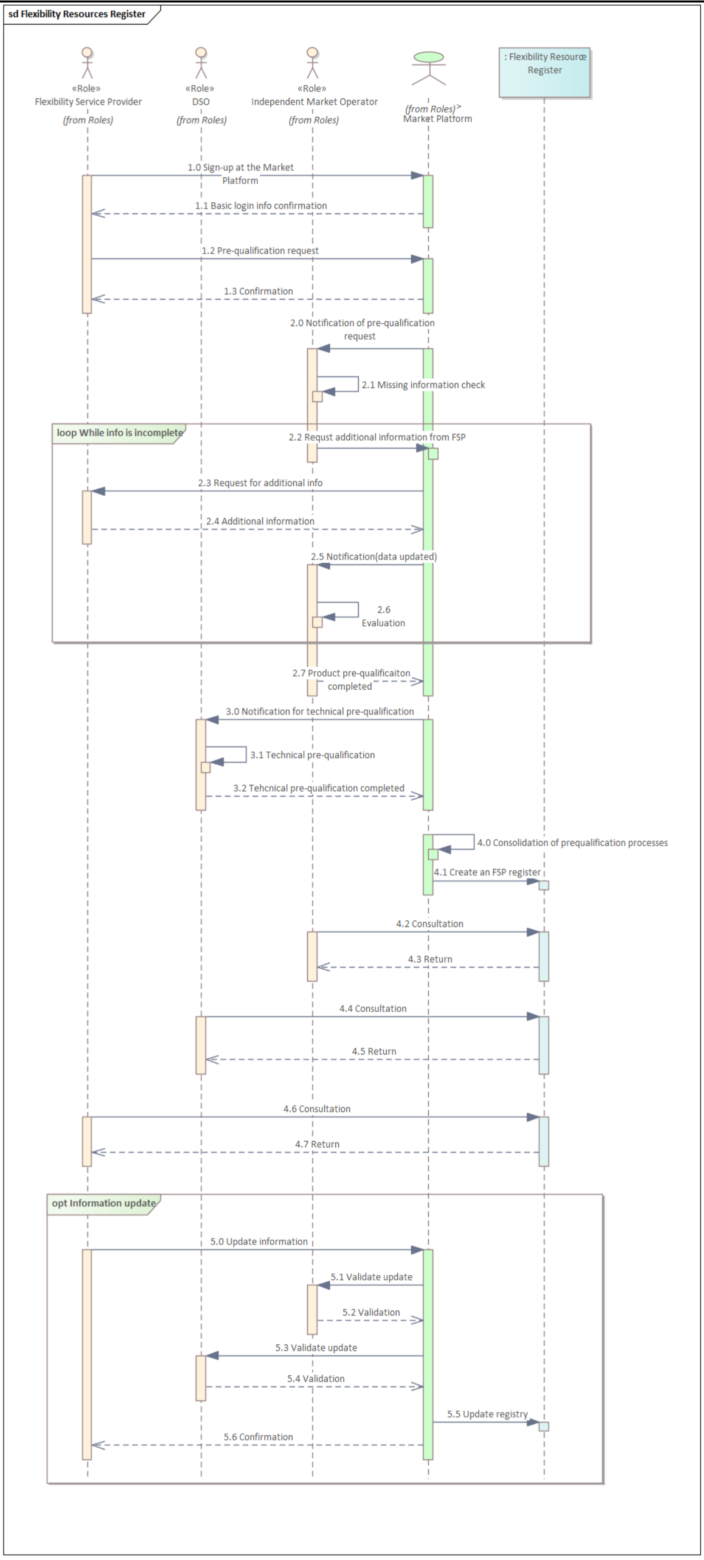
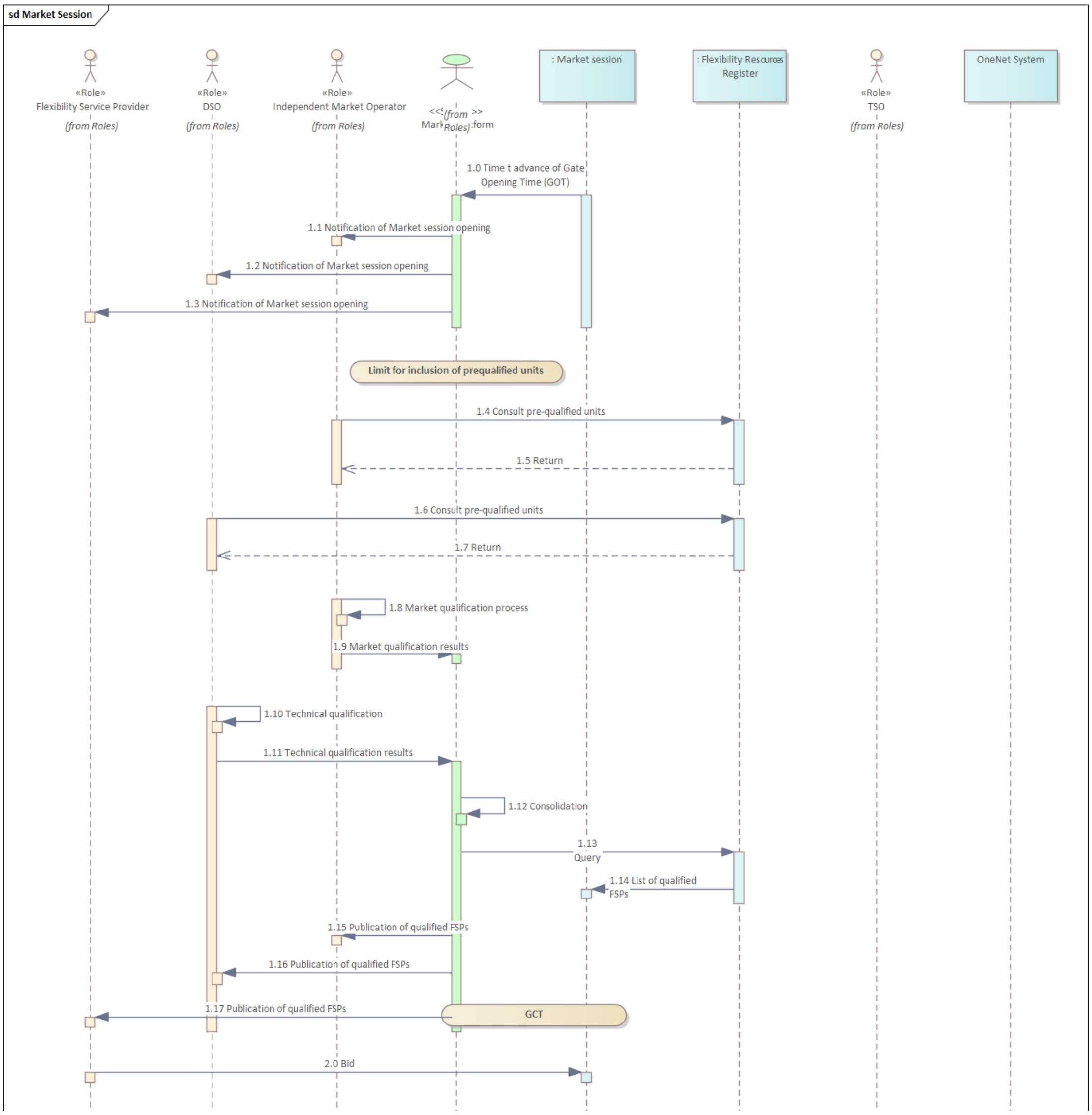
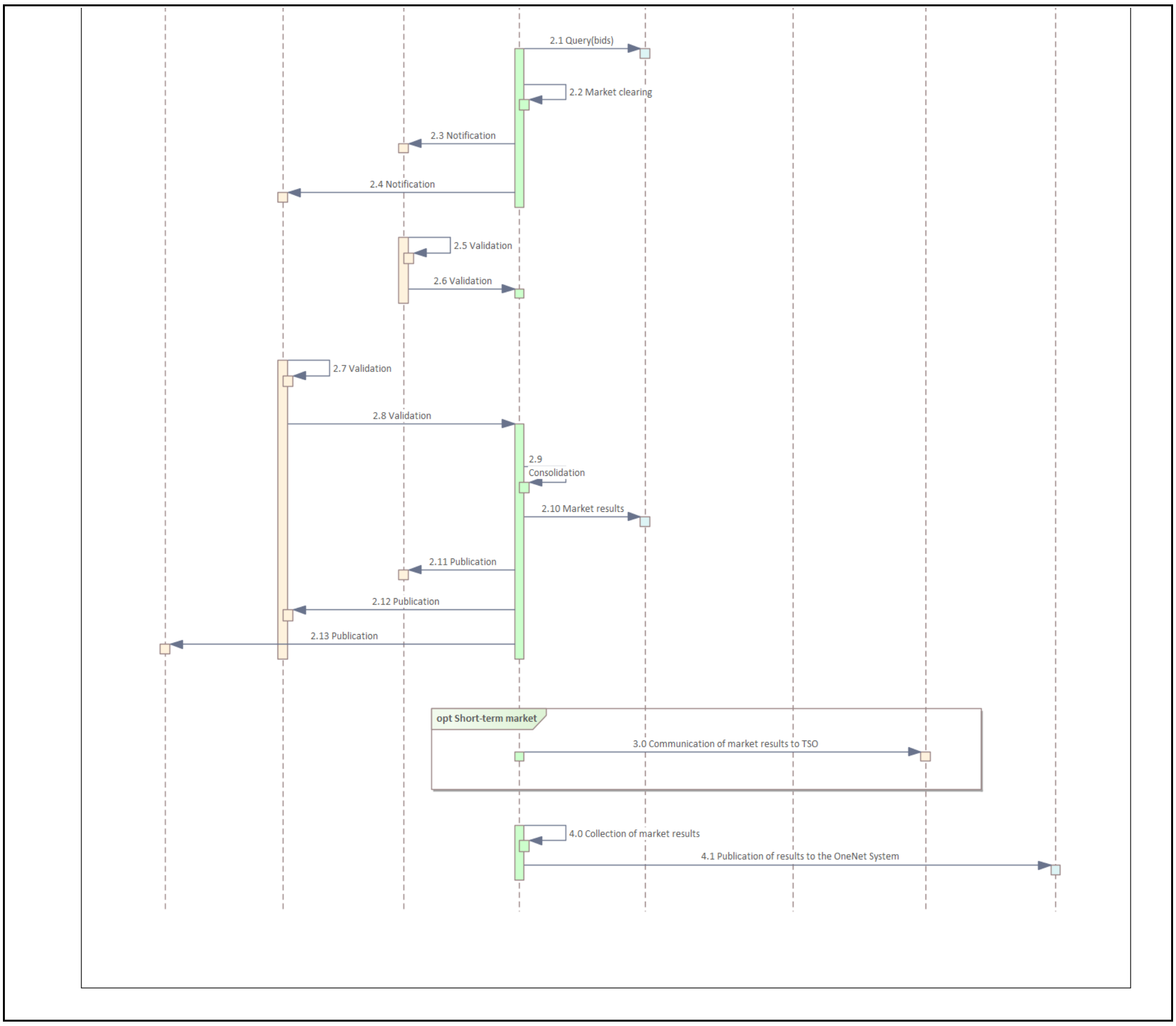

sd Flexibility Resources Register
«Role»
Flexibility Service Provider
(from Roles)
«Role»
DSO
(from Roles)
«Role»
Independent Market Operator
(from Roles)
(from Roles)
Market Platform
: Flexibility Resource Register
1.0 Sign-up at the Market Platform
1.1 Basic login info confirmation
1.2 Pre-qualification 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

**Part 1**


sd Market Session
«Role»
Flexibility Service Provider
(from Roles)
«Role»
DSO
(from Roles)
«Role»
Independent Market Operator
(from Roles)
: Market session
: Flexibility Resources Register
«Role»
TSO
(from Roles)
OneNet System
1.0 Time t advance of Gate Opening Time (GOT)
1.1 Notification of Market session opening
1.2 Notification of Market session opening
1.3 Notification of Market session opening
Limit for inclusion of prequalified units
1.4 Consult pre-qualified units
1.5 Return
1.6 Consult pre-qualified units
1.7 Return
1.8 Market qualification process
1.9 Market qualification results
1.10 Technical qualification
1.11 Technical qualification results
1.12 Consolidation
1.13 Query
1.14 List of qualified FSPs
1.15 Publication of qualified FSPs
1.16 Publication of qualified FSPs
1.17 Publication of qualified FSPs
GCT
2.0 Bid

**Part 2**




### 10.3.2.1.3 Technical details

#### *10.3.2.1.3.1 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". | |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| | | | |
|---|---|---|---|
| | | 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. | |

##### *10.3.2.1.3.2 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/

#### 10.3.2.1.4 Step by step analysis of use case

##### *10.3.2.1.4.1 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 register for the period in which the FSP is active. | 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 |
| 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 | 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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| | | | | | | |
|---|---|---|---|---|---|---|
| | | an open market session to the publication of market results. | | | | |

### 10.3.2.1.4.2 Steps - Scenarios

#### 10.3.2.1.4.2.1 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<br>I.E.03<br>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 pre-qualification | Notification of pre-qualification request | The IMO is informed about the request for a pre-qualification. | REPORT | LMP | IMO | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | was requested | | | | | | | |
| 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 concludes the product pre-qualification. | EXECUTE | IMO | IMO | | |
| 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 | Notification for technical pre-qualification | The LMP informs the DSO that a technical | REPORT | LMP | DSO | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | pre-qualification was requested | | pre-qualification was requested | | | | | |
| 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 | | |
| 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 | 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; | The IMO and the DSO validate the update | Update validation | The IMO and the DSO validate the update | EXECUTE REPORT | IMO; DSO | LMP | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5.4 | | | | | | | | |
| 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 | | |

### *10.3.2.1.4.2.2 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 creation of a Market Session | Market session request | The DSO requests the creation of a Market Session | CREATE | DSO | LMP | I.E.05; I.E.06 | |
| 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 | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 session and registers it into the LMP | Market session validation and defined in a date of the auction calendar (previously defined by the IMO) | The IMO validates the market session and registers it into the LMP | EXCUTE; CREATE | IMO | 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 | | |

*10.3.2.1.4.2.3 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



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| *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. 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. | TIMER | LMP: Market Session | LMP | | |
| 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, | The IMO and the DSO | Consult pre-qualified units | The IMO and the DSO consult the | GET | IMO; | LMP: Flexibility | I.E.07 | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.6 | consult the Flexibility Resources Register | | Flexibility Resources Register. This consultation aims at retrieving the pre-qualified FSPs and starting the qualification processes. This consultation may be done automatically | | DSO | Resources Register | | |
| 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 qualification processes | Consolidation | The LMP consolidates the results of the qualification processes received from DSO and IMO. | EXECUTE | LMP | LMP | | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 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 on the LMP | Validation | The DSO validates the market results and confirms it on the LMP | EXECUTE; REPORT | DSO | LMP | I.E.10 | |
| 2.9 | The LMP consolidate | Consolidation | The LMP consolidated the | EXECUTE | LMP | LMP | I.E.10 | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | d the validations of both IMO and DSO | | validations of both IMO and DSO | | | | | |
| 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 | |

#### 10.3.2.1.5 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 | |


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| | | | |
|---|---|---|---|
| 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.:<br>• Auction identifier<br>• Associated DSO<br>• Product Type: Flexibility Product<br>• Type of negotiation: Auction<br>Area: Basic or aggregated. | |
| I.E.06 | Product parameters | Composed of product parameters concerning the market session being requested. E.g.:<br>1. Service window: Selection of the required date and duration of the service<br>o Start date: 01/06/2021<br>o Duration: 2 months<br>o Selection of days: M, T, W, T, F, S and S.<br>o Opening time: 8:00 PM<br>o Closing time: 10:00 PM<br>2. Availability: Selection of the capacity, the direction and the estimated hours of activation.<br>o Capacity: 4MW<br>o Direction: Upwards (up for generation, down for consumption)<br>o Estimated hours of activation: 120h<br>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.:<br>o Day: 01/06/2021<br>o Hour: 19h<br>o Duration: 2h<br>o Capacity to modify: 1MW<br>o Direction: Upward<br>4. Local area: Selection of the trading area. Choice by postal code, connection point, lines… (to be determined).<br>o Area: postal code<br>5. Activation Announcement: Time in advance that a DSO informs a DER that its activation is programmed confirmed.<br>6. Form of Remuneration: It establishes form of payment to winner DERs Two different terms are defined availability and activation (depending on the product). | |



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| | | | |
|---|---|---|---|
| | | ○ Type of product: availability/activation<br><br>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<br><br>1. General attributes<br>• FSP identifier<br>2. Availability: Selection of the capacity, the direction and the estimated hours of activation.<br>• Period of availability (multiple periods may be possible within the service window)<br>• Price: for availability and/or activation<br><br>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. | |

## 10.3.3 FRENCH DEMO

### 10.3.3.1 DSUC_WE_FR_01

#### 10.3.3.1.1 Description of the use case

##### *10.3.3.1.1.1 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 |

##### *10.3.3.1.1.2 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 |



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#### 10.3.3.1.1.3 Narrative of Use Case

| Narrative of use case |
|---|
| ***Short description*** |
| Need:<br>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.<br>Service (short description of how the service meets the objectives):<br>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:<br>• Market phase<br>• Monitoring and Activation<br>• Measurement and settlement<br>• 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:<br>• 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.<br>• 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.<br>• Measurement and Settlement: In this service phase, the process of production metering and settlement related information tracking is tackled.<br>• Platform consultation: At any time, the platform will enable the different actors to have access authorized information through interfaces. |

#### 10.3.3.1.1.4 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 |
| ***Further keywords for classification*** |
| TSO-DSO coordination, information exchange, DER flexibility activation |

### 10.3.3.1.2 Diagrams of use case

| Diagram(s) of use case |
|---|



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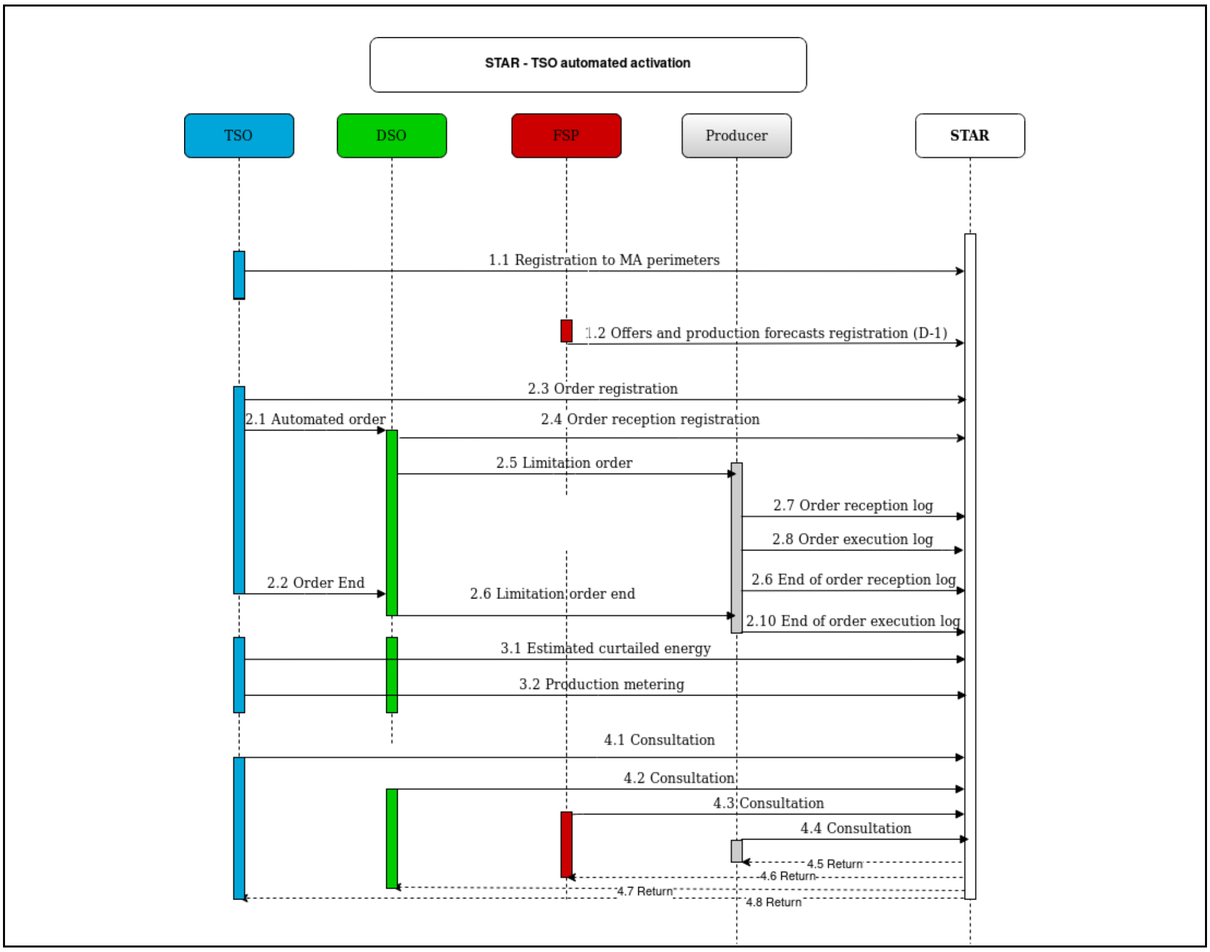


### 10.3.3.1.3 Step by step analysis of use case

#### *10.3.3.1.3.1 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 |



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| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

### 10.3.3.1.3.2 Steps – Scenarios

#### 10.3.3.1.3.2.1 Scenario name #1: Market phase

| 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 | | 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 |

#### 10.3.3.1.3.2.2 Scenario name #2: Monitoring and activation

| 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** |
| 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 | | TSO | STAR platform | Target in MW, Activation order date, automaton | Determined such information |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | tracked in the STAR platform | | | | ID, impacted producers ID | |
| 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 |
| 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 |

*10.3.3.1.3.2.3 Scenario #3: Measurements and settlement*

| ***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 | | DSO or TSO | STAR platform | Power time series, producer ID | Determined such information |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 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. | | | | | |
| 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 |

*10.3.3.1.3.2.4 Scenario #4: Platform Consultation*

| ***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 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 requested information | | STAR platform | Producer | Information requested | Determined such information |

### 10.3.3.2 DSUC_WE_FR_02


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#### 10.3.3.2.1 Description of the use case

##### *10.3.3.2.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***SUC-FR-01b*** | | System for Trackability of Renewable Activations for Automated and Manual Congestion Management: DSO manual activation case |

##### *10.3.3.2.1.2 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.<br>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.<br>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 |

##### *10.3.3.2.1.3 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| Need:<br>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.<br>Service (short description of how the service meets the objectives):<br>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:<br>• Forecast phase<br>• Monitoring and Activation<br>• Measurement and settlement<br>• 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:<br>• Forecast phase: This is the process of collecting production forecasts from the producers. In this SUC, this process is non-compulsory for producers.<br>• 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.<br>• Measurement and Settlement: In this service phase, the process of production metering and settlement related information tracking is tackled.<br>• Platform consultation: At any time, the platform will enable the different actors to have access authorized information through interfaces. |


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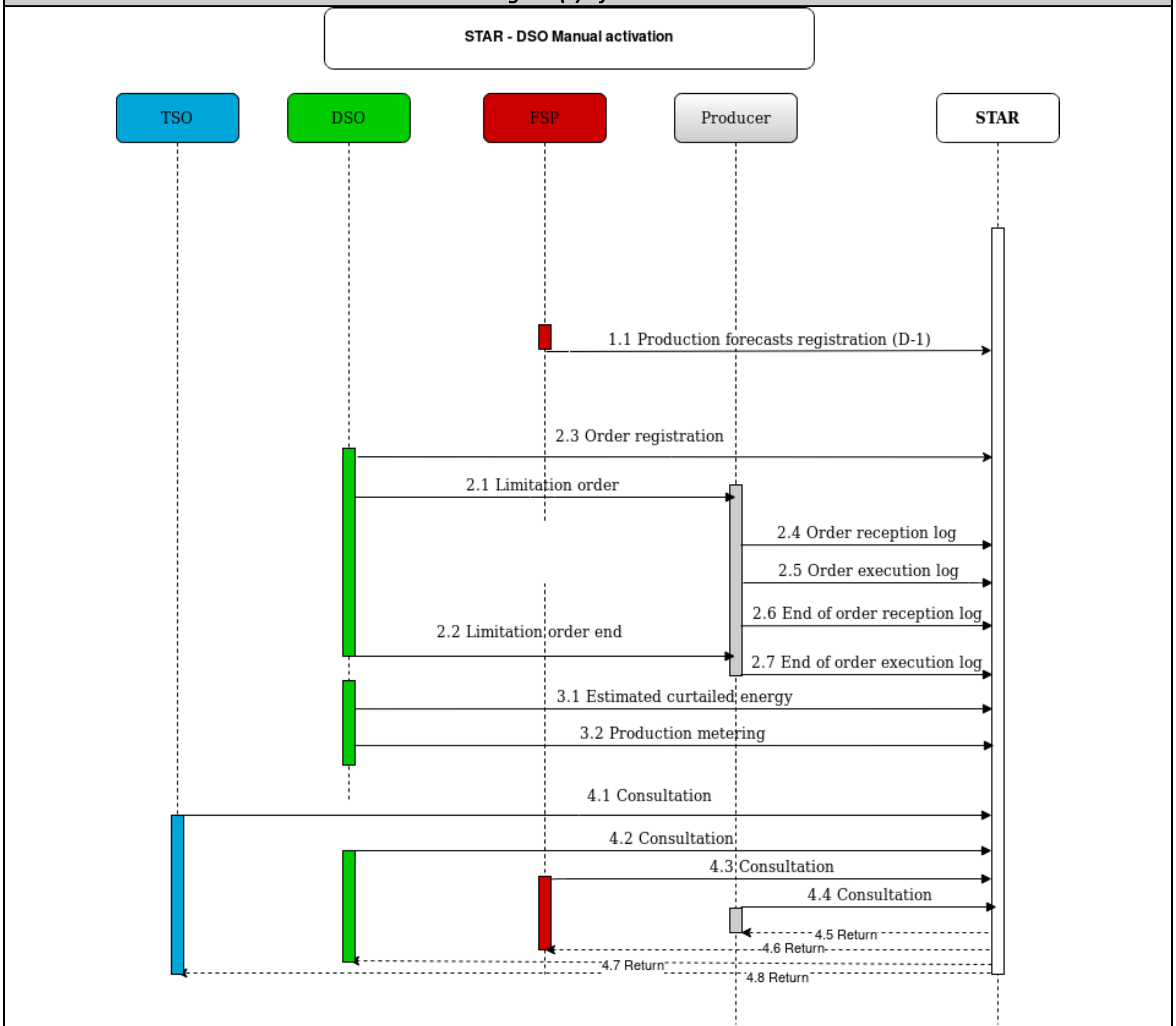
##### 10.3.3.2.1.4 Further information to the Use case for classification/mapping

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

#### 10.3.3.2.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|



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##### 10.3.3.2.3 Step by step analysis of use case

###### *10.3.3.2.3.1 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 |

###### *10.3.3.2.3.2 Steps – Scenarios*

*10.3.3.2.3.2.1 Scenario name #1: Market phase*

| ***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 optionally provide day-ahead their production forecasts. | | FSP | STAR platform | Daily production forecasts (power time series) | Determined such information |

*10.3.3.2.3.2.2 Scenario name #2: Monitoring and activation*

| ***Scenario*** | |
|---|---|
| ***Scenario name*** | Monitoring and activation |



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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 | | 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 |
| 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 |

*10.3.3.2.3.2.3 Scenario name #3: Measurement and settlement*

| ***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*** |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 since the producer is connected to its network. | | DSO | STAR platform | Power time series, producer ID | Determined such information |
| 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 |

*10.3.3.2.3.2.4 Scenario name #4: Platform consultation*

| **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 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 |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 |

## 10.4 Eastern Cluster

### 10.4.1 POLISH DEMO

#### 10.4.1.1 DSUC_EA_PL_01

##### 10.4.1.1.1 Description of the use case

###### *10.4.1.1.1.1 Name of use case*

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

###### *10.4.1.1.1.2 Version Management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2021-07-04 | Kamil Starzewski (TTSA) | Initial draft | |

###### *10.4.1.1.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Description of prequalification process of potentials on the Flexibility Platform (FP) |
| ***Objective(s)*** | To register Distributed Energy Resource (DER) and its flexibility potential by Flexibility Service Provider (FSP) in the Flexibility Register (FR), which will enable submission of bids on the FP and participation in the flexibility market |
| ***Related business case(s)*** | - |

###### *10.4.1.1.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| This use case describes prequalification process on the FP which consists of:<br>• market prequalification (registration and assessment of a new FSP on the FP)<br>• certification of DER (registration and assessment of a new unit by FSP)<br>• product prequalification and/or static grid prequalification (registration and assessment of a new potential by FSP in response to certain product available of the FP)<br>This use case covers all obligatory steps for a FSP to participate in the flexibility market through FP |
| ***Complete description*** |
| **I Market prequalification** |



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1. FSP fills a registration form on the FP providing all necessary data including obligatory attachments to start the registration process. FSP must confirm registration request through an e-mail account.
2. Registration process is started on the FP and the Market Operator (MO) is notified.
3. MO checks data provided by the FSP and accepts or cancels registration. MO can demand additional info from the FSP. In case of acceptance, use case is continued, else use case is stopped. FSP is notified.
4. FSP is registered on the FP and can log into the FP. FSP has access to view available products on the FP.

**II Certification of DER**

1. FSP fills a new DER registration form on the FP providing all necessary data to start the certification process. If DER will provide balancing products, it is necessary for FSP to select Scheduling Unit (SU) from certain Balancing Service Provider (BSP) which will represent FSP's DER on the balancing market.
2. System Operator (SO) is notified depending on the location of the DER. If DER will provide balancing products, BSP is notified.
3. SO performs certification of the DER and registers the outcome of the process on the FP. In case of acceptance, use case is continued, else use case is stopped. FSP is notified.
4. BSP has to accept DER-SU connection. In case of acceptance, user case is continued, else use case is stopped.
5. FSP can register new potential on the FP.

**III Product and/or static grid prequalification**

1. FSP fills a new potential registration form on the FP providing all necessary data to start the prequalification process. New potential is based on products available on the FP and corresponds to certified DER. FP validates parameters of the potential against parameters of the product. In case of acceptance, use case is continued, else use case is stopped. SO is notified about new potential registration process.
2. Depending on product parameters, product and/or static grid prequalification is performed by SO. In case of acceptance, use case is continued, else use case is stopped. FSP is notified.
3. New potential is registered in the Flexibility Register (FR). FSP is able to offer bids using certain potential.

## 10.4.2 SLOVENIAN DEMO

### 10.4.2.1 DSUC_EA_SL_01

#### 10.4.2.1.1 Description of the use case

##### *10.4.2.1.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Energy market | Grid prequalification |

##### *10.4.2.1.1.2 Version Management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2021-08-26 | Luka Nagode (GEN-I) | draft-concept | |

##### *10.4.2.1.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** |
|---|


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| | |
|---|---|
| ***Scope*** | This SUC will validate a prequalification process for flexibility in the distribution grid, mainly used for congestion management. The flexibility prequalified with this SUC could also be utilised for other system services. It will verify information exchange between stakeholders IT systems in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| ***Objective(s)*** | Validate prequalification mechanism for various flexibility sources<br>Prequalify numerous flexibility sources.<br>Improve security of supply through a transparent and easy process |
| ***Related business case(s)*** | Congestion management |

##### *10.4.2.1.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. This use case describes the process of prequalification for units planned for use in support demans response services. |
| ***Complete description*** |
| **Grid prequalification:** at the start of this process, flexibility resources are registered at the flexibility register. Flexibility register (component located at the market operator) initiates prequalification of the registered resource run by DSO, to validate existence of the resource and it's impact on the distribution grid. The complexity of this procedure depends on the volume/power and the impact on the grid of the flexibility resources.<br>Summary of use case<br>• **Grid prequalification**Description: Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.<br>▪ Initiate grid prequalification<br>Description:<br>▪ Receive grid prequalification report<br>Description:<br>▪ Receive grid prequalification request<br>Description:<br>▪ Register flexibility resource<br>Description:<br>▪ Request to register flexibility resource<br>Description:<br>▪ Run grid prequalification tests<br>Description:<br>▪ Send grid prequalification report<br>Description:<br>▪ Send grid prequalification result<br>Description:<br>▪ Validate and register flexibility resource<br>Description: |

##### *10.4.2.1.1.5 Key Performance Indicators (KPIs)*

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | A number of successfully prequalified units | | |
| 2 | Volume of flexibility by prequalified units | | |
| 3 | Average time needed for prequalification of a unit | | |



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##### 10.4.2.1.1.6 Use Case conditions

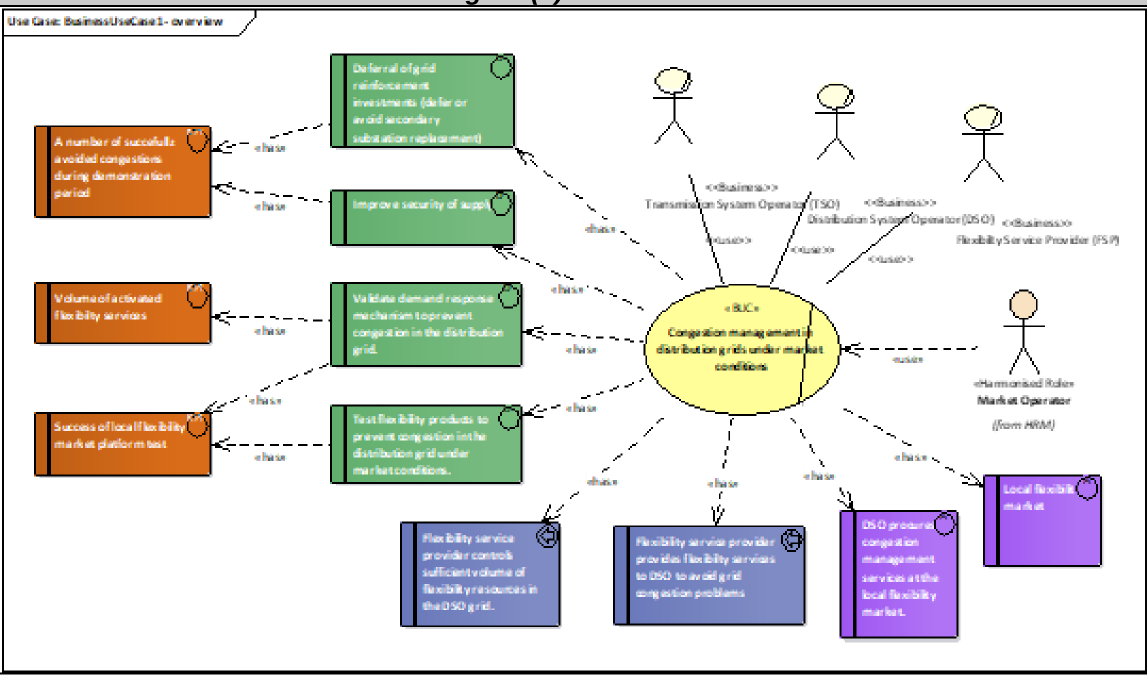
| Use case conditions | |
|---|---|
| **Assumptions** | |
| 1 | Local flexibility market |
| 2 | DSO procures congestion management services at the local flexibility market. |
| **Prerequisites** | |
| 1 | Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems |
| 2 | Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid. |

##### 10.4.2.1.1.7 Further information to the Use case for classification/mapping

| Classification information |
|---|
| ***Relation to other use cases*** |
| <<BUC>> Congestion management<br><<SUC>> Grid prequalification<br><<SUC>> Product prequalification<br><<SUC>> Bidding<br><<SUC>> Activation - Flexibility market<br><<SUC>> Settlement-Flexibility market |
| ***Level of depth*** |
| High level |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| National relation |
| ***Nature of the use case*** |
| SUC |
| ***Further keywords for classification*** |
| Flexibility, Local flexibility market, Congestion management |

#### 10.4.2.1.2 Diagrams of use case

| Diagram(s) of use case |
|---|



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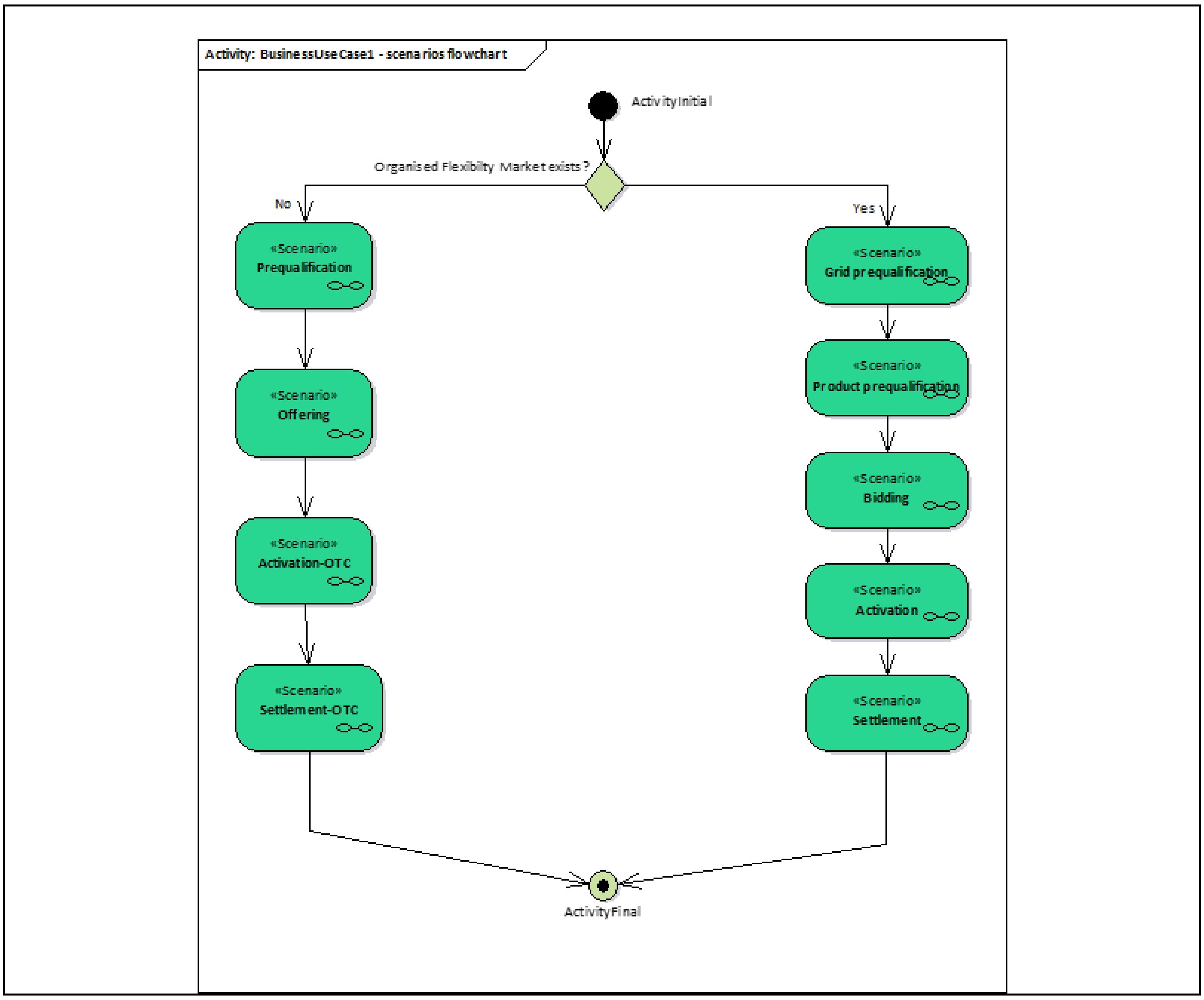


### 10.4.2.1.3 Technical Details

#### *10.4.2.1.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this business use case*** |
| Transmission System Operator (TSO) | Business | According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area.<br>Source : EU Commission Task Force for Smart Grids, EG3 | |



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| | | | |
|---|---|---|---|
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.<br><br>Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast), | |
| Flexibility Service Provider (FSP) | Business | Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties. | |
| Market Operator | Harmonised Role | A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity.<br><br>**Additional Information**:<br>This usually is an energy/power exchange or platform.<br>The definition is based on Regulation on the internal market for electricity (EU) 2019/943. | |

### *10.4.2.1.3.2 Systems*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***System name*** | ***System owner*** | ***System description*** | ***Further information specific to this system use case*** |
| DSO Scada system | Distribution System Operator (DSO) | System responsible for displaying grid measurements, which serve as input for DSO activation system | |
| TSO Scada system | Transmission System Operator (TSO) | System responsible for displaying grid measurements, which serve as input for ancillary services etc. | |
| DSO smartgrid activation system | Distribution System Operator (DSO) | Automatic system that according to the measurements decide where an activation is needed | |
| DSO smartgrid platform | Distribution System Operator (DSO) | Controls registers of all location where flexibility is needed, communicates with bidding platform from market operator | |
| Virtual power plant technical channel | Flexibility Service Provider (FSP) | Takes care of real-time exchanged information for activations etc. | |
| Virtual power plant business channel | Flexibility Service Provider (FSP) | Takes care of business files exchange (bids, measurements etc) | |
| Virtual power plant | Flexibility Service Provider (FSP) | System responsible for units activation, internal baseline calculations, monitoring of available locations | |
| Bidding platform | Market Operator | System collecting DSO offerings and FSP bids, organising them and publishing results | |
| Settlement system | Market Operator | System collecting DSO activations and FSP measurements, evaluating activation success and energy to be paid | |
| Unit controller | Flexibility Service Provider (FSP) | Controller that transmits activation demand to technical units | |



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| | | | |
|---|---|---|---|
| Flexibility marketplace platform for FSP | Flexibility Service Provider (FSP) | | |
| Flexibility register | Market Operator | | |
| DSO mailbox | Distribution System Operator (DSO) | | |

#### 10.4.2.1.4 Step by step analysis of use case

##### *10.4.2.1.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Grid prequalification | Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid. | DSO | | | |

##### *10.4.2.1.4.2 Steps – Scenarios*

**Grid prequalification**
Run by DSO to validate existence of the flexibility resource and evaluate impact on the distribution grid.


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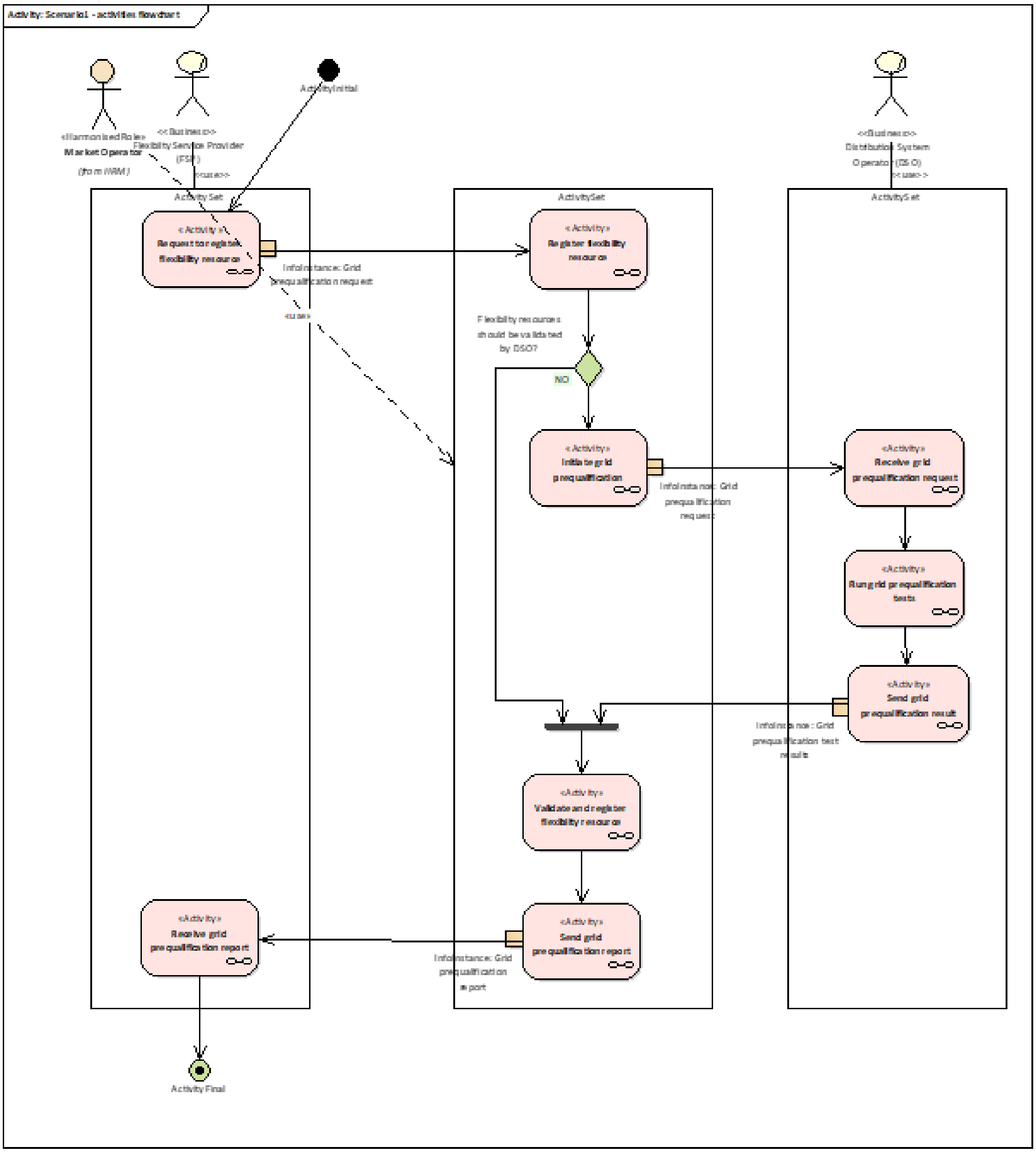






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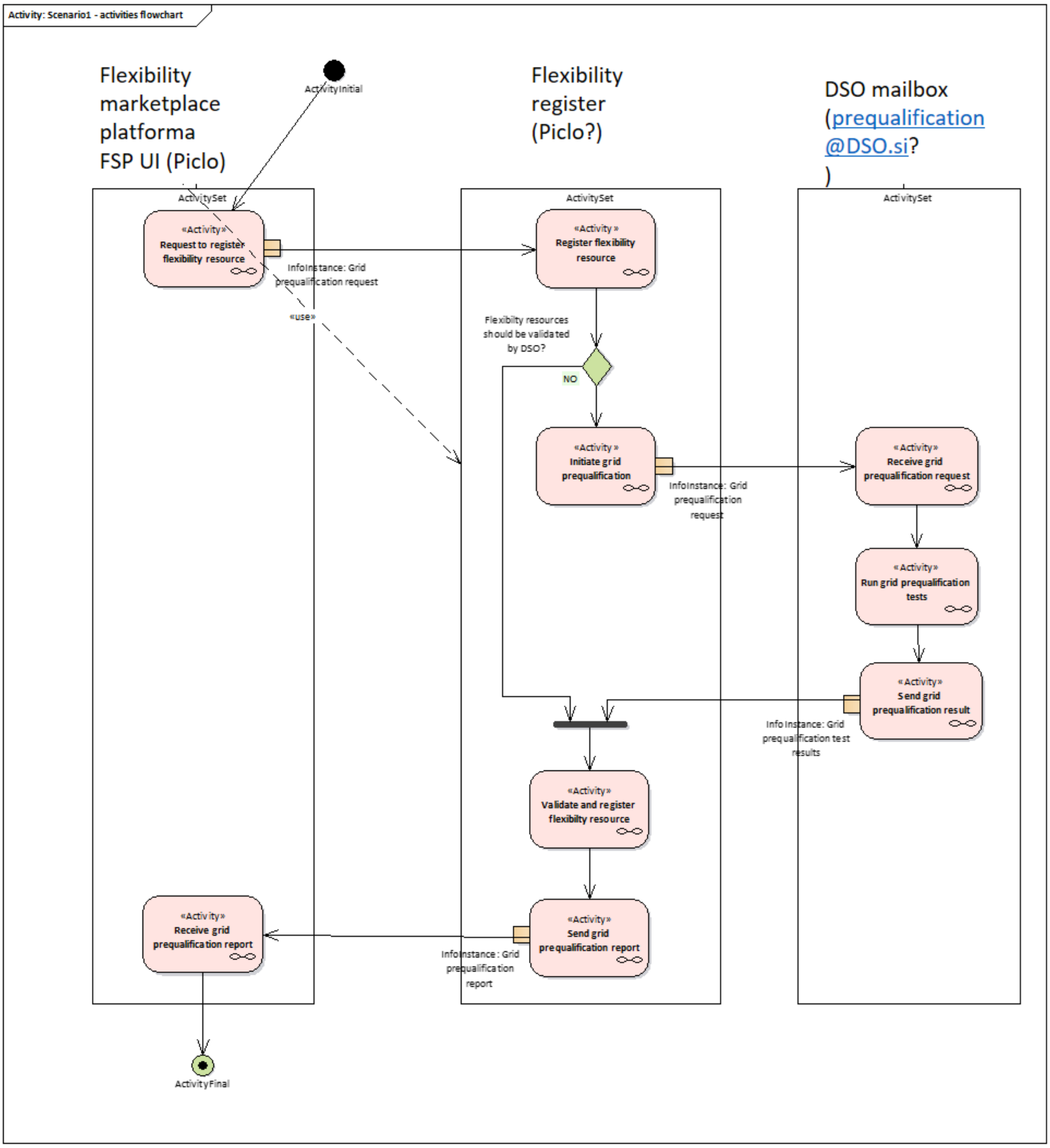


Scenario step by step analysis

Scenario 1: resource should be validated by DSO

| *Scenario 1* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Grid prequalification with 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 | | Request to register flexibility resource | | | Flexibility marketplace platform for FSP | Flexibility register | Info9-Grid prequalification request | |




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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.2 | | Register flexibility resource | | | Flexibility register | Flexibility register | | |
| 1.3 | | Initiate grid prequalification | | | Flexibility register | DSO mailbox | Info9-Grid prequalification request | |
| 1.4 | | Receive grid prequalification request | | | DSO mailbox | | | |
| 1.5 | | Run grid prequalification tests | | | DSO mailbox | | | |
| 1.6 | | Send grid prequalification result | | | DSO mailbox | Flexibility register | Info11-Grid prequalification test results | |
| 1.7 | | Validate and register flexibility resource | | | Flexibility register | Flexibility register | | |
| 1.8 | | Send grid prequalification report | | | Flexibility register | Flexibility marketplace platform for FSP | Info10-Grid prequalification report | |
| 1.9 | | Receive grid prequalification report | | | Flexibility marketplace platform for FSP | Flexibility marketplace platform for FSP | | |

Scenario 2: resource does not need to be validated by DSO

| ***Scenario 2*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Grid prequalification without 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 | | Request to register flexibility resource | | | Flexibility marketplace platform for FSP | Flexibility register | Info9-Grid prequalification request | |
| 1.2 | | Register flexibility resource | | | Flexibility register | Flexibility register | | |
| 1.3 | | Validate and register flexibility resource | | | Flexibility register | Flexibility register | | |
| 1.4 | | Send grid prequalification report | | | DSO mailbox | | Info10-Grid prequalification report | |
| 1.5 | | Receive grid prequalification report | | | Flexibility marketplace platform for FSP | | | |

#### 10.4.2.1.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info9 | Grid prequalification request | Request for grid prequalification sent by FSP or flexibility resource owner. The request contains all technical data such as: | |

| | | | |
|---|---|---|---|
| | | 1. Flexibility resource type<br>2. Connectivity (voltage level, transformer substation, DSO)<br>3. Location (GPS coordinates)<br>4. Active power<br>5. ....<br>Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO. | |
| Info10 | Grid prequalification report | This is information to FSP about the grid prequalification and it is in the form of a document. | |
| Info11 | Grid prequalification test results | This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered and used later without negative impact on the distribution grid. | |
| Info15 | Prequalification request | Request document with all the information necessary to run prequalification tests. These documents include:<br>1. Type of the DER<br>2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location)<br>3. Installed power | |
| Info16 | Prequalification information | Document with the prequalification results. | |

### 10.4.2.2 DSUC_EA_SL_02

#### 10.4.2.2.1 Description of the use case

##### *10.4.2.2.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Energy market | Product prequalification |

##### *10.4.2.2.1.2 Version Management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2021-08-26 | Luka Nagode (GEN-I) | draft-concept | |
| 2 | 2021-04-28 | Nermin Suljanović (EIMV) | Domain, Roles, BUC description, SUC list without detailed description | |
| 3 | 2021-08-16 | Luka Nagode (GEN-I) | Roles, SUC description | |

##### *10.4.2.2.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | This SUC will define information exchange between all stakeholders in the process of prequalifying units for congestion management under flexibility market conditions. The flexibility tested in this SUC can also be utilised for various system services.t |
| ***Objective(s)*** | Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>Improve security of supply.<br>Validate demand response mechanism to prevent congestion in the distribution grid.<br>Test flexibility products to prevent congestion in the distribution grid under market conditions. |



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| Related business case(s) | Congestion management |
|---|---|

#### 10.4.2.2.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| **Short description** |
| Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. |
| **Complete description** |
| · **Product prequalification**: DSO defines the requirements that each local flexibility product should meet. Flexibility market operator (FMO) coordinates the prequalification process. Flexibility service provider sends the prequalification request with accompanying information to the FMO, who forwards this request to DSO. DSO runs predefined tests and calculation, after send the results and acknowledge FMO about the final decision. FMO stores this information to the flexibility register and acknowledges FSP.<br><br>Summary of use case<br>○ Product prequalification Description: Process is coordinated by the Flexibility Market Operator (FMO).<br>○ Send product prequalification requirements<br>Description:<br>○ Publish call for flexibility service<br>Description:<br>○ Send request for flexibility service prequalification<br>Description:<br>○ Receive and forward request for flexibility service prequalification<br>Description:<br>○ Receive and validate request<br>Description:<br>○ Run prequalification tests<br>Description:<br>○ Send prequalification test results<br>Description:<br>○ Receive prequalification test results<br>Description:<br>○ Evaluate prequalification test results<br>Description:<br>○ Send service prequalification information<br>Description:<br>○ Receive and acknowledge<br>Description:<br>○ Receive and acknowledge<br>Description:<br>○ Receive and acknowledge<br>Description: |

#### 10.4.2.2.1.5 Key Performance Indicators (KPIs)

| Key performance indicators | | | |
|---|---|---|---|
| ID | Name | Description | Reference to mentioned use case objectives |
| 1 | A number of successfully prequalified units | | |
| 2 | Volume of flexibility by prequalified units | | |
| 3 | Average time needed for prequalification of a unit | | |


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##### 10.4.2.2.1.6 Use case conditions

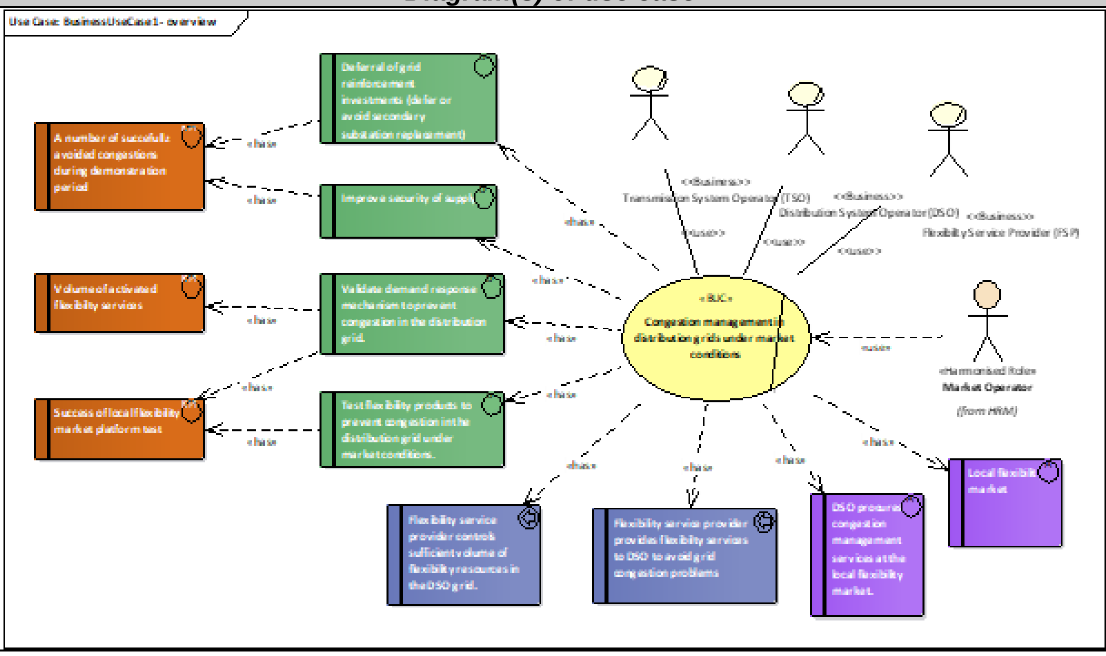
| Use case conditions | |
|---|---|
| **Assumptions** | |
| 1 | Local flexibility market |
| 2 | DSO procures congestion management services at the local flexibility market. |
| **Prerequisites** | |
| 1 | Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems |
| 2 | Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid. |

##### 10.4.2.2.1.7 Further information to the Use case for classification/mapping

| Classification information |
|---|
| **Relation to other use cases** |
| <<BUC>> Congestion management<br><<SUC>> Grid prequalification<br><<SUC>> Product prequalification<br><<SUC>> Bidding<br><<SUC>> Activation - Flexibility market<br><<SUC>> Settlement-Flexibility market |
| **Level of depth** |
| High level |
| **Prioritisation** |
| |
| **Generic, regional or national relation** |
| National relation |
| **Nature of the use case** |
| SUC |
| **Further keywords for classification** |
| Flexibility, Local flexibility market, Congestion management |

#### 10.4.2.2.2 Diagrams of use case

| Diagram(s) of use case |
|---|



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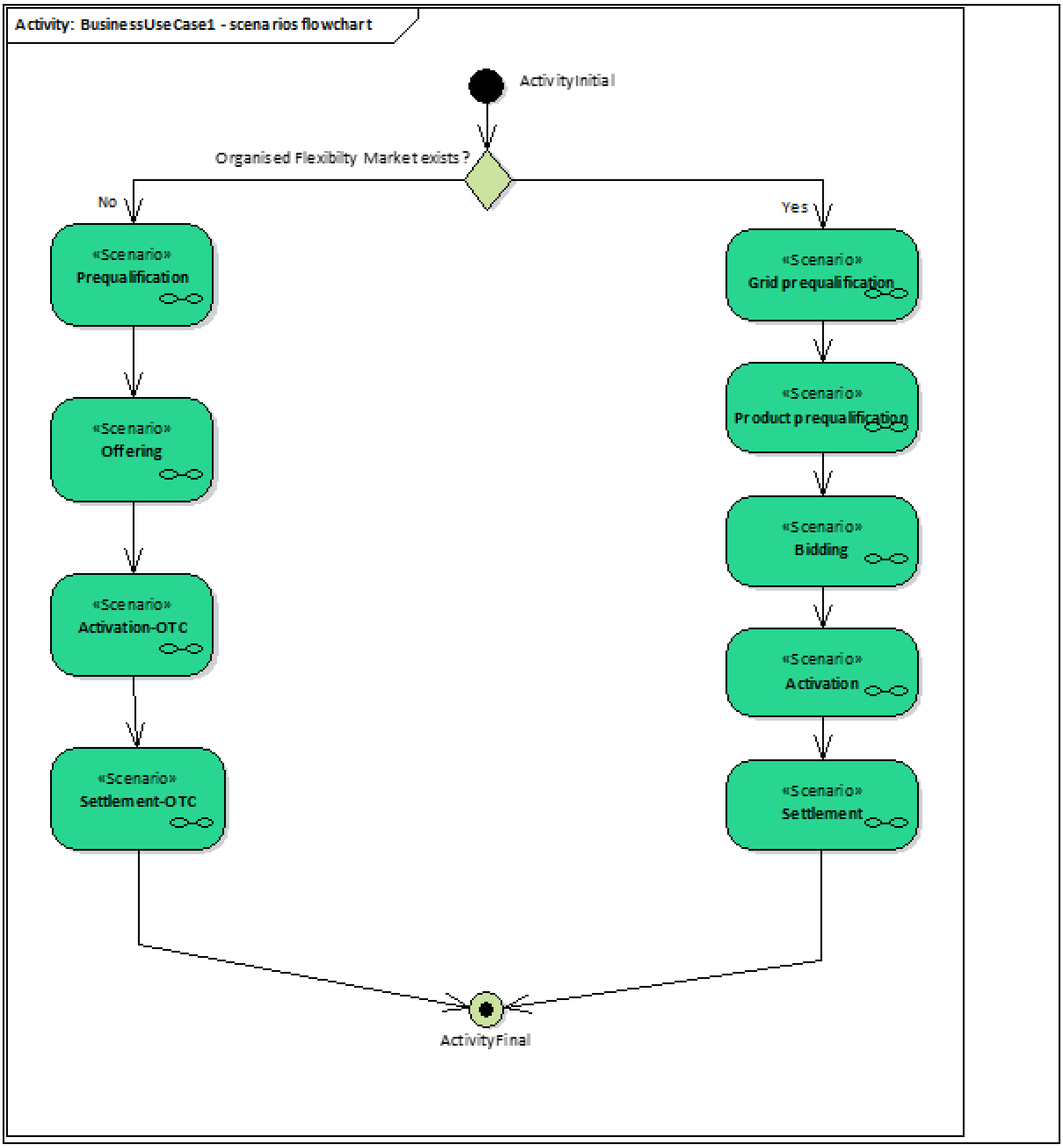


### 10.4.2.2.3 Technical Details

#### *10.4.2.2.3.1 Actors*

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


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| | | | |
|---|---|---|---|
| Transmission System Operator (TSO) | Business | According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area. Source : EU Commission Task Force for Smart Grids, EG3 | |
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.<br><br>Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast), | |
| Flexibility Service Provider (FSP) | Business | Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties. | |
| Market Operator | Harmonised Role | A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity.<br><br>**Additional Information**:<br>This usually is an energy/power exchange or platform.<br>The definition is based on Regulation on the internal market for electricity (EU) 2019/943. | |

#### *10.4.2.2.3.2 Systems*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***System name*** | ***System owner*** | ***System description*** | ***Further information specific to this system use case*** |
| DSO Scada system | Distribution System Operator (DSO) | System responsible for displaying grid measurements, which serve as input for DSO activation system | |
| TSO Scada system | Transmission System Operator (TSO) | System responsible for displaying grid measurements, which serve as input for ancillary services etc. | |
| DSO smartgrid activation system | Distribution System Operator (DSO) | Automatic system that according to the measurements decide where an activation is needed | |
| DSO smartgrid platform | Distribution System Operator (DSO) | Controls registers of all location where flexibility is needed, communicates with bidding platform from market operator | |
| Virtual power plant technical channel | Flexibility Service Provider (FSP) | Takes care of real-time exchanged information for activations etc. | |
| Virtual power plant business channel | Flexibility Service Provider (FSP) | Takes care of business files exchange (bids, measurements etc) | |



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| | | | |
|---|---|---|---|
| Virtual power plant | Flexibility Service Provider (FSP) | System responsible for units activation, internal baseline calculations, monitoring of available locations | |
| Bidding platform | Market Operator | System collecting DSO offerings and FSP bids, organising them and publishing results | |
| Settlement system | Market Operator | System collecting DSO activations and FSP measurements, evaluating activation success and energy to be paid | |
| Unit controller | Flexibility Service Provider (FSP) | Controller that transmits activation demand to technical units | |
| Flexibility marketplace platform for FSP | Flexibility Service Provider (FSP) | | |
| Flexibility marketplace platform for MO | Market Operator | | |
| Flexibility marketplace platform for DSO | Distribution System Operator (DSO) | | |
| Flexibility marketplace platform for TSO | Transmission System Operator (TSO) | | |

##### 10.4.2.2.4 Step by step analysis of use case

###### *10.4.2.2.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Product prequalification | Process is coordinated by the Flexibility Market Operator (FMO). | FMO | | | |


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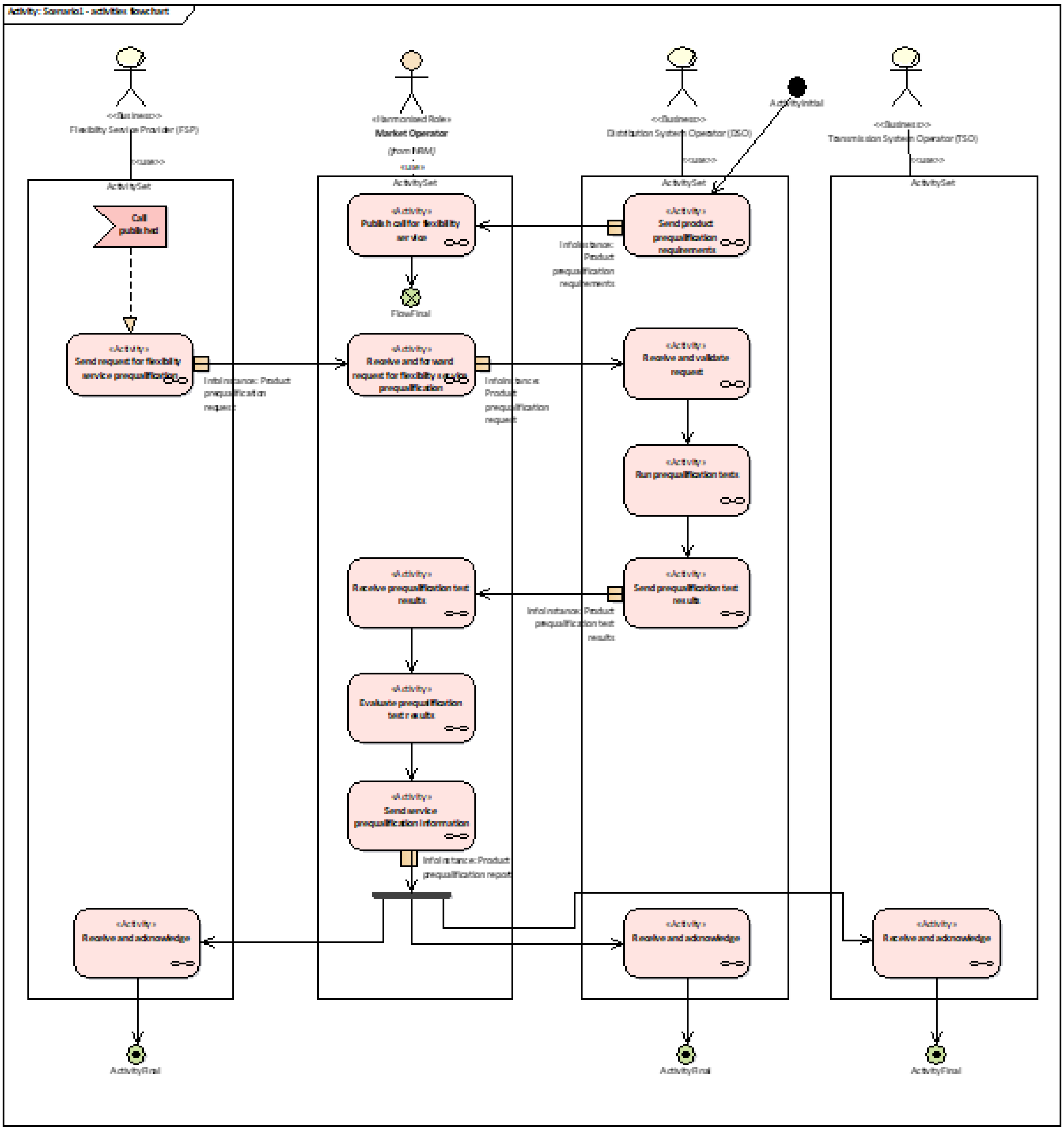
10.4.2.2.4.2 Steps – Scenarios





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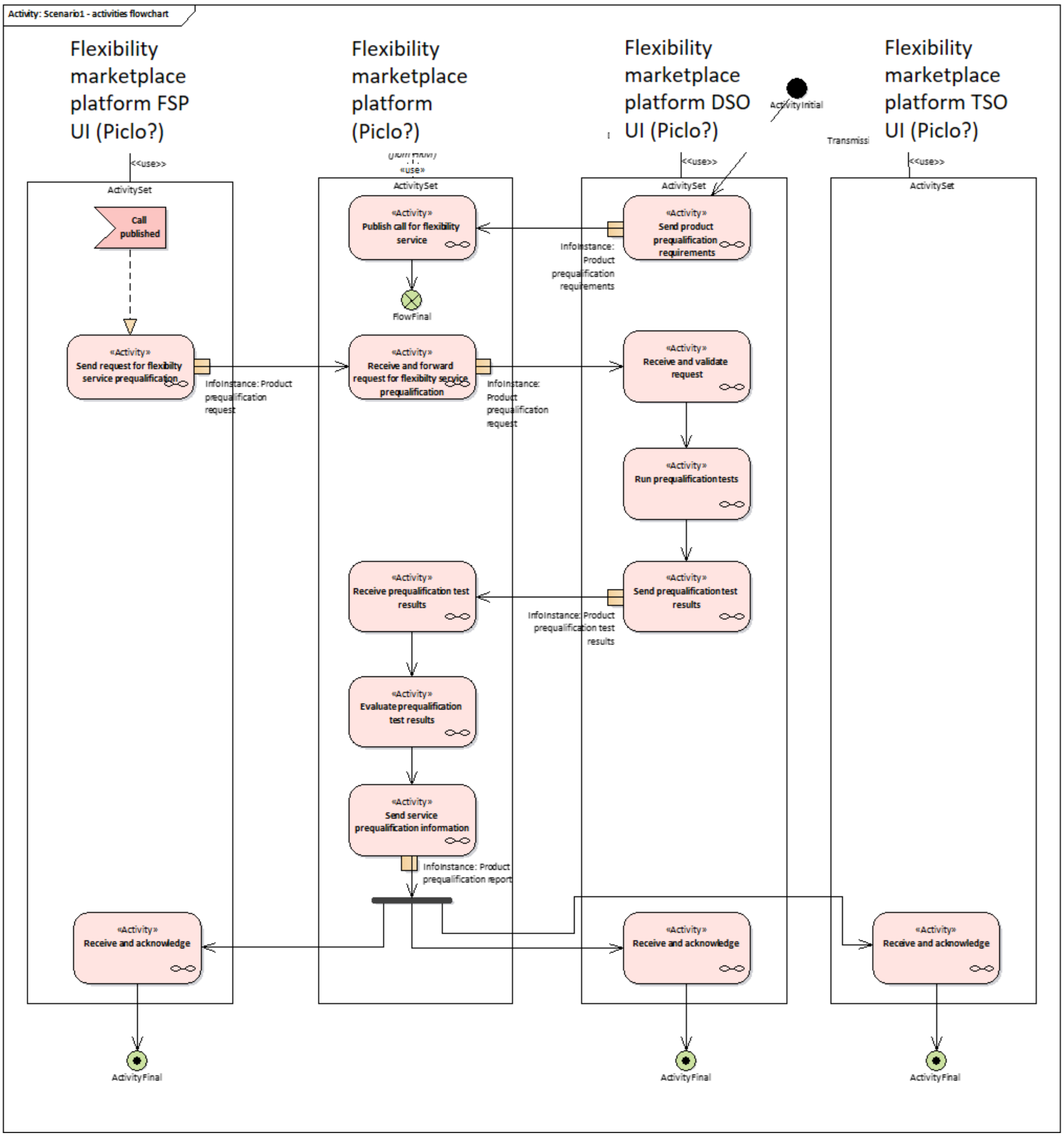


## Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Product prequalification | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 1.1 | | Send product prequalification requirements | | | Flexibility marketplace platform for DSO | | Info19-Product prequalification | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Present baseline calculation options | |
| 1.2 | | Publish call for flexibility service | | | Flexibility marketplace platform for MO | | | |
| 1.3 | | Send request for flexibility service prequalification | | | Flexibility marketplace platform for FSP | | Info17-Product prequalification request Suggest most suitable baseline calculation | |
| 1.4 | | Receive and forward request for flexibility service prequalification | | | Flexibility marketplace platform for MO | | Info17-Product prequalification request | |
| 1.5 | | Receive and validate request | | | Flexibility marketplace platform for DSO | | | |
| 1.6 | | Run prequalification tests | | | Flexibility marketplace platform for DSO | | | |
| 1.7 | | Send prequalification test results | | | Flexibility marketplace platform for DSO | | Info18-Product prequalification test results | |
| 1.8 | | Receive prequalification test results | | | Flexibility marketplace platform for MO | | | |
| 1.9 | | Evaluate prequalification test results | | | Flexibility marketplace platform for MO | | | |
| 1.10 | | Send service prequalification information | | | Flexibility marketplace platform for MO | | Info20-Product prequalification report | |
| 1.11 | | Receive and acknowledge | | | Flexibility marketplace platform for FSP | | | |
| 1.12 | | Receive and acknowledge | | | Flexibility marketplace platform for DSO | | | |
| 1.13 | | Receive and acknowledge | | | Flexibility marketplace platform for TSO | | | |

#### 10.4.2.2.5 Data exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info1 | Activation acknowledgement | To confirm that activation has been executed. | |
| Info2 | Activation status | DSO informs TSO about successful activation of the flexibility service in the distribution grid. | |
| Info3 | Activation signal | This a request for activation of the contracted flexibility resource. | |



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| | | | |
|---|---|---|---|
| Info4 | Real-time measurement | Measured active power delivered by the flexibility resource. This is time series, delivered in real-time. | |
| Info5 | Call for bids | Request to prequalified FSP to place a bid for the flexibility service. | |
| Info6 | Flexibility need | Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids.<br>This request contains information about the needed flexibility service, location/area, volume, date and time interval. | |
| Info7 | Flexibility service bid | | |
| Info8 | Selected bids | | |
| Info9 | Grid prequalification request | Request for grid prequalification sent by FSP or flexibility resource owner. The request contains all technical data such as:<br>1. Flexibility resource type<br>2. Connectivity (voltage level, transformer substation, DSO)<br>3. Location (GPS coordinates)<br>4. Active power<br>5. ....<br><br>Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO. | |
| Info10 | Grid prequalification report | This is information to FSP about the grid prequalification and it is in the form of a document. | |
| Info11 | Grid prequalification test results | This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered and used later without negative impact on the distribution grid. | |
| Info12 | Offer acceptance | Information about accepted offers. | |
| Info13 | Flexibility offer | Offer for the flexibility service on OTC market. | |
| Info14 | Request for flexibility offer | | |
| Info15 | Prequalification request | Request document with all the information necessary to run prequalification tests. These documents include:<br>1. Type of the DER<br>2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location)<br>3. Installed power<br>4. | |
| Info16 | Prequalification information | Document with the prequalification results. | |
| Info17 | Product prequalification request | Request for product prequalification with accompanying documents. | |
| Info18 | Product prequalification test results | Results of tests run by DSO. | |
| Info19 | Product prequalification requirements | Detailed description of the flexibility service product and requirements. This is a document. | |
| Info20 | Product prequalification report | | |
| Info21 | Volume acknowledged | FSP agrees with the calculated volume related to the delivered flexibility service. | |
| Info22 | Bill | Document, not modeled in CIM. | |



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| | | | |
|---|---|---|---|
| Info23 | Reimbursement | This information is related to the sending the invoice and payment. It will not be modelled with CIM. | |
| Info24 | Flexibility service volume | Information about calculated delivered volume, from the baseline and measurements. | |
| Info25 | Recalculation request | FSP determinates the deviation in the calculated volume and requests a check of the calculation. | |
| Info26 | Volume validation request | After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement. | |

### 10.4.2.3 DSUC_EA_SL_03

#### 10.4.2.3.1 Description of the use case

##### *10.4.2.3.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Energy market | Bidding |

##### *10.4.2.3.1.2 Version Management*

| *Version management* | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2021-08-26 | Luka Nagode (GEN-I) | draft-concepts | |

##### *10.4.2.3.1.3 Scope and objectives of use case*

| **Scope and objectives of use case** | |
|---|---|
| **Scope** | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process for bidding flexibility in the distribution grid. It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| **Objective(s)** | Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>Improve security of supply.<br>Organize a marketplace with fair competition between agregators |
| **Related business case(s)** | Congestion management |

##### *10.4.2.3.1.4 Narrative of Use Case*

| **Narrative of use case** |
|---|
| **Short description** |
| Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. DSO purchases flexibility service at the local flexibility market to resolve congestion problems in the distribution grid. |
| **Complete description** |
| · Bidding: DSO expresses the need for the flexibility service to FMO (based on the load and distributed generation prediction and state of the distribution grid), which publishes request for bids. FMO collects the bids from flexibility service provides and selects the optimal bids. FMO sends information about selected bids to DSO, flexibility service provider, TSO |



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| |
|---|
| and flexibility register.<br><br>Summary of use case<br>• Bidding Description: Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.<br>▪ Activity1<br>Description:<br>▪ Send flexibility need<br>Description:<br>▪ Publish flexibility need<br>Description:<br>▪ Receive call for bid<br>Description:<br>▪ Send flexibility service bid<br>Description:<br>▪ Receive flexibility service bid<br>Description:<br>▪ Market clearing<br>Description:<br>▪ Send trading results<br>Description:<br>▪ Receive and acknowledge<br>Description:<br>▪ Receive and acknowledge<br>Description:<br>▪ Receive and acknowledge<br>Description: |

##### 10.4.2.3.1.5 Key Performance Indicators (KPIs)

| Key performance indicators | | | |
|---|---|---|---|
| ID | Name | Description | Reference to mentioned use case objectives |
| 1 | A number of succefully avoided congestions during demonstration period | | Deferral of grid reinforcement investments (defer or avoid secondary substation replacement)Improve security of supply |
| 2 | Volume of activated flexibility services | | Validate demand response mechanism to prevent congestion in the distribution grid. |
| 3 | Success of local flexibility market platform test | | Validate demand response mechanism to prevent congestion in the distribution grid. Test flexibility products to prevent congestion in the distribution grid under market conditions. |

##### 10.4.2.3.1.6 Use Case Conditions

| Use case conditions | |
|---|---|
| **Assumptions** | |
| 1 | Local flexibility market |
| 2 | DSO procures congestion management services at the local flexibility market. |
| **Prerequisites** | |
| 1 | Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems |
| 2 | Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid. |

##### 10.4.2.3.1.7 Further information to the Use case for classification/mapping

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |



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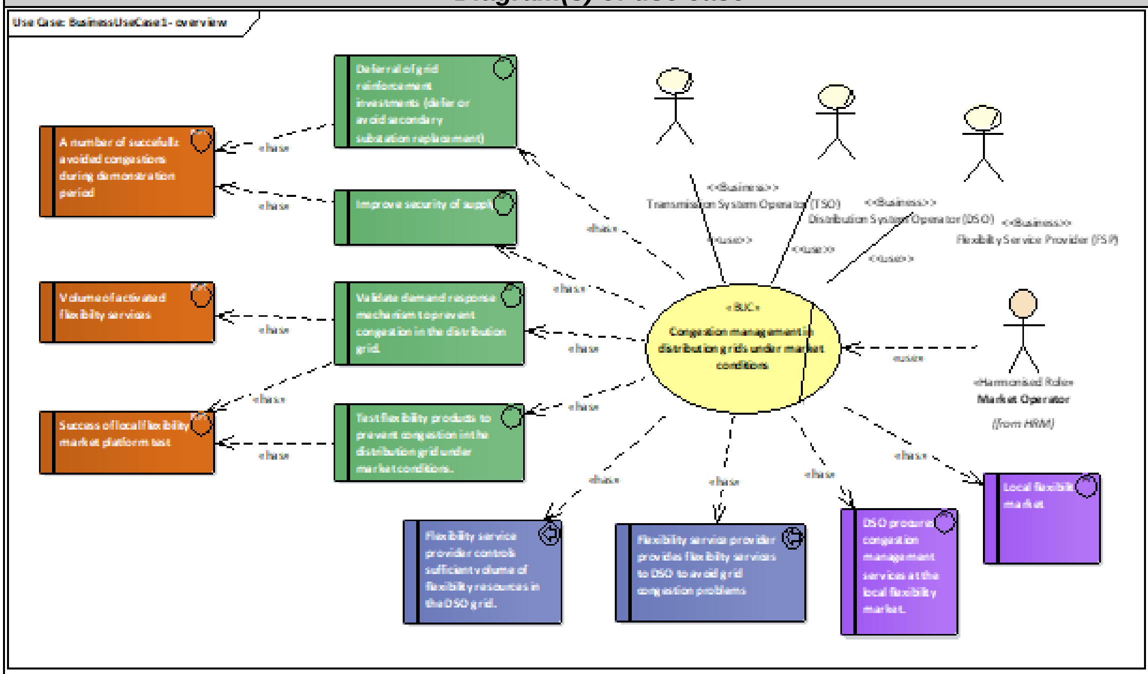
| |
|---|
| <<BUC>> Congerstion management<br><<SUC>> Grid prequalification<br><<SUC>> Product prequalification<br><<SUC>> Bidding<br><<SUC>> Activation - Flexibility market<br><<SUC>> Settlement-Flexibility market |
| ***Level of depth*** |
| High level |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| National relation |
| ***Nature of the use case*** |
| SUC |
| ***Further keywords for classification*** |
| Flexibility, Local flexibility market, Congestion management |

### 10.4.2.3.2 Diagrams of use case

***Diagram(s) of use case***



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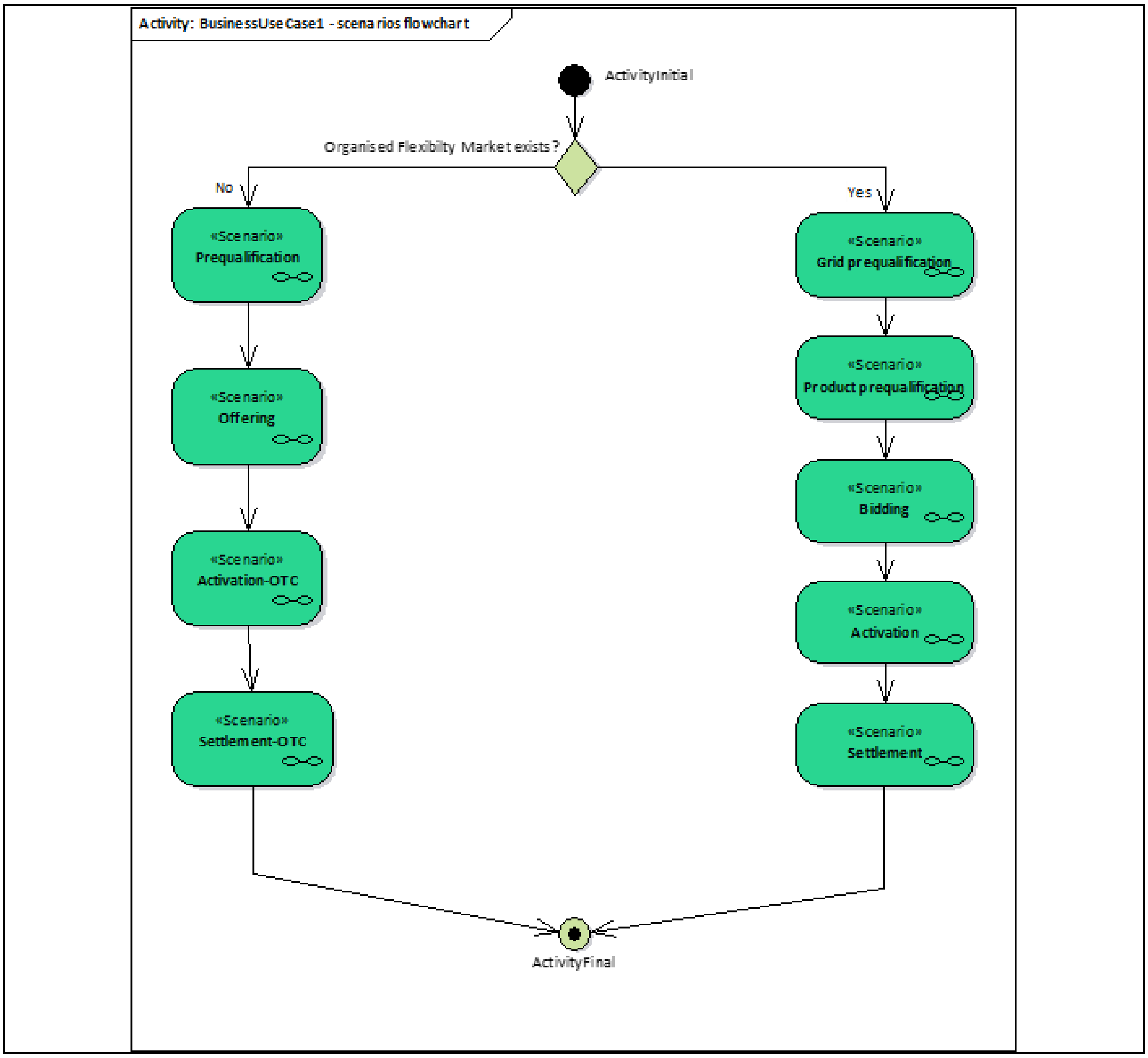


### 10.4.2.3.3 Technical Details

#### *10.4.2.3.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | ***Group description*** | | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this business use case*** |
| Transmission System Operator (TSO) | Business | According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission | |


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| | | | |
|---|---|---|---|
| | | level and connection of the DSOs within the TSO control area. Source : EU Commission Task Force for Smart Grids, EG3 | |
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.<br>Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast), | |
| Flexibility Service Provider (FSP) | Business | Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties. | |
| Market Operator | Harmonised Role | A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity.<br>**Additional Information**:<br>This usually is an energy/power exchange or platform.<br>The definition is based on Regulation on the internal market for electricity (EU) 2019/943. | |

##### *10.4.2.3.3.2 Systems*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***System name*** | ***System owner*** | ***System description*** | ***Further information specific to this system use case*** |
| DSO Scada system | Distribution System Operator (DSO) | System responsible for displaying grid measurements, which serve as input for DSO activation system | |
| TSO Scada system | Transmission System Operator (TSO) | System responsible for displaying grid measurements, which serve as input for ancillary services etc. | |
| DSO smartgrid activation system | Distribution System Operator (DSO) | Automatic system that according to the measurements decide where an activation is needed | |
| DSO smartgrid platform | Distribution System Operator (DSO) | Controls registers of all locations where flexibility is needed, communicates with bidding platform from market operator | |
| Virtual power plant technical channel | Flexibility Service Provider (FSP) | Takes care of real-time exchanged information for activations etc. | |
| Virtual power plant business channel | Flexibility Service Provider (FSP) | Takes care of business files exchange (bids, measurements etc) | |
| Virtual power plant | Flexibility Service Provider (FSP) | System responsible for units activation, internal baseline calculations, monitoring of available locations | |
| Bidding platform | Market Operator | System collecting DSO offerings and FSP bids, organising them and publishing results | |
| Settlement system | Market Operator | System collecting DSO activations and FSP measurements, evaluating | |


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| | | | |
|---|---|---|---|
| | | activation success and energy to be paid | |
| Unit controller | Flexibility Service Provider (FSP) | Controller that transmits activation demand to technical units | |
| Flexibility marketplace platform for FSP | Flexibility Service Provider (FSP) | | |
| Flexibility marketplace platform for MO | Market Operator | | |
| Flexibility marketplace platform for DSO | Distribution System Operator (DSO) | | |
| Flexibility marketplace platform for TSO | Transmission System Operator (TSO) | | |

#### 10.4.2.3.4 Step by step analysis of use case

##### *10.4.2.3.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Bidding | Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO. | FMO | | | |

##### *10.4.2.3.4.2 Steps – Scenarios*

**Bidding BUC** Flexibility Market Operator collects the bids from Flexibility Service Provider, for the flexibility need published by DSO.


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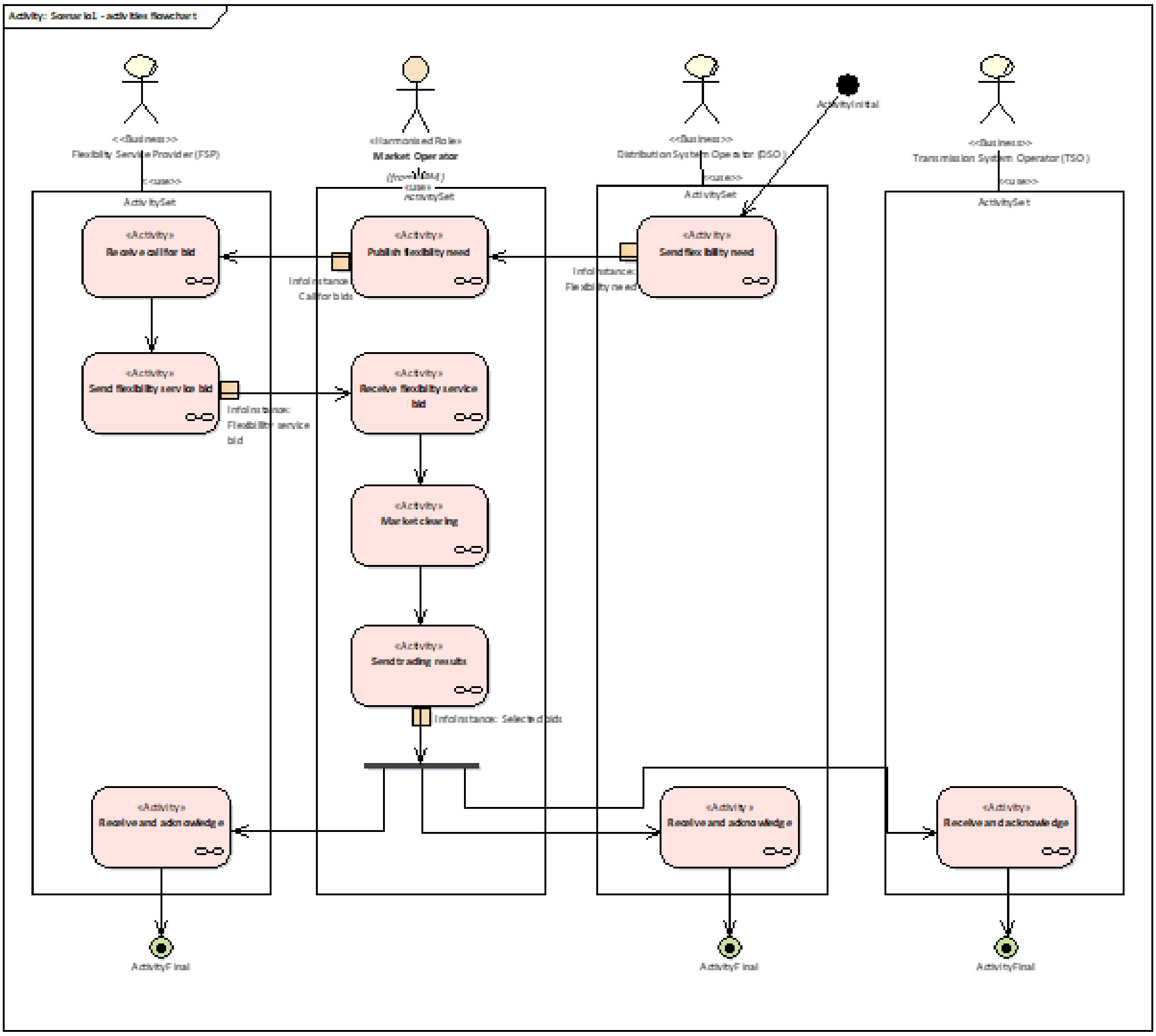




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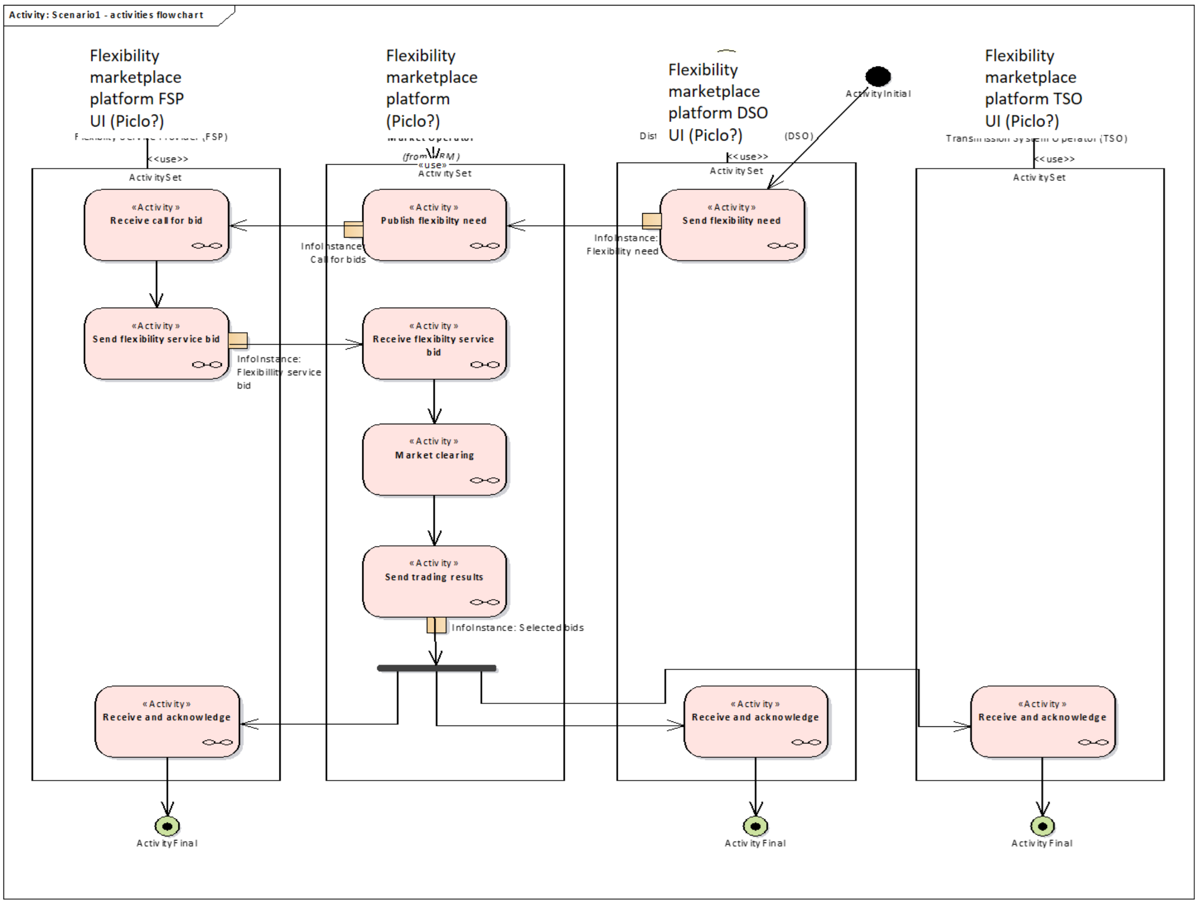


Scenario step by step analysis

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Bidding | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 7.1 | | Send flexibility need | | | Flexibility marketplace platform for DSO | | Info6-Flexibility need<br><br>1.Location<br>2.Timeframe (dates & hours),<br>3.Power needed,<br>4.Max energy price<br>,<br>5.Max availability price. | |
| 7.2 | | Publish flexibility need | | | Flexibility marketplace platform for MO | | Info5-Call for bids | |
| 7.3 | | Receive call for bid | | | Flexibility marketplace platform for FSP | | | |
| 7.4 | | Send flexibility service bid | | | Flexibility marketplace platform for FSP | | Info7-Flexibillity service bid | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Location<br>Timeframe<br>Energy price<br>Availability price<br>Availability volume | |
| 7.5 | | Receive flexibility s ervice bid | | | Flexibility marketplace platform for MO | | | |
| 7.6 | | Market clearing | | | Flexibility marketplace platform for MO | | | |
| 7.7 | | Send trading results | | | Flexibility marketplace platform for MO | | Info8-Selected bids<br><br>Location<br>ContractID<br>Accepted availability volume | |
| 7.8 | | Receive and acknowledge | | | Flexibility marketplace platform for FSP | | | |
| 7.9 | | Receive and acknowledge | | | Flexibility marketplace platform for DSO | | | |
| 7.10 | | Receive and acknowledge | | | Flexibility marketplace platform for TSO | | | |

#### 10.4.2.3.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info1 | Activation acknowledgement | To confirm that activation has been executed. | |
| Info2 | Activation status | DSO informs TSO about successful activation of the flexibility service in the distribution grid. | |
| Info3 | Activation signal | This a request for activation of the contracted flexibility resource. | |
| Info4 | Real-time measurement | Measured active power delivered by the flexibility resource. This is time series, delivered in real-time. | |
| Info5 | Call for bids | Request to prequalified FSP to place a bid for the flexibility service. | |
| Info6 | Flexibility need | Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids.<br>This request contains information about the needed flexibility service, location/area, volume, date and time interval. | |
| Info7 | Flexibillity service bid | | |
| Info8 | Selected bids | | |
| Info9 | Grid prequalification request | Request for grid prequalification sent by FSP or flexibility resource owner. The requst contains all technical data such as:<br>1. Flexibility resource type<br>2. Connectivity (voltage level, transformer substation, DSO)<br>3. Location (GPS coordinates)<br>4. Active power | |



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| | | | |
|---|---|---|---|
| | | 5. ....<br><br>Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO. | |
| Info10 | Grid prequalification report | This is information to FSP about the grid prequalification and it is in the form of a document. | |
| Info11 | Grid prequalification test results | This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered, and used later without negative impact on the distribution grid. | |
| Info12 | Offer acceptance | Information about accepted offers. | |
| Info13 | Flexibiltity offer | Offer for the flexibility service on OTC market. | |
| Info14 | Request for flexibility offer | | |
| Info15 | Prequalification request | Request document with all the information necessary to run prequalifcation tests. These documents include:<br>1. Type of the DER<br>2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location)<br>3. Installed power<br>4. | |
| Info16 | Prequalification information | Document with the prequalification results. | |
| Info17 | Product prequalification request | Request for product prequalification with accompanying documents. | |
| Info18 | Product prequalification test results | Results of tests run by DSO. | |
| Info19 | Product prequalification requirements | Detailed description of the flexibility service product and requirements. This is a document. | |
| Info20 | Product prequalification report | | |
| Info21 | Volume acknowledged | FSP agrees with the calculated volume related to the delivered flexibility service. | |
| Info22 | Bill | Document, not modeled in CIM. | |
| Info23 | Reimbursement | This information is related to the sending the invoice and payment. It will not be modeled with CIM. | |
| Info24 | Flexibility service volume | Information about calculated delivered volume, from the baseline and measurements. | |
| Info25 | Recalculation request | FSP determinates the deviation in the calculated volume and requests a check of the calculation. | |
| Info26 | Volume validation request | After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement. | |

### 10.4.2.4 DSUC_EA_SL_04

#### 10.4.2.4.1 Description of the use case

##### *10.4.2.4.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Energy market | Activation |


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#### 10.4.2.4.1.2 Version Management

| Version management | | | | |
|---|---|---|---|---|
| **Version No.** | **Date** | **Name of author(s)** | **Changes** | **Approval status** |
| 1 | 2021-08-26 | Luka Nagode (GEN-I) | draft-concepts | |

#### 10.4.2.4.1.3 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| **Scope** | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate an activation of flexibility resources in distribution grid. It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| **Objective(s)** | Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>Improve security of supply.<br>Validate demand response mechanism to prevent congestion in the distribution grid.<br>Test activations of flexibility in distribution grid. |
| **Related business case(s)** | Congestion management |

#### 10.4.2.4.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| **Short description** |
| Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. This use case covers the mechanism of activating purchased flexibility. |
| **Complete description** |
| · Activation: For the selected bid, activation is initiated by DSO sending activation signal to the flexibility service provider. FSP internally activates flexibility resources and acknowledges DSO. DSO informs TSO about activated flexibility resources in the distribution grid in order to avoid collision and double activation on the balancing market. During the activation, flexibility register (component of the market operator) collects the measurements from DSO and FSP.<br><br>Summary of use case<br>▪<br>• Activation Description: Activation of flexibility service procured on the flexibility market.<br>▪<br>▪ Send activation signal<br>Description:<br>▪ Receive activation measurement<br>Description:<br>▪ Send acknowledgement<br>Description:<br>▪ Receive acknowledgement<br>Description:<br>▪ Send activation info<br>Description:<br>▪ Receive activation info<br>Description:<br>▪ Activate flexibility resource<br>Description:<br>▪ Send real-time measurements<br>Description: |


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| |
|---|
| ▪ Receive measurements<br>Description: |

##### 10.4.2.4.1.5 Key Performance Indicators (KPIs)

| **Key performance indicators** | | | |
|---|---|---|---|
| **ID** | **Name** | **Description** | **Reference to mentioned use case objectives** |
| 1 | A number of succefully avoided congestions during demonstration period | | Deferral of grid reinforcement investments (defer or avoid secondary substation replacement)Improve security of supply |
| 2 | Volume of activated flexibility services | | Validate demand response mechanism to prevent congestion in the distribution grid. |
| 3 | Success of local flexibility market platform test | | Validate demand response mechanism to prevent congestion in the distribution grid. Test flexibility products to prevent congestion in the distribution grid under market conditions. |

##### 10.4.2.4.1.6 Use Case conditions

| **Use case conditions** | |
|---|---|
| **Assumptions** | |
| 1 | Local flexibility market |
| 2 | DSO procures congestion management services at the local flexibility market. |
| **Prerequisites** | |
| 1 | Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems |
| 2 | Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid. |

##### 10.4.2.4.1.7 Further information to the Use case for classification/mapping

| **Classification information** |
|---|
| **Relation to other use cases** |
| <<BUC>> Congestion management<br><<SUC>> Grid prequalification<br><<SUC>> Product prequalification<br><<SUC>> Bidding<br><<SUC>> Activation - Flexibility market<br><<SUC>> Settlement-Flexibility market |
| **Level of depth** |
| High level |
| **Prioritisation** |
| |
| **Generic, regional or national relation** |
| National relation |
| **Nature of the use case** |
| SUC |
| **Further keywords for classification** |
| Flexibility, Local flexibility market, Congestion management |

#### 10.4.2.4.2 Diagrams of use case

| **Diagram(s) of use case** |
|---|



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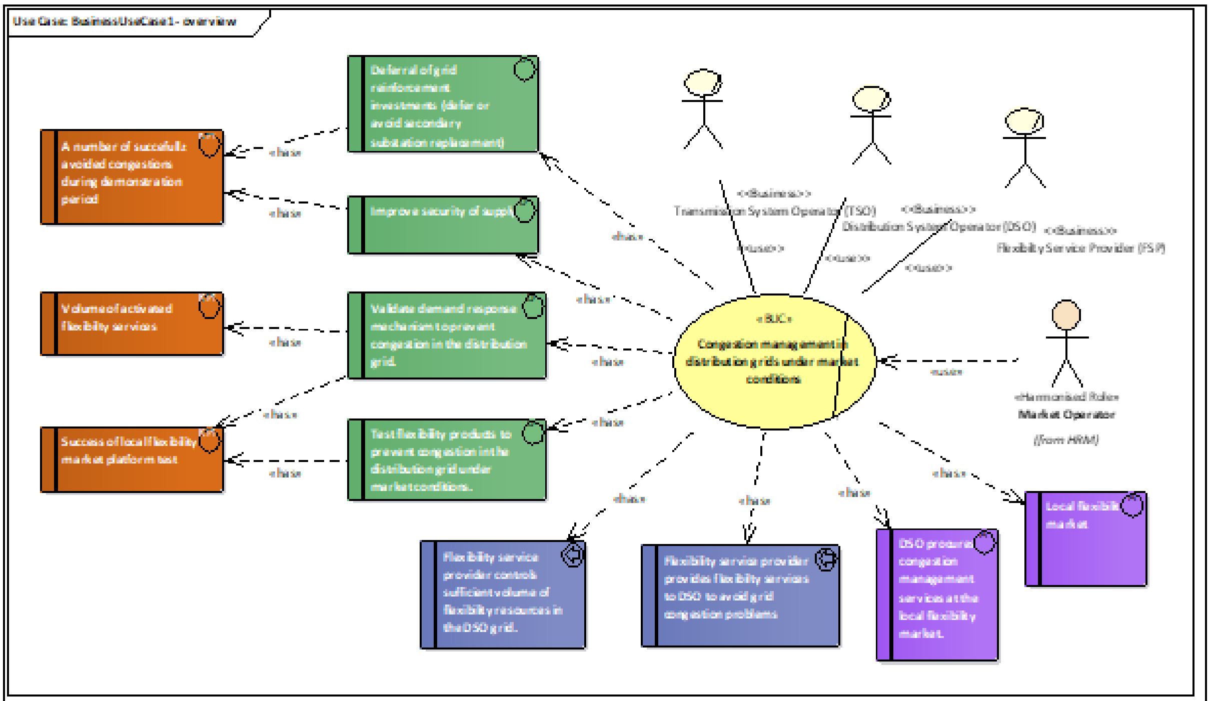


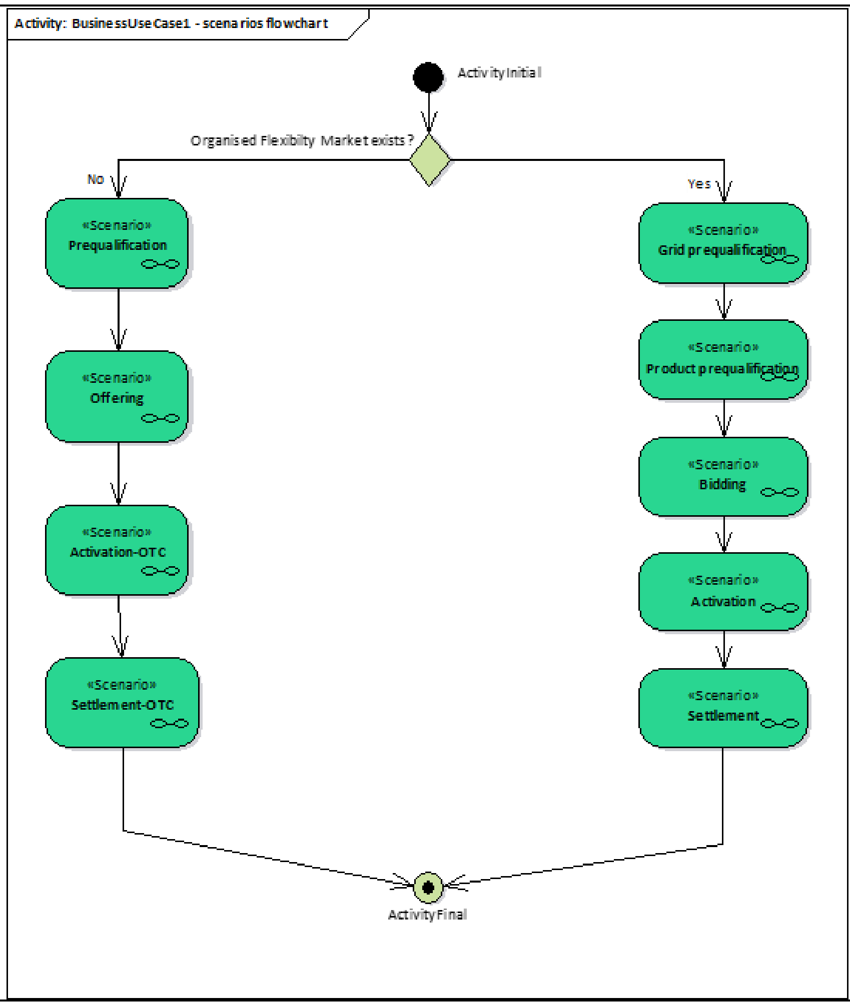




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#### 10.4.2.4.3 Technical Details

##### *10.4.2.4.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this business use case*** |
| Transmission System Operator (TSO) | Business | According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area. Source : EU Commission Task Force for Smart Grids, EG3 | |
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity. Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast), | |
| Flexibility Service Provider (FSP) | Business | Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties. | |
| Market Operator | Harmonised Role | A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity. **Additional Information**: This usually is an energy/power exchange or platform. The definition is based on Regulation on the internal market for electricity (EU) 2019/943. | |

##### *10.4.2.4.3.2 Systems*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***System name*** | ***System owner*** | ***System description*** | ***Further information specific to this system use case*** |
| DSO Scada system | Distribution System Operator (DSO) | System responsible for displaying grid measurements, which serve as input for DSO activation system | |



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| | | | |
|---|---|---|---|
| TSO Scada system | Transmission System Operator (TSO) | System responsible for displaying grid measurements, which serve as input for ancillary services etc. | |
| DSO smartgrid activation system | Distribution System Operator (DSO) | Automatic system that according to the measurements decide where an activation is needed | |
| DSO smartgrid platform | Distribution System Operator (DSO) | Controls registers of all locations where flexibility is needed, communicates with bidding platform from market operator | |
| Virtual power plant technical channel | Flexibility Service Provider (FSP) | Takes care of real-time exchanged information for activations etc. | |
| Virtual power plant business channel | Flexibility Service Provider (FSP) | Takes care of business files exchange (bids, measurements etc) | |
| Virtual power plant | Flexibility Service Provider (FSP) | System responsible for units activation, internal baseline calculations, monitoring of available locations | |
| Bidding platform | Market Operator | System collecting DSO offerings and FSP bids, organising them and publishing results | |
| Settlement system | Market Operator | System collecting DSO activations and FSP measurements, evaluating activation success and energy to be paid | |
| Unit controller | Flexibility Service Provider (FSP) | Controller that transmits activation demand to technical units | |
| Flexibility marketplace activation module | Market operator | | |

#### 10.4.2.4.4 Step by step analysis of use case

##### *10.4.2.4.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Activation | Activation of flexibility service procured on the flexibility market. | DSO | | | |

##### *10.4.2.4.4.2 Steps – Scenarios*

**Activation SUC**
Activation of flexibility service procured on the flexibility market.



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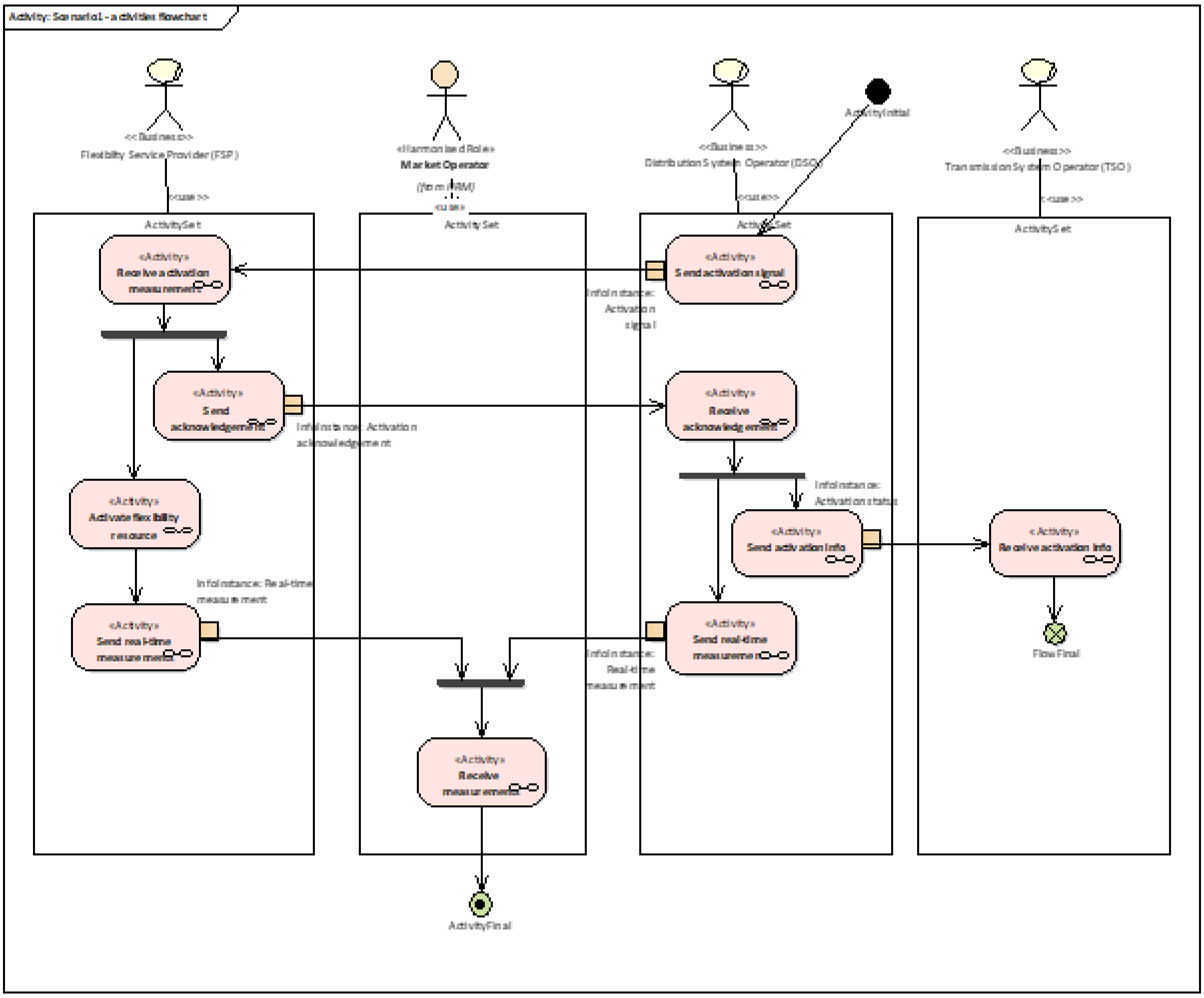




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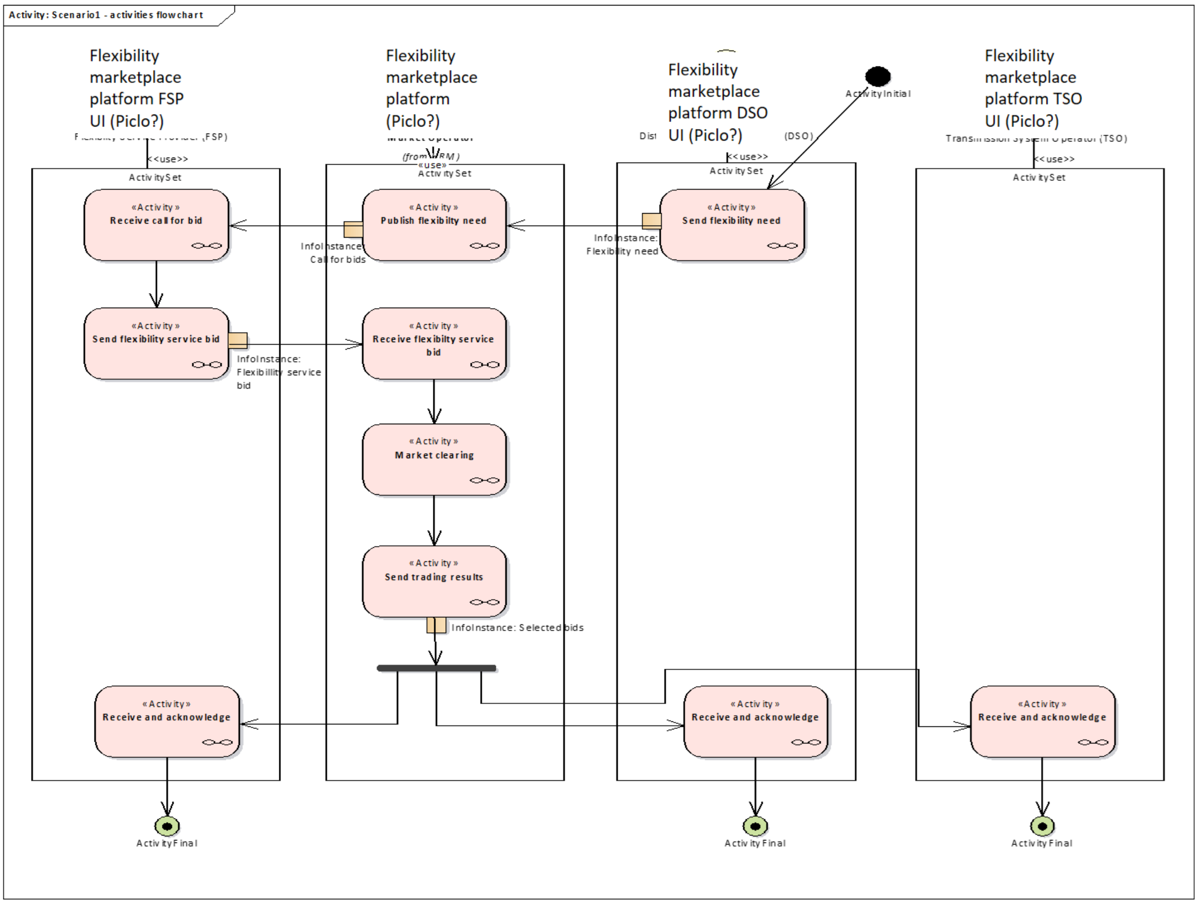


## Scenario step by step analysis

| 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 | | Send activation signal | | | DSO Scada system | | Info3-Activation signal<br>Contract ID<br>Start of activation<br>End of activation<br>Volume of power | |
| 1.2 | | Forward activation signal | | | Flexibility marketplace activation module | | | |
| 1.3 | | Receive activation measurement | | | Virtual power plant business channel | | | |
| 1.4 | | Send acknowledgement | | | Virtual power plant business channel | | Info1-Activation acknowledgement | |
| 1.5 | | Forward acknowledgment | | | Flexibility marketplace activation module | | | |
| 1.6 | | Receive acknowledgement | | | DSO Scada system | | | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.7 | | Send activation info | | | DSO Scada system | | Info2-Activation status | |
| 1.8 | | Receive activation info | | | TDSO Scada system | | | |
| 1.9 | | Activate flexibility resource | | | Virtual power plant | | | |
| 1.10 | | Send real-time measurements | | | Virtual power plant | | Info4-Real-time measurement<br>Timestamp<br>Power | |
| 1.11 | | Receive measurements | | | Flexibility marketplace activation module | | Timestamp<br>Power | |

#### 10.4.2.4.5 Information exchanged

| ***Information exchanged*** | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info1 | Activation acknowledgement | To confirm that activation has been executed. | |
| Info2 | Activation status | DSO informs TSO about successful activation of the flexibility service in the distribution grid. | |
| Info3 | Activation signal | This a request for activation of the contracted flexibility resource. | |
| Info4 | Real-time measurement | Measured active power delivered by the flexibility resource. This is time series, delivered in real-time. | |
| Info5 | Call for bids | Request to prequalified FSP to place a bid for the flexibility service. | |
| Info6 | Flexibility need | Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids.<br>This request contains information about the needed flexibility service, location/area, volume, date and time interval. | |
| Info7 | Flexibillity service bid | | |
| Info8 | Selected bids | | |
| Info9 | Grid prequalification request | Request for grid prequalification sent by FSP or flexibility resource owner. The requst contains all technical data such as:<br>1. Flexibility resource type<br>2. Connectivity (voltage level, transformer substation, DSO)<br>3. Location (GPS coordinates)<br>4. Active power<br>5. ....<br><br>Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO. | |
| Info10 | Grid prequalification report | This is information to FSP about the grid prequalification and it is in the form of a document. | |
| Info11 | Grid prequalification test results | This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered, and | |


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| | | | |
|---|---|---|---|
| | | used later without negative impact on the distribution grid. | |
| Info12 | Offer acceptance | Information about accepted offers. | |
| Info13 | Flexibiltity offer | Offer for the flexibility service on OTC market. | |
| Info14 | Request for flexibility offer | | |
| Info15 | Prequalification request | Request document with all the information necessary to run prequalifcation tests. These documents include:<br>1. Type of the DER<br>2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location)<br>3. Installed power<br>4. | |
| Info16 | Prequalification information | Document with the prequalification results. | |
| Info17 | Product prequalification request | Request for product prequalification with accompanying documents. | |
| Info18 | Product prequalification test results | Results of tests run by DSO. | |
| Info19 | Product prequalification requirements | Detailed description of the flexibility service product and requirements. This is a document. | |
| Info20 | Product prequalification report | | |
| Info21 | Volume acknowledged | FSP agrees with the calculated volume related to the delivered flexibility service. | |
| Info22 | Bill | Document, not modelled in CIM. | |
| Info23 | Reimbursement | This information is related to the sending the invoice and payment. It will not be modelled with CIM. | |
| Info24 | Flexibility service volume | Information about calculated delivered volume, from the baseline and measurements. | |
| Info25 | Recalculation request | FSP determinates the deviation in the calculated volume and requests a check of the calculation. | |
| Info26 | Volume validation request | After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement. | |

### 10.4.2.5 DSUC_EA_SL_05

#### 10.4.2.5.1 Description of the use case

##### *10.4.2.5.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Energy market | Settlement |

##### *10.4.2.5.1.2 Version Management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2021-08-26 | Luka Nagode (GEN-I) | draft-concept | |

#### 10.4.2.5.1.3 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| ***Scope*** | Demonstrate effectiveness and appropriateness of flexibility services for the congestion management of a distribution grid, under market conditions. The flexibility tested with this BUC can also be utilised for mFRR at the balancing market. This BUC will validate a process of monetizing activated flexibility It will also verify information exchange between all stakeholders in this process enabling data as well as communication interoperability, under flexibility market conditions. |
| ***Objective(s)*** | Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).<br>Improve security of supply.<br>Validate demand response mechanism to prevent congestion in the distribution grid.<br>Monetize activated flexibility so tha the FSP receives reimbursement. |
| ***Related business case(s)*** | Congestion management |

#### 10.4.2.5.1.4 Narrative of Use Case

| Narrative of use case |
|---|
| ***Short description*** |
| Due to excessive and increasing energy consumption, existing MV/LV secondary substations occasionally becomes thermally overloaded and power lines congested. Demand response services can be utilised to decrease duration or even prevent overloads of the distribution grid components. In particular, switching off the heat pumps in one substation area can be used to reduce the transformer load during peak hours. After activation market operator validates delivered volume and monetizes flexibility service used. |
| ***Complete description*** |
| **Settlement**: Flexibility register calculates the base line. After the activated product has been delivered, flexibility register calculates delivered volume and information to DSO and FSP. In the process of volume validation, DSO and FSP should validate delivered volume. When volume can't be validated, alignment process is initiated. FMO monetizes the delivered flexibility product and send the bill to DSO and reimbursement to FSP.<br>Summary of use case<br>• **Settlement** Description: Monetisation of the delivered flexibility product, procured on the flexibility market.<br>▪ Calculate baseline<br>Description:<br>▪ Validate delivered volume<br>Description:<br>▪ Receive proposed volume<br>Description:<br>▪ Receive proposed volume<br>Description:<br>▪ Start volume aligment process<br>Description:<br>▪ Start alignement process<br>Description:<br>▪ Send acknowledgement<br>Description:<br>▪ Send acknowledgement<br>Description:<br>▪ Receive acknowledgement<br>Description:<br>▪ Monetize flexibility service<br>Description:<br>▪ Send the bill<br>Description: |



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| | |
|---|---|
| | ▪ Receive the bill<br>Description:<br>▪ Send the reimbursement<br>Description:<br>▪ Receive the reimbursement<br>Description: |

##### 10.4.2.5.1.5 Key Performance Indicators (KPIs)

| Key performance indicators | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Success of local flexibility market platform test | | All measurements and baseline data give exact results for billing |
| 2 | Percentage of instances where alignment process was necessary | | If the volume is calculated correctly by the market operator, neither DSO nor FSP should be opening alignment processes |
| 3 | Volume of total monetized flexibility | | Total volume of reimbursement |

##### 10.4.2.5.1.6 Use Case conditions

| Use case conditions | |
|---|---|
| ***Assumptions*** | |
| 1 | Local flexibility market |
| 2 | DSO procures congestion management services at the local flexibility market. |
| ***Prerequisites*** | |
| 1 | Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems |
| 2 | Flexibility service provider controls sufficient volume of flexibility resources in the DSO grid. |

##### 10.4.2.5.1.7 Further information to the Use case for classification/mapping

| Classification information |
|---|
| ***Relation to other use cases*** |
| <<BUC>> Congestion management<br><<SUC>> Grid prequalification<br><<SUC>> Product prequalification<br><<SUC>> Bidding<br><<SUC>> Activation - Flexibility market<br><<SUC>> Settlement-Flexibility market |
| ***Level of depth*** |
| High level |
| ***Prioritisation*** |
| |
| ***Generic, regional or national relation*** |
| National relation |
| ***Nature of the use case*** |
| SUC |
| ***Further keywords for classification*** |
| Flexibility, Local flexibility market, Congestion management |

#### 10.4.2.5.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|



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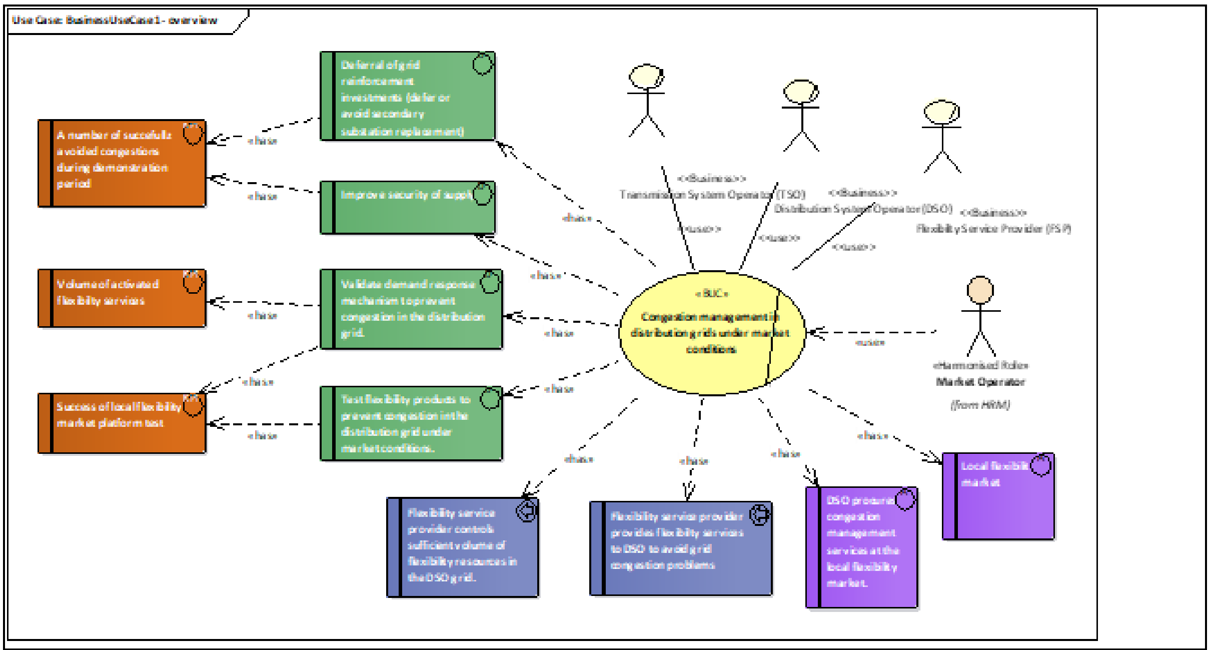


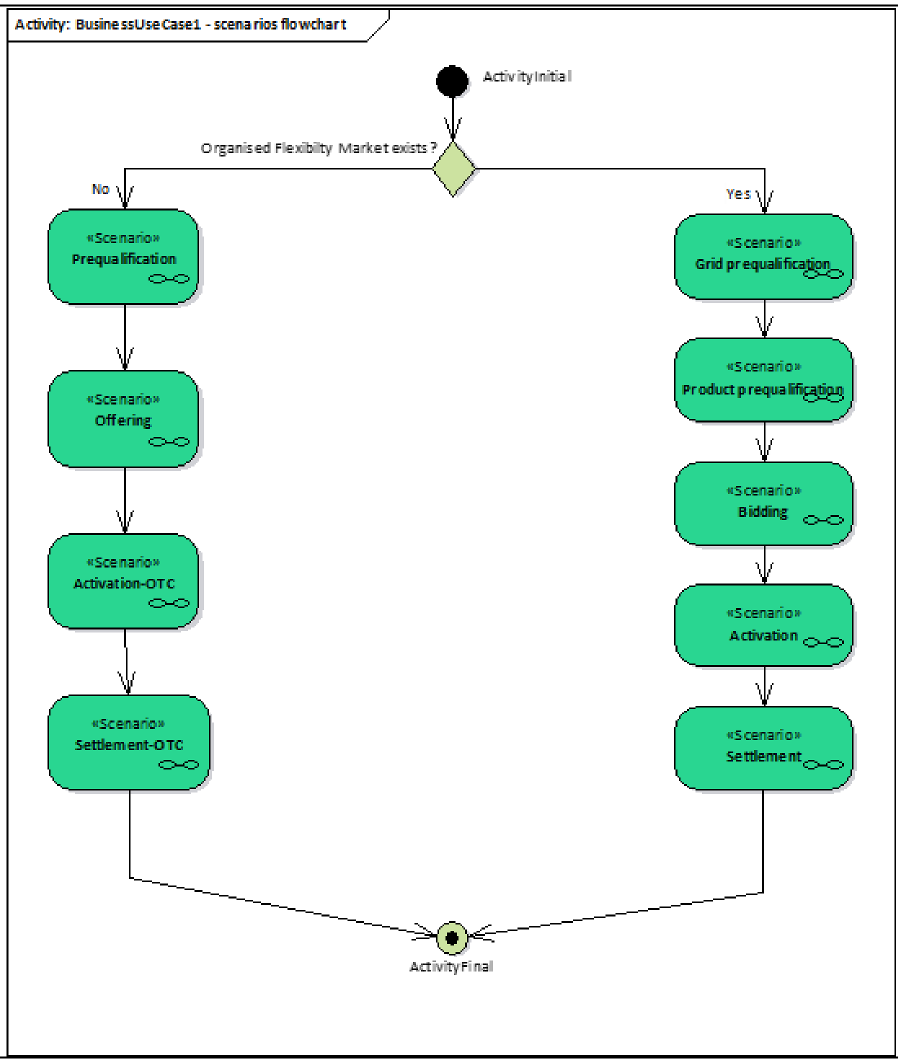






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#### 10.4.2.5.3 Technical Details

##### *10.4.2.5.3.1 Actors*

| Actors | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this business use case*** |
| Transmission System Operator (TSO) | Business | According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area.<br>Source : EU Commission Task Force for Smart Grids, EG3 | |
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.<br><br>Defined in the European Union Internal Electricity Market is legally defined in Article 2(29) of the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity (recast), | |
| Flexibility Service Provider (FSP) | Business | Defined as any legal entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties. | |
| Market Operator | Harmonised Role | A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity.<br><br>**Additional Information**:<br>This usually is an energy/power exchange or platform.<br>The definition is based on Regulation on the internal market for electricity (EU) 2019/943. | |

##### *10.4.2.5.3.2 Systems*

| Actors | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***System name*** | ***System owner*** | ***System description*** | ***Further information specific to this system use case*** |
| DSO Scada system | Distribution System Operator (DSO) | System responsible for displaying grid measurements, which serve as input for DSO activation system | |
| TSO Scada system | Transmission System Operator (TSO) | System responsible for displaying grid measurements, which serve as input for ancillary services etc. | |



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| | | | |
|---|---|---|---|
| DSO smartgrid activation system | Distribution System Operator (DSO) | Automatic system that according to the measurements decide where an activation is needed | |
| DSO smartgrid platform | Distribution System Operator (DSO) | Controls registers of all location where flexibility is needed, communicates with bidding platform from market operator | |
| Virtual power plant technical channel | Flexibility Service Provider (FSP) | Takes care of real-time exchanged information for activations etc. | |
| Virtual power plant business channel | Flexibility Service Provider (FSP) | Takes care of business files exchange (bids, measurements etc) | |
| Virtual power plant | Flexibility Service Provider (FSP) | System responsible for units activation, internal baseline calculations, monitoring of available locations | |
| Bidding platform | Market Operator | System collecting DSO offerings and FSP bids, organising them and publishing results | |
| Settlement system | Market Operator | System collecting DSO activations and FSP measurements, evaluating activation success and energy to be paid | |
| Unit controller | Flexibility Service Provider (FSP) | Controller that transmits activation demand to technical units | |
| Marketplace settlement module for FSP | Flexibility Service Provider (FSP) | | |
| Marketplace settlement module for MO | Market Operator | | |
| Marketplace settlement module for DSO | Distribution System Operator (DSO) | | |
| Marketplace settlement module for other balance groups | Other separate Balance groups Owners | | |

### 10.4.2.5.4 Step by step analysis of use case

#### *10.4.2.5.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Settlement | Monetisation of the delivered flexibility product, procured on the flexibility market. | FMO? DSO? | | | |

#### *10.4.2.5.4.2 Steps – Scenarios*

**Settlement BUC**

Monetisation of the delivered flexibility product, procured on the flexibility market.


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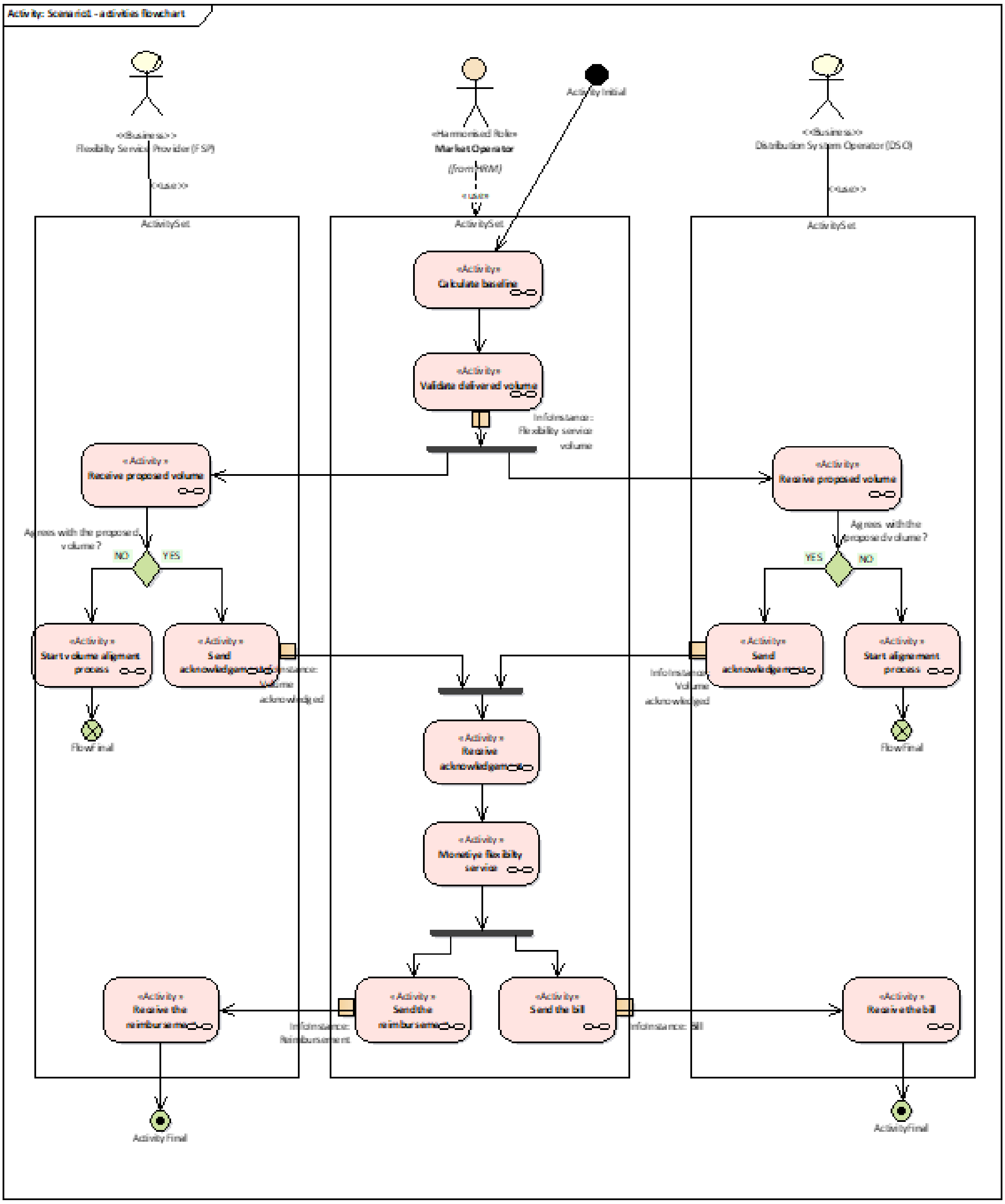






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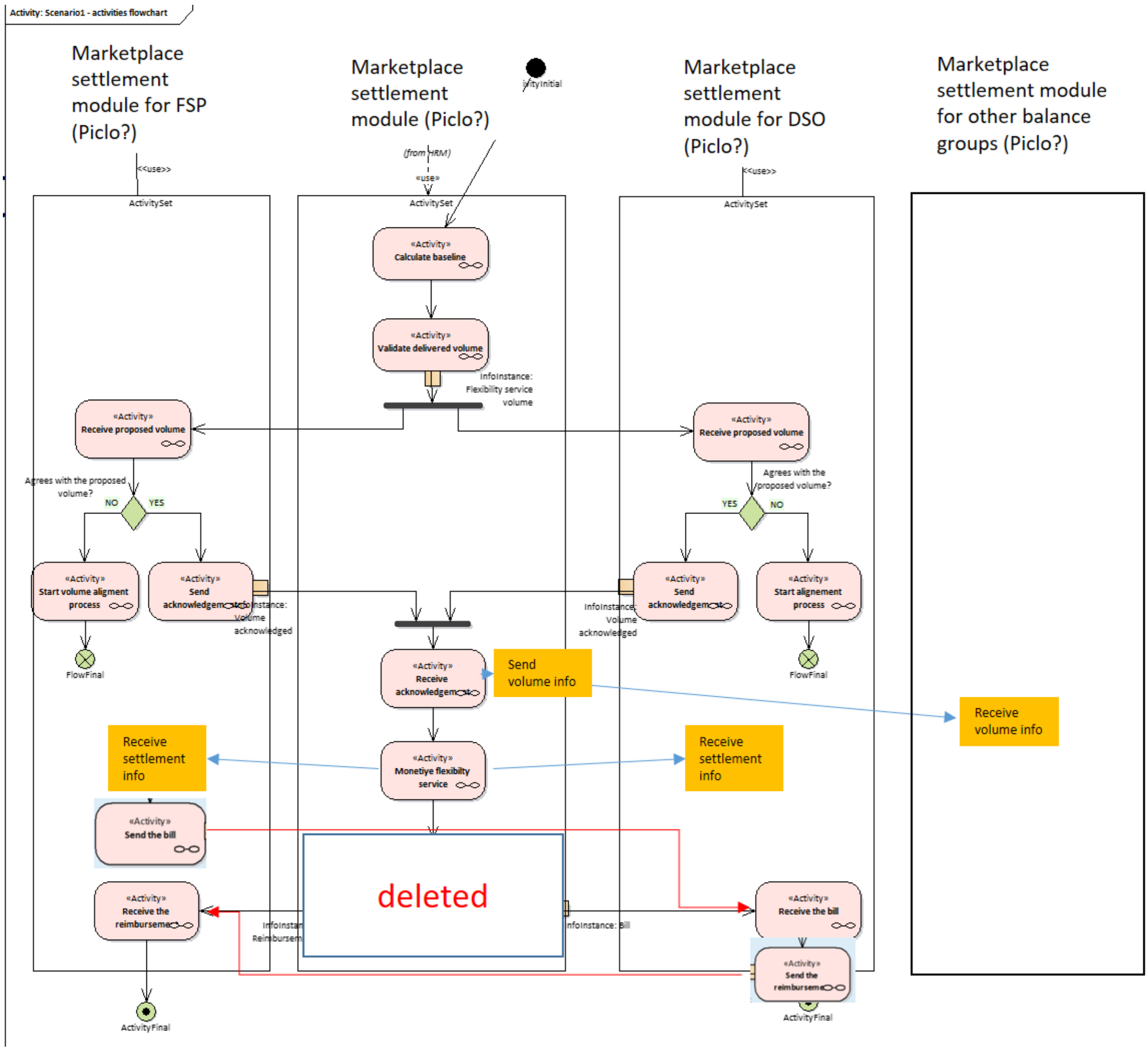


Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Settlement | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 1.1 | | Calculate baseline | | | Marketplace settlement module for MO | | | Marketplace settlement module for FSP |
| 1.2 | | Validate delivered volume | | | Marketplace settlement module for MO | | Info24-Flexibility service volume | |
| 1.3 | | Receive proposed volume | | | Marketplace settlement module for FSP | | | |





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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.4 | | Receive proposed volume | | | Marketplace settlement module for DSO | | | |
| 1.5 | | Start alignement process | | | Marketplace settlement module for FSP | | | |
| 1.6 | | Start volume aligment process | | | Marketplace settlement module for DSO | | | |
| 1.7 | | Send acknowledgement | | | Marketplace settlement module for FSP | | Info21-Volume acknowledged | |
| 1.8 | | Send acknowledgement | | | Marketplace settlement module for DSO | | Info21-Volume acknowledged | |
| 1.9 | | Receive acknowledgement | | | | | | |
| | | Send volume info | | | Marketplace settlement module for MO | | | |
| 1.10 | | Receive volume info | | | Marketplace settlement module for other balance groups | | | |
| 1.11 | | Monetize flexibility service | | | Marketplace settlement module for MO | | | |
| 1.12 | | Send the bill | | | Marketplace settlement module for FSP | | Info22-Bill | |
| 1.13 | | Receive the bill | | | Marketplace settlement module for DSO | | | |
| 1.14 | | Send the reimbursement | | | Marketplace settlement module for DSO | | Info23-Reimbursement | |
| 1.15 | | Receive the reimbursement | | | Marketplace settlement module for FSP | | | |

#### 10.4.2.5.5 Information exchanged

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



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| | | | |
|---|---|---|---|
| Info1 | Activation acknowledgement | To confirm that activation has been executed. | |
| Info2 | Activation status | DSO informs TSO about successful activation of the flexibility service in the distribution grid. | |
| Info3 | Activation signal | This a request for activation of the contracted flexibility resource. | |
| Info4 | Real-time measurement | Measured active power delivered by the flexibility resource. This is time series, delivered in real-time. | |
| Info5 | Call for bids | Request to prequalified FSP to place a bid for the flexibility service. | |
| Info6 | Flexibility need | Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids.<br>This request contains information about the needed flexibility service, location/area, volume, date and time interval. | |
| Info7 | Flexibillity service bid | | |
| Info8 | Selected bids | | |
| Info9 | Grid prequalification request | Request for grid prequalification sent by FSP or flexibility resource owner. The requst contains all technical data such as:<br>1. Flexibility resource type<br>2. Connectivity (voltage level, transformer substation, DSO)<br>3. Location (GPS coordinates)<br>4. Active power<br>5. ....<br><br>Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO. | |
| Info10 | Grid prequalification report | This is information to FSP about the grid prequalification and it is in the form of a document. | |
| Info11 | Grid prequalification test results | This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered, and used later without negative impact on the distribution grid. | |
| Info12 | Offer acceptance | Information about accepted offers. | |
| Info13 | Flexibiltity offer | Offer for the flexibility service on OTC market. | |
| Info14 | Request for flexibility offer | | |
| Info15 | Prequalification request | Request document with all the information necessary to run prequalifcation tests. These documents include:<br>1. Type of the DER<br>2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location)<br>3. Installed power<br>4. | |
| Info16 | Prequalification information | Document with the prequalification results. | |
| Info17 | Product prequalification request | Request for product prequalification with accompanying documents. | |
| Info18 | Product prequalification test results | Results of tests run by DSO. | |



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| | | | |
|---|---|---|---|
| Info19 | Product prequalification requirements | Detailed description of the flexibility service product and requirements. This is a document. | |
| Info20 | Product prequalification report | | |
| Info21 | Volume acknowledged | FSP agrees with the calculated volume related to the delivered flexibility service. | |
| Info22 | Bill | Document, not modelled in CIM. | |
| Info23 | Reimbursement | This information is related to the sending the invoice and payment. It will not be modelled with CIM. | |
| Info24 | Flexibility service volume | Information about calculated delivered volume, from the baseline and measurements. | |
| Info25 | Recalculation request | FSP determinates the deviation in the calculated volume and requests a check of the calculation. | |
| Info26 | Volume validation request | After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement. | |

## 10.4.3 HUNGARIAN DEMO

For this demonstrator the SUCs are derived directly from the BUCs. Hence, the BUCs have been included in this part.

### 10.4.3.1 EACL_HU_01

#### 10.4.3.1.1 Description of the use case

##### *10.4.3.1.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | Hungary | MV feeder voltage control |

##### *10.4.3.1.1.2 Version management*

| ***Version management*** | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 07/05 2021 | Bálint Hartmann | 1.1-1.4 added | |
| 2 | 24/05 2021 | Bálint Hartmann, Péter Sőrés, Bálint Sinkovics | 1.5-3.2 added | |
| 3 | 31/08 2021 | Bálint Hartmann, Péter Sőrés, Bálint Sinkovics | Completion | |

##### *10.4.3.1.1.3 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Increasing renewable penetration causes violation of standard voltage bands on MV lines. The main scope of EACL-HU-01 is to mitigate voltage variations of MV feeders by activating flexibility services. |
| ***Objective(s)*** | The objective of the use case is to keep actual voltage values of MV feeders within the standard bands. |
| ***Related business case(s)*** | EACL-HU-02 “HV/MV transformer overload” |

##### *10.4.3.1.1.4 Narrative of Use Case*

| ***Narrative of use case*** |
|---|



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| Short description |
|---|
| Need: Due to the proliferation of PV plants, connected to DSO MV lines or directly to the MV side of HV/MV substations, violation of standard voltage bands on MV lines is a forthcoming issue in Hungary. This technical issue can be mitigated by P and/or Q on MV level.<br>Service: Voltage issues of MV feeders can be mitigated by P and/or Q injection/consumption. |
| **Complete description** |
| The BUC operates on two time horizons, each related to the specified grid service:<br>• capacity auction<br>• and energy activation (scheduled), respectively.<br>Capacity auctions will be driven by technical needs of the DSOs, which are determined on a weekly basis based on weekly maintenance plans. Gate opens at W-1 Monday 0:00 and closes at W-1 Friday 14:00, thus enabling bidders a fairly long time to place bids, but the market can be cleared during working hours on W-1. Results of the auction are to be published by W-1 Friday 15:00.<br><br>Energy bids can be submitted between W-1 Monday 0:00 and D-1 6:00. The early gate opening supports the procurement of services that are expected to be necessary with probability. The gate closure on D-1 allows SOs to procure services based on day-ahead predictions and network calculations. Results of the clearing are to be published by D-1 7:00, which is 60 minutes ahead of local daily balancing capacity market gate closure, and well before the active period of DAM market bidding. This allows market players to participate on flexibility and day-ahead markets separately, and also supports that uncleared flexibility bids are submitted to shorter horizon markets (DAM, BAM). |

###### 10.4.3.1.1.5 Key performance indicators (KPI)

| Key performance indicators | | | |
|---|---|---|---|
| **ID** | **Name** | **Description** | **Reference to mentioned use case objectives** |
| 1 | Number of flexibility service provider assets involved in the service | There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the number of assets involved. | |
| 2 | Ratio of flexibility service provider assets involved in the service | There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the ratio of involved and total number of assets involved. | |
| 3 | Avoided operational limit violations | The aim of using flexibility services is to mitigate voltage variations of the MV feeders and to avoid possible violations of voltage limits. The KPI reflects on the number and duration of violations avoided. | |
| 4 | Bid success | The ratio of accepted (successful) and submitted (total) flexibility bids. | |
| 5 | Market success | Flexibility services are one of many possible means to reach the aims of the BUC. The KPI reflects on the ratio of violations avoided by the provision of flexibility services and the violations avoided by other means (redispatch, curtailment, load shedding, etc.). | |
| 6 | Successful market optimization runs | The ratio of converging auctions of the market of flexibility services. | |
| 7 | Cost of service | Minimal, maximal and average prices of capacity auctions and energy activations are reflective on the liquidity of the market. | |
| 8 | Accuracy of DSO flexibility demand prediction | The DSOs prepare for possible operational issues through the energy activations. As energy bids have to be submitted before D-1 6:00, the accuracy of grid forecasts largely affects the performance of the DSO in using flexibility services. The KPI reflects on the accuracy of DSO flexibility demand predictions by calculating the ratio and volume of expected and actual flexibility service needs. | |

###### 10.4.3.1.1.6 Use case conditions

| Use case conditions | |
|---|---|
| **Assumptions** | |
| **Prerequisites** | |
| 1 | DSO requires P and/or Q to keep actual voltage values of MV feeders within the standard bands. |


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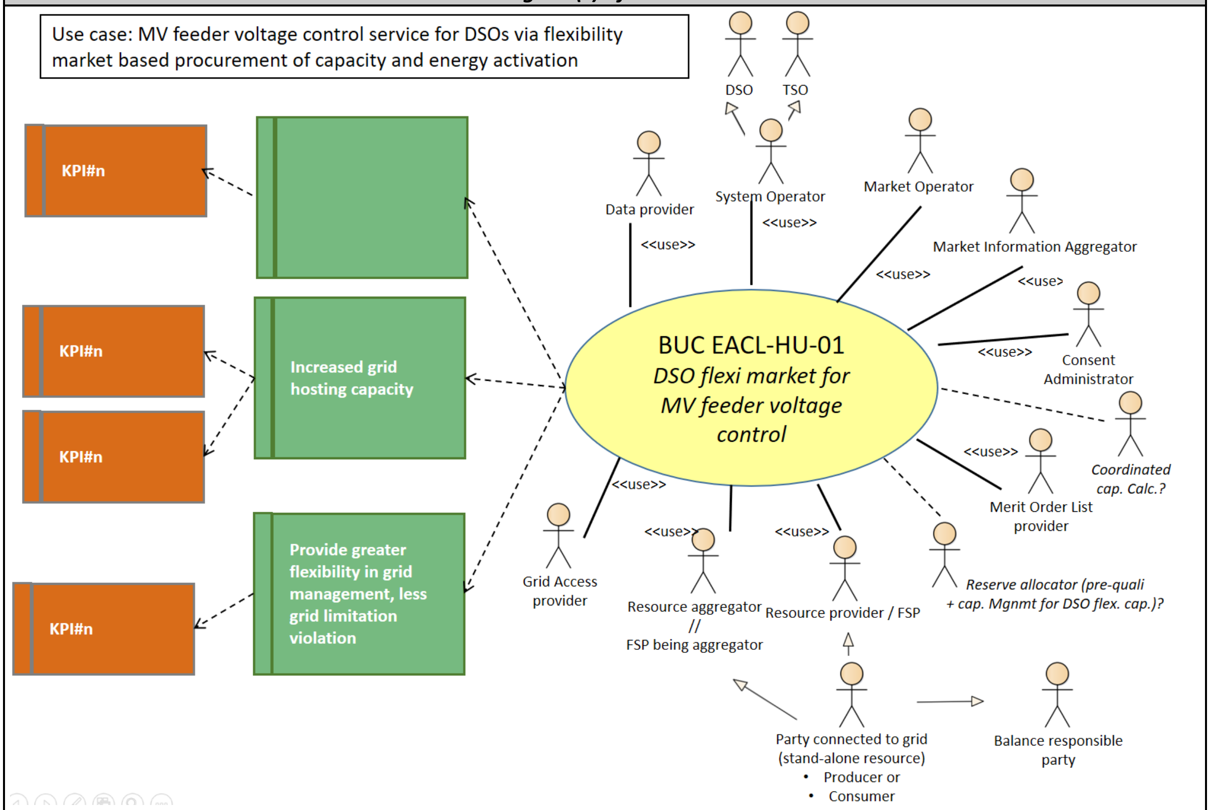
| | |
|---|---|
| 2 | FSP capable of providing P and/or Q is located at the bidding zone |

#### *10.4.3.1.1.7 Further information to the use case for classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| BUC will use the same products and market design as EACL-HU-02 |
| ***Level of depth*** |
| Generic use case |
| ***Prioritisation*** |
| High level of priority |
| ***Generic, regional or national relation*** |
| National use case for Hungary |
| ***Nature of the use case*** |
| BUC |
| ***Further keywords for classification*** |
| MV line, DSO voltage control |

### 10.4.3.1.2 Diagrams of use case

***Diagram(s) of use case***




*Not connected to BUC, only indirectly affected:*

- *Billing agent*
- *Metered data administ.*
- *Energy supplier*
- *Imbalance settlement responsible*



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#### 10.4.3.1.3 Technical details

##### *10.4.3.1.3.1 Actors*

| **Actors** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| ***Bidding zone***<br>***Metering point*** | | The actors are grouped by the two layers of the market structure: the operation area of each participating DSO, and the location of metering points (i.e. HV/MV transformer supply area) | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| DSO | • Grid Access Provider<br>• Data Provider<br>• System operator | Active actor<br>Responsible for maintaining service quality (e.g. EN 50160) and quantifying flexibility service needs<br>Participates in energy auctions and energy activations | In the present BUC, the DSO is responsible for the operation of the distribution network and all related technical matters. |
| TSO | • System Operator<br>• Data Provider | Passive actor<br>Receives information on capacity auctions and energy activations | In the present BUC, the TSO is informed on the results of the flexibility service market and the actions of DSOs and FSPs. The TSO considers this information in the operation of the transmission system and all related technical matters. |
| FSP | • Flexibility/Balancing Service Provider<br>• Resource aggregator<br>• Producer / Consumer<br>• Party connected to the grid<br>• Flexibility service provider being aggregator | Provides services for the DSO<br>Provides information to the TSO in case of activations through schedules | In the present BUC, the FSP is technology-independent; potential assets include photovoltaic plants, energy storage, B2B demand-side response, etc. |
| Market operator | • Market operator<br>• Data Provider<br>• Merit Order List Responsible | Responsible for market clearing | In the present BUC, the market operator aggregates the supply bids in the order book and carry out market clearing process. |
| OneNet common platfrom | • Flexibility register provider // consent administrator<br>• TSO-DSO coordinator platform provider // coordinated cap. calculator<br>• Market interface provider / market information aggregator | Responsible for the necessary TSO-DSO coordination | In the present BUC, the common coordination platform carries out TSO-DSO and DSO-FSP coordination steps, including: DSO demand finalization, flexibility registration and bid prequalification, and market result broadcasting. |



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##### 10.4.3.1.3.2 References

https://eepublicdownloads.entsoe.eu/clean-documents/EDI/Library/HRM/Harmonised_Role_Model_2020-01.pdf

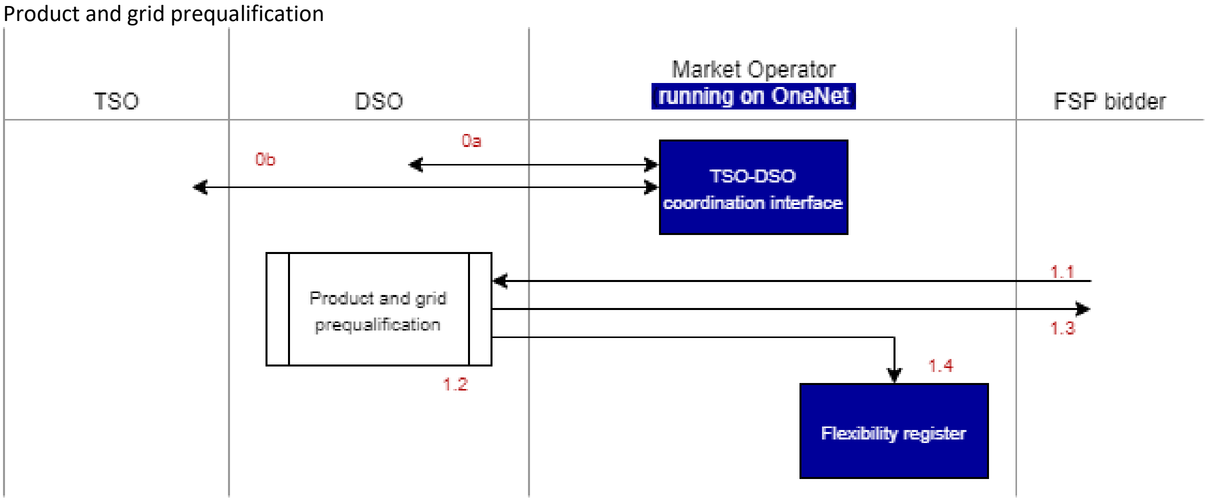
### 10.4.3.1.4 Step by step analysis of use case

#### 10.4.3.1.4.1 Overview of scenarios

| Scenario conditions | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Scenario 1: Prequalification | Product and grid prequalification | | | | |
| 2 | Scenario 2: Forecasting | DSO determines the volume and spatial-temporal location of flexibility needs | DSO | | | |
| 3 | Scenario 3: W-1 flexibility procurement W-1 | Collection of supply bid in the order book, market clearing in W-1 | Market operator | time, Gate Opening of W-1 capacity market | | |
| 4 | Scenario 4: D-1 flexibility procurement | Collection of supply bid in the order book, market clearing in D-1 | Market operator | time, Gate Opening of W-1 capacity market | | |

#### 10.4.3.1.4.2 Steps - Scenarios

**Scenario 1: Prequalification**
Product and grid prequalification




Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Scenario 1: Prequalification | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 1.1 | | Prequalification request | FSP requests prequalification | | FSP | DSO | I-01 | |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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.2 | | Product and grid prequalification | DSO executes prequalification | | DSO, | DSO | | |
| 1.3 | | Approval of prequalification | DSO informs FSP of the prequalification result | | DSO | FSP | I-02 | |
| 1.4 | | Prequalification results | Prequalification result is sent to the Market Operator (MO) | | DSO | MO (Flexi register) | I-03 | |

- Step No 1.1 / Prequalification request

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP initialization data for prequalification | data transfer | FSP initializes prequalification |

- Step No 1.3 / Approval of prequalification

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP qualification result | Data transfer | Status of FSP prequalification |

- Step No 1.4 / Prequalification results

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP qualification result | Data transfer | Location identifier and product parameters, assignment of FSP to congested substation/MV feeder |

**Scenario 2: Forecasting**

DSO determines the volume and spatial-temporal location of flexibility needs


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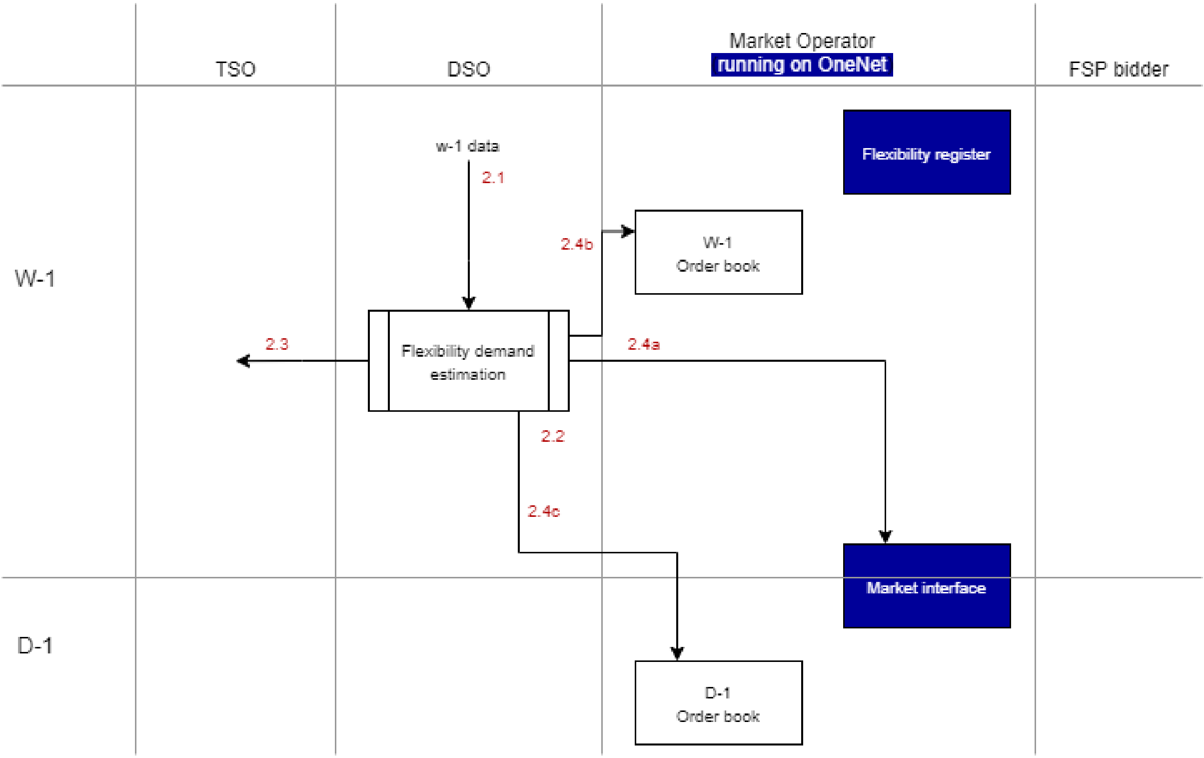


Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Scenario 2: Forecasting | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 2.1 | | DSO receives data for modelling flexibility needs | DSO collects past grid and external forecasting data | | DSO | DSO | I-04 | |
| 2.2 | | DSO determines flexibility needs | DSO determines the amount and spatial-temporal location of service needs | | DSO | DSO | | |
| 2.3 | | DSO informs TSO on flexibility needs | DSO-TSO data exchange | | DSO | TSO | I-05 | |
| 2.4 | | DSO delivers flexibility needs | DSO informs MO of the flexibility needs | | DSO | MO (W-1 & D-1 order book, market interface) | I-05 | |

- Step No 2.1 / Set database for modelling

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Historical grid operation dataset | Data transfer | Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting |



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- Step No 2.3 / DSO informs TSO on flexibility needs

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Flexibility service need | Data exchange | Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept |

- Step No 2.4 / DSO delivers flexibility needs

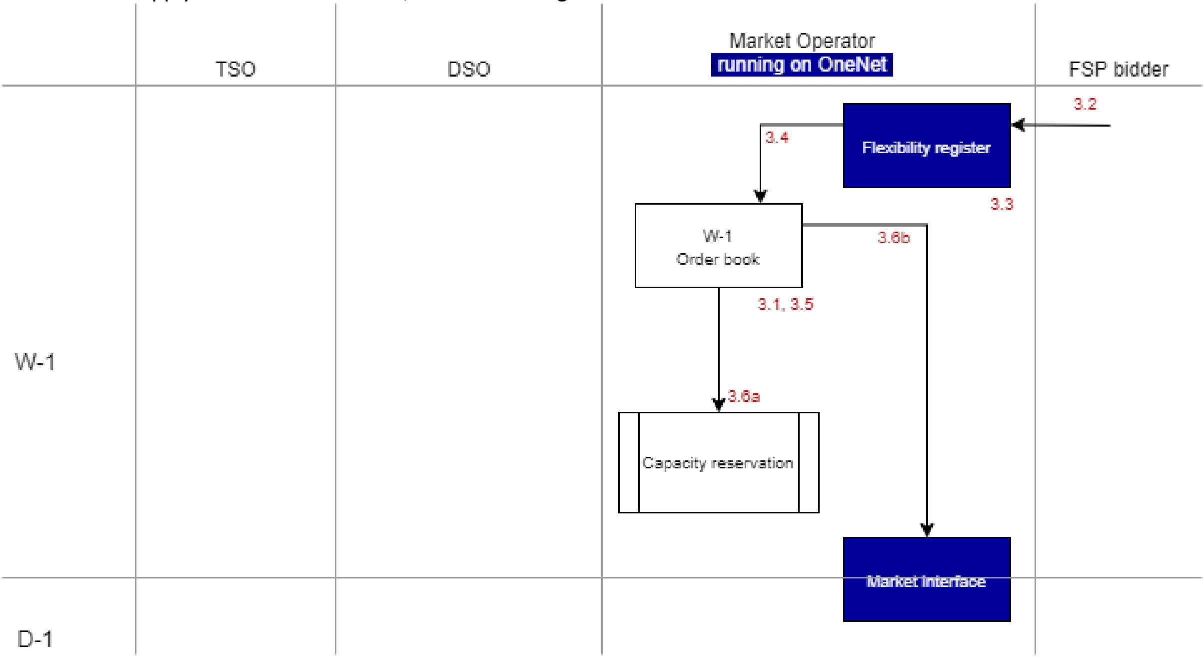
**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Flexibility service need | Data exchange | Quantity, type (capacity/activation), bid price, location, timing of demand |

**Scenario 3: Flexibility procurement W-1**

Collection of supply bid in the order book, market clearing in W-1




Scenario step by step analysis

| *Scenario* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Scenario name* | Scenario 3: W-1 flexibility procurement | | | | | | | |
| *Step No* | *Event* | *Name of process/activity* | *Description of process/activity* | *Service* | *Information producer (actor)* | *Information receiver (actor)* | *Information exchanged (IDs)* | *Requirement, R-IDs* |
| 3.1 | | Flexibility market opening, DSO needs announced | Market interface announces flexibility needs | | 1)Market Operator (MO)<br>2) MO (market interface) | 1) MO (order book)<br>2) FSP | I-05 | |
| 3.2 | | FSPs submit bids | FSP submit bids to W-1 & D-1 order book | | FSP | MO (flexi register) | I-06 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3.3 | | W-1 és D-1 FSP bid prequalification | FSP bid prequalification by MO | | MO | MO | | |
| 3.4 | | FSP bids delivered | FSP bids are submitted to W-1 & D-1 order book | | MO (flexi register) | MO (W-1 & D-1 order book) | I-06 | |
| 3.5 | | Clearing | Clearing is executed | | MO | MO | | |
| 3.6 | | Results of the clearing are transferred and announced | Market operator shares clearing result with the market interface | | MO | MO (market interface) | I-07 | |

- Step No 3.1 / Flexibility market opening, DSO needs announced

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand |

- Step No 3.2 / FSPs submit bids

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP supply bid | Data transfer | W-1/D-1 priced bid (+additional parameters) |

- Step No 3.4 / FSP bids delivered

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP supply bid | Data exchange | W-1/D-1 priced bid (+additional parameters) |

- Step No 3.6 / Results of the clearing are transferred and announced

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Clearing result | promulgation (?) | General action (clearing) results; List of accepted bids |

**Scenario 4: D-1 flexibility procurement**

Collection of supply bid in the order book, market clearing in D-1



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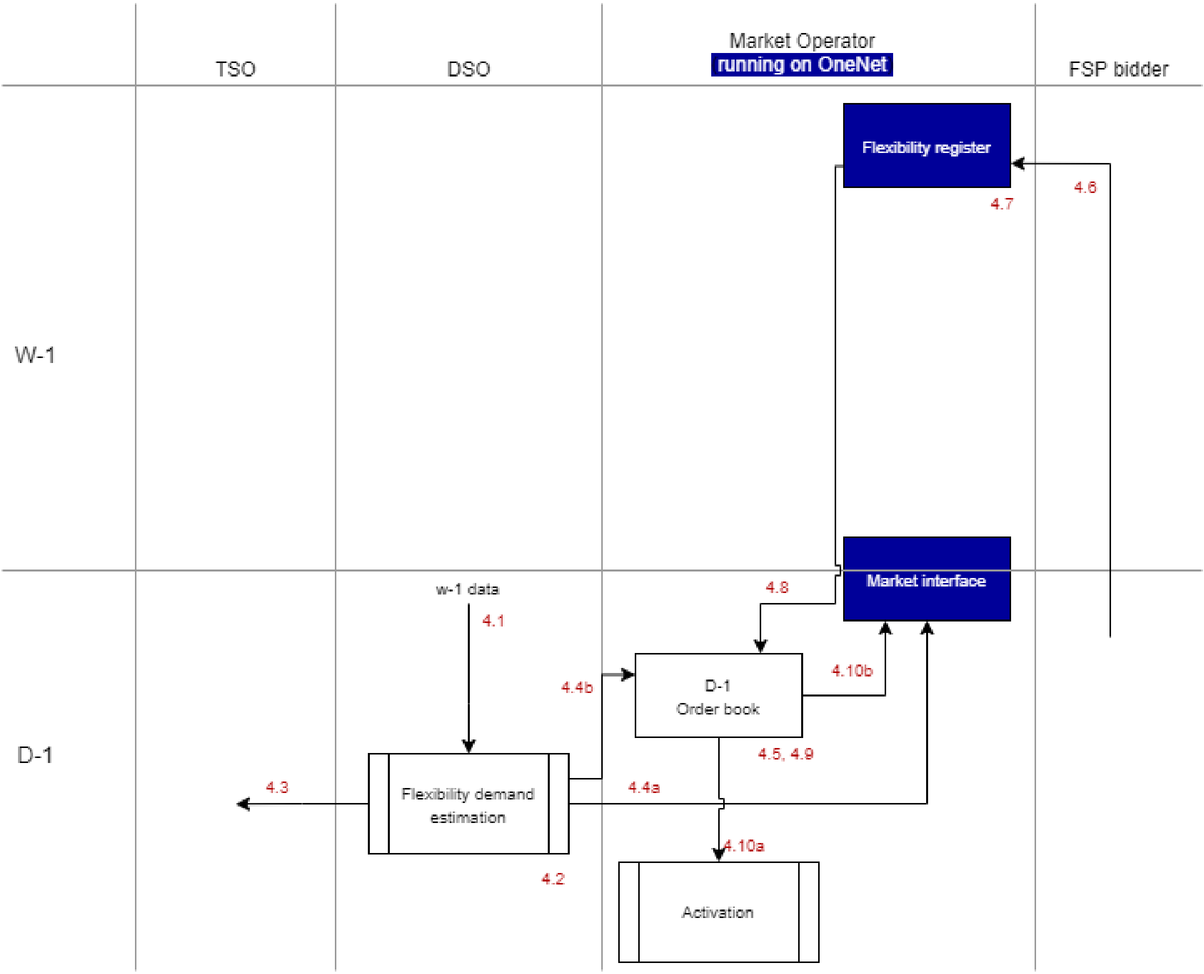


Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Scenario 4: D-1 flexibility procurement | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 4.1 | | DSO receives data for modelling flexibility needs | DSO collects past grid and external forecasting data | | DSO | DSO | I-08 | |
| 4.2 | | DSO determines flexibility needs | DSO determines the amount and spatial-temporal location of service needs | | DSO | DSO | | |
| 4.3 | | DSO informs TSO on flexibility needs | DSO-TSO data exchange | | DSO | TSO | I-05 | |
| 4.4 | | DSO delivers flexibility needs | DSO informs MO of the flexibility needs | | 1) DSO<br>2) DSO | 1) MO (W-1 & D-1 order book)<br>2) MO (market interface) | I-05 | |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4.5 | | Flexibility market opening, DSO needs announced | Market interface announces flexibility needs | | 1) MO (order book)<br>2) MO (market interface | 1) MO (order book)<br>2) FSP | I-05 | |
| 4.6 | | FSPs submit bids | FSP submit bids to D-1 order book | | FSP | MO (flexi register) | I-06 | |
| 4.7 | | D-1 FSP bid prequalification | FSP bid prequalification by MO | | MO | MO | | |
| 4.8 | | FSP bids delivered | FSP bids are submitted to D-1 order book | | MO (flexi register) | MO (D-1 order book) | I-06 | |
| 4.9 | | Clearing | Clearing is executed | | MO | MO | I-07 | |
| 4.10 | | Announcement | Market operator shares clearing result with the market interface | | MO (market interface) | MO (market interface) | | |

- Step No 4.1 / DSO receives data for modelling flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Weather forecast and historical grid operation dataset | Data transfer | Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/producer plans; Historical data for production forecasting |

- Step No 4.3 / DSO informs TSO on flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept |

- Step No 4.4 / DSO delivers flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand |

- Step No 4.5 / Flexibility market opening, DSO needs announced

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand |

- Step No 4.6 / FSPs submit bids

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| FSP supply bid | Data transfer | D-1 priced bid (+additional parameters) |

- Step No 4.8 / FSP bids delivered


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**Business section:**

Information sent:

| Business object | Instance name | Instance description |
|---|---|---|
| FSP supply bid | Data transfer | D-1 priced bid (+additional parameters) |

- Step No 4.9 / Clearing

**Business section:**

Information sent:

| Business object | Instance name | Instance description |
|---|---|---|
| Information on DSO needs | Data transfer | General action (clearing) results; List of accepted bids |

#### 10.4.3.1.5 Information exchanged

| Information exchanged | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| I-01 | FSP initialization data for prequalification | Type of service unit identifier (name, location, technical parameters) | |
| I-02 | FSP qualification result | Status of FSP prequalification (successful/ not successful); | |
| I-03 | FSP qualification result | Location identifier and product parameters (ID, POD, P, Q, activation time, sensitivity factor), assignment of FSP to congested substation/MV feeder | |
| I-04 | Historical grid operation dataset for flexibility service need modelling (W-1) | Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting (either profile or time series); | |
| I-05 | Flexibility service need | Quantity, type (capacity/activation), bid price, location, timing of demand | |
| I-06 | FSP supply bid | W-1/D-1 priced bid (+additional parameters) | |
| I-07 | Clearing result | General action (clearing) results; List of accepted bids | |
| I-08 | Weather forecast and historical grid operation dataset for flexibility service need modelling (D-1) | Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/ producer plans; Historical data for production forecasting (either profile or time series); | |

### 10.4.3.2 EACL_HU_02

#### 10.4.3.2.1 Description of the use case

##### *10.4.3.2.1.1 Name of use case*

| Use case identification | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| ***1*** | Hungary | MV feeder voltage control |

##### *10.4.3.2.1.2 Version management*

| Version management |
|---|

| Version No. | Date | Name of author(s) | Changes | Approval status |
|---|---|---|---|---|
| 1 | 07/05 2021 | Bálint Hartmann | 1.1-1.4 added | |
| 2 | 24/05 2021 | Bálint Hartmann, Péter Sőrés, Bálint Sinkovics | 1.5-3.2 added | |
| 3 | 31/08 2021 | Bálint Hartmann, Péter Sőrés, Bálint Sinkovics | Completion | |

###### 10.4.3.2.1.3 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| **Scope** | Increasing renewable penetration causes violation of standard voltage bands on MV lines. The main scope of EACL-HU-01 is to mitigate voltage variations of MV feeders by activating flexibility services. |
| **Objective(s)** | The objective of the use case is to keep actual voltage values of MV feeders within the standard bands. |
| **Related business case(s)** | EACL-HU-02 “HV/MV transformer overload” |

###### 10.4.3.2.1.4 Narrative of Use Case

**Narrative of use case**

**Short description**

Need: Due to the proliferation of PV plants, connected to DSO MV lines or directly to the MV side of HV/MV substations, violation of standard voltage bands on MV lines is a forthcoming issue in Hungary. This technical issue can be mitigated by P and/or Q on MV level.
Service: Voltage issues of MV feeders can be mitigated by P and/or Q injection/consumption.

**Complete description**

The BUC operates on two time horizons, each related to the specified grid service:

- capacity auction
- and energy activation (scheduled), respectively.

Capacity auctions will be driven by technical needs of the DSOs, which are determined on a weekly basis based on weekly maintenance plans. Gate opens at W-1 Monday 0:00 and closes at W-1 Friday 14:00, thus enabling bidders a fairly long time to place bids, but the market can be cleared during working hours on W-1. Results of the auction are to be published by W-1 Friday 15:00.

Energy bids can be submitted between W-1 Monday 0:00 and D-1 6:00. The early gate opening supports the procurement of services that are expected to be necessary with probability. The gate closure on D-1 allows SOs to procure services based on day-ahead predictions and network calculations. Results of the clearing are to be published by D-1 7:00, which is 60 minutes ahead of local daily balancing capacity market gate closure, and well before the active period of DAM market bidding. This allows market players to participate on flexibility and day-ahead markets separately, and also supports that uncleared flexibility bids are submitted to shorter horizon markets (DAM, BAM).

###### 10.4.3.2.1.5 Key performance indicators (KPI)

| Key performance indicators | | | |
|---|---|---|---|
| **ID** | **Name** | **Description** | **Reference to mentioned use case objectives** |
| 1 | Number of flexibility service provider assets involved in the service | There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the number of assets involved. | |
| 2 | Ratio of flexibility service provider assets involved in the service | There are different assets in the location with flexibility service provision capabilities, which can contribute to the needs of the DSO. The KPI reflects on the ratio of involved and total number of assets involved. | |
| 3 | Avoided operational limit violations | The aim of using flexibility services is to mitigate voltage variations of the MV feeders and to avoid possible violations of voltage limits. The KPI reflects on the number and duration of violations avoided. | |


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| | | | |
|---|---|---|---|
| 4 | Bid success | The ratio of accepted (successful) and submitted (total) flexibility bids. | |
| 5 | Market success | Flexibility services are one of many possible means to reach the aims of the BUC. The KPI reflects on the ratio of violations avoided by the provision of flexibility services and the violations avoided by other means (redispatch, curtailment, load shedding, etc.). | |
| 6 | Successful market optimization runs | The ratio of converging auctions of the market of flexibility services. | |
| 7 | Cost of service | Minimal, maximal and average prices of capacity auctions and energy activations are reflective on the liquidity of the market. | |
| 8 | Accuracy of DSO flexibility demand prediction | The DSOs prepare for possible operational issues through the energy activations. As energy bids have to be submitted before D-1 6:00, the accuracy of grid forecasts largely affects the performance of the DSO in using flexibility services. The KPI reflects on the accuracy of DSO flexibility demand predictions by calculating the ratio and volume of expected and actual flexibility service needs. | |

###### *10.4.3.2.1.6 Use case conditions*

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| ***Prerequisites*** | |
| 1 | DSO requires P and/or Q to keep actual voltage values of MV feeders within the standard bands. |
| 2 | FSP capable of providing P and/or Q is located at the bidding zone |

###### *10.4.3.2.1.7 Further information to the use case for classification/mapping*

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| BUC will use the same products and market design as EACL-HU-02 |
| ***Level of depth*** |
| Generic use case |
| ***Prioritisation*** |
| High level of priority |
| ***Generic, regional or national relation*** |
| National use case for Hungary |
| ***Nature of the use case*** |
| BUC |
| ***Further keywords for classification*** |

##### 10.4.3.2.2 Diagrams of use case

| ***Diagram(s) of use case*** |
|---|


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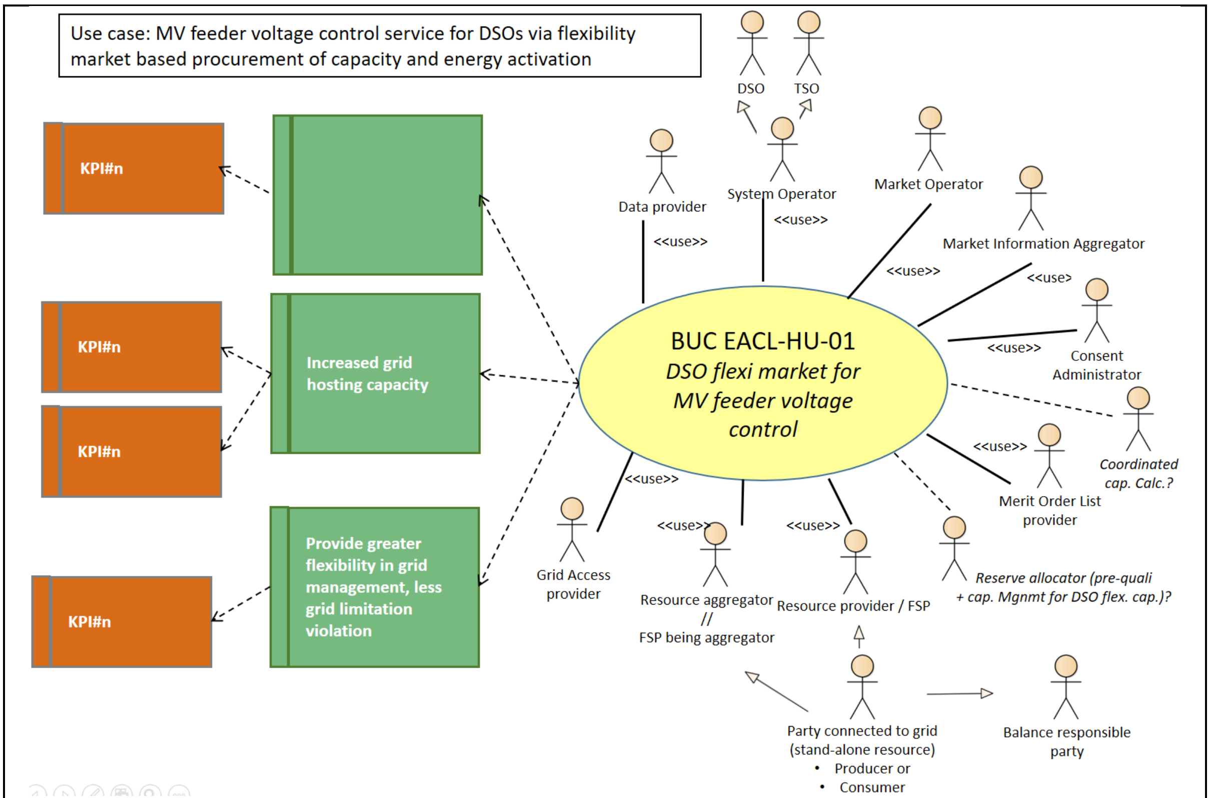


*Not connected to BUC, only indirectly affected:*

- *Billing agent*
- *Metered data administ.*
- *Energy supplier*
- *Imbalance settlement responsible*

### 10.4.3.2.3 Technical details

#### *10.4.3.2.3.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| ***Bidding zone***<br>***Metering point*** | | The actors are grouped by the two layers of the market structure: the operation area of each participating DSO, and the location of metering points (i.e. HV/MV transformer supply area) | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| DSO | • Grid Access Provider<br>• Data Provider<br>• System operator | Active actor<br>Responsible for maintaining service quality (e.g. EN 50160) and quantifying flexibility service needs<br>Participates in energy auctions | In the present BUC, the DSO is responsible for the operation of the distribution network and all related technical matters. |





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| | | | |
|---|---|---|---|
| | | and energy activations | |
| TSO | • System Operator<br>• Data Provider | Passive actor Receives information on capacity auctions and energy activations | In the present BUC, the TSO is informed on the results of the flexibility service market and the actions of DSOs and FSPs. The TSO considers this information in the operation of the transmission system and all related technical matters. |
| FSP | • Flexibility/Balancing Service Provider<br>• Resource aggregator<br>• Producer / Consumer<br>• Party connected to the grid<br>• Flexibility service provider being aggregator | Provides services for the DSO Provides information to the TSO in case of activations through schedules | In the present BUC, the FSP is technology-independent; potential assets include photovoltaic plants, energy storage, B2B demand-side response, etc. |
| Market operator | • Market operator<br>• Data Provider<br>• Merit Order List Responsible | Responsible for market clearing | In the present BUC, the market operator aggregates the supply bids in the order book and carry out market clearing process. |
| OneNet common platfrom | • Flexibility register provider // consent administrator<br>• TSO-DSO coordinator platform provider // coordinated cap. calculator<br>• Market interface provider / market information aggregator | Responsible for the necessary TSO-DSO coordination | In the present BUC, the common coordination platform carries out TSO-DSO and DSO-FSP coordination steps, including: DSO demand finalization, flexibility registration and bid prequalification, and market result broadcasting. |

*10.4.3.2.3.2 References*

https://eepublicdownloads.entsoe.eu/clean-documents/EDI/Library/HRM/Harmonised_Role_Model_2020-01.pdf

### 10.4.3.2.4 Step by step analysis of use case

*10.4.3.2.4.1 Overview of scenarios*

| ***Scenario conditions*** | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Scenario 1: Prequalification | Product and grid prequalification | | | | |
| 2 | Scenario 2: Forecasting | DSO determines the volume and spatial-temporal location of flexibility needs | DSO | | | |
| 3 | Scenario 3: W-1 flexibility procurement W-1 | Collection of supply bid in the order book, market clearing in W-1 | Market operator | time, Gate Opening of W-1 capacity market | | |


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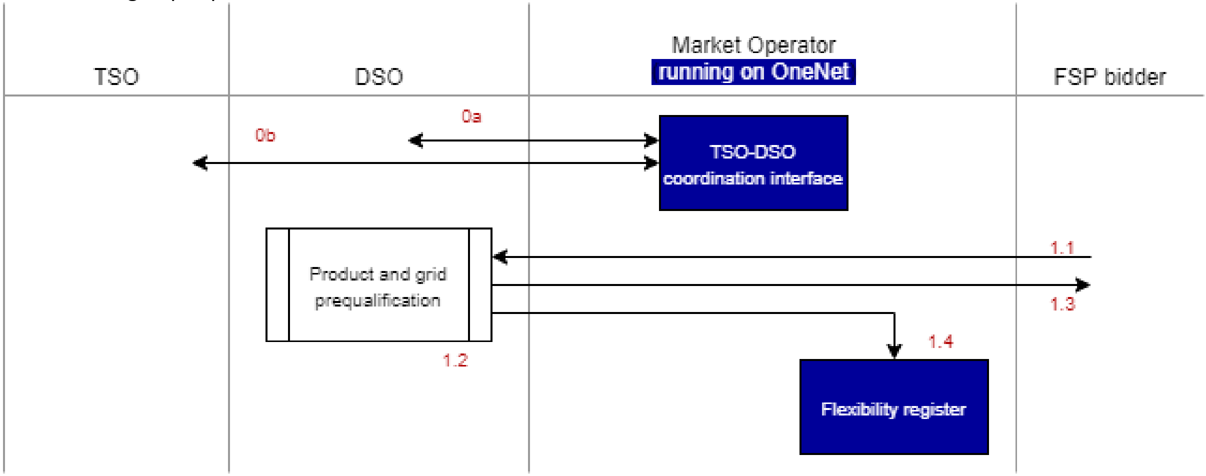
| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Scenario 4: D-1 flexibility procurement | Collection of supply bid in the order book, market clearing in D-1 | Market operator | time,<br>Gate Opening of W-1 capacity market | | |

### *10.4.3.2.4.2 Steps - Scenarios*

**Scenario 1: Prequalification**

Product and grid prequalification




Scenario step by step analysis

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Scenario 1: Prequalification | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 1.1 | | Prequalification request | FSP requests prequalification | | FSP | DSO | I-01 | |
| 1.2 | | Product and grid prequalification | DSO executes prequalification | | DSO, | DSO | | |
| 1.3 | | Approval of prequalification | DSO informs FSP of the prequalification result | | DSO | FSP | I-02 | |
| 1.4 | | Prequalification results | Prequalification result is sent to the Market Operator (MO) | | DSO | MO (Flexi register) | I-03 | |

- Step No 1.1 / Prequalification request

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| FSP initialization data for prequalification | data transfer | FSP initializes prequalification |

- Step No 1.3 / Approval of prequalification

**Business section:**

Information sent:



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| Business object | Instance name | Instance description |
|---|---|---|
| FSP qualification result | Data transfer | Status of FSP prequalification |

- Step No 1.4 / Prequalification results

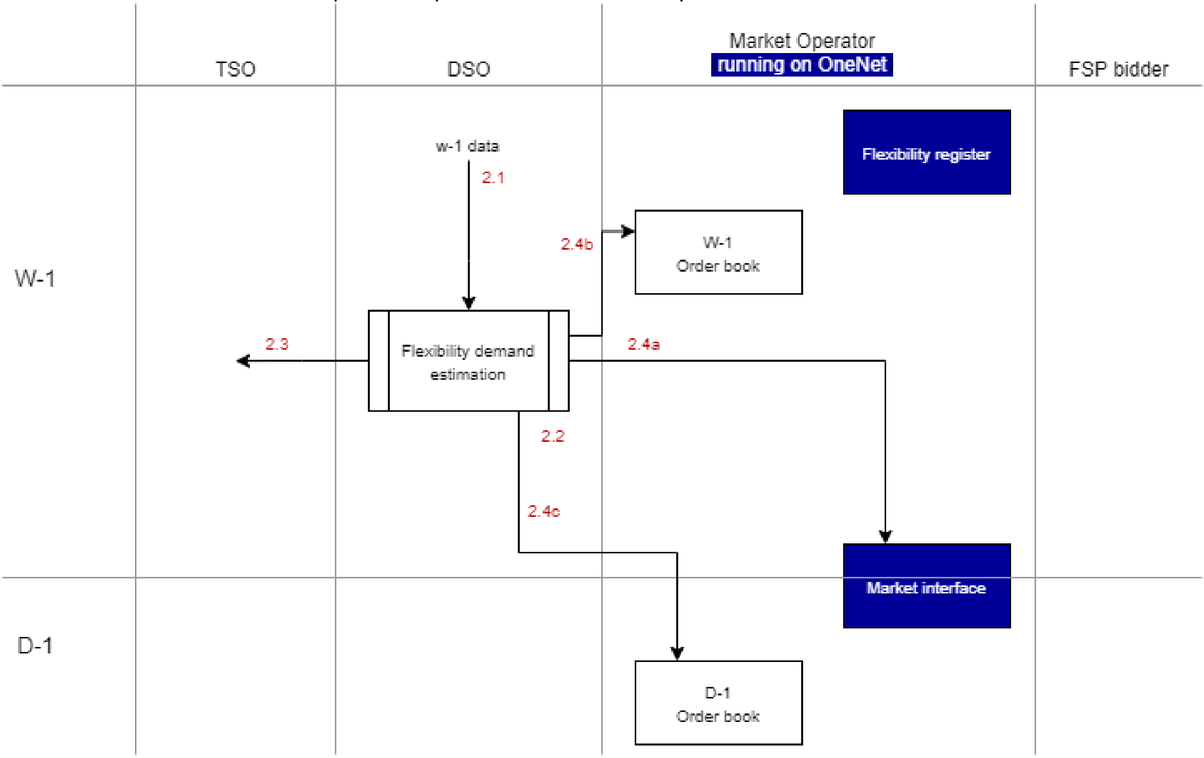
**Business section:**

Information sent:

| Business object | Instance name | Instance description |
|---|---|---|
| FSP qualification result | Data transfer | Location identifier and product parameters, assignment of FSP to congested substation/MV feeder |

**Scenario 2: Forecasting**

DSO determines the volume and spatial-temporal location of flexibility needs




Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Scenario name | Scenario 2: Forecasting | | | | | | | |
| Step No | Event | Name of process/activity | Description of process/activity | Service | Information producer (actor) | Information receiver (actor) | Information exchanged (IDs) | Requirement, R-IDs |
| 2.1 | | DSO receives data for modelling flexibility needs | DSO collects past grid and external forecasting data | | DSO | DSO | I-04 | |
| 2.2 | | DSO determines flexibility needs | DSO determines the amount and spatial-temporal location of service needs | | DSO | DSO | | |
| 2.3 | | DSO informs TSO on flexibility needs | DSO-TSO data exchange | | DSO | TSO | I-05 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2.4 | | DSO delivers flexibility needs | DSO informs MO of the flexibility needs | | DSO | MO (W-1 & D-1 order book, market interface) | I-05 | |

- Step No 2.1 / Set database for modelling

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Historical grid operation dataset | Data transfer | Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting |

- Step No 2.3 / DSO informs TSO on flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data exchange | Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept |

- Step No 2.4 / DSO delivers flexibility needs

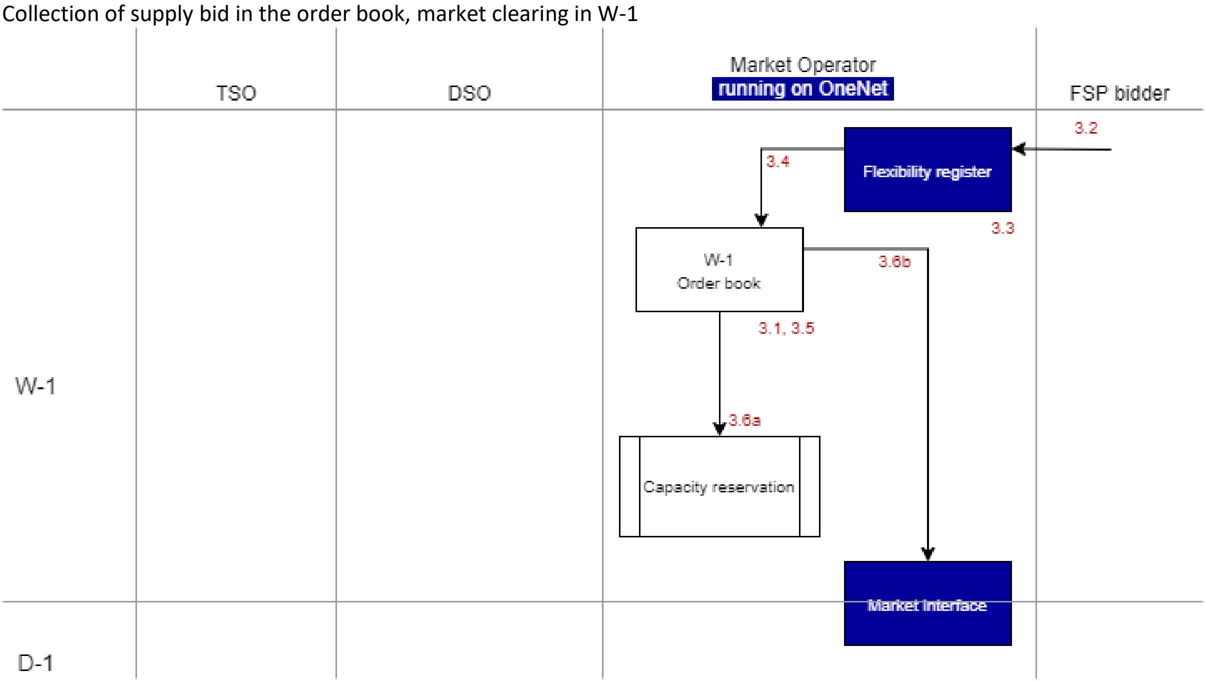
**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data exchange | Quantity, type (capacity/activation), bid price, location, timing of demand |

**Scenario 3: Flexibility procurement W-1**

Collection of supply bid in the order book, market clearing in W-1




Scenario step by step analysis

| ***Scenario*** | |
|---|---|
| ***Scenario name*** | Scenario 3: W-1 flexibility procurement |



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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 | | Flexibility market opening, DSO needs announced | Market interface announces flexibility needs | | 1)Market Operator (MO)<br>2) MO (market interface) | 1) MO (order book)<br>2) FSP | I-05 | |
| 3.2 | | FSPs submit bids | FSP submit bids to W-1 & D-1 order book | | FSP | MO (flexi register) | I-06 | |
| 3.3 | | W-1 és D-1 FSP bid prequalification | FSP bid prequalification by MO | | MO | MO | | |
| 3.4 | | FSP bids delivered | FSP bids are submitted to W-1 & D-1 order book | | MO (flexi register) | MO (W-1 & D-1 order book) | I-06 | |
| 3.5 | | Clearing | Clearing is executed | | MO | MO | | |
| 3.6 | | Results of the clearing are transferred and announced | Market operator shares clearing result with the market interface | | MO | MO (market interface) | I-07 | |

- Step No 3.1 / Flexibility market opening, DSO needs announced

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand |

- Step No 3.2 / FSPs submit bids

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP supply bid | Data transfer | W-1/D-1 priced bid (+additional parameters) |

- Step No 3.4 / FSP bids delivered

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP supply bid | Data exchange | W-1/D-1 priced bid (+additional parameters) |

- Step No 3.6 / Results of the clearing are transferred and announced

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Clearing result | promulgation (?) | General action (clearing) results; List of accepted bids |

**Scenario 4: D-1 flexibility procurement**

Collection of supply bid in the order book, market clearing in D-1


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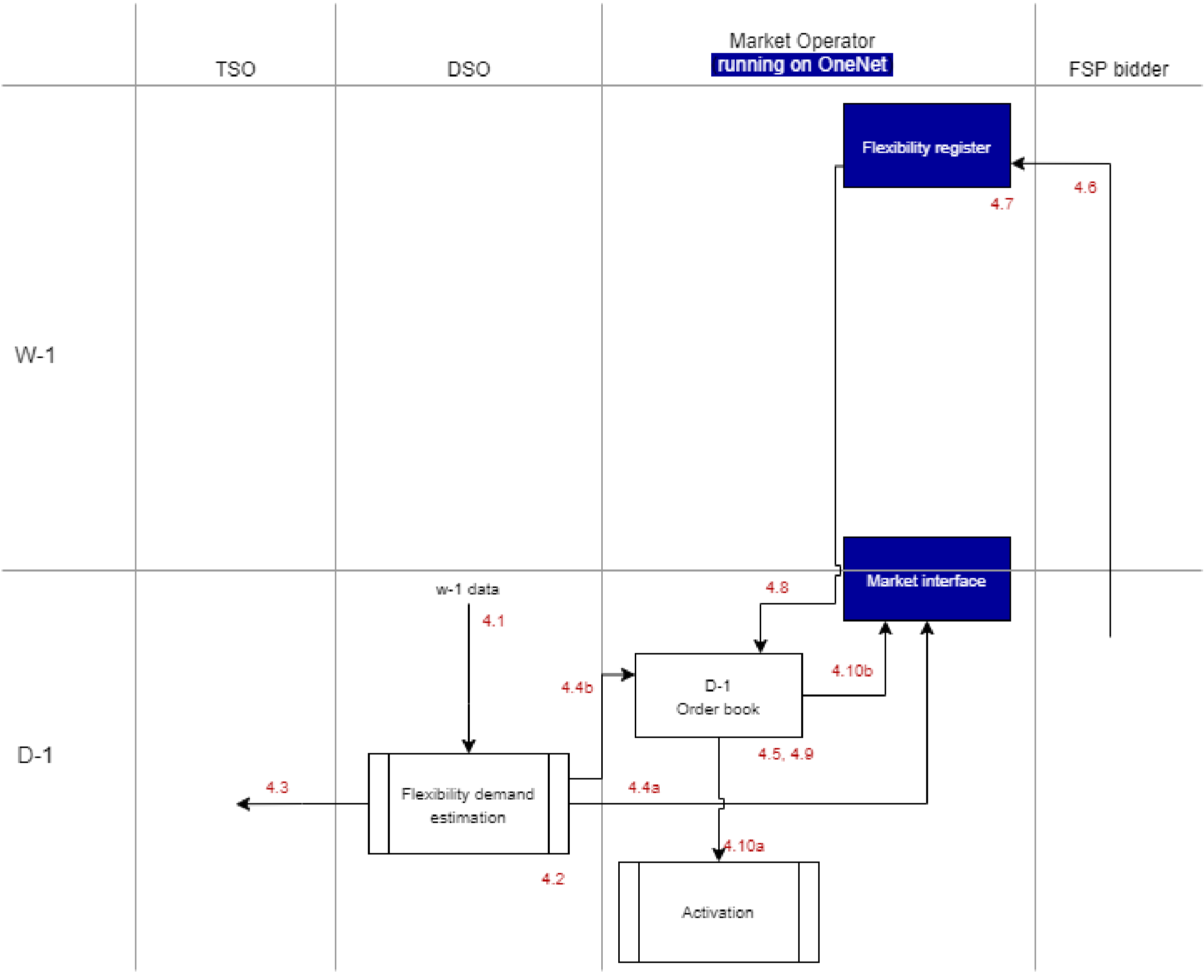


Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Scenario 4: D-1 flexibility procurement | | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 4.1 | | DSO receives data for modelling flexibility needs | DSO collects past grid and external forecasting data | | DSO | DSO | I-08 | |
| 4.2 | | DSO determines flexibility needs | DSO determines the amount and spatial-temporal location of service needs | | DSO | DSO | | |
| 4.3 | | DSO informs TSO on flexibility needs | DSO-TSO data exchange | | DSO | TSO | I-05 | |
| 4.4 | | DSO delivers flexibility needs | DSO informs MO of the flexibility needs | | 1) DSO<br>2) DSO | 1) MO (W-1 & D-1 order book)<br>2) MO (market interface) | I-05 | |



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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4.5 | | Flexibility market opening, DSO needs announced | Market interface announces flexibility needs | | 1) MO (order book)<br>2) MO (market interface | 1) MO (order book)<br>2) FSP | I-05 | |
| 4.6 | | FSPs submit bids | FSP submit bids to D-1 order book | | FSP | MO (flexi register) | I-06 | |
| 4.7 | | D-1 FSP bid prequalification | FSP bid prequalification by MO | | MO | MO | | |
| 4.8 | | FSP bids delivered | FSP bids are submitted to D-1 order book | | MO (flexi register) | MO (D-1 order book) | I-06 | |
| 4.9 | | Clearing | Clearing is executed | | MO | MO | I-07 | |
| 4.10 | | Announcement | Market operator shares clearing result with the market interface | | MO (market interface) | MO (market interface) | | |

- Step No 4.1 / DSO receives data for modelling flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Weather forecast and historical grid operation dataset | Data transfer | Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/producer plans; Historical data for production forecasting |

- Step No 4.3 / DSO informs TSO on flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand; TSO response according to the traffic light concept |

- Step No 4.4 / DSO delivers flexibility needs

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand |

- Step No 4.5 / Flexibility market opening, DSO needs announced

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| Flexibility service need | Data transfer | Quantity, type (capacity/activation), bid price, location, timing of demand |

- Step No 4.6 / FSPs submit bids

**Business section:**

Information sent:

| ***Business object*** | ***Instance name*** | ***Instance description*** |
|---|---|---|
| FSP supply bid | Data transfer | D-1 priced bid (+additional parameters) |

- Step No 4.8 / FSP bids delivered



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**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| FSP supply bid | Data transfer | D-1 priced bid (+additional parameters) |

- Step No 4.9 / Clearing

**Business section:**

Information sent:

| *Business object* | *Instance name* | *Instance description* |
|---|---|---|
| Information on DSO needs | Data transfer | General action (clearing) results; List of accepted bids |

#### 10.4.3.2.5 Information exchanged

| *Information exchanged* | | | |
|---|---|---|---|
| *Information exchanged, ID* | *Name of information* | *Description of information exchanged* | *Requirement, R-IDs* |
| I-01 | FSP initialization data for prequalification | Type of service unit identifier (name, location, technical parameters) | |
| I-02 | FSP qualification result | Status of FSP prequalification (successful/ not succesful); | |
| I-03 | FSP qualification result | Location identifier and product parameters (ID, POD, P, Q, activation time, sensitivity factor), assignment of FSP to congested substation/MV feeder | |
| I-04 | Historical grid operation dataset for flexibility service need modelling (W-1) | Grid condition status and outage from maintenance; Time series data of consumer/prosumer/ producer plans; Historical data for production forecasting (either profile or time series); | |
| I-05 | Flexibility service need | Quantity, type (capacity/activation), bid price, location, timing of demand | |
| I-06 | FSP supply bid | W-1/D-1 priced bid (+additional parameters) | |
| I-07 | Clearing result | General action (clearing) results; List of accepted bids | |
| I-08 | Weather forecast and historical grid operation dataset for flexibility service need modelling (D-1) | Weather forecast; Grid condition status and outage from maintenance; Time series data of consumer/ prosumer/ producer plans; Historical data for production forecasting (either profile or time series); | |

## 10.4.4 CZECH DEMO

### 10.4.4.1 DSUC_EA_CZ_01

#### 10.4.4.1.1 Description of the use case

##### *10.4.4.1.1.1 Name of use case*

| *Use case identification* | | |
|---|---|---|
| *ID* | *Area(s)/Domain(s)/Zone(s)* | *Name of use case* |
| | Country market layer | Non frequency services |



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##### 10.4.4.1.1.2 Scope and objectives of use case

| Scope and objectives of use case | |
|---|---|
| ***Scope*** | Non frequency services |
| ***Objective(s)*** | Enable the procurement of non-frequency services for DSO to address the grid related issues |
| ***Related business case(s)*** | - |

##### 10.4.4.1.1.3 Narrative of Use Case

| Narrative of use case |
|---|
| ***Short description*** |
| The newly created IT environment shall cover activities related to procurement of non-frequency services. The system shall:<br>• accommodate different types of non-frequency services<br>• enable DSOs to procure non-frequency services in a way that fits to needs of operation of distribution grid<br>• allow access for FSP/units to the platform in order to provide non-frequency services<br>• enable via traffic light system availability for activation of relevant resources |
| ***Complete description*** |
| **I Administration module**<br>1. FSP and Units providing Non-frequence services are registered into the system<br>2. The system uses specific identification code (EAN) which is unique to any unit providing flexibility, and EIC code unique for each FSP.<br>3. Each unit needs to specify its reserved capacity and to which FSP provider belongs (if relevant)<br>4. The system also involved system operators (DSOs,TSO)<br><br>**II Market module non-frequency services**<br>1. Registration of needs and offers via GUI or API<br>2. Overview of needs and flexibility bids (offered / accepted values)<br>3. Each unit needs to specify its location (nodal area), capacity, FSP provider (if relevant)<br>4. Semi-automatic evaluation (needs-offers matching) supervised by TSO / DSOs<br><br>**III Availability for activation of relevant resources (via traffic light system)**<br>1. DSO reports every unavailability of the distribution grid through announcement on the grid events<br>2. Way of reporting is different for planned outages/outages → planned events also includes planned duration (from – to) which is impossible indicate in case of sudden outages<br>3. As a dedicated communication tool XML messages are used<br>4. This information of grid unavailability is automatically sent through ECP communication to the registered units and FSP<br>5. The system also displays grid unavailability as a traffic light via GUI to the registered units and FSP |

#### 10.4.4.1.2 Technical Details

##### 10.4.4.1.2.1 Actors

| Actors | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution | |



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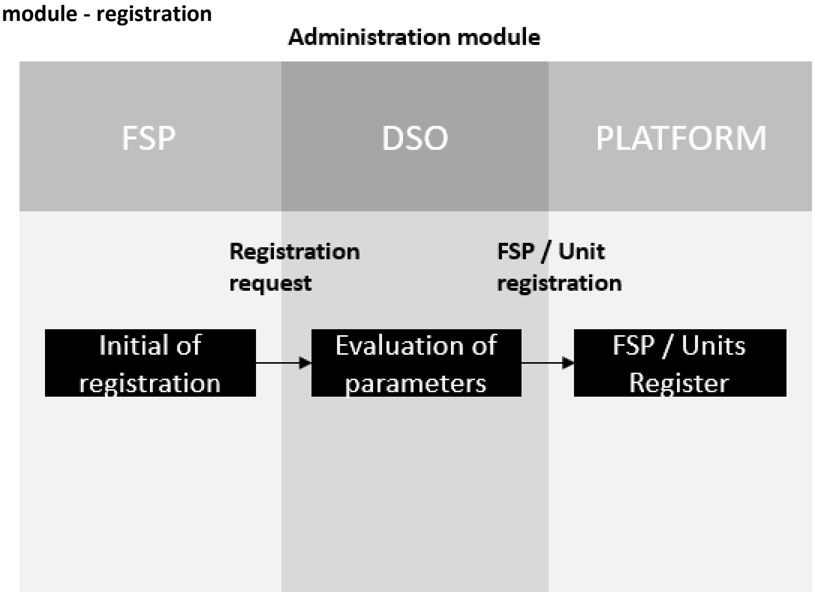
| | | | |
|---|---|---|---|
| | | system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity | |
| Aggregator | Business | A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resources (DER). | |
| Platform | IT | IT environment allowing for market parties exchange of market-based flexibility products, providing necessary feedback both on Aggregators/Units involved in flexibility provision. Moreover, in gives all participant relevant information on the grid availability through traffic light scheme. | |
| Unit/Flexibility provider | Business | Single units (part of the portfolio of the aggregator) proving flexibility to the distribution grid operator. | |

### 10.4.4.1.3 Step by step analysis of use case

#### *10.4.4.1.3.1 Steps – Scenarios*

**#1 Administration module - registration**




Scenario step by step analysis

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | | Administration module – registration | | | | | | |
| ***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 | Initial of registration | Registration request | The FSP (units/users) will requested the access to the system – at this initial phase the relevant DSO will serve as an interface | Access assessment | Unit data | Unit data | Unit → DSO | |
| 1.2 | Registration into the system | Unit registration | After the unit is recognised through DSO | Registration to the system | DSO approval | DSO approval | DSO → System provider | |



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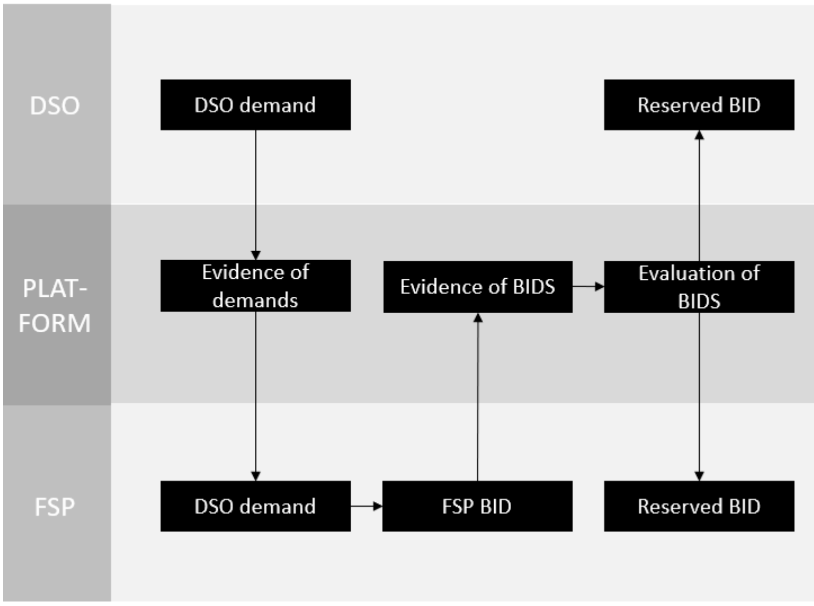
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | authentication, it is registered through system provider | | | | | |

**#2 Market module Non-frequency services**

**Market module Non – frequency services**

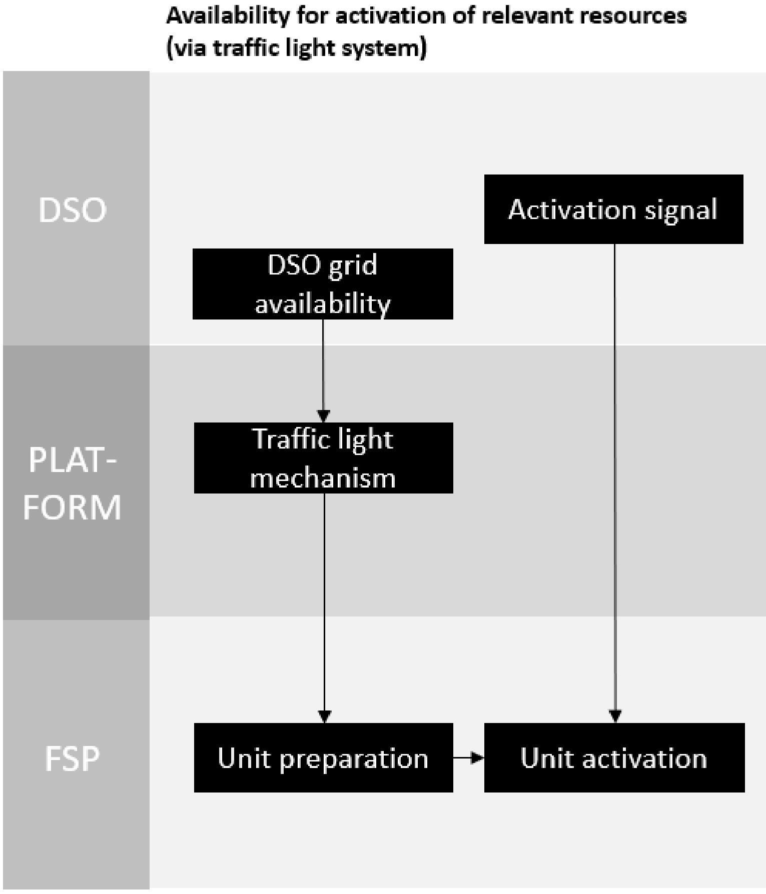



<u>Scenario step by step analysis</u>

| ***Scenario*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Market module Non-frequency services | | | | | | | |
| ***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 | Flexibility demand | Flexibility procurement | DSO sends flexibility demand to the platform via ECP through dedicated XML message The message contains details of the demand and list of units which might provide this service. | Flexibility provision | DSO | Platform | DSO → Platform | |
| 2.2 | Flexibility offer | Flexibility procurement | FSPs indicate total amount of flexibility available for given time period. Like for the flexibility demand there | Flexibility provision | FSP | Platform | FSP → Platform | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | is dedicated XML message containing details on type of service and duration. | | | | | |
| 2.3 | Offers relevance verification | Data verification | The platform verifies the relevance of offers (in terms of correct XML message format, traffic light status to given units etc.) | Data verification | Platform | Platform | Platform → Platform | |
| 2.4 | Offers – data transfer | Data delivery | The platform informs DSOs on offers available | Data delivery | Platform | DSO | Platform → DSO | |
| 2.5 | Offers – acceptance | Data delivery | DSOs inform relevant units on the acceptance of the service | Information delivery | Platform | FSP | Platform → FSP | |

### #3 Availability for activation of relevant resources (via traffic light system)



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Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Availability for activation of relevant resources (via traffic light 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 | Report | Report of availability | DSOs reports system availability concerning planned/ unplanned grid events | Grid report | DSO | Platform | DSO → Platform | |
| 3.2 | Selection | Selection according to nodal areas | The platform selects reported grid events (according to reported data) to individual units | Data processing | Platform | Platform | Platform → Platform | |
| 3.3 | Traffic light indication | Traffic light indication | Each unit is provided an information detailing beginning/end of planned outage and beginning of unplanned outage in given time framework | Traffic light display | Platform | Unit | Platform → Unit | |

### 10.4.4.2 DSUC_EA_CZ_02

#### 10.4.4.2.1 Description of the use case

##### *10.4.4.2.1.1 Name of use case*

| ***Use case identification*** | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Country market layer | Traffic light system |

##### *10.4.4.2.1.2 Scope and objectives of use case*

| ***Scope and objectives of use case*** | |
|---|---|
| ***Scope*** | Traffic light system |
| ***Objective(s)*** | Enable notification of unavailability of DSO to other market participants → allowing safe and reliable operation of distribution grid |
| ***Related business case(s)*** | - |

##### *10.4.4.2.1.3 Narrative of Use Case*

| ***Narrative of use case*** |
|---|
| ***Short description*** |
| In order to notify properly grid unavailability, the traffic light system shall enable:<br>• registration of all participants FSP/DSO/TSO into the system (database includes also reserved capacity of FSP, location and other details)<br>• DSO to report and announce outages (interruptions) / planned outages<br>• FSP to report day ahead contracted capacities (for DSO to consider load in given nodal areas) |
| ***Complete description*** |
| **I Administration module**<br>1. FSP and Units providing flexibility are registered into the system |



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| |
|---|
| 2. The system uses specific identification code (EAN) which is unique to any unit providing flexibility, and EIC code unique for each FSP.<br>3. Each unit needs to specify its reserved capacity and to which FSP provider belongs (if relevant)<br>4. The system also involved system operators (DSOs,TSO)<br>**II Outages/planned outages announcement**<br>1. DSO reports every unavailability of the distribution grid through announcement on the grid events<br>2. Way of reporting is different for planned outages/outages → planned events also includes planned duration (from – to) which is impossible indicate in case of sudden outages<br>3. As a dedicated communication tool XML messages are used<br>4. This information of grid unavailability is automatically sent through ECP communication to the registered units and FSP<br>5. The system also displays grid unavailability as a traffic light via GUI to the registered units and FSP<br>**III FSP – contracted capacities of Ancillary services**<br>1. FSP reports to the system on day ahead basis amount of contracted capacities<br>2. Reports includes namely contracted capacity and duration of service<br>3. As a dedicated communication tool XML message are used<br>4. The information is transferred through the platform to DSO to enable day ahead operation planning |

### 10.4.4.2.2 Technical Details

#### *10.4.4.2.2.1 Actors*

| ***Actors*** | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| | | | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Distribution System Operator (DSO) | Business | A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity | |
| Aggregator | Business | A natural or legal person who is a market participant providing flexibility services to any electricity market that represents and aggregates the capacity of the entities that own a distributed energy resources (DER). | |
| Platform | IT | IT environment allowing for market parties exchange of market-based flexibility products, providing necessary feedback on Aggregators/Units involved in flexibility provision. Moreover, in gives all participant relevant information on the grid availability through traffic light scheme. | |
| Unit/Flexibility provider | Business | Single units (part of the portfolio of the aggregator) proving flexibility to the distribution grid operator. | |

#### *10.4.4.2.2.2 Systems*

### 10.4.4.2.3 Step by step analysis of use case

#### *10.4.4.2.3.1 Overview of scenarios*

**#1 Administration module – registration**


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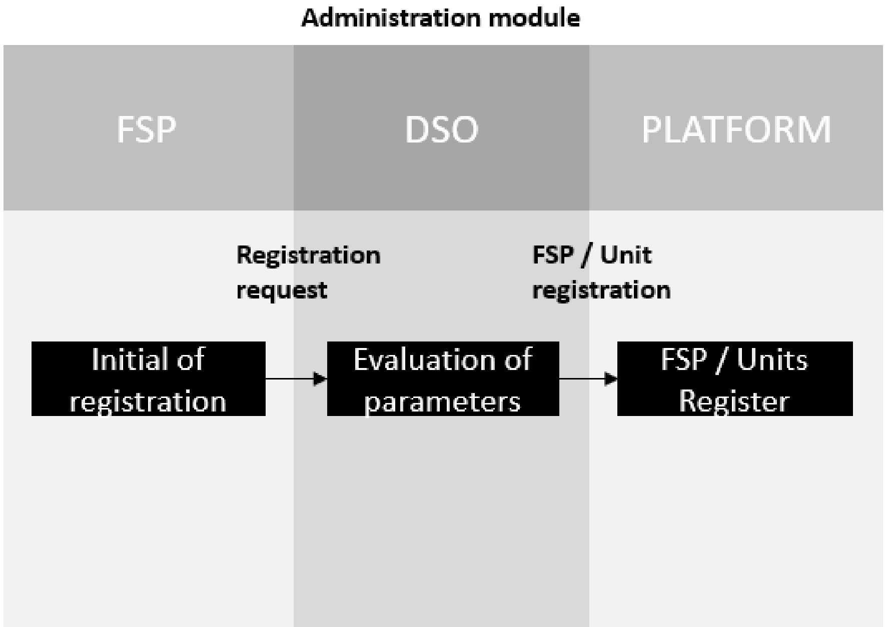


Scenario step by step analysis

| *Scenario* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | Administration module – registration | | | | | | | |
| ***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 | Initial of registration | Registration request | The FSP (units/users) will requested the access to the system – at this initial phase the relevant DSO will serve as an interface | Access assessment | Unit data | Unit data | Unit → DSO | |
| 1.2 | Registrati into the system | Unit registration | After the unit is recognised through DSO authentication, it is registered through system provider | Registration to the system | DSO approval | DSO approval | DSO → System provider | |

**#2 Outages/planned outages announcement**



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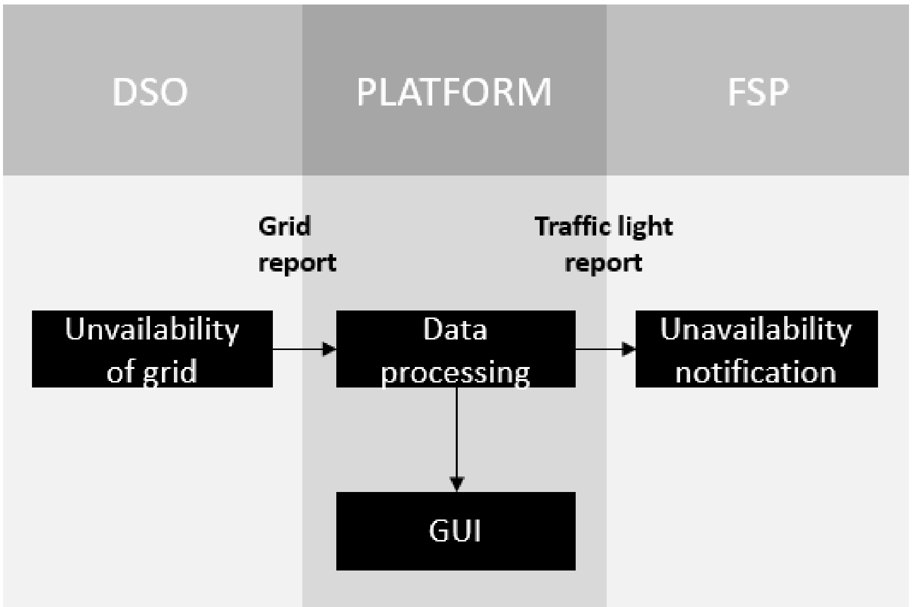
Outages / planned outages announcement




Scenario step by step analysis

| Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Scenario name* | | Outages/planned outages announcement | | | | | | |
| *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 | Report | Report of unavailability | DSOs reports system unavailability concerning planned/ unplanned grid events | Grid report | DSO | Platform | DSO → Platform | |
| 2.2 | Selection | Recipient selection | The platform selects reported grid events (according to reported data) to individual units | Data processing | Platform | Platform | Platform → Platform | |
| 2.3 | Traffic light notification | Traffic light notification | Each unit is provided an information detailing beginning/end of planned outage and beginning of unplanned outage in given time framework | Traffic light display | Platform | Unit | Platform → Unit | |

**#3 FSP – contracted capacities of Ancillary services**



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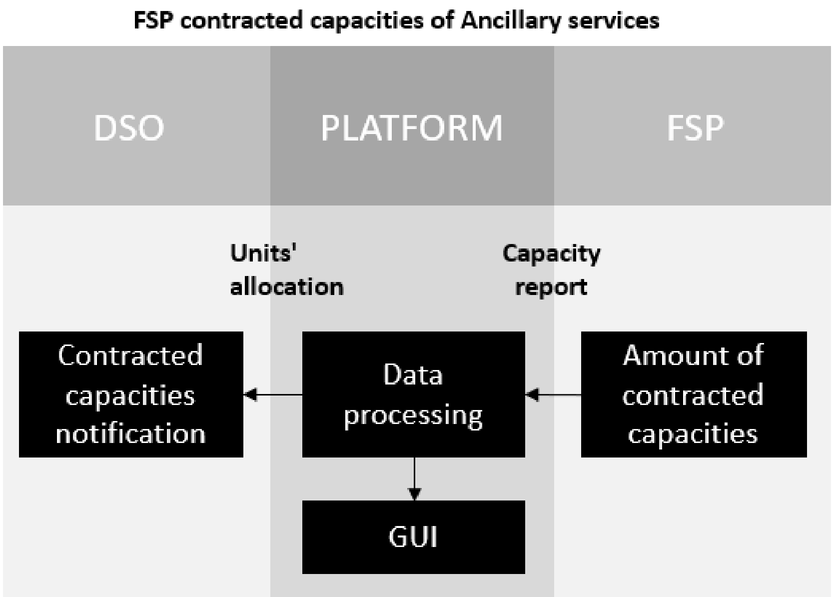


Scenario step by step analysis

| *Scenario* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Scenario name*** | FSP – contracted capacities of Ancillary services | | | | | | | |
| ***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 | Report on contracted capacities | Contracted capacity report | FSP reports (day ahead) contracted capacities to DSO (via platform) | Report on contracted capacities | FSP | Platform | FSP → Platform | |
| 3.2 | Recipient selection | Data processing | Platform divided received data according to relevant DSOs | Selection of data on contracted capacities | Platform | Platform | Platform → Platform | |
| 3. | Distribution of the processed information | Contracted capacity allocation | Platform will redistribute the information on contracted capacities (according to information included in the XML message) to particular DSOs | Redistribution of information on contracted capacities to relevant DSOs | Platform | DSO | Platform → DSO | |

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