

# **OneNet Concept and Requirements**

# D5.1

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# About OneNet

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

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

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

OneNet will see the participation of a consortium of over 70 partners. 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
loT	Internet of Things
IP	Internet Protocol
КҮС	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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ΤΟΤΕΧ	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 nearreal 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,



- 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.





# 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 sovereigntypreserving working space.



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



## 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.







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 gamechanging 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<sup>1</sup>, 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.

<sup>1</sup> Please consult Appendix C for an extensive description. Copyright 2021 OneNet





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.

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- 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].



- 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



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.





- 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	MACHINE	SYSTEM	REGULATORY	COMMERCIAL	GRID	MARKET
	Unum				ACCESS?	READABLE?	PLANNING	COMPLIANCE	USE	OPERATIONS	EFFICIENCY
1. Distribution Capital investment	1			•	0	x	~	~		4	
2. Circuit capacity (nominal)	4		1	•	0	٠	4	1		1	~
3. Circuit connectivity models	~			0	0	×	~			~	
4. Customer data (individual)	4			•	×	•	4	1	~	~	1
5. Customer data (aggregate)	~			•	0	•	1	1	1	1	1
6. DER capacity (existing and queued)	~	~	1	•	0	0	4		1	<ul> <li></li> </ul>	4
7. DER services performance	1	1	1	0	×	×	1	1	1	1	1
8. Distributed generation adoption forecasts	4	1	4	•	•	×	1	4		<	~
9. Grid conditions (historic)	1			•	0	×	1	1	1	1	1
10. Grid conditions (real time)	1			0	x	x	1	1	1	1	1
11. Hosting capacity	1			•	•	٠	1	1	1		
12. Hourly DER gross profiles	1	1	1	•	x	0	1		1	1	
13. Interconnection cost data	1			•	•	×	1	1	1		1
14. Load growth forecast	1			•	•	•	1	1			
15. Locational net benefits or value	1			•	0	0	1	1	1	1	4
16. Market potential or saturation studies		1		٠	×	×	1				1
17. Planned resiliency and reliability projects	1			•	•	•	*			1	
18. Project attributes	1	1		•	•	•	1			1	
19. Reliability statistics	1		1	•	•	0	1	4		4	
20. Utility rates	1		1	•	•	0	1	1			~
21. Voltage & power quality	1			•	•	0	1	1		1	1

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].

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## 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



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.,



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 crossstakeholder 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 datadriven 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).





Features	"Dumb Charging"	Smart Charging	vic	Bidirectional Charging V2B V2H
One-way EV charging	4	4	+	+
Set time of charge		4	+	+
Set charge rate			+	+
Access energy markets			+	4
Store + discharge energy				4

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.





### 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:





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	100 A	
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:





#### 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<sup>2</sup>,
- 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	

<sup>2</sup> 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<sup>3</sup>: 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<sup>4</sup>: 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.



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<sup>&</sup>lt;sup>3</sup> Please consult the Appendix A and a brief description, based on the input received from D2.3.

<sup>&</sup>lt;sup>4</sup> 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.





*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

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.
	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	<ul> <li>Flexibility contract Management</li> <li>Prequalification Phase</li> </ul>
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.

#### Table 4-1: DSUC\_NO\_01.



### 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	<ul> <li>Flexibility (capacity and energy) procurement</li> </ul>
	• Activation
	<ul> <li>Delivery and real-time monitoring</li> </ul>
Involved Business	FSP, FR, SO, MO, T&D CP, RP, CA
and System actors	
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.



### 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	<ul> <li>Opening of the procurement process</li> <li>Trading</li> <li>Matching</li> <li>Closing</li> <li>Settlement</li> </ul>
Involved Business and System actors	MO, SO, FR, T&D CP, ISR





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.
	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.



	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
	<ul> <li>Grid qualification of resource in procurement phase</li> </ul>
	<ul> <li>Grid qualification of resource in activation phase</li> </ul>
Involved Business	MO, SO, FR, T&D CP, RP, CA
and System actors	
Related BUCs	Northern regional flexibility market
Connection to	Details about the interactions will be collected from the Northern Cluster in the next
OneNet	months and reported in the other WP5 deliverables.

#### Name SUC **Bid Ranking & Optimization SUCID** 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. 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. 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** MO, SO, T&D CP and System actors **Related BUCs** Northern regional flexibility market Details about the interactions will be collected from the Northern Cluster in the next **Connection to** months and reported in the other WP5 deliverables. OneNet

#### Table 4-8: DSUC\_NO\_08.



### 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. 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





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	<ul> <li>Frequency stability</li> <li>Cost-effective operation of the system</li> <li>Better FSPs planning and managing flexibility resources.</li> <li>Better energy predictions and power system state predictions</li> <li>Improved identification of the available flexibility resources on all power system levels.</li> <li>Improved prediction of the system flexibility needs.</li> </ul>
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	<ul> <li>Frequency stability</li> <li>Load flow and contingency monitoring and predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> <li>Early warning on a hazardous power system regimes,</li> <li>Better FSPs planning and managing flexibility resources.</li> </ul>
	<ul> <li>Better energy predictions and power system state predictions</li> </ul>

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Narrative Steps	<ul> <li>Improved identification of the available flexibility resources on all power system levels.</li> <li>Improved prediction of the system flexibility needs.</li> <li>Register of POIs - Point of Interest with necessary regular periodic updates, technical data, historic data, forecasted data archiving and analysis for AI applications.</li> </ul>
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), 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.

Nama SUC	Change View different aggregation level simulations
Name SOC	change view - unreferit aggregation level simulations
SUC ID	DSUC_SO_GR_03
Objectives	<ul> <li>Frequency stability</li> <li>Load flow and contingency monitoring and predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> <li>Early warning on a hazardous power system regimes,</li> <li>Better FSPs planning and managing flexibility resources.</li> <li>Better energy predictions and power system state predictions</li> <li>Improved identification of the available flexibility resources on all power system levels.</li> <li>Improved prediction of the system flexibility needs.</li> </ul>
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)



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 Narrative	<ul> <li>Frequency stability</li> <li>Load flow and contingency monitoring and predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> <li>Early warning on a hazardous power system regime</li> <li>Better FSPs planning and managing flexibility resources</li> <li>Better energy predictions and power system state predictions</li> <li>Improved identification of the system flexibility needs.</li> <li>Improved prediction of the system flexibility needs.</li> </ul>
	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	<ul> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> </ul>



	<ul> <li>Early warning on a hazardous power system regime</li> </ul>
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	<ul> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> <li>Early warning on a hazardous power system regime</li> </ul>
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	<ul> <li>Provide fast, accurate, and reliable visualization of the Cyprus power system operating condition (transmission level)</li> <li>Enhance the situational awareness of the TSO</li> </ul>
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



	distribution grid the real time monitoring scheme will provide to the DSO the node voltages and line loadings.			
Steps	<ul> <li>Real time monitoring of the transmission grid operating condition</li> <li>Real time monitoring of the distribution grid operating condition</li> </ul>			
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	<ul> <li>Provide fast, accurate, and reliable visualization of the Cyprus distribution grid</li> <li>Enhance the situational awareness of the DSO</li> </ul>				
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	<ul> <li>Real time grid assessment of the transmission and distribution grid operating condition</li> <li>Evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market</li> </ul>			
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.			



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	<ul> <li>Coordinate (on-line) the available flexible resources according to the grid operating conditions</li> <li>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</li> </ul>				
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.				
	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	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> <li>Enable FSPs and their resources for flexibility markets, since Prequalification phase is necessary for the following phases that we will approach.</li> <li>List of requirements for product prequalification for DSO and TSO.</li> <li>Ensure coordination between system operators for all scenarios.</li> <li>Receive and send data between system operators in a secure manner.</li> </ul>				
Narrative	<ul> <li>Receive and send data between system operators in a secure manner.</li> <li>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.</li> <li>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.</li> <li>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:</li> <li>Comprehensive grid data -selecting the most efficient combination of flexibilities and switching of topology</li> <li>Partial grid data -using essentially the sensitivities of flexibilities, e.g., Traffic lights system</li> <li>Simple Rule – Empirical selection</li> <li>Within the scope of this SUC, real-world implementation of technologies enabling</li> </ul>				
Steps	<ul> <li>Prequalification for FSPs connected to Distribution Grid</li> <li>Prequalification for FSPs connected to Transmission Grid</li> </ul>				
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	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> <li>Identify potential network constrains and planning of the grid operation for the</li> </ul>		
	next day/hours considering the load and generation forecasts		



	<ul> <li>Promote the participation of flexible resources connected at all voltage levels grids in distribution and transmission networks operation</li> <li>Ensure coordination between system operators for all scenarios.</li> <li>Receive and send data between system operators in a secure manner.</li> </ul>
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.
	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.
Steps	<ul> <li>Day-Ahead &amp; Intraday Flexibility needs for DSO</li> <li>Day-Ahead &amp; Intraday Flexibility needs for TSO</li> <li>Day-Ahead &amp; Intraday Flexibility needs for DSO within OneNet System</li> <li>Day-Ahead &amp; Intraday Flexibility needs for TSO within OneNet System</li> </ul>
Involved Business and System actors	DSO Plan/Forecast System, TSO Plan/Forecast System, 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	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> <li>Cover grid investment needs through flexibility services.</li> <li>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.</li> <li>Improve network operation security during maintenance actions, using flexibility to minimize the risk of reduced redundancy.</li> <li>Ensure coordination between system operators for all scenarios.</li> </ul>			



Narrative	This SUC is focused on the steps that system operators should perform to pla forecast their grid utilization. This SUC supports the coordination between DS TSO so that they can determine how much flexibility they will need to acquire 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 a forecasting of possible congestion areas, that system operators should go throu considering the possibility of reserving flexibility services for congestion managem 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.					
Steps	<ul> <li>Long-term Flexibility needs for DSO</li> <li>Long-term Flexibility needs for TSO</li> </ul>					
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.
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Name SUC	Selection of Bids
SUC ID	DSUC_WE_PT_04
Objectives	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> <li>Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a technical point of view.</li> <li>Ensure coordination between system operators for all scenarios.</li> <li>Receive and send data between system operators in a secure manner</li> </ul>
Narrative	This SUC focuses on the steps that system operators should perform to select bids from FSP's. After the system operators have identified the amount of flexibility, they need to solve their needs and possible constraints, FPS offers bids can cover the amount of flexibility identified. In this SUC is described which bid parameters, such as flexibility direction, possibility for aggregation, etc., are addressed in order to select what bids can solve system operators needs and constraints taking into account the impact of each bid on both the
	operator's network and the neighbouring operator's network. In addition to the parameters of the bids, another aspect to consider when selecting bids is the



	coordination between DSO and TSO markets, namely the coordination in forwarding bids from the DSO market to the TSO market and vice versa.
	Furthermore, it is described which parameters are addressed in order to select which bids can and cannot be acquired and the merit order list (MOL) of the previous acquired bids.
	After the selection of the bids, based on the requirements described above, a merit order list (MOL) of the acquired bids is defined.
	Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about the bids that need to be analysed by the operator they are connected to and the bids that are forwarded from one network operator to another. This implementation is supported by work done in previous H2020 projects.
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	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> <li>Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a grid point of view.</li> <li>Ensure coordination between system operators for all scenarios.</li> <li>Receive and send data between system operators in a secure manner.</li> </ul>
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.
	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.



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	<ul> <li>Anticipate grid constraints due to maintenance works scheduled</li> <li>Have an updated view of the maintenance plans defined by TSO and DSO from long-term until close to real-time.</li> </ul>
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.
	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.
Steps	<ul> <li>Year-ahead works programming</li> <li>Monthly-ahead, Weekly-ahead or on event update of maintenance plans</li> </ul>
Involved Business	Work Management, System Planning, Data Exchange Platform,
and System actors	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	<ul> <li>Improve TSO and DSO forecast processes by taking into account each other's generation and load forecasts.</li> <li>Improve programming of TSO and DSO operation activities.</li> <li>Contribute to the improvement of the forecast of technical constraints.</li> </ul>



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. 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.
Steps	<ul> <li>Exchange forecasts of disaggregated generation and load</li> </ul>
Involved Business	• Data exchange platform
and System actors	• Pre-Operation Planning
	Network Model Management
	• 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	<ul> <li>Improve TSO and DSO grid planning by taking into account each other's short- circuit contributions in the TSO/DSO interface</li> <li>Improve security of operation and quality of service</li> </ul>
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



	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.
Steps	<ul> <li>Short-circuit power definition at bay level considering TSO information</li> <li>Short-circuit power definition at bay level considering TSO and DSO information</li> </ul>
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	<ul> <li>Enable local flexibility procurement by DSOs</li> <li>Open market sessions at the request of the DSO</li> <li>Collect bids from market participants</li> <li>Clear the local flexibility markets</li> <li>Communicate market results to stakeholders</li> </ul>
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	<ul> <li>Flexibility Resource Register</li> <li>Market Request</li> <li>Market Session</li> </ul>
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.
	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.
	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	<ul> <li>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:</li> <li>Market phase</li> <li>Monitoring and Activation</li> <li>Measurement and settlement</li> <li>Platform consultation</li> </ul>
Involved Business	STAR Platform, FSP, IMO, DSO, TSO, producer
and System actors	
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.
	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.
	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	<ul> <li>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:</li> <li>Market phase</li> <li>Monitoring and Activation</li> <li>Measurement and settlement</li> <li>Platform consultation</li> </ul>
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	<ul> <li>This use case describes prequalification process on the FP which consists of:         <ul> <li>market prequalification (registration and assessment of a new FSP on the FP)</li> <li>certification of DER (registration and assessment of a new unit by FSP)</li> <li>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)</li> </ul> </li> <li>This use case covers all obligatory steps for a FSP to participate in the flexibility market through FP</li> </ul>	
Steps	<ul> <li>Market prequalification</li> <li>Certification of DER</li> <li>Product and/or static grid prequalification</li> </ul>	
and System actors		
Related BUCs		

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### 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	<ul> <li>The newly created IT environment shall cover activities related to procurement of non-frequency services. The system shall:         <ul> <li>accommodate different types of non-frequency services</li> <li>enable DSOs to procure non-frequency services in a way that fits to needs of operation of distribution grid</li> <li>allow access for FSP/units to the platform in order to provide non-frequency services</li> <li>enable via traffic light system availability for activation of relevant resources</li> </ul> </li> </ul>	
Steps	<ul> <li>Administration module</li> <li>Market module non-frequency services</li> <li>Availability for activation of relevant resources (via traffic light system)</li> </ul>	
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	<ul> <li>Enable notification of unavailability of DSO to other market participants</li> <li>Allowing safe and reliable operation of distribution grid</li> </ul>
Narrative	<ul> <li>In order to notify properly grid unavailability, the traffic light system shall enable:</li> <li>registration of all participants FSP/DSO/TSO into the system (database includes also reserved capacity of FSP, location and other details)</li> <li>DSO to report and announce outages (interruptions) / planned outages</li> <li>FSP to report day ahead contracted capacities (for DSO to consider load in given nodal areas)</li> </ul>
Steps	<ul> <li>Administration module</li> <li>Outages/planned outages announcement</li> <li>FSP – contracted capacities of Ancillary services</li> </ul>
Involved Business and System actors	DSO, Aggregator, Platform, Unit/ Flexibility provider

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Related BUCs	ŝs		
Connection to OneNet	:0		

#### Table 4-35: DSUC\_EA\_HU\_01<sup>5</sup>.

Name SUC	Prequalification	
SUC ID	DSUC_EA_HU_01	
Objectives		
Narrative	Product and grid prequalification	
Steps	<ul> <li>Prequalification Request</li> <li>Product and grid prequalification</li> <li>Approval of prequalification</li> <li>Prequalification Results</li> </ul>	
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<sup>6</sup>.

Name SUC	Forecasting	
SUC ID	DSUC_EA_HU_02	
Objectives		
Narrative	DSO determines the volume and spatial temporal location of flexibility needs	
Steps	<ul> <li>DSO receives data for modelling flexibility needs</li> <li>DSO determines flexibility needs</li> <li>DSO informs TSO on flexibility needs</li> <li>DSO delivers flexibility needs</li> </ul>	
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.	

<sup>&</sup>lt;sup>5</sup> This is information extracted by the BUCs and initially reflects the Demo SUCs, which are under development. <sup>6</sup> Ibid, pg.66

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#### Table 4-37: DSUC\_EA\_HU\_03<sup>7</sup>.

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	<ul> <li>DSO receives data for modelling flexibility needs</li> <li>DSO determines flexibility needs</li> <li>DSO informs TSO on flexibility needs</li> <li>DSO delivers flexibility needs</li> <li>Flexibility market opening, DSO needs announced</li> <li>FSPs submit bids</li> <li>D-1 FSP bid prequalification</li> <li>FSP bids delivered</li> <li>Clearing</li> <li>Announcement</li> </ul>	
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	<ul> <li>Validate prequalification mechanism for various flexibility sources</li> <li>Prequalify numerous flexibility sources.</li> <li>Improve security of supply through a transparent and easy process</li> </ul>	
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	<ul> <li>Grid Prequalification with DSO</li> <li>Grid Prequalification without DSO</li> </ul>	
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	

#### Name SUC **Product Pregualification SUCID** DSUC\_EA\_SL\_02 **Objectives** Deferral of grid reinforcement investments (defer or avoid secondary 0 substation replacement). Improve security of supply. 0 0 Validate demand response mechanism to prevent congestion in the distribution grid. Test flexibility products to prevent congestion in the distribution grid under 0 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** TSO, DSO, FSP, MO, DSO Scada system, TSO Scada system, DSO smart grid activation and System actors 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 4-39: DSUC\_EA\_SL\_02.

#### Table 4-40: DSUC\_EA\_SL\_03.

Name SUC	Bidding
SUC ID	DSUC_EA_SL_03
Objectives	<ul> <li>Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).</li> </ul>



	<ul> <li>Improve security of supply.</li> <li>Organize a marketplace with fair competition between aggregators</li> </ul>
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	o 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 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	<ul> <li>Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).</li> <li>Improve security of supply.</li> <li>Organize a marketplace with fair competition between aggregators</li> </ul>
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	<ul> <li>Activation</li> </ul>
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	


#### Table 4-42: DSUC\_EA\_SL\_05.

Name SUC	Settlement	
SUC ID	DSUC_EA_SL_05	
Objectives	<ul> <li>Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).</li> <li>Improve security of supply.</li> <li>Validate demand response mechanism to prevent congestion in the distribution grid.</li> <li>Monetize activated flexibility so that the FSP receives reimbursement.</li> </ul>	
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	o 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 DSO, 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.



Cluster	Country	DSUC	Connection to OneNet	
Southern	Cyprus	DSUC_SO_CY_02	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 4-43: Connection to OneNet system as identified by the Demonstrators' SUCs.

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



				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



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.



- 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.

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.

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



## 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	<ul> <li>Enable the cross-platform data exchange</li> <li>Ensure a standardized connection of different platforms</li> <li>Allow the discovery of data sources and services</li> <li>Definition of common vocabularies for improving interoperability</li> <li>Manage data exchange in a secure and trusted way</li> </ul>
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.) 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.
	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
	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.
	The following aspects are central for the concept:
	<ul> <li>identification (i.e., claiming an identity),</li> <li>authentication (i.e., verifying an identity), and</li> <li>authorization (i.e., making access decisions based on an identity).</li> <li>The Identification of a OneNet Participant is made by requesting to the Identity Provider an identity token using a certificate.</li> </ul>
	The Identity provider return an Identity Token that can be used for requesting an Access Token.
	The Access Token is used for any data access request.
	Scenario 2 – Registration of the connector
	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.

Scenario 3 – Cross-Platform data exchange





	After the registration of its OneNet connector, a OneNet participant can act as Data Provider or Data consumer within the OneNet system.
	The Data Provider publishes metadata to the Broker Service Provider that contains information about data provided.
	The Data Consumer can find a specific data source (though OneNet Connector Id/Participant Id) or query for data sources.
	The Broker Serviced Provider returns information about data sources.
	The Data Consumer can request for data in two ways: on demand (pull request), periodically (publish/subscribe)
	Scenario 3a – Data Pull request
	The Data Consumer searches data through the Broker Service Provider returns information about data source metadata.
	The Data Consumer requests for specific dataset to Broker Service Provider.
	The Data Consumer is able to pull data directly from the Data Provider.
	All the data exchanges are logged into Clearing House.
	Scenario 3b – Data Publish/Subscribe
	The Data Consumer searches data through the OneNet Middleware. The Broker Service Provider returns information about data source metadata.
	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.
	The Data Provider create a listener for the specific dataset.
	When Data Provider publishes data, it transfers data to the Data Consumer.
	All the data exchanges are logged into Clearing House.
ed .	OneNet Participant
'ms/	o Data Provider
	Data Consumer
	OneNet System
	• Broker Service Provider
	Broker Service Registry
	<ul> <li>Vocabulary Provider</li> </ul>
	Scenario 1 – Identification
nce ms	

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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	<ul> <li>Enable AI, Big Data and IoT data orchestration for cross-platform services</li> <li>Tracking the performance of the cross-platform services</li> </ul>
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. The OneNet Orchestration Workbench allows to integrate data coming from the OneNet middleware and implement a data pipeline orchestration.
	It also should include: Job Scheduling App/Service registry and discovery Error/Retries management SLAs tracking, alerting and notification
Steps	The Service Provider register its service in the OneNet Workbench. The Service Provider create a workflow, using OneNet Middleware Data for running a service. The OneNet Workbench monitors the execution of the job, manages the errors and needed retries as well as tracking the performance. The Service Provider access to a log result for all the activities of the job.
Involved Platforms/ actors	Third-Party Actors <ul> <li>Service Provider</li> </ul> <li>OneNet System <ul> <li>OneNet Middleware</li> <li>OneNet Workbench</li> </ul> </li>





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	<ul> <li>Connect different data sources using standardized FIWARE components</li> <li>Adaption and evolution of the FIWARE context Broker for providing a data-model agnostic connector based on NSGI-LD</li> </ul>
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. 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
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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	<ul> <li>Scenario 1 – Identification (see GSUC_01)</li> </ul>				
<ul> <li>Scenario 2 – Data Provider and Consumer</li> <li>This scenario foresees three different steps/actions:</li> </ul>					
<ul> <li>Context Provision – Data Provider can create, modify, and delete an NGSI-LD</li> <li>Context Consumption – a Data Consumer can retrieve or query for NGSI-LD E</li> <li>Context Subscription – Data Consumer subscribe to a regular or event-driver notifications of the context of one or more Entities</li> </ul>	Entity. Intities. n update				
<ul> <li>Scenario 3 – IoT Devices integration</li> <li>A Data source is registered to the OneNet system using IoT Agent.</li> </ul>					
After the registration each data source is mapped as an Entity associated to a Provider.	Context				
This scenario includes two different actions:					
Set Command     A Third-Darty Actor request to set an attribute in the device's entity for y	hich the				
IoT Agent is registered as Data Source.	men me				
The IoT Agent contacts the device to perform the command itself, updatin status and info attributes in the entity as soon as it has any information command progress	g special n of the				
The device returns an acknowledgement of the command, and the resu action is returned to the Context Broker.	The device returns an acknowledgement of the command, and the result of the action is returned to the Context Broker.				
Get Data     A Third-Party Actor queries for a context using the NGSI Context Broker.     IoT Agent receives the request from the Context Broker and acts a     Provider, so if any component asks the Context Broker for the value of that se     request will be redirected to the IoT Agent.	<ul> <li>Get Data         A Third-Party Actor queries for a context using the NGSI Context Broker.         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.     </li> </ul>				
Context Broker which in turn transfer it to the Third-Party applicant. Th process is synchronous for the Third Party; the Context Broker won't return a r until the device has returned its response to the IoT Agent.	e to the e entire esponse				
Involved OneNet Participant					
Involved OneNet Participant Platforms/ actors • Data Provider • Data Consumer					
Involved Platforms/ actors OneNet Participant Data Provider Data Consumer Data Source (IoT Device + IoT Agent). In this particular Use Case the	Data				
Involved Platforms/ actors OneNet Participant Data Provider Data Consumer Data Consumer Data Source (IoT Device + IoT Agent). In this particular Use Case the Source represents the integration of an IoT Agent within any IoT device. Agent is a component that let device send its data to and be managed fr	Data The <b>IoT</b> om a				
Involved Platforms/ actors OneNet Participant Data Provider Data Consumer Data Source (IoT Device + IoT Agent). In this particular Use Case the Source represents the integration of an IoT Agent within any IoT device. Agent is a component that let device send its data to and be managed fr FIWARE NGSI Context Broker using its own native protocols. IoT Agent is able to deal with security aspects of the FIWARE architecture.	Data The <b>IoT</b> om a also				
Involved Platforms/ actors       OneNet Participant         • Data Provider       • Data Consumer         • Data Source (IoT Device + IoT Agent). In this particular Use Case the Source represents the integration of an IoT Agent within any IoT device. Agent is a component that let device send its data to and be managed fr FIWARE NGSI Context Broker using its own native protocols. IoT Agent is able to deal with security aspects of the FIWARE architecture.         OneNet System	Data The <b>IoT</b> om a also				
Involved       OneNet Participant         Platforms/ actors       Data Provider         •       Data Consumer         •       Data Source (IoT Device + IoT Agent). In this particular Use Case the Source represents the integration of an IoT Agent within any IoT device.         Agent is a component that let device send its data to and be managed fr FIWARE NGSI Context Broker using its own native protocols. IoT Agent is able to deal with security aspects of the FIWARE architecture.         OneNet System       •         •       Identity Provider	Data The <b>IoT</b> om a also				

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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.



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



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 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	
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_FUR_11	Each OneNet Connector have a unique certificate and identifier	OneNet Participants are uniquely identified within the OneNet ecosystem, using certification process and establishing trust among all participants.	
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	GSUC 01
OneNet_FUR_16	The OneNet Participant must be able to search and discover other OneNet Participants	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.	GSUC_02 GSUC_03
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	
OneNet_FUR_20	The OneNet participant could use vocabularies for	models, or metadata elements) that can be used to annotate and describe datasets.	



	creating and structuring its metadata		
OneNet_FUR_21	The OneNet system should offer data services/apps for data processing and transformation		
OneNet_FUR_22	The OneNet system should be able to log any data transaction between any OneNet participant	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	
OneNet_FUR_23	The OneNet system should be able to assess the quality of data processed	transaction.	
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. The OneNet Orchestration Workbench allows to integrate data coming from the OneNet middleware and implement a data pipeline orchestration. It also should include: Job Scheduling App/Service registry and discovery Error/Retries management SLAs tracking, alerting and notification	
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		GSUC_02
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		





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.



- **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.



- 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.



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.

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.

#### Table 5-2: OneNet NFR.

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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)





## 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,
  - o 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



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	<ul> <li>Develop seamless end-to-end process for market-based flexibility utilization for grid services.</li> <li>Lower the entry barrier for flexibility by simplifying the process for flexibility service providers.</li> <li>Ensure availability of short-term flexibility from multiple sources.</li> </ul>
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	<ul> <li>Frequency stability;</li> <li>Load flow and contingency monitoring and predictions;</li> <li>Predictive congestion management for maintaining secure and stable power system operation;</li> <li>Cost-effective operation of the system</li> <li>Early warning on hazardous power system regimes;</li> <li>Better FSPs planning and managing flexibility resources;</li> <li>Better energy predictions and power system state predictions;</li> <li>Improved identification of the available flexibility resources on all power system levels;</li> <li>Improved prediction of the system flexibility needs.</li> </ul>		
Services	mFRR, RR, predictive reactive power products for VC, and predictive active power products for CM		
Type of	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	<ul> <li>Predictive maintenance and outage management;</li> <li>Enhanced severe weather condition management;</li> <li>Outage management optimisation for increased system adequacy;</li> <li>Early warning on a potentially hazardous power system topology and regimes;</li> </ul>

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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	<ul> <li>Frequency stability;</li> <li>Congestion management for maintaining capacity limits of the grid;</li> <li>Cost-effective operation of the system.</li> </ul>
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	<ul> <li>Voltage stability;</li> <li>Congestion management for maintaining capacity limits of the grid;</li> <li>Power quality enhancement.</li> </ul>
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	<ul> <li>To apply market procedures to obtain flexibility services attending DSO requirements;</li> <li>Demonstrate that long term agreements are suitable amongst different available DERs;</li> <li>Implement flexibility provision/usage through a market platform;</li> <li>Use consumer's demand-response in efficient flexibility services.</li> </ul>
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	<ul> <li>To apply market procedures to obtain flexibility services attending short term DSO requirements:</li> </ul>

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	<ul> <li>To implement flexibility provision/usage through a market platform;</li> <li>To use consumer's demand-response in efficient flexibility services;</li> </ul>
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	<ul> <li>Design and detail each process phase of ASM report so that it can serve as a basis for future developments.</li> <li>Coordination of the use of flexibility for different voltage levels.</li> <li>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.</li> <li>Develop information exchange mechanisms to enable market-based procurement of flexibility products.</li> </ul>
Services	Predictive active power management for CM
Type of coordination	Technical based TSO-DSO coordination





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	<ul> <li>Design and detail each process phase of ASM report so that it can serve as a basis for future developments.</li> <li>Coordination of the use of flexibility for different voltage levels.</li> <li>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.</li> <li>Develop information exchange mechanisms to enable market-based procurement of flexibility products.</li> </ul>
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	<ul> <li>Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of DSO operation.</li> <li>Identify the scheduled/forecasted information exchanged between DSO and TSO in order to improve programming of TSO operation.</li> <li>Anticipate and solve distribution grid constraints.</li> <li>Anticipate and solve transmission grid constraints.</li> <li>Develop information exchange mechanisms to share the identified information.</li> </ul>
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)



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.				
	<ul> <li>Open a balancing market for resources connected to the distribution network.</li> </ul>				
	• Ensure flexibility services for DSO to support congestion management and voltage control.				
	<ul> <li>Develop rules for coordination between TSO and DSO when using flexibility services.</li> </ul>				
	• 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	Market-based TSO-DSO coordination				
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	<ul> <li>Elimination of congestion in the distribution network using active power</li> <li>Elimination of voltage violations in the distribution MV and LV network, using active power</li> <li>Coordination of TSO and DSO activities in the field of congestion management and voltage control</li> </ul>
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	<ul> <li>Deferral of grid reinforcement investments (defer or avoid secondary substation replacement);</li> <li>Improve security of supply;</li> <li>Validate demand response mechanism to prevent congestion in the distribution grid;</li> </ul>				





	<ul> <li>Test flexibility products to prevent congestion in the distribution grid under market conditions.</li> </ul>
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. 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	<ul> <li>Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).</li> <li>Improve security of supply.</li> <li>Validate demand response mechanism to prevent voltage increase in the distribution grid.</li> <li>Test flexibility products to prevent voltage increase in the distribution grid under market conditions.</li> </ul>
Services	Corrective active power management for VC
Type of coordination	Market-based DSO coordination



# 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	МО	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



OneNet_North_19	DSUC NO 01	Receive request for	MO	FR
		prequalification FSP, product and grid		
OneNet_North_20	DSUC_NO_02	Receive Market Outcome	МО	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_29 OneNet_North_30	DSUC_NO_03 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional) Manage resource provider's consent	FR RP	Imbalance Settlement Responsible (ISR) CA
OneNet_North_29 OneNet_North_30 OneNet_North_31	DSUC_NO_03 DSUC_NO_07 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional) Manage resource provider's consent Receive Resource Provider's consent	FR RP CA	Imbalance Settlement Responsible (ISR) CA T&D CP
OneNet_North_29 OneNet_North_30 OneNet_North_31 OneNet_North_32	DSUC_NO_03 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional) Manage resource provider's consent Receive Resource Provider's consent Collect information about flexibility needs and resources	FR RP CA FR	Imbalance Settlement Responsible (ISR) CA T&D CP T&D CP
OneNet_North_29 OneNet_North_30 OneNet_North_31 OneNet_North_32 OneNet_North_33	DSUC_NO_03 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional) Manage resource provider's consent Receive Resource Provider's consent Collect information about flexibility needs and resources Request grid information	FR RP CA FR T&D CP	Imbalance Settlement Responsible (ISR) CA T&D CP T&D CP SO
OneNet_North_29 OneNet_North_30 OneNet_North_31 OneNet_North_32 OneNet_North_33 OneNet_North_34	DSUC_NO_03 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional) Manage resource provider's consent Receive Resource Provider's consent Collect information about flexibility needs and resources Request grid information Collect grid information	FR RP CA FR T&D CP SO	Imbalance Settlement Responsible (ISR) CA T&D CP T&D CP SO T&D CP
OneNet_North_29 OneNet_North_30 OneNet_North_31 OneNet_North_32 OneNet_North_33 OneNet_North_34 OneNet_North_35	DSUC_NO_03 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional) Manage resource provider's consent Receive Resource Provider's consent Collect information about flexibility needs and resources Request grid information Collect grid information Forward input information for grid qualification	FR RP CA FR T&D CP SO T&D CP	Imbalance Settlement Responsible (ISR) CA T&D CP T&D CP SO T&D CP SO
OneNet_North_29 OneNet_North_30 OneNet_North_31 OneNet_North_32 OneNet_North_33 OneNet_North_34 OneNet_North_35 OneNet_North_36	DSUC_NO_03           DSUC_NO_07           DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional)Manage resource provider's consentReceive Resource Provider's consentCollect information about flexibility needs and resourcesRequest grid informationCollect grid information for grid qualification results	FR RP CA FR T&D CP SO T&D CP SO	Imbalance Settlement Responsible (ISR)CACAT&D CPT&D CPSOT&D CPSOT&D CPSOT&D CP
OneNet_North_29 OneNet_North_30 OneNet_North_31 OneNet_North_32 OneNet_North_33 OneNet_North_34 OneNet_North_35 OneNet_North_36 OneNet_North_37	DSUC_NO_03 DSUC_NO_07	Forward adjusted volumes to imbalance settlement (Optional)Manage resource provider's consentReceive Resource Provider's consentCollect information about flexibility needs and resourcesCollect grid informationCollect grid information for grid qualification resultsCollect grid qualification results	FR RP CA FR T&D CP SO T&D CP SO T&D CP	Imbalance         Settlement         Responsible (ISR)         CA         T&D CP         T&D CP         SO         T&D CP         SO         T&D CP         SO         T&D CP         Responsible (ISR)

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



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	МО	T&D CP
OneNet_North_57	DSUC_NO_10	Send information about calls for tender	T&D CP	МО



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	МО
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	МО
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	МО	(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	МО	T&D CP
OneNet_North_75	DSUC_NO_06	Receive grid impact assessment results	T&D CP	МО
OneNet_North_76	DSUC_NO_06	Notification of the market results	MO	FSP



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



		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



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



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



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



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	Publication of	Market	
	DSUC_CY_04	awarded bids	Operator	130, 230, 1313
OneNet_Cypriot_15	DSUC_CY_02	Provision of services	FSD	
	DSUC_CY_04	FIOUSION OF SELVICES	155	130, 030
OneNet_Cypriot_16	DSUC_CY_03	Monitoring of FSP response	ABCM-T/ Real- time Monitoring 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 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	Prequalification	FSD	DSO
	EACL_HU_02	request	131	550
OneNet_Hungarian_02	EACL_HU_01	Approval of	DSO	ESP
	EACL_HU_02	prequalification	200	
OneNet_Hungarian_03	EACL_HU_01	Prequalification	DSO	MO (Flexi
	EACL_HU_02	results		register)
OneNet_Hungarian_04	EACL_HU_01	DSO informs TSO on	DSO	TSO
	EACL_HU_02	flexibility needs		
OneNet_Hungarian_05	EACL_HU_01 EACL_HU_02	DSO delivers flexibility needs	DSO	MO (W-1 & D-1 order book, market interface)
OneNet_Hungarian_06	EACL_HU_01 EACL_HU_02	Flexibility market opening, DSO needs announced	1)Market Operator (MO) 2) MO (market interface)	1) MO (order book) 2) FSP
OneNet_Hungarian_07	EACL_HU_01 EACL_HU_02	FSPs submit bids	FSP	MO (flexi register)



OneNet_Hungarian_08	EACL_HU_01 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	МО	MO (market interface)



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# 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	10 / 2021	Jukka Rinta-Luoma,	Eirst draft	Discussed in task 7.2
T	Taneli Leiskamo		meeting on 19 April	
2	17 5 202	Jukka Rinta-	Second draft based on discussion and	Discussed in task 7.2
Z	17.5.202	Luoma, Taneli Leiskamo	comments provided in task 7.2 meeting	meeting on 20 May
			Updates and additions from discussions	Discussed in task 7.2
3	31.5.202	Jukka Rinta-Luoma	between WP7 parties and previous task	meeting on 22 June
			meeting	

10.1.1.1.1.3 Scope and objectives of use case

	Scope and objectives of use case
	Role of Flexibility Register in process phases prior to flexibility trading is
Scope	described. The processes include managing flexibility contracts, registering
	FSPs and their resources and doing product prequalification.
	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
Objective(s)	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





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.

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 <b>or electricity flexibility</b> are matched with bids to buy electricity <b>or electricity flexibility</b> .	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.				

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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						
Scena name	rio	1. Flexibility contract mana	gement						
Step No	Event	Name of process/activity	Description of process/activity	Serv ce	Inform ition produc r (actor)	a Inform tion re receive (actor)	a Informa tion er exchang ed (IDs)	Requ men IDs	uire ht, R-
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 <sup>1</sup>		
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 contra ct			FR	FR	FlexCont		
1.8		Confirm Flexibility contract termination	If termination_was successful		FR	FSP, D H	Response		
1.9		Reject Flexibility contract termination	If termination_was not successful		FR	FSP, D H	Response		

### 10.1.1.1.3.1.2 Scenario name #2: Prequalification phase

Scenario								
Scer nam	nario e	2. Prequalification phase						
Step No	Even t	Name of process/activit y	Description of process/activity	Servic e	Informati on producer (actor)	Informati on receiver (actor)	Informati on exchange d (IDs)	Requireme nt, R-IDs



2.1.1	Specification n Receive include qualific product specificati verification an on remuneration information		٦	MO	FR	ProdSpec	
2.1.2	Validate new product	Technical check of data content	F	R	FR	ProdSpec	
2.1.3	Register new product	If validation is successful.	F	R	FR	ProdSpec	
2.1.4	Reject product	If validation failed	F	R	FR	ProdSpec	
2.1.5	Confirm product registration	Inform MO whether the product was registered successfully or not.	F	R	МО	Response	
2.2	Register as Flexibility service provider in Flexibility Register		F	SP	FR	FSPInfo	
2.2.1	Validate new FSP	Make sure that required information is included	F	R	FR	FSPInfo	
2.2.2	Register new FSP	Store information if validation is successful	F	R	FR	FSPInfo	
2.2.3	Reject FSP	If validation fails	F	R	FR	Response	
2.2.4	Confirm FSP registration	Inform FSP whether the registration was successfully or not.	F	R	FSP	Response	
2.3	SO communicates its (short-term) flexibilit Publish flexibility needs so that FSPs c need (optional) more accurately answer to the locatio		ç	60	FR	FlexNeed	
2.3.1	Receive flexibility need		F	R	FR	FlexNeed	
2.3.2	Validate flexibility need		F	R	FR	FlexNeed	
2.3.3	Register flexibility need		F	R	FR	FlexNeed	
2.3.3	Confirm need Inform SO whether the need registration registration was successfully or		F	R	SO	Response	
2.4	Publish flexibility resource	Each Flexibility Service Provider registers its flexible resources		FSP	FR	ResInfo	
2.4.1	Receive resource informati on		F	R	FR	ResInfo	
2.4.2	Validate resource informati on	Make sure that required information is provided including a valid flexibility contra ct.	F	R	FR	ResInfo	
2.4.3	Register resource to FR database	Store information if validation is successful	F	R	FR	ResInfo	



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 reguirements			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	





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		мо	FR	PreQualReq	
2.12. 1	Publish the results of prequalification		FR	мо	FSPInfo 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.				



#### 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	



#### 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				



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 <b>or electricity flexibility</b> are matched with bids to buy electricity <b>or electricity flexibility</b> .	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		. 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		мо	FR	FSPInfo		



1.1.1	Send the list of FSPs		FR	МО	FSPInfo	
1.2	Receive request for prequalification of FSP, product and grid		МО	FR	PreQualReq	
1.2.1	Send prequalification information		FR	мо		
1.2	Receive market outcome		мо	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	мо	FR	MarOut	
1.4.1	Register new contract holder		FR	FR	MarOut	

10.1.1.2.3.1.2 Scenario name #2: Activation

	Scenario							
Sce	<i>icenario name</i> 2. Activation (in case a separate activation after "3. Flexibility procurement" is needed)							
Ste p No	Event	Name of process/activity	Description of process/activity	Servi ce	Informat ion produce r (actor)	Informat ion receiver (actor)	Information exchanged (IDs)	Requirem ent, 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	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	In cases here ex- ante schedule is known, it can be used as a reference against which the performance of the		FR	FR	Schedule	
		resource is evaluated.					
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							



# 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					
	Role of Flexibility Register in process phases after flexibility trading is				
Scope	described. The verification process quantifies the delivered flexibility and settlement process this information to conclude financial and imbalance				
	settlement done outside FR.				
	Enable quantifying the delivered flexibility volumes and support the financial				
Objective(s)	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	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

	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 that is designed to avoid, through grid impact assessm activation of flexibilities which either do not contribute to solv System 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) A party responsible for and, if necessary, deve applicable, its intercon ensuring the long-term demands for the distrik		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				

#### 10.1.1.3.3.1 Actors



			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.
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									
Scen nam	ario e	7. Verification and	'. Verification and settlement							
Step Even No t		Name of process/activity	Description of process/activity e		Informati Infor on on producer recei (actor) (acto	Informati on receiver (actor)	Information exchanged (IDs)	Requireme nt, R-IDs		
7.1		Receive metering data	Receive generation and consum ption 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	MDA <u>R</u> / 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			



			-	1		1
7.4	Determine verificati on method	The verification method depends on the product.	FR	FR	Baseline	
7.4. 1	Alt 1: Calculate baselin e	In case the product requires FR to calculate a baseline with the baseline model used by the respective product <del>.</del>	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/ DelivFl ex/ Deviation	
7.6	Optional: Determin e 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 Settlemen t Responsibl e (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			



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 21 <sup>st</sup> and 31 <sup>st</sup> and comment provided until Jun 1 <sup>st</sup> . 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.
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.

#### 10.1.1.4.1.5 Key performance indicators (KPI)

	Key performance indicators					
ID Name Description Reference to mentioned use case objecti						
	Cover SO needs	The amount of unsatisfied flexibility need Target Value: 0	Providing the flexibility product for all needs of different SOs			

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Avaidance of similar	The number of products having any	
nroducts	overlap	
products	Target Value: 0	

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

# 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 <b>or electricity flexibility</b> are matched with bids to buy electricity <b>or electricity flexibility</b> .	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				



		(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-con						Post-condition
7.3.1.1	MO steps in add new product		мо			

#### 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								
Scei nan	nario 1e	/O steps in add new product							
Ste p No	Event	Name of process/activity	Description of process/activity	Servic e	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requiremen t, 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		МО	MO	MODec		
4		Inform MO decision whet her wants to offer the product	MO inform SO regarding the decision		MO	SO	MODec		
5		Send product specifications	Publish product specifications and requirement s 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 Name of exchanged, ID information		Description of information exchanged	Requirement, R-IDs			
ProdNam	Product Name	The name of the existing Flexibility product				


ProdSpec	Product	The technical specification of the flexibility product	
	Specification	(technical parameters, validation, requirements)	
MODec	Market Operator	The decision of the market operator regarding whether	
	Decision	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 21 <sup>st</sup> and 31 <sup>st</sup> and comment provided until Jun 1 <sup>st</sup> . 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 Target Value: 0	Providing the flexibility product for all needs of different SO	

# CHENET

norformanco Target Value: TRD	Procurement	Per unit cost of purchased flexibility	
	performance	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 <b>or electricity flexibility</b> are matched with bids to buy electricity <b>or electricity flexibility</b> .	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 oper and, if necessary, developing where applicable, its interco for ensuring the long-term a reasonable demands for the electricity.		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 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		



		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). 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		мо			
7.3.2.2	Trading		мо			
7.3.2.3	Matching		мо			
7.3.2.4	Closing		мо			
7.3.2.5	Settlement		МО			

#### 10.1.1.5.3.2 Steps – Scenarios

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

				Scenar	io			
Scenai name	rio	7.3.2.1. Opening of	the procurement pro	DCess				
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	мо	FCT	
1.b		Alt. 2 – Send request	MO request from T&D CP about ongoing calls		мо	T&D CP	FCT	
1.c		Alt. 2 – Receive the request reply	T&D CP reply to the request by sending		T&D CP	мо	FCT	



		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	мо	FR	FSPInfo	
<u>3</u>	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	мо	FSPInfo	
4	Opening of the flexibility call	if MO decide to continue	мо	мо	FCT	
5	Inform about opening of the flexibility call for tenders	FSPs should receive information about call for tenders opening.	мо	FSP	FCT	

10.1.1.5.3.2.2 Scenario name #2: Trading

			Scenario						
Scen nam	ario e	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	мо	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. Alt 1 (Default): This request send once a while, e.g. daily, and MO update its list Alt : MO send request for each bid (FSP need give the consents for MO, T&D CP,)		мо	FR	PreQualReq		
2.b		Receive reply on prequalification request	FR will reply to the MO request on prequalification		FR	МО	<u>FSPInfo</u> ProdQual		
2.c		Check bids and Register compliant bids	MO check the general properties of the bid, e.g., Bid format, valid consent, whether the call is		мо	MO	BidLis	New	



		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	мо	мо		
4	Send compliant flexibility bids for grid impact assessment	All the attributes associated to FlexBid should be forwarded	мо	T&D CP	BidLis	

10.1.1.5.3.2.3 Scenario name #3: Matching

			Scenario					
Scend name	ario ?	7.3.2.3. Matching						
Step No	Event	Name of process/activity	Description of process/activity	Serv ice	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requiremen t, R-IDs
1		Receive optimisation (opti mim 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	мо	OptRes	
2		Confirm availability of flexibility bid	Check if the bid is still available (apply only to locational Intraday market)		мо	мо	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)		мо	мо	MarOut	
4		Register market outcome			мо	мо	MarOut	New

10.1.1.5.3.2.4 Scenario name #4: Closing

				Scenar	io						
Scenai name	rio	7.3.2.4. Closing	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			мо	FSP	MarOut				
2		Notify market outcome	Submission of information about the matching of bids and offers on the marketplaces.		мо	FR, T&D CP	MarOut				



10.1.1.5.3.2.5	Scenario name #5: Settlement	

				Scenar	rio					
Scen nam	ario e	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	мо	Baseline/ DelivFlex/ Deviation	,		
2		Calculate remuneration for each FSP			мо	<del>FSP</del> MO				
		Send invoices the parties involved in the bid being settled			мо	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 fle		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	



# 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 21 <sup>st</sup> and 31 <sup>st</sup> and comment provided until Jun 4 <sup>th</sup> . 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. 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

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 <b>or electricity flexibility</b> are matched with bids to buy electricity <b>or electricity flexibility</b> .	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		мо			

#### 10.1.1.6.3.2 Steps – Scenarios

# 10.1.1.6.3.2.1 Scenario name #1:

	Scenario									
Scen nam	nario ne	CONDITIONAL Se	CONDITIONAL Secondary Trading							
Step No	Event	Name of process/activity	Description of process/activity	Service	Informatior 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	мо	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		мо	мо		new		
3		Request the list of registered FSP	MO need to have the list of the FSP to inform them about the call opening		мо	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	мо				
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.		мо	(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	мо	FlexBid			
7		Send contract bids for grid impact assessment	All the attributes associated to FlexBid should be forwarded		мо	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	мо	OptRes	new		



9	Notification of the market results	MO inform the new FSP	МО	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.	мо	T&D CP, FR	MarOut	

# 10.1.1.6.4 Information exchanged

Information exchanged				
Information exchanged, ID	Name of information	Name of Description of information exchanged		
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	



#### 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. 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.

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

• 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
  resource information.
- 2.a. Collect information about flexibility needs and resources: See precondition #5.

• 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?)

- 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 resources.

• 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 need and resource information: Inserting flexibility need and resource information 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 resource.

• 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.

• 4.a. Publish qualification results

#### 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		





Grid qualification algorithm	Performance of grid qualification algorithm Target value: tbd	Improve TSO-DSO coordination in flexibility market.
Grid qualification tool	Performance of TSO-DSO Coordination Platform Target value: tbd	Improve TSO-DSO coordination in flexibility market.
Avoidance of congestions	Maximum number of congestions 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					



#### 10.1.1.7.2 Diagrams of use case



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#### 10.1.1.7.3 Technical details

1	0.	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)	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 <b>or electricity</b> <b>flexibility</b> are matched with bids to buy electricity <b>or</b> <b>electricity flexibility</b> .	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	Sta Ir tus c	mpact on use ase	Originator / organisation	Link
1	Report	EU- SysFlex del iverable 5.2	lr re ci	nvestigation of elevant 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		INTERRFA CE task 5.3	lr re ca	nvestigation of elevant use cases	Horizon2020 project INTERRFACE	
3	Report	CoordiNet deliverabl e 1.5	lr re ca	nvestigation of elevant use cases	Horizon2020 project CoordiNet	https://private.coordinet- project.eu//files/documentos/5d724207ca9 82Coordinet Deliverable 1.5.pdf
4		TDX- ASSIST	lr re ca	nvestigation of elevant use cases	Horizon2020 project TDX- ASSIST	
5	Report	SmartNet deliverabl e 1.3	lr re ca	nvestigation of elevant 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	lr re ci	nvestigation of elevant use cases	ebIX®	https://mwgstorage1.blob.core.windows.ne t/public/Ebix/ebIX%20Overview%20of%20e nergy%20flexibility%20services%20- %20v1r0A%2020200106.pdf
7	Report	An integrated approach to Active System Managem ent	lr re ca	nvestigation of elevant use cases	CEDEC, E.DSO, ENTSO- E, Eurelectric, GEODE	https://www.entsoe.eu/Documents/Publica tions/Position%20papers%20and%20report s/TSO-DSO_ASM_2019_190416.pdf



# 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 (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		.4.1.1. Grid qualification of resource in prequalification phase							
Ste p No	Event	Name of process/activity	Description of process/activity	Service	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n 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 resource information.		CA	T&D CP	Consent	ConsMan ConnectCA DataSec	
2.a		Collect information about flexibility needs and resources	See precondition #5.		FR	T&D CP	FlexNeed ResInfo	ConnectFR DataSec	
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?)		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	ConnectSODataSe c
3.a	Alt. 1 – Forward input information for grid qualification	If SO conducts grid impact assessment it needs information about concerned resource s.	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 informati on	Inserting flexibility need and resource information as input into the algorithm.	T&D CP	T&D CP	FlexNeed 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: a) Is SO	FR	T&D CP		
5.b	Tbc – inform concerned SOs	testing actually required while FSPs	T&D CP	SO		
5.c	Tbc – testing results from SOs	connect to FR, MO	SO	T&D CP		
5.d	Tbc – forward testing results to flexibility register	b) If still required should be probably separate SUC)	T&D CP	FR		

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

	Scenario		
Scenario	7.4.1.2. Grid gualification of resource in procurement phase		
name			





Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R- IDs
1.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			мо	T&D CP	FlexBid	ConnectMO DataSec
2.b		ldentify 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 mode / 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

				Scent	irio			
Scen name	ario e	7.4.1.3. Grid qualific	ation of resource in	activatio	n 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.		мо	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



		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			





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	0 07 2021	Kalla Kukk Kaia Troos Kristian Kuhi	Updated diagram, 'complete	For inclusion in
4	9.07.2021	Kalle Kukk, Kaja Trees, Kristjan Kulli	description' added	milestone report

# 10.1.1.8.1.3 Scope and objectives of use case

Scope and objectives of use case			
Scono	Ranking of qualified bids based on 'relative price' and optimising the bids		
Scope	based on value-stacking.		
	Tool and algorithm developed for ranking and optimising flexibility bids		
Objective(s)	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

Short description An algorithm performs bid ranking and bid optimisation processes. Grid model or grid topology or grid constraints are
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. 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.
Bids for balancing need to be shared with relevant EU platform (MARI, PICASSO). If bids were meanwhile activated for
Complete description
<ol> <li>1.a. Get qualified bids for selection (from SUC 7.4.1.2): Only bids which were fully or partly qualified are considered here.</li> <li>2.a. Identify bids which should be shared with relevant EU platform: EU platforms like MARI, TERRA, PICASSO</li> <li>2.b. Forward relevant bids to European platform. Bids for balancing need to be sent to relevant EU platform at right time.</li> <li>2.c. Withdraw bids from European platform: Balancing bids can be withdrawn from EU platform at any time before activation.</li> <li>3.a. Update algorithm for bid ranking with bid information: Inserting bids as input into the algorithm.</li> <li>3.b. Update algorithm for bid ranking with grid information : Inserting grid model / topology / constraints as input into the algorithm.</li> <li>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</li> </ol>
<ul> <li>continuously.</li> <li>4.a. Request flexibility purchase offers (CONDITIONAL): Purchase offers need to be requested if these are not made available automatically (pushed)</li> <li>4.b. Get flexibility purchase offers</li> <li>5.a. Update algorithm for bid ranking with purchase offers information: Inserting purchase offers as input into the algorithm.</li> <li>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.</li> <li>6.a. Publication of optimisation results: Sending relevant information to SOs</li> </ul>
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 Target value: tbd	Improve TSO-DSO coordination in flexibility market.		



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





# 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.			



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

# 10.1.1.8.3.1 References

	References						
No.	Reference Type	Referenc e	Status	Impact on use case	Originator / organisation	Link	
1	Report	EU- SysFlex d eliverabl e 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		INTERRF ACE task 5.3		Investigation of relevant use cases	Horizon2020 project INTERRFACE		
3	Report	CoordiNe t delivera ble 1.5		Investigation of relevant use cases	Horizon2020 project CoordiNet	https://private.coordinet- project.eu//files/documentos/5d724207c a982Coordinet Deliverable 1.5.pdf	
4		TDX- ASSIST		Investigation of relevant use cases	Horizon2020 project TDX- ASSIST		
5	Report	SmartNet deliverab le 1.3		Investigation of relevant use cases	Horizon2020 project SmartNet	http://smartnet-project.eu/wp- content/uploads/2016/12/D1.3_2016120 2 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 integrate d approach to Active System Manage ment		Investigation of relevant use cases	CEDEC, E.DSO, ENTSO- E, Eurelectric, GEODE	https://www.entsoe.eu/Documents/Publ ications/Position%20papers%20and%20r eports/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	7.4.2.1. Bid Ranking						
name	6						

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Ste p No	Event	Name of process/activity	Description of process/activity	Service	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requiremen t, 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		ldentify 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 <b>'relative price'</b> 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 flexibil ity 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 result s	Sending relevant information to SOs		T&D CP	SO	OptRes	ConnectSO DataSec
6.b		Publication of optimisation result s	Sending relevant information to MOs		T&D CP	МО	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.	
1OL Nill be removed if bid anking merged with ptimisation) Merit Order List Rank of Flexibility Bids based on predefined criteria.			
GridInfo Grid Information Grid case-by-case rase rates and some information grid constraint		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)			



# 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.			
	Tool developed for flexibility activation to facilitate multilateral flexibility			
Objective(s)	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.						
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.





1.b. Identify concerned system operators for market outcome: Identification of system operators who were involved as flexibility byers (according to flexibility purchase offers).

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.

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.

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.

3.a. Identify the need for counter action: Counter Action is needed if activation of would cause imbalance in system.
 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.

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)

3.d. Alt. 2 – Receive information about whether counter action should be taken: The selection of this requirement needs to be defined in advance.

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

4.b. Register request for activation

4.c. Receive activation request confirmation: If no answer or denial received from FSP, back to step 2.a/2.b

- 4.d. Register activation request confirmation
- 5.a. Receive activation confirmation
- 5.b. Register activation confirmation

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.

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.

6.a. Notify activation requests

6.b. Notify activation requests: MO should be informed for the sake of transparency.

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 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.				





#### 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





# 10.1.1.9.3 Technical details

# 10.1.1.9.3.1 Actors

Actors						
Groupin	g	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.
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	Referenc e	Status	Impact on use case	Originator / organisation	Link
1	Report	EU- SysFlex d eliverabl e 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		INTERRF ACE task 5.3		Investigation of relevant use cases	Horizon2020 project INTERRFACE	
3	Report	CoordiNe t delivera ble 1.5		Investigation of relevant use cases	Horizon2020 project CoordiNet	https://private.coordinet- project.eu//files/documentos/5d724207ca9 82Coordinet_Deliverable_1.5.pdf
4		TDX- ASSIST		Investigation of relevant use cases	Horizon2020 project TDX-ASSIST	
5	Report	SmartNet deliverab le 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.ne t/public/Ebix/ebIX%20Overview%20of%20e nergy%20flexibility%20services%20- %20v1r0A%2020200106.pdf
7	Report	An integrate d approach to Active System Manage ment		Investigation of relevant use cases	CEDEC, E.DSO, ENTSO- E, Eurelectric, GEODE	https://www.entsoe.eu/Documents/Publica tions/Position%20papers%20and%20report s/TSO-DSO_ASM_2019_190416.pdf



# 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								
Scen nam	ario e	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.		мо	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		



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	<i>Alt. 2</i> – 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	<i>Alt. 3</i> – 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 <b>2.a/2.b</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	мо	FlexActReq	ConnectMO DataSec


6.c	Notify activation		T&D CP	FR	FlexActReq	ConnectFR
	requests					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 ensure						
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





#### 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
Scono	Opening flexibility call for tender and sharing information about ongoing calls
Scope	with market and system operators.
Objective	Facilitate coordinated trading by centralising information about active calls for
Objective(s)	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						
• 1.b. Register flexibility calls for tender						
• 2.a. Publish information about calls for tender: This information helps other system operators to						
understand if they would like to open similar call.						
• 2.b. Alt.1 – Publish information about calls for tender: Information can be published to all subscribed						
market operators						
• 2.c. Alt.2 – Request information about calls for tender: If market operator has not previously						
subscribed it can request the information						
• 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

## CHENET

# 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



#### 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				



		(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								
N 0	Refer ence Type	Reference	Sta tus	Impact on use case	Originator / organisation	Link			
1	Repor t	EU- SysFlex deliv erable 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	Repor t	CoordiNet de liverable 1.5		Investigation of relevant use cases	Horizon2020 project CoordiNet	https://private.coordinet- project.eu//files/documentos/5d724207ca982Coordinet_Del iverable_1.5.pdf			
4		TDX-ASSIST		Investigation of relevant use cases	Horizon2020 project TDX- ASSIST				
5	Repor t	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	Repor t	Overview of energy flexibility services		Investigation of relevant use cases	ebIX®	https://mwgstorage1.blob.core.windows.net/public/Ebix/ebl X%20Overview%20of%20energy%20flexibility%20services%2 0-%20v1r0A%2020200106.pdf			
7	Repor t	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%2 Opapers%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 Pos								
7.4.4.1	FCT opening		T&D CP					

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## CHENET

#### 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 openin	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	мо	FCT	ConnectMO DataSec				
2.c		<i>Alt.2</i> – Request information about calls for tender	If market operator has not previously subscribed it can request the information		мо	T&D CP	FCT	ConnectMO DataSec				
2.d		Alt.2 – Send information about calls for tender			T&D CP	мо	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		



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)	<ul> <li>Frequency stability</li> <li>Cost-effective operation of the system</li> <li>Better FSPs planning and managing flexibility resources.</li> <li>Better energy predictions and power system state predictions</li> <li>Improved identification of the available flexibility resources on all power system levels.</li> <li>Improved prediction of the system flexibility needs.</li> </ul>			
Related business case(s)	Enhanced Active Power Management for TSO-DSO coordination			





#### 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.

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:

identification of the flexibility resources to procure grid services

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

#### 10.2.1.1.1.6 Use case conditions

	Use case conditions
Assumptions	Assumptions

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	<ul> <li>The use case will the power system simular</li> </ul>	be developed and demonstrated in a non-invasive, offline environment using lation models.			
	<ul> <li>Aggregators and r</li> </ul>	and prosumers will be simulated in the demonstration			
	Additional DERs w	ill be simulated if necessary in order to represent the near future conditions			
		Prereauisites			
1	Availability of the network and market data	<ul> <li>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),</li> <li>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.</li> <li>Technical data: Technical data on wind turbines, solar parks, OHLs</li> <li>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).</li> <li>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.</li> <li>Energy policy information: Information on applicable EU Directives and Regulations that are of interest for TSO DSO coordination.</li> </ul>			
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	weather forecasts as an input and
		term production forecasts, later on	as an output provide further
		used for TSO level modelling under f-	inputs for
		channel platform coordination: IGM	various functionalities inside of
		updates, DACF and 2DACF procedures,	the f-channel platform as and
		Contingency Analysis and Capacity	input for further simulations,
		Calculations.	calculations and analysis.
		TSO/Aggregator Short term planning	Production forecasts (in the case
		department production forecasting	of F-channel, wind and solar parks
		operator is responsible for wind, solar	production forecasts) are using
Production Forecasting		and hydro, short term, mid	weather forecasts as an input and
operator	Information	term and long term production	as an output provide further
(TSO/Aggregator);	receiver/provider	forecasts, later on used for TSO level	inputs for
		modelling under f-channel platform	various functionalities inside of
		coordination: IGM updates, DACF and	the f-channel platform as and
		2DACF procedures, Contingency	input for further simulations,
		Analysis and Capacity Calculations.	calculations and analysis.
	Information	TSO/Aggregator Short term planning	
	receiver/provider	department load forecasting operator	Lood forecasts are using weather
		is responsible for consumption short	forecasts as an input and as an
Load Forecasting operator		term, mid term and long	output provide further inputs for
(TCO (Aggregator))		term forecasts, later on used for TSO	output provide function inputs for
(TSO/Aggregator);		level modelling under f-channel	the f channel platform as and
		platform coordination: IGM updates,	ine i-channel platform as and
		DACF and 2DACF procedures,	input for further simulations,
		Contingency Analysis and Capacity	calculations and analysis.
		Calculations.	
Flexibility Register Operator	Information receiver		
(FRO);			
Production scheduling	Information receiver		
operator (market			
operator);			

#### 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



	Register of POIs - Point of Interest with necessary regular periodic updates,	
Scope	technical data, historic data, forecasted data archiving and analysis for Al	
	Frequency stability	
	<ul> <li>Load flow and contingency monitoring and predictions</li> </ul>	
	<ul> <li>Predictive congestion management for maintaining secure and stable power system operation</li> </ul>	
	Cost-effective operation of the system	
Objective(s)	<ul> <li>Early warning on a hazardous power system regimes,</li> </ul>	
	<ul> <li>Better FSPs planning and managing flexibility resources.</li> </ul>	
	<ul> <li>Better energy predictions and power system state predictions</li> </ul>	
	Improved identification of the available flexibility resources on	
	all power system levels.	
	<ul> <li>Improved prediction of the system flexibility needs.</li> </ul>	
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, forecas	sted		
data archiving and analysis for AI applications			
Complete description			

#### 10.2.1.2.1.5 Use case conditions

	Use case conditions					
	Assumptions					
	<ul> <li>The use case will the power system simular</li> </ul>	be developed and demonstrated in a non-invasive, offline environment using llation models				
		Prerequisites				
1	Availability of the network and market data	<ul> <li>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),</li> <li>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.</li> <li>Technical data: Technical data on wind turbines, solar parks, OHLs</li> <li>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).</li> <li>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.</li> <li>Energy policy information: Information on applicable EU Directives and Regulations that are of interest for TSO DSO coordination.</li> </ul>				
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.				



#### 10.2.1.2.2 Technical details

#### 10.2.1.2.2.1 Actors

Actors				
Grouping (e.g. domains, zon	es)	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	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	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 measuresIf 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 systemsIGM 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



			simulations are done in a virtual f-channel
	Information	TSO Operational personnel	grid environment.
Power system control expert (TSO/DSO);	receiver	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 measuresIf 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.



		assumed power exchanges	
		with the neighbouring	
		systemsCGM 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 coordinatorsStill does not exist, but is foreseen by CEPIt 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



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



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

#### 10.2.1.3.1.6 Use case conditions

				Use	e case	e conditions				
					Assu	mptions				
• the	The use power sys	case will stem simul	be c ation	developed n models,	and	demonstrated in	а	non-invasive,	offline environment	using
•	Aggregat	tors and pi	rosum	ners will be	simu	llated in the demo	nst	ration.		



	Additional DERs will be simulated if necessary, in order to represent the near future conditions		
		Prerequisites	
		<ul> <li>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),</li> </ul>	
		<ul> <li>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.</li> </ul>	
		<ul> <li>Technical data: Technical data on wind turbines, solar parks, OHLs</li> </ul>	
1	Availability of the network and market data	<ul> <li>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).</li> </ul>	
		<ul> <li>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.</li> </ul>	
		• 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, zo	ones)	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 measuresIf 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



		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 systemsIGM 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 measuresIf 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



		TSO/Short term planning	
		department or and RSC's	
		Expert/s responsible for	
		development, maintenance and	
		regular updates of a Common	
		Grid Models containing	CGM is being produced using production
		consumption nodes (active and	forecasts, load forecasts and condition
		reactive power), production	forecasts submodule outputs. CGM in
CGM manager (RSC)	Information	nodes (active power and	the case of the EUROPAN platform
	receiver	voltage set), overall voltage	represents an interface between a
		profile, assumed power	simulation/calculation/analysis tools
		exchanges with the	that already exist in the RSC and/or TSO
		neighbouring systemsCGM	Energy Management Systems.
		models are further used by	
		DACF, 2DACF and ATC	
		calculator for further	
		simulations, calculations and	
		analysis.	
		Future regional RES production	
		coordinatorsStill does not	
		exist, but is foreseen by CEPIt	
		will have a coordination role for	
		all RES units, not only	
Production		national/system located but all	
Forecasting/Scheduling	Information	regional RES production will be	
operator (Regional RES	receiver	run from this body. The role	
coordinator)		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)	<ul> <li>Frequency stability</li> <li>Load flow and contingency monitoring and predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> <li>Early warning on a hazardous power system regimes,</li> <li>Better FSPs planning and managing flexibility resources.</li> <li>Better energy predictions and power system state predictions</li> <li>Improved identification of the available flexibility resources on all power system levels.</li> <li>Improved prediction of the system flexibility needs.</li> </ul>
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	<ul> <li>Frequency stability</li> <li>Load flow and contingency monitoring and predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Early warning on a hazardous power system regimes,</li> <li>Better FSPs planning and managing flexibility resources.</li> <li>Better energy predictions and power system state predictions</li> <li>Improved identification of the available flexibility resources on all power system levels.</li> <li>Improved prediction of the system flexibility needs.</li> </ul>		
4	Capacity prediction error	<ul> <li>Load flow and contingency monitoring and predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> </ul>		
5	Transmission losses prediction error	Cost-effective operation of the system		
6	Contingency identification rate	<ul> <li>Better energy predictions and power system state predictions</li> </ul>		



	<ul> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Early warning on a hazardous power system regimes</li> </ul>
Early warning on a 7 hazardous power system regimes rate	<ul> <li>Better energy predictions and power system state predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Early warning on a bazardous power</li> </ul>
	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 simu	lation models,					
	<ul> <li>Aggregators and p</li> </ul>	rosumers will be simulated in the demonstration.					
	Additional DERs w	ill be simulated if necessary in order to represent the near future conditions					
	1	Prerequisites					
	Availability of the network and market data	<ul> <li>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),</li> </ul>					
		• 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.					
		<ul> <li>Technical data: Technical data on wind turbines, solar parks, OHLs</li> </ul>					
1		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 Pelonophese)					
		<ul> <li>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.</li> </ul>					
		• 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		





#### 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		
	Actor type		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 measuresIf the DACF is performed by a national TSO than targeted, analysed system is usually only	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.		
		a national power system and first neighbouring systems.			
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 systemsIGM 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	to TSO main server and processed by
		composite values).	capacity calculations or simulations are done in a virtual f-channel
			grid environment
	Information receiver	TSO Operational personnel working on intraday - real time	
		power system control and	
		operations in a dispatching	
		room, using DACF, 2DACF,	IGM, with 2-4 per day updates, is being
		Outage schedules, production	processed under t-channel platform,
Power system control		schedules and Contingency	being updated with the new production,
expert (TSO/DSO);		analysis outputs that are	
		day-ahead basis Also these	forecasting tool IGM is than being
		experts are using SCADA/EMS	transferred back to TSO main server and
		in order to perform intraday 5-	processed by operational personnel.
		15 min simulations and	
		contingency analysis in order to	
		update of the same analysis in a	
		real time	
Losses calculator (TSO)	Information	Improved forecasting of grid	
	receiver	losses and available future	
		capacities	
		An expert from RSC-Regional	
		Security Center, responsible for	
	Information	day ahead congestion forecast	RSC's DACF operator uses production
		simulation and analysis which	forecasts, load forecasts and capacity
		as all output gives the list of	forecasts, all already modelled inside of
Regional DACE operator		outages with the list	the CGM - Common Grid Model, and
(RSC)		of proposed mitigation	performed n-1 analysis, so called
		measuresIf the DACF is	contingency analysis on CGM - Common
		performed by a RSC than	Grid Model, which is previously merged
		targeted, analysed system is	models in this case covering its CCP
		usually regional, CCR based	inodels, in this case covering its cer.
		network model (CGM -	
		Common Grid Model).	
Regional 2DACF operator (RSC)	Information receiver	The same as previous	The same as previous
		TSO/Short term planning	
		department or and RSC's	
		Expert/s responsible for	
		development, maintenance and	
		regular updates of a Common	CGM is being produced using production
		Grid Models containing:	forecasts, load forecasts and condition
	Information	consumption nodes (active and	forecasts submodule outputs. CGM in
CGIVI manager (RSC)		reactive power),	the case of the EUROPAN platform
	receiver	production hodes (active power	represents an interface between
		nrofile assumed nower	tools that already exist in the RSC and/or
		exchanges with the	TSO Energy Management Systems
		neighbouring systemsCGM	
		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 coordinatorsStill does not exist, but is foreseen by CEPIt 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		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)	<ul> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> <li>Early warning on a hazardous power system regimes,</li> </ul>		
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 consequenc 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:			
The main foreseen benefits/functionalities related to this particular use case are as follows.			
<ul> <li>Improved System adequacy on DSO and TSO side</li> <li>Improved Islanded operation on DSO and TSO side</li> </ul>			

#### **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		<ul> <li>Better energy predictions and power system state predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Early warning on a hazardous power system</li> </ul>		
2	Early warning on a hazardous power system regimes rate		regimes     Better energy predictions and power system     state predictions     Predictive congestion management for     maintaining secure and stable power system     operation     Early warning on a hazardous power system     regimes		

#### 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 simul	lation models,			
	<ul> <li>Aggregators and pr</li> </ul>	rosumers will be simulated in the demonstration.			
	<ul> <li>Additional DERs with the second second</li></ul>	Il be simulated, if necessary, in order to represent the near future conditions			
		Prerequisites			
1	Availability of the network and market data	<ul> <li>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),</li> <li>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.</li> </ul>			
		<ul> <li>Technical data: Technical data on wind turbines, solar parks, OHLs</li> <li>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).</li> </ul>			



		<ul> <li>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.</li> </ul>	
		• 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		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



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)	<ul> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Cost-effective operation of the system</li> </ul>	
	<ul> <li>Early warning on a hazardous power system regimes,</li> </ul>	
Related business case(s) Enhanced severe weather condition management and outage managem		

#### 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:		

- Improved System adequacy on DSO and TSO side
- 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		<ul> <li>Better energy predictions and power system state predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Early warning on a hazardous power system regimes</li> </ul>		
2	Early warning on a hazardous power system regimes rate		<ul> <li>Better energy predictions and power system state predictions</li> <li>Predictive congestion management for maintaining secure and stable power system operation</li> <li>Early warning on a hazardous power system regimes</li> </ul>		

#### 10.2.1.6.1.6 Use case conditions

	Use case conditions			
	Assumptions			
	<ul> <li>The use case will be developed and demonstrated in a non-invasive, offline environment using the power system simulation models,</li> <li>Aggregators and prosumers will be simulated in the demonstration.</li> </ul>			
	<ul> <li>Additional DERs will be simulated if necessary, in order to represent the near future conditions</li> </ul>			
	Prerequisites			
1Availability of the network and market data• Network models (in raw or uct file exchange format) data and HEDNO network models (400 kV, 220 kV, 150 kV, 110 kV, 3 and 20 kV) voltage levels),		<ul> <li>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),</li> </ul>		



		<ul> <li>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.</li> <li>Technical data: Technical data on wind turbines, solar parks</li> </ul>
		OHLs
		<ul> <li>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).</li> </ul>
		<ul> <li>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.</li> </ul>
		• 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	Information			
(TSO/DSO)	receiver			



#### **10.2.2CYPRIOT 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 Le Hadjidemetriou	nos Initial definition of the SUC (up to section 1.4)				
2	24/08/2021	Markos Asprou and Le Hadjidemetriou	nos 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     The state of the state o					
Polatod husiness case(s)	Enhance the situational awareness of the ISO and DSO      BUC1: Active power flexibility					
Keluteu business cuse(s)	<ul> <li>BUC2: Reactive power flexibility and power quality services</li> </ul>					

#### 10.2.2.1.1.4 Narrative of Use Case

## Narrative of use case Short description This SUC deals with the menitoring schemes that will be used for obtaining in real time the operating condition of the

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.





#### **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.

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.

10.2.2.1.1.3 Rey perjoindince indicators (RFI	10.2.2.1.1.5	Key performance indicators	(KPI)
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	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
•	<ul> <li>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.</li> <li>The monitoring schemes will be located inside the ABCM-T and ABCM-D platform</li> <li>The transmission grid will be fully observable by PMUs and SCADA measurements</li> <li>The distribution grid will be fully observable by smart meters and conventional SCADA measurements</li> </ul>
	Prerequisites

- Provision of PMU and SCADA measurements from the transmission system

• 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

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#### 10.2.2.1.3 Technical details

10.2.2.1.3.1	Actors
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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			



		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

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



		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

#### Scenario step by step analysis

Scenario	
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Scenario name		Real time monitoring of the transmission grid operating condition						
Step No	Event	Name of process/activi ty	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1.1	Send measureme nts 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)	CAP TURE	PMU	TSO, PDC	11-01	
1.2	Send measureme nts from the conventiona l power measureme nt device	Conventio nal 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	CAP TURE	P/Q measureme nt devices	TSO, SCADA	11-02	
1.3	PMU measureme nts 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	FOR WARD	PDC	TSO/AB CM-T platform/re al time monitoring scheme	11-03	
1.4	Convent ional measureme nts 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	FOR WARD	SCADA	TSO/AB CM-T platform/re al time monitoring scheme	11-04	
1.5	Monitori ng transmission system operating condition	Monitorin g	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	PRO CESS	TSO/AB CM-T platform/re al time monitoring scheme	TSO, TSO/ABCM- T platform/ Evaluation of the FSPs response, Prequalificat ion	11-05	



	well as to other SUCs namely "Evaluation o 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	Servi ce	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1.1	Send measureme nts 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)	CAPT URE	Smart meter	DSO, AMI	12-01	
1.2	Send measureme nts from the conventiona	Conventiona I measurement forwarding	Conventional power measurement devices situated at the distribution level	C APTU RE	P/Q measureme nt devices	DSO, SCADA	12-02	



r				r				
	l power measureme nt 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 measureme nts 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	F ORW ARD	AMI	DSO/AB CM-D platform/re al time monitoring scheme	12-03	
1.4	Convent ional measureme nts 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	F ORW ARD	SCADA	DSO/AB CM-T platform/re al time monitoring scheme	12-04	
1.5	Monitori ng 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"	P ROCE SS	DSO/AB CM-D platform/re al time monitoring scheme	DSO, DSO/ABCM- D platform/ Evaluation of the FSPs response, Prequalificat ion, Coordinatio n of the FSPs	12-05	

#### 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			
11-02	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			


11-03	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
11-04	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
11-05	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.
12-01	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.
12-02	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
12-03	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
12-04	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
12-05	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.	ersion 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 H	Markos	Asprou	and	Lenos	Detailed	definition	of	the	SUC	
		Hadjidemetriou				(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)	<ul> <li>Ensure the safe operation of the system by prequalifying certain operational limits for transmission and distribution grid</li> </ul>
Related business case(s)	<ul> <li>BUC1: Active power flexibility</li> <li>BUC2: Reactive power flexibility and power quality services</li> </ul>

# 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)

Ке	Key performance indicators										
ID	Name Description r		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								



# 10.2.2.2.1.6 Use case conditions

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

#### 10.2.2.2.2 Diagrams 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 zones,	g. domains, )	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

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



r r			
	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

Sce	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	CAPTUR E	TSO, DSO/ABCM- T, ABCM- D/real time monitoring	TSO, DSO/ABCM- T, ABCM- D/Prequalifi cation	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	CAPTUR E	Databas e with historical data	TSO, DSO/ABCM- T, ABCM- D/Prequalifi cation	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/ Prequalificat ion	Market operator	I-03	

# 10.2.2.2.5 Information exchanged

Information ex	changed			
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.	
1-02	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	Pregualification	TSO and DSO send the prequalification	Communication	
	limits	limits to the Market Operator through the	between TSO/DSO	with
		Onenet system		

# 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)	<ul> <li>Real time monitoring or estimation of the FSPs response under different operating conditions.</li> <li>Evaluation of the response of the FSPs according to the awarded bids cleared by the corresponding market</li> </ul>					
Related business case(s)	<ul> <li>BUC1: Active power flexibility</li> <li>BUC2: Reactive power flexibility and power quality services</li> </ul>					

# 10.2.2.3.1.4 Narrative of Use Case

Narrative of use case
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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								
h	D 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: • The use case will be developed and demonstrated in a non-invasive environment using the real time digital twin of the Cyprus power system.

- The TSO, DSO control centre and the energy market will be emulated in the demo architecture.
- The energy market will be based on a generic market setup in the absence of an energy market in Cyprus
- Additional PVs and energy storage systems will be installed to represent near future conditions.
- Aggregators and prosumers will be emulated in the demonstration considering online coordination capabilities by system operators.

#### Prerequisites

This system use case has the following prerequisites:

- Provision of PMU data and SCADA measurements from the transmission system operation
- Provision of smart meter and SCADA measurements from the distribution grid
- 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. do zones)	omains,	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)	Distribution ystem Operator (DSO) Distribution (DSO) Distribution (DSO) Distribution 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 bilatera 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 -TSO -DSO -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 -FSPs are informed about the awarded bids that are obligated for the examined period (hours-ahead or day- ahead) -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			



#### 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							
Scena	irio name	Assessme	ent of FSPs response					
Step No	Event	Name of process/ activity	Description of process/ activity	Service	Information producer (actor)	Informatio n receiver (actor)	Information exchanged (IDs)	Requiremen t, 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	



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 ABCM-D/ Real-time Monitoring	TSO and ABCM-T/ Evaluation of FSPs response DSO and ABCM-d/ Evaluation of FSPs response	1-02	
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 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 Name of exchanged, ID 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				



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
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# 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 mete PMUs) to evaluate the response of the FSPs located at the transmission and t distribution grid after the provision of grid services. The objective of the SUC is determine if the response of the FSPs corresponds to the awarded bids cleared the TSO and local DSO market respectively. On-line coordination of the services provided by the distributed flexible resource to avoid operational limit violations and ensure the reliable, stable, efficient and hig quality operation of distribution grids. This SUC will be integrated within the ABCI D platform to coordinate the operation of the available flexible resources (accordi to the market clearing) by considering the monitoring information (from SCADA a smart meters). The coordination signal will be sent by the DSO to the flexibl resources to maintain the proper operation.					
Objective(s)	<ul> <li>Coordinate (on-line) the available flexible resources according to the grid operating conditions</li> <li>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</li> </ul>					





Related business case(s)	0	BUC1: Active power flexibility
. ,	0	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.

	Key performance indicators						
ID	Name	Description	Reference to mentioned use cas 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.				

#### 10.2.2.4.1.5 Key performance indicators (KPI)

# 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.
- The TSO, DSO control centre and the energy market will be emulated in the demo architecture.
- The energy market will be based on a generic market setup in the absence of an energy market in Cyprus
- Additional PVs and energy storage systems will be installed to represent near future conditions.
- Aggregators and prosumers will be emulated in the demonstration considering online coordination capabilities by system operators.

#### Prerequisites

This system use case has the following prerequisites:

- Provision of PMU data and SCADA measurements from the transmission system operation
- Provision of smart meter and SCADA measurements from the distribution grid
- 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



#### 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 conditio	ons			
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 -FSP -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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#### 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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S	cenario 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)	1-02	
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	1-03	



			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.	EXECUT E	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						



# **10.3 Western Cluster**

# 10.3.1PORTUGESE 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					
	10/00/2021	E-REDES							
		NESTER							
	10/00/2021	REN							
		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).					
	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> </ul>					
Objective(s)	<ul> <li>Enable FSPs and their resources for flexibility markets, since Prequalification phase is necessary for the following phases that we will approach.</li> </ul>					
	- List of requirements for product prequalification for DSO and TSO.					
	- Ensure coordination between system operators for all scenarios.					
	- Receive and send data between system operators in a secure manner.					
Related business case(s)	WECL-PT-01 & WECL-PT-02					



#### 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.

For product evaluation is identified which mandatory and informative requirements, such as mode of activation, minimum quantity to deliver, locational information, etc., are required to evaluate whether the unit can (technically) deliver the product it wants to sell/deliver.

For Grid evaluation, in prequalification phase, a grid impact assessment is evaluated. In order to do this evaluation, it is defined what kind of grid data is the most appropriate:

Comprehensive grid data -selecting the most efficient combination of flexibilities and switching of topology

Partial grid data -using essentially the sensitivities of flexibilities, e.g., Traffic lights system.

Simple Rule – Empirical selection

Within the scope of this SUC, real-world implementation of technologies enabling the exchange of data about product and grid prequalification is foreseen. This implementation is supported by work done in previous H2020 projects.

#### 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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#### Nature of the use case

#### Further keywords for classification

Congestion Management; Flexibility; Prequalification

#### 10.3.1.1.2 Diagrams of use case



#### 10.3.1.1.3 Technical details

#### 10.3.1.1.3.1 Actors

Actors							
Grouping (e.g., do zones)	omains,	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.					



	-	-	
		The Data-agnostic ICT infrastructure that enables a secured and reliable information exchange for different purposes and within different time scales. When information reaches this actor, the other SO is automatically notified.	
DSO Prequalification System	System	The DSO Prequalification System function involves managing all the tools and platforms that concern the product and grid prequalification on the distribution network.	
Network Model Management	System	The Network Model Management (NMM) manages information for establishing and maintenance of the functional description of the grid that is provided by current installed asset (as-built model), planned installed asset (future model) or potential installation (what-if/ hypothetical model). The focus is to provide a mathematical model of the power system that can be used in different analysis, including, but not limited to, steady state power flow, state estimation, contingency analysis as part of security assessment and stability analysis. It maintains master representations of the power system for network analysis functions, such that all analysis tools share the same source information. Network Model Management (NMM) handles both internal enterprise element and cross entity both in the horizontal and vertical domain, e.g., TSOs-TSOs and TSOs-DSOs coordination. In this SUC this is an internal System of DSO/TSO.	
TSO Prequalification System	System	The TSO Prequalification System function involves managing all the tools and platforms that concern the product and grid prequalification on the transmission network.	

# 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		Prequalificatio	Prequalification for FSPs connected to Distribution Grid									
Step No	Eve nt	Name of process/ activity	Description of process/activity	Servic e	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							



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



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



			the FSP to make the Grid Prequalification				
1.6	S infor	end network mation	Provide the required network information	Network Model Management	DSO Prequalificatio n System	ID-4 (internal information)	
1.7	Prec	Grid qualification	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	Prec	Send FSP qualification 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	U Prec	pdate FSP qualification 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 Prequalificatio n System			

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





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





		Prequalification result				
1.5	Request FSP's Network information	If FSP is connected to Transmission Grid: Send the requirements from step 1.1	DSO Prequalificatio n System	Data exchange platform	ID-2	
1.5	Request FSP's Network information	If FSP is connected to Transmission Grid: Send the requirements from step 1.1	Data exchange platform	TSO Prequalificatio n 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 Prequalificatio n System	Network Model Management	ID-3	
1.6	Send network information	Provide the required network information	Network Model Management	TSO Prequalificatio n 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 Prequalificatio n System			
1.8	Send FSP Prequalification Result	If FSP is interested in TSO Market: Send the Product and Grid prequalification result. If FSP is interested in DSO Market: Send the Grid Prequalification result	TSO Prequalificatio n System	Data exchange platform	ID-5	

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

# 10.3.1.1.5 Information exchanged

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



		1	
		Single or Aggregated portfolio?	
		Capacity/Energy	
		Maximum Full Activation time	
		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. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	
ID-4	Network information	The structural information of the network (lines) characteristics 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: Int. Request ID Substation Power Transformer R L Feeder Line R L C	ID-3
ID-5	FSP information for Product and Grid Prequalification	ID Name Resource Mode of activation (If it is Automatic should be tested) Minimum Quantity Flexibility direction (load/generation reduction/increase, both) Locational information and SO connected Maximum duration of delivery period offer Single or Aggregated portfolio? Capacity/Energy Maximum Full Activation time <u>Mandatory:</u> Product Prequalification Result: (Approved) Grid Prequalification: (Approved/Reproved)	ID-3, ID-4



# 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			
		NESTER			
		REN			
		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).
	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> </ul>
	<ul> <li>Identify potential network constrains and planning of the grid operation for the next day/hours considering the load and generation forecasts</li> </ul>
Objective(s)	<ul> <li>Promote the participation of flexible resources connected at all voltage levels grids in distribution and transmission networks operation</li> </ul>
	- Ensure coordination between system operators for all scenarios.
	- Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-01, SUC-07

# 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 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.

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;				



#### 10.3.1.2.2 Diagrams of use case



#### 10.3.1.2.3 Technical details

#### 10.3.1.2.3.1 Actors

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

#### 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								



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

#### Scenario step by step analysis

	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	Informat ion producer (actor)	Infor mation receiver (actor)	Infor mation exchang ed (IDs)	Requir ement, 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/Fore cast 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/Fore cast System	Energ y Forecasti ng	ID-1	
1.3		Compute the required forecast	The forecast should be computed for the next 72 hours in intervals of 15 minutes. The forecast creation process is not the main focus of the present SUC.		Energ Y Forecasti ng	DSO Plan/Fore cast System	ID-2	
1.4		Request Network Topology	The SO system should request the network information to define the aggregation of information		DSO Plan/Fore cast System	Netw ork Model Managem ent	ID-3	
1.5		Provide the required network information			Netw ork Model Managem ent	DSO Plan/Fore cast 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/Fore cast System			
1.7		Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration		DSO Plan/For ecast System			
1.8		Quantification of flexibility needs for solving constraints	Quantification of flexibility needs for solving technical restrictions in distribution network. In case network assets cannot solve all technical restrictions, flexibility from DER will be considered to solve the		DSO Plan/Fore cast System			



		problem. Quantify flexibility ne eded to solve constraints per node/zon e.				
1.9	Send the amount of flexibility needed	Send the Quantify flexibility needed to solve constraints per node/zon e for the next day or for the next 6 hours.	DSO Plan/Fore cast 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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Ste p No	nt	Eve	Name of process/ activity	Description of process/activity	Servi ce	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requiremen t, 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. 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. 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	Transmissic n 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	Quantificat on of flexibility needs for solving constraints	Quantificatio n 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 8	Intraday Flexibility needs for D	SO with	in OneNe	t System		
Step No	Event	Name of process/activity	Description of process/activity	Service	Informat ion producer (actor)	Informat ion receiver (actor)	Informat ion exchang ed (IDs)	Requirem ent, R-IDs
3.1		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"		DSO Plan/Fore cast 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 Forecasti ng	ID-1	



	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 Forecast ng	DSO Plan/ i Forecast System	ID-2	
3.4	Request Network Topology	The SO system should request the network information to define the aggregation of information	DSO Pla Forecast System	Network Model Managem ent	ID-3	
3.5	Provide the required network information		Network Model Manager ent	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 Pla Forecast System	n/		
3.7	Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration	DSO Pla Forecast System	n/		
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 need ed to solve constraints per node/zone.	DSO Pla Forecast System	n/		
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/For cast 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 exchang Platform	OneN et 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									
Scer nam	nario Ie	Day-Ahead &	Intraday Flexibility needs	for TSO	within OneNe	et System				
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Informat ion	Informat ion	Requir ement, R- IDs		

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					receiver (actor)	exchang ed (IDs)	
4.1		Retrieve the planned works programmes	To determine the consumption and production profiles, the SO should take into consideration any planned maintenance works. This activity is described in the SUC "Maintenance plans information exchange"	TSO Plan/ Forecast System			
4.2		Retrieve the market results	If the SGU participate in the markets, the market results should be taken into account in the operational planning	TSO Plan/ Forecast System			
4.3	t	Request the generation and he consumption forecast	Producers should provide the forecast of their generation for the next day or the next 6 hours.	TSO Plan/Forecast System	Energy Forecasti ng	ID-1	
4.4	r	Compute the equired 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/Fore cast System	ID-2	
4.4	R	Request Network Topology	The SO system should request the network information to define the aggregation of information	TSO Plan/Forecast System	Netw ork Model Managem ent	ID-3	
4.5	r	Provide the equired 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/z one 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 Type of Request Substation Transformer Feeder Start Time (day; hour; minute) End Time (day; hour; minute) the time should be done in intervals of 15 minutes.	
ID-2	Generation and the consumption forecast	Request ID Type of Request Substation Quantile Pconso_Substation Pprod_Substation Qprod_Substation Transformer Quantile Pconso_Transformer Pprod_Transformer Qconso_Transformer Qeder Quantile Pconso_Feeder Pprod_Feeder Quantile Pconso_Feeder Start Time (day; hour; minute)	ID-1



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

# 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





	16/06/2021	E-REDES	
		NESTER	
		REN	
		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).
	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> </ul>
	- Cover grid investment needs through flexibility services.
Objective(s)	<ul> <li>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.</li> </ul>
	<ul> <li>Improve network operation security during maintenance actions, using flexibility to minimize the risk of reduced redundancy.</li> </ul>
	- Ensure coordination between system operators for all scenarios.
	- Receive and send data between system operators in a secure manner.
Related business case(s)	WECL-PT-02

#### 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

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.



#### 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			
	Historical load diagram profile from HV/MV/LV substations, most recent year Full characterization of network topology			

#### 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





#### 10.3.1.3.3 Technical details

10.3.1.3.3.1	Actors
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	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.				





Energy Forecasting	The Energy Forecasting business or more of the items consumpt System or price inelastic production), dir include energy forecast for inte part of Distributed Energy Resou	s (EF) function involves the forecasting of one ion (load), production (primarily intermittent ect current and area inter-exchange. This also rmittent or price inelastic production that is urces (DER).	
Network Model Management	The Network Model Manage establishing and maintenance of provided by current installed as (future model) or potential The focus is to provide a mathem used in different analysis, inclu System flow, state estimation, continger stability analysis. It maintains manetwork analysis functions, such information. Network Model Menterprise element and cross domain, e.g., TSOs-TSOs and TS internal System of DSO/TSO.	ement (NMM) manages information for f the functional description of the grid that is set (as-built model), planned installed asset installation (what-if/ hypothetical model). natical model of the power system that can be ding, but not limited to, steady state power ney analysis as part of security assessment and aster representations of the power system for n that all analysis tools share the same source Management (NMM) handles both internal entity both in the horizontal and vertical SOS-DSOS coordination. In this SUC this is an	

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

#### 10.3.1.3.4.1 Overview of scenarios

		Scenario conditi	ons			
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





## Scenario step by step analysis

	Scenario								
Sci na	enario me	Long-term Fle	Long-term Flexibility needs for DSO						
Step No	Event	Name of process/activity	Description of process/activity	Service	Informatio n producer (actor)	Informatio n receiver (actor)	Informati on exchange d (IDs)	Requireme nt, 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/Forecas t System	Energy Forecasting	ID-1		



1.3	Compute the required forecast	The forecast should be computed for the next 2-3 years. Define planning horizon, define load and distributed energy sources growth rates. The forecast creation process is not the main focus of the present SUC.	Energy Forecasting	DSO Plan/ Forecast System	ID-2	
1.4	Request Network Topology	The SO system should request the network information to define the aggregation of information	DSO Plan/Forecas t System	Network Model Managemen t	ID-3	
1.5	Provide the required network information		Network Model Managemen t	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/Forecas t System			
1.7	Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration)	DSO Plan/Forecas t 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/Forecas t 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/Forecas t System	Data exchange Platform	ID-5	



1.10		Amount of Flexibility needed	Flexibility needed to solve constraints per no de/zone for the next 2-3 years		Data exchange Platform			
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#### 10.3.1.3.5.1.2 Scenario #2: Long-term Flexibility needs for TSO

#### Scenario #2 description



# Scenario step by step analysis

	Scenario							
Sce nc	Scenario name Long-term Flexibility needs for TSO							
Ste p No	Even t	Name of process/activi ty	Description of process/activity	Servic e	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requiremen t, 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/Foreca st System			

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		This activity is described in the SUC "Maintenance plans information exchange"				
2.2	Request the generation an the consumption forecast	d Producers should provide the forecast of their generation for the 2-3 years	TSO Plan/Foreca st System	Energy Forecasting	ID-1	
2.3	Compute the required forecast	The forecast should be computed for the next 2-3 years. Define planning horizon, define load and distributed energy sources growth rates. The forecast creation process is not the main focus of the present SUC.	Energy Forecasting	TSO Plan/Foreca st System	ID-2	
2.4	Request Network Topology	The SO system should request the network information to define the aggregation of information	TSO Plan/Foreca st System	Network Model Managemen t	ID-3	
2.5	Provide the required network information		Network Model Managemen t	TSO Plan/Foreca st 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/Foreca st System			
2.7	Network Optimization	Optimization will run considering network assets (capacitor banks, tap changers, network reconfiguration)	TSO Plan/Foreca st System			
2.8	Quantifica on of flexibilit 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/Foreca st System			
2.9	Send the amount of	Send the quantify flexibility needed to solve	TSO Plan/Foreca st System	Data exchange Platform	ID-5	



	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/z one 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 Type of Request Substation Transformer Feeder Start Time (day; hour; minute) End Time (day; hour; minute)				
ID-2	Generation and the consumption forecast	Request ID Type of Request Substation Quantile Pconso_Substation Pprod_Substation Qconso_Substation Qprod_Substation Transformer Quantile Pconso_Transformer Qconso_Transformer Qprod_Transformer Qprod_Transformer Feeder Quantile Pconso_Feeder Pprod_Feeder Qconso_Feeder Qconso_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder Qtod_Feeder	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. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer)				



		Feeder (All the information from the feeder)	
ID-4	Network information	The structural information of the network (lines) characteristics 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: Int. Request ID Substation Power Transformer R L Feeder Line R L C	ID-3
ID-5	Amount of flexibility needed	The amount of flexibility required per flexibility aggregation node/zone will be quantified. Node/Zone Quantity (MW)	

# 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		
		E-REDES				
	16/06/2021	NESTER				
	16/06/2021	REN				
		INESC TEC				



#### 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).			
	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> </ul>			
Objective(s)	<ul> <li>Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a technical point of view.</li> </ul>			
	- Ensure coordination between system operators for all scenarios.			
	- Receive and send data between system operators in a secure manner.			
Related business case(s)	WECL-PT-01 & WECL-PT-02			

#### 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



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





#### 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. 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.		

#### 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





# 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	



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			



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

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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				
		NESTER				
		REN				
		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).			
	<ul> <li>Demonstrate that it is feasible to implement these system processes efficiently and within the expected timeframe.</li> </ul>			
Objective(s)	- Ensure that the solution provided by the flexibility activation through the market mechanisms will not create additional problems from a grid point of view.			
	- Ensure coordination between system operators for all scenarios.			
	- Receive and send data between system operators in a secure manner.			
Related business case(s)	WECL-PT-01 & WECL-PT-02 & SUC-01			

#### 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



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







|--|

Actors					
Groupir domains, 2	ng (e.g. cones)	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. 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.			





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.	
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#### 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



#### Scenario step by step analysis

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	Scenario									
Scen na	nario me	Evaluate Grid Co	Evaluate Grid Constraints							
Step No	Even t	Name of process/activity	Description of process/activity	Servi ce	Informatio n producer (actor)	Informatio n receiver (actor)	Informati on exchanged (IDs)	Requiremen t, 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			
		Bid ID				
		Resource				
		Connected SO				
		Day				
ID-1	Accepted bids	Hour				
		Duration				
		Quantity				
		Flexibility direction				
		Full Activation time				

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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. A structural network information request consists of: Int. Request ID Type of request Substation (All grid information from the substation) Transformer (All the information from the transformer) Feeder (All the information from the feeder)	ID-1
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: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed of several lines.	ID-2
Validation Result	Bid ID Grid Result Evaluation: (approved/reproved)	ID-2, ID-4
	Request Bids Network information Network information Validation Result	Request Bids       The structural information of the network (lines)         Request Bids       A structural network information request consists of:         Inf. Request ID       Type of request         Substation       Substation (All grid information from the substation)         Transformer (All the information from the transformer)         Feeder (All the information from the feeder)         The structural network 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 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:         Int.       Request ID         Substation         Power       Transformer         R       L         Substation         Power       Transformer         R       L         C       Each feeder is composed of several lines.         Validation       Bid ID         Grid Result Evaluation: (approved/reproved)

# 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	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				





	NESTER	
	REN	
	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)	<ul> <li>Anticipate grid constraints due to maintenance works scheduled</li> <li>Have an updated view of the maintenance plans defined by TSO and DSO from long- term until close to real-time.</li> </ul>	
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** 

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 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



#### 10.3.1.6.3 Technical details

10.3.1.6.3.1 Actors

Actors

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



	and vertical domain, e.g. TSOs-TSOs and TSOs-DSOs coordination.	
Validation System Planning	Corresponds to the second SO system that is the one that is responsible to assess the work programmes planned and validate their feasibility.	

#### 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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Scenario step by step analysis

	Scenario								
Scenario	name	Prepare							
Step No	Event	Name of process/ activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs	
1.1		Request planned/needed works for next year	One time a year, the TSO and DSO should request the expected works to from each other that could affect them, mainly in the observability area. The System Planning should transmit the works concerning to the network expansion and the times with impact in the existing network as well as the		Work Management	Data Exchange Platform	Info1- Request (external) of Planned works		
		Request planned/needed	planned to the next year One time a year, the TSO and DSO should request the expected works to from each other that could affect them, mainly in the observability area. The System		Work		Info2-		
1.2		planned/needed works for next year	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	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 maintenance plan and consequent analysis by the SO.	Work Management	Energy Forecasting	Info7- Request (internal) the Consumption and production forecast	
1.10	Send Forecast information		Energy Forecasting	Work Management	Info8- Consumption and production forecast (internal) information	

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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.







#### Scenario step by step analysis

	Scenario								
Scenario	name	Monthly-ahea	d, Weekly-ahead o	r on eve	nt update of m	aintenance plans	i		
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		



	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			



	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. Date Request ID Observability area ID or Bus ID	
INFO2	Request(internal) of Planned works	Request of planned works in the SO system. Date Request ID Year	
INFO4	Maintenance and expansion planned works (internal) information	Maintenance and expansion planned works exchanged internally	
INFO5	Request (internal) the Network characteristics information	Corresponds to the network model and characteristics that has the structural information of the network. This is required to the computation process. Structural network information request: Int. Request ID Type of request Substation Transformer Feeder	
INFO6	Network characteristics (internal) information	Corresponds to the network model and characteristics that has the structural information of the network. This information is exchange between the SO owned systems Structural network information request: Int. Request ID Substation Power Transformer R L Feeder Line R L C Each feeder is composed by several lines.	
INFO7	Request (internal) the Consumption and production forecast	The consumption and generation forecast (scheduled information) are needed by several SUCs. This BO request intends to be general for all the SUCs Request ID Type of Request	

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

# 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.	Approval status							
		E-REDES						
	22/26/2024	NESTER						
	23/06/2021	REN						
		INESC TEC						

#### 10.3.1.7.1.3 Scope and objectives of use case

#### Scope and objectives of use case



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

This SUC presents the information exchanged between TSO and DSO regarding load and generation forecast in shortterm. 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 shortterm. 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.)



#### 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
SUC 02 - Day-Ahead & Intraday Flexibility needs
SUC 05 - Evaluate Grid Constrains
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



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#### 10.3.1.7.3 Technical details

#### 10.3.1.7.3.1 Actors

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



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

#### 10.3.1.7.4.1 Overview of scenarios

	Scenario conditions									
No.	lo. Scenario name Scenario Primary Triggering event description actor					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

				5	Scenario					
Scer name	nario	Exchange forecasts of disaggregated generation and load								
Ste p No	Even t	Name of process/activit y	Descriptio n of process/activit y	Servic e	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requiremen t, R-IDs		
1.1		Retrieve the market results	If the SGU in the observability area participate in the markets, the market results should be taken into account in the operational planning		Pre- Operation Planning					
1.2		Request Network Topology	The system should request the network information to define the aggregation of information		Pre- Operation Planning	Network Model Management	Info1- Request (internal) the Network characteristics information			
1.3		Provide the required network information			Network Model Management	Pre- Operation Planning	Info2- Network characteristics (internal) information			
1.4		Request the generation and the consumption forecast	Producers should provide the forecast of their generation. The forecast of the consumption should be done by HV/MV substation.		Pre- Operation Planning	Energy Forecasting	Info3- Request (internal) the Consumption and production forecast			



1.5	Co the re fore	The forecast should be computed for the next 72 hours in mpute intervals of 15 quired minutes. The cast 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	Retrie planne progra	To determine the consumption and production ve the profiles, the d works DSO and TSO mmes should take into consideration the works planned (SUC 06)	Pre-Operation Planning			
1.7	Netv const dete	Considering the consumption and production forecast, the DSO and the TSO should evaluate if some constraints can exist in their respective network.				
1.8	Netv Optim	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 reconfiguratio n topologies (normally the ones with human intervention needs), etc.	Pre- Operation Planning		
1.1 0	Works validation information (SUC 06)	The information concerning the works validation should be provided to other SOs and internally to the different entities in the SO. If the works were not validated, the system should change the schedule of the planned works in collaboration with other	Pre- Operation Planning		

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			entities - SUC 06.				
1	1.1	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			
2	1.1	Computatio n of the forecasted consumption disaggregated by node	The system should aggregate the forecasts by node in each observability area.	Pre- Operation Planning			
3	1.1	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	
4	1.1	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				
		E-REDES						
	22/05/2021	NESTER						
	23/06/2021	REN						
		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).				





Objective(s)	<ul> <li>Improve TSO and DSO grid planning by taking into account each other's short-circuit contributions in the TSO/DSO interface</li> <li>Improve security of operation and quality of service</li> </ul>
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 (threephase 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 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



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#### 10.3.1.8.3 Technical details

10.3.1.8.3.1 Actors

Actors								
Groupin domains, z	ig (e.g. cones)	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.						



#### 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.







#### Scenario step by step analysis

	Scenario							
Scenario name		Short-circuit p	ower definition at	bay level o	considering TS	O information		
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs





1.1	Request Network information	Request the network characteristics	Pre- Operation Planning	Network Model Management	Info1- Request (internal) the Network characteristics information	
1.2	Send network characteristics information		Network Model Managemen t	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			



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.







#### Scenario step by step analysis

Scenario							
Scenario name	Short-circuit power definition at bay level considering TSO and DSO information						
Step No Event	Name of process/ activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs

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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. 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	



			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			
0	2.1	Calculation of short-circuit power in HV buses in observability area		Pre-Operation Planning			
1	2.1	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	2.1	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.			



# 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.
	- Enable local flexibility procurement by DSOs
	- Open market sessions at the request of the DSO
Objective(s)	- Collect bids from market participants
	- Clear the local flexibility markets
	- Communicate market results to stakeholders
Related business case(s)	WECL-ES-01 and WECL-ES-02

#### 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 fo flexibility procurement, the bids from FSPs, for the market clearing and for the communication of market results to differen 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.

Three scenarios are defined for this SUC, namely (i) flexibility resource register, (ii) market request, (iii) market session.

#### Scenarios:

#### 1. Flexibility Resource Register:

In this scenario, the FSP applicants will be able to request to be allowed to participate in market sessions, follow up the prequalification 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.

#### 2. Market Request:

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

#### 3. Market Session:

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

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

	Key performance indicators				
ID	Name	Description	Reference to mentioned use case objectives		
1	Cost Value	Compare cost for flexibility with avoided cost	-Collect bids from market participants -Clear the local flexibility markets		
2	ICT Cost	The term ICT cost comprises the communications and information technologies, including the software for the aggregation and market clearing process. Only those ICT costs that are directly related to the implementation of each coordination scheme will be considered.	<ul> <li>Enable local flexibility procurement by DSO</li> <li>Open market sessions</li> <li>Clear the local flexibility markets</li> <li>Communicate market results</li> </ul>		
3	Available flexibility	The available power flexibility in a defined period (eg. per day) that can be allocated by the DSO at a specific grid segment. Measured in MW. This in relation with the total amount of power in the specific grid segment in the same period.	-Enable local flexibility procurement by DSOs -Open market sessions		

#### 10.3.2.1.1.5 Key performance indicators (KPI)

#### 10.3.2.1.1.6 Use case conditions

#### Use case conditions

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#### 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.

It is assumed that settlement conditions are well defined and clearly state eventual needs for compensations and/or financial adjustments among affected parties in the flexibility provision process (e.g. BRPs, BSPs, Aggregators).

Prerequisites

Communication infrastructure between DSOs, FSPs, IMO and the Market Platform should be in place

FSP engagement

#### 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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# 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".									



		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: <u>https://www.entsoe.eu/news/2019/04/16/a-toolbox-fortsos-and-dsos-to-make-use-of-new-system-and-grid-services/</u>

10.3.2.1.4 Step by step analysis of use case

## 10.3.2.1.4.1 Overview of scenarios

			Scer	ario 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.



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 prequalification process, and registration once it is finished, and the maintenance of the register for the period in which the FSP is active.

## Scenario step by step analysis

Scenario name	Flexibility Resource Register							
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1.0	FSP sign- up to the LMP	Sign-up at the Market Platform	The FSP opens the Local Market Platform front- end and signs up	CREATE	FSP	LMP	I.E.01	
1.1	LMP validates new account	Basic login info confirmation	The FSP receives a confirmation of the creation of new account. Email/phone validations may be included	REPORT	LMP	FSP	I.E.01	
1.2	FSP requests to be pre- qualified	Pre-qualification request	The FSP opens the Local Market Platform front- end, signs in, and requests to have its resources pre- qualified.	CREATE	FSP	LMP	I.E.02 I.E.03 I.E.04	
1.3	LMP sends a confirmation that the pre- qualification request was made	Confirmation	LMP sends a confirmation that the pre- qualification request was made	REPORT	LMP	FSP		
2.0	LMP notifies the IMO that a pre- qualification	Notification of pre-qualification request	The IMO is informed about the request for a pre- qualification.	REPORT	LMP	IMO		



	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	



	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	





5.4							
5.5	The LMP updates the Flexibility registry	Update registry	The LMI 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				
Sce	enario 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		





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 I	name		Market Session					
Step No	Event	Nan process,	ne of /activity	Description of process/activity	Service	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requirement , R-IDs
1.0	Market session becomes active	Ho advance Openir (Go	ours in of Gate Ig Time OT)	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/year s 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	Marke ope	et session ning	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	Lir inclus prequalif	nit for ion of fied 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	Con: qualifie	sult pre- d units	The IMO and the DSO consult the	GET	IMO;	LMP: Flexibility	I.E.07	

- (1)



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 consolidate s 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 <i>,</i> 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	



	d the validations of both IMO and DSO		validations of both IMO and DSO					
2.10	The LMP register to the Market Session the consolidate d 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	Communicatio n 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						



I.E.02	Market participant pre- qualification information	Contact information; Fiscal data; Access contract; bank details; power of representation; confidentiality agreement; declaration of non-collusion
I.E.03	Market resource pre- qualification information	Market participants provide information on the resources they want to prequalify: Facility/resource name; Type of technology; Location; Market participant; etc.
I.E.04	Technical resource pre- qualification information	Verification of the installed capacity to provide the service: Power; CUPS (Universal Supply Point Code acronym in Spanish); Maximum quantity; Response time, Etc
I.E.05	Generic attributes	Composed of generic parameters concerning the market session being requested. E.g.: Auction identifier Associated DSO Product Type: Flexibility Product Type of negotiation: Auction Area: Basic or aggregated.
I.E.06	Product parameters	Composed of product parameters concerning the market session being requested. E.g.: 1. Service window: Selection of the required date and duration of the service

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		• Type of product: availability/activation	
		Availability/Activation cap price: X €/MW or X €/MWh	
I.E.07	List of pre- qualified units	List of pre-qualified units for a given market session	
I.E.08	List of qualified units (market, technical or consolidated)	List of qualified units for a given market session. The list can refer to the market qualification, technical qualification or the consolidated list.	
I.E.09	Bid	Composed of bidding information <ol> <li>General attributes         <ul> <li>FSP identifier</li> </ul> </li> <li>Availability: Selection of the capacity, the direction and the estimated hours of activation.             <ul> <li>Period of availability (multiple periods may be possible within the service window)</li> <li>Price: for availability and/or activation</li> <li>Additional parameters (complex bids) may be considered (under discussion).</li> </ul> </li> </ol>	
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						



# CHENET

### 10.3.3.1.1.3 Narrative of Use Case

#### Narrative of use case

#### Short description

Need:

In order to simplify and optimize the management of renewable production curtailments building the STAR platform, we have to define the information exchanges and processes needed to perform the related BUC's traceability objectives in the case of TSO automated activations.

Service (short description of how the service meets the objectives):

This SUC highlights the needed information and processes between TSO, DSO, FSP and producers in the case of DSO manual activations for the four following phases:

- Market phase
- Monitoring and Activation
- Measurement and settlement
- Platform consultation

## Complete description

This SUCs provides requirements in terms of data exchanges and processes between TSO, DSO, FSPs and producers for the STAR platform to handle the related BUC's traceability objectives in the case of TSO automated flexibility activations. It focuses on the following phases:

- Market phase: This is the process of collecting offers and production forecasts from the producers. The market algorithm, however, is outside the scope of this SUC.
- Monitoring and activation: This phase is related to the flexibility activation orders' transmission and monitoring. Every transmission and reception of activation orders between actors should be registered. Activations are not triggered via the platform, STAR only tracks them and has the relevant information accessible to the participants.
- Measurement and Settlement: In this service phase, the process of production metering and settlement related information tracking is tackled.
- Platform consultation: At any time, the platform will enable the different actors to have access authorized information through interfaces.

#### 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





## 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			



4	Platform consultation	Anytime, the platform should enable the different actors to have access authorized information through interfaces.	All	Information consultation	Consultation request	Information delivered
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# 10.3.3.1.3.2 Steps – Scenarios

# 10.3.3.1.3.2.1 Scenario name #1: Market phase

	Scenario										
Scen nam	ario e	Aarket 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		тѕо	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						
Scen nam	ario 2	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		тѕо	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		тѕо	STAR platform	Target in MW, Activation order date, automaton	Determined such information		



		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 settler	ent
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	Scenario									
Scenario name		Neasurement 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

			S	cenario					
Scen name	ario e	Patform 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		тѕо	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	тѕо	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





#### 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-		System for Trackability of Renewable Activations for Automated and Manual					
01b		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. The business use case WECL-FR-01 related to this SUC aims to simplify and optimize the management of renewable production curtailments, by covering the entire life cycle of a flexibility offer, from the formulation of offers to the control of their activations for invoicing. The final goal is to build a platform based on the blockchain technology, enabling such objectives and test it for each participating entity on a chosen area of the French network. This system use case particularly highlights the information to be tracked and processes to follow in order to meet the BUC WECL-FR-01 objective in the case where the DSO manually activates flexibilities in a context of congestion management.
Related business case(s)	WECL-FR-01

#### 10.3.3.2.1.3 Narrative of Use Case

# Narrative of use case Short description 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.

Service (short description of how the service meets the objectives):

This SUC highlights the needed information and processes between TSO, DSO, FSP and producers in the case of DSO manual activations for the four following phases:

- Forecast phase
- Monitoring and Activation
- Measurement and settlement
- Platform consultation

#### Complete description

Need:

This SUCs provides requirements in terms of data exchanges and processes between TSO, DSO, FSPs and producers for the STAR platform to handle the related BUC's traceability objectives in the case of DSO manual flexibility activations. It focuses on the following phases:

- Forecast phase: This is the process of collecting production forecasts from the producers. In this SUC, this process is non-compulsory for producers.
- Monitoring and activation: This phase is related to the flexibility activation orders' transmission and • monitoring. Every transmission and reception of activation orders between actors should be registered.

Measurement and Settlement: In this service phase, the process of production metering and settlement related information tracking is tackled.

Platform consultation: At any time, the platform will enable the different actors to have access authorized information through interfaces.



## 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



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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		/larket 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





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

			S	cenario						
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		тѕо	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	тѕо	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 Pla				
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

This use case describes prequalification process on the FP which consists of:

- market prequalification (registration and assessment of a new FSP on the FP)
  - certification of DER (registration and assessment of a new unit by FSP)
  - 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)
- This use case covers all obligatory steps for a FSP to participate in the flexibility market through FP

## Complete description

Short description

I Market prequalification





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.

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.
 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





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 Prequalify numerous flexibility sources. Improve security of supply through a transparent and easy process				
Related business case(s)	ess 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						
hermally 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 prequalificatio						
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.						
Summary of use case						
<ul> <li>Grid prequalification<u>Description</u>: Run by DSO to validate existence of the flexibility resource</li> </ul>						
and evaluate impact on the distribution grid.						
<ul> <li>Initiate grid prequalification</li> </ul>						
Description:						
<ul> <li>Receive grid prequalification report</li> </ul>						
Description:						
Receive grid prequalification request						
Description:						
<ul> <li>Register flexibility resource</li> </ul>						
Description:						
Request to register flexibility resource						
Description:						
Run grid prequalification tests						
Description:						
Send grid prequalification report						
Description:						
Send grid prequalification result						
Description:						
Validate and register flexibility resource						
Description:						

## 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						



## 10.4.2.1.1.6 Use Case conditions

_						
	Use case conditions					
	Assumptions					
1	1 Local flexibility market					
2	2 DSO procures congestion management services at the local flexibility market.					
	Prerequisites					
1	1 Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems					
2	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>&gt; Congestion management</buc>				
< <suc>&gt; Grid prequalification</suc>				
< <suc>&gt; Product prequalification</suc>				
< <suc>&gt; Bidding</suc>				
< <suc>&gt; Activation - Flexibility market</suc>				
< <suc>&gt; Settlement-Flexibility market</suc>				
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



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## 10.4.2.1.3 Technical Details

10.4.2.1.3.1 Actors

Actors								
Grouping (e.g. doma	ins, zones)	Group description	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 <u>distribution</u> 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 <u>Regulation on the internal market for</u> 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 activatior 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.	1					
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	Flexibility Service	
platform for FSP	Provider (FSP)	
Flexibility register	Market Operator	
	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.











# Scenario step by step analysis

Scenario 1: resource should be validated by DSO

	Scenario 1									
Scenario name		Grid prequalificati	on 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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Step	Event	Name of	Description of	Sorui	Informati	on Informat	ion	Information	Requirement, R-
Scena name	ario 2	Grid prequalificati	on without DSO						
				S	Scenario 2				
Scena	ario 2: re	esource does not n	eed to be validate	d by DS	0				
1.9	1	prequalification report			platform for FSP	platform for FSP			
1.0	ł	Receive grid			Flexibility marketplace	Flexibility marketplace			
1.8		Send grid prequalification report			Flexibility register	Flexibility marketplace platform for FSP	Info: preq	10-Grid ualification repor	t
1.7		Validate and register flexibility resource			Flexibility register	Flexibility register			
1.6	o)	Send grid prequalification result			DSO mailbox	Flexibility register	Info: preq resu	<u>11-Grid</u> ualification test Its	
1.5	1	Run grid prequalification tests			DSO mailbox				
1.4	1	Receive grid prequalification request			DSO mailbox				
1.3		Initiate grid prequalification			Flexibility register	DSO mailbox	Info§ preq requ	<u>Ə-Grid</u> Jualification Jest	
1.2	1	Register flexibility resource			Flexibility register	Flexibility register			

Step No	Event	Name of process/activity	Description of process/activity	Service	producer (actor)	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	
		2. Connectivity (voltage level, transformer substation, DSO)	
		3. Location (GPS coordinates)	
		4. Active power	
		5	
		Based on these data, flexibility resource will be registered in	
		the flexibility register. Otherwise, grid prequalification test	
		can be required from DSO.	
Info 10	Grid prequalification	This is information to FSP about the grid prequalification and	
111010	report	it is in the form of a document.	
		This is information that DSO sends to market operator after	
Info 11	Grid prequalification	running the grid prequalification tests. It concludes does or	
INIOTT	test results	not flexibility resources can be registered and used later	
		without negative impact on the distribution grid.	
		Request document with all the information necessary to	
		run prequalification tests. These documents include:	
Info 1 F	Prequalification	1. Type of the DER	
111012	request	2. Connection information (DSO, nominal voltage, transformer	
		substation ID, GPS location)	
		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-	Luka Nagodo (CEN I)	draft concent				
Ŧ	26	Luka Nagoue (GEN-I)	diait-concept				
2	2021-04- Normin Sulianović (EINA)		Domain, Roles, BUC description, SUC list without				
Z	28	detailed description					
2	2021-08-	Luka Nagodo (CEN I)	Poloc SUC description				
5	16	Luka Nagoue (GEN-I)	Koles, Soc 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 S can also be utilised for various system services.t					
Objective(s)	Deferral of grid reinforcement investments (defer or avoid secondary substation replacement). Improve security of supply. Validate demand response mechanism to prevent congestion in the distribution grid. Test flexibility products to prevent congestion in the distribution grid under market conditions.					



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## 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.

Summary of use case

- Product prequalification Description: Process is coordinated by the Flexibility Market Operator (FMO).
  - o Send product prequalification requirements
  - Description:
  - Publish call for flexibility service Description:
  - Send request for flexibility service prequalification Description:
  - Receive and forward request for flexibility service prequalification Description:
  - Receive and validate request Description:
  - Run prequalification tests Description:
  - Send prequalification test results
  - Description:
     Receive prequalification test results Description:
  - Evaluate prequalification test results Description:
  - Send service prequalification information Description:
  - Receive and acknowledge Description:
  - Receive and acknowledge Description:
  - Receive and acknowledge
     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							




# 10.4.2.2.1.6 Use case conditions

_					
	Use case conditions				
	Assumptions				
1	1 Local flexibility market				
2	2 DSO procures congestion management services at the local flexibility market.				
	Prerequisites				
1	1 Flexibility service provider provides flexibility services to DSO to avoid grid congestion problems				
2	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>&gt; Congestion management</buc>				
< <suc>&gt; Grid prequalification</suc>				
< <suc>&gt; Product prequalification</suc>				
< <suc>&gt; Bidding</suc>				
< <suc>&gt; Activation - Flexibility market</suc>				
< <suc>&gt; Settlement-Flexibility market</suc>				
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



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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.	
Distribution System Operator (DSO)	Business	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the <u>distribution</u> 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. <b>Additional Information</b> : This usually is an energy/power exchange or platform. The definition is based on <u>Regulation on the internal market for</u> <u>electricity (EU) 2019/943.</u>	

# 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)		



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	Cooperio description	Primary	Triggering	Dro condition	Doct condition		
		scenario description	actor	event	pre-condition	Post-condition		
1	Product prequalification	Process is coordinated by the Flexibility Market Operator (FMO).	FMO					





10.4.2.2.4.2 Steps – Scenarios

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# Scenario step by step analysis

	Scenario								
Scenario name		Product prequalif	ication						
Ste p No	Even t	Name of process/activity	Description of process/activi ty	Servic e	Information producer (actor)	Informati on receiver (actor)	Information exchanged (IDs)	Requireme nt, R-IDs	
1.1		Send product prequalification requirements			Flexibility marketplace platform for DSO		<u>Info19-</u> <u>Product</u> prequalificatio <u>n</u>		

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			Present
			baseline
			calculation
			options
	Publish call for	Elexibility marketplace platform for	
1.2	flexibility service	MO	
			Info17-
			Product
	Send request		pregualificatio
	for flevibility serv	Elevibility marketplace platform for	n request
1.3	ico		Suggest most
	nroqualification	FJF	suitable
	prequanication		basolino
			baseline
	Dessive and		calculation
	forward request		Info17-
1 4	for flovibility conv	Flexibility marketplace platform for	Product
1.4	for nexibility serv	МО	prequalificatio
	Ice		n request
	prequalification		
1.5	Receive and	Flexibility marketplace platform for	
	validate request	DSO	
	Run	Flexibility marketplace platform for	
1.6	prequalification	DSO	
	tests		
	Send	Flexibility marketplace platform for	Info18-
1.7	pregualification	DSO	<u>Product</u>
	test results		prequalificatio
			<u>n test results</u>
	Receive	Flexibility marketplace platform for	
1.8	prequalification	MO	
	test results		
	Evaluate	Flexibility marketplace platform for	
1.9	prequalification	MO	
	test results		
	Sand convice	Flexibility marketplace platform for	Info20-
1.1	proqualification	MO	Product
0	information		prequalificatio
	mormation		n report
1.1	Receive and	Flexibility marketplace platform for	
1	acknowledge	FSP	
1.1	Receive and	Flexibility marketplace platform for	
2	acknowledge	DSO	
1.1	Receive and	Flexibility marketplace platform for	
3	acknowledge	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.				



Info4	Real-time measurement	Measured active power delivered by the flexibility resource. This is time series, delivered in real-time.	
Info5	Call for bids	Request to prequalified FSP to place a bid for the flexibility service.	
Info6	Flexibility need	Based on load forecast and simulation, DSO predicts the state of the distribution grid. Time intervals and volume of flexibility are determined. DSO sends a request to market operator to open a call for bids. This request contains information about the needed flexibility service, location/area, volume, date and time interval.	
Info7	Flexibility service bid		
Info8	Selected bids		
Info9	Grid prequalification request	Request for grid prequalification sent by FSP or flexibility resource owner. The request contains all technical data such as: 1. Flexibility resource type 2. Connectivity (voltage level, transformer substation, DSO) 3. Location (GPS coordinates) 4. Active power 5 Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO.	
Info10	Grid prequalification report	This is information to FSP about the grid prequalification and it is in the form of a document.	
Info11	Grid prequalification test results	This is information that DSO sends to market operator after running the grid prequalification tests. It concludes does or not flexibility resources can be registered and used later without negative impact on the distribution grid.	
Info12	Offer acceptance	Information about accepted offers.	
Info13	Elexibility 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: 1. Type of the DER 2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location) 3. Installed power 4.	
Info16	Prequalification information	Document with the prequalification results.	
Info17	Product prequalification request	Request for product prequalification with accompanying documents.	
Info18	Product prequalification test results	Results of tests run by DSO.	
Info19	Product prequalification requirements	Detailed description of the flexibility service product and requirements. This is a document.	
Info20	Product prequalification report		
Info21	Volume acknowledged	FSP agrees with the calculated volume related to the delivered flexibility service.	
Info22	Bill	Document, not modeled 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.	

# 10.4.2.3 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 manage of a distribution grid, under market conditions. The flexibility tested with this BUC can also be un 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 proces enabling data as well as communication interoperability, under flexibility market conditions.				
Objective(s)	Deferral of grid reinforcement investments (defer or avoid secondary substation replacement). Improve security of supply. 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.	
	Summary of use case
Bidding	Description: Flexibility Market Operator collects the bids from Flexibility Service
Provider, for	the flexibility need published by DSO.
	Activity1
	Description:
	Send flexibility need
	Description:
	Publish flexibility need
	Description:
	<ul> <li>Receive call for bid</li> </ul>
	Description:
	<ul> <li>Send flexibility service bid</li> </ul>
	Description:
	<ul> <li>Receive flexibility service bid</li> </ul>
	Description:
	<ul> <li>Market clearing</li> </ul>
	Description:
	<ul> <li>Send trading results</li> </ul>
	Description:
	Receive and acknowledge
	Description:
	Receive and acknowledge
	Description:
	Receive and acknowledge
	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>&gt; Congerstion management</buc>	
< <suc>&gt; Grid prequalification</suc>	
< <suc>&gt; Product prequalification</suc>	
< <suc>&gt; Bidding</suc>	
< <suc>&gt; Activation - Flexibility market</suc>	
< <suc>&gt; Settlement-Flexibility market</suc>	
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









#### 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		



	level and connection of the DSOs within the TSO control area.	
	Source : EU Commission Task Force for Smart Grids, EG3	
	A natural or legal person who is responsible for operating,	
	ensuring the maintenance of and, if necessary, developing	
	the <u>distribution</u> system in a given area and, where applicable, its	
	interconnections with other systems, and for ensuring the long-	
Business	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),	
	Defined as any legal entity that offers flexibility services in the	
Business	market, based on acquired (aggregated) capabilities, usually from	
	third parties.	
	A market operator is a party that provides a service whereby the	
	offers to sell electricity are matched with bids to buy electricity.	
Harmonised	Additional Information:	
Role	This usually is an energy/power exchange or platform.	
	The definition is based on Regulation on the internal market for	
	electricity (EU) 2019/943.	
	Business Business Harmonised Role	level and connection of the DSOs within the TSO control area. Source : EU Commission Task Force for Smart Grids, EG3A 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 

# 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		





		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 Scenario description		Primary	Triggering	Pre-	Post-			
	name	Scenario description	actor	event	condition	condition			
1		Flexibility Market Operator collects the bids							
	Bidding	from Flexibility Service Provider, for	FMO						
		the flexibility need published by DSO.							

# 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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Scenario step by step analysis

	Scenario							
Scei na	nario me	Bidding						
Ste p No	Even t	Name of process/activity	Description of process/acti vity	Servic e	Information producer (actor)	Informati on receiver (actor)	Information exchanged (IDs)	Requirem ent, R-IDs
7.1		Send flexibility need			Flexibility marketplace platform for DSO		Info6-Flexibility need 1.Location 2.Timeframe (dates & hours), 3.Power needed, 4.Max energy price , 5.Max availability p rice.	
7.2		Publish flexibility n eed			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	





			Location Timeframe Energy price Availability price Availability volume
7.5	ervice bid	for MO	
7.6	Market clearing	Flexibility marketplace platform for MO	
7.7	Send trading results	Flexibility marketplace platform for MO	Info8-Selected bids Location ContractID Accepted availability volume
7.8	Receive and acknowledge	Flexibility marketplace platform for FSP	
7.9	Receive and acknowledge	Flexibility marketplace platform for DSO	
7.1 0	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. 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: 1. Flexibility resource type 2. Connectivity (voltage level, transformer substation, DSO) 3. Location (GPS coordinates) 4. Active power				



		5	
		Pasad on those data, flavibility resource will be	
		registered in the flexibility register. Otherwise, grid	
		progualification test can be required from DSO	
	Crid proqualification	This is information to ESD about the grid progualification	
Info10	Grid prequaincation	and it is in the form of a document	
	report	This is information that DCO and a to market expension	
		after running the grid proguelification tests. It concludes	
Info11	Grid prequalification test	does or not flowibility recourses can be registered, and	
IIIOII	results	used later without negative impact on the distribution	
		arid	
Info12	Offer acceptance	Information about accepted offers.	
Info13	Flexibiltity offer	Offer for the flexibility service on OTC market.	
	Bequest for flexibility		
Info14	offer		
		Request document with all the information necessary to	
		run pregualification tests. These documents include:	
		1. Type of the DER	
Info15	Pregualification request	2. Connection information (DSO, nominal voltage,	
		transformer substation ID, GPS location)	
		3. Installed power	
		4.	
lufa 1 C	Prequalification		
111010	information	bocument with the prequaincation results.	
Info17	Product prequalification	Request for product prequalification with accompanying	
111017	request	documents.	
Info18	Product prequalification	Results of tests run by DSO	
111018	test results		
Info19	Product prequalification	Detailed description of the flexibility service product and	
	requirements	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	Elexibility 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.	
	Volume validation	After delivered flexibility service, volume is determined	
Into26	request	based on measurements. This volume is a basis for	
1		reimbursement.	1

# 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
	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
Scope	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.
	Deferral of grid reinforcement investments (defer or avoid secondary substation replacement).
Objective(a)	Improve security of supply.
Objective(s)	Validate demand response mechanism to prevent congestion in the distribution grid.
	Test activations of flexibility in distribution grid.
Related business	Congestion management
case(s)	

# 10.4.2.4.1.4 Narrative of Use Case

	Narrative of use case
	Short description
Due to excessive and increasing energy consump thermally overloaded and power lines congested prevent overloads of the distribution grid compo area can be used to reduce the transformer load purchased flexibility.	tion, existing MV/LV secondary substations occasionally becomes . Demand response services can be utilised to decrease duration or even nents. In particular, switching off the heat pumps in one substation during peak hours. This use case covers the mechanism of activating
	Complete description
Activation: For the selected bid, activation is ini FSP internally activates flexibility resources and a n the distribution grid in order to avoid collision lexibility register (component of the market ope	tiated by DSO sending activation signal to the flexibility service provider. icknowledges DSO. DSO informs TSO about activated flexibility resources and double activation on the balancing market. During the activation, rator) collects the measurements from DSO and FSP.
	Summary of use case
•	,
Activation Descript     Activation Descript     Descr     Descr     Descr     Descr     Descr     Descr     Descr	ion: Activation of flexibility service procured on the flexibility market. Send activation signal iption: Receive activation measurement iption: Send acknowledgement iption: Receive acknowledgement iption: Send activation info
Descr	iption:
	Receive activation info
	Activate flexibility resource

- Description:
  - Send real-time measurements
  - Description:

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Receive measurements
 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>&gt; Congestion management</buc>
< <suc>&gt; Grid prequalification</suc>
< <suc>&gt; Product prequalification</suc>
< <suc>&gt; Bidding</suc>
< <suc>&gt; Activation - Flexibility market</suc>
< <suc>&gt; Settlement-Flexibility market</suc>
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







#### 10.4.2.4.3 Technical Details

#### 10.4.2.4.3.1 Actors

	Actors					
Grouping (e.g. dom	ains, 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 <u>distribution</u> 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)		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. <b>Additional Information</b> : This usually is an energy/power exchange or platform. The definition is based on <u>Regulation on the internal market for</u> <u>electricity (EU) 2019/943.</u>				

# 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	Scenario description	Primary	Triggering	Pre-condition	Post-condition
	name		actor	event		
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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# Scenario step by step analysis

	Scenario							
Scen nam	ario e	Activation						
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Informatio n receiver (actor)	Information exchanged (IDs)	Requirement , R-IDs
1.1		Send activation signal			DSO Scada system		Info3-Activation signal Contract ID Start of activation End of activation 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	<u>Info4-Real-time</u> <u>measurement</u> Timestamp Power
1.11	Receive measurements	Flexibility marketplace activatio n module	Timestamp 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. 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: 1. Flexibility resource type 2. Connectivity (voltage level, transformer substation, DSO) 3. Location (GPS coordinates) 4. Active power 5 Based on these data, flexibility resource will be registered in the flexibility register. Otherwise, grid pregualification test can be required from DSO.		
Info10	Grid prequalification	This is information to FSP about the grid prequalification		
111010	report	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	
Info12	Offer acceptance	Information about accepted offers	
Info13	Elexibilitity 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: 1. Type of the DER 2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location) 3. Installed power 4.	
Info16	Prequalification information	Document with the prequalification results.	
Info17	Product prequalification request	Request for product prequalification with accompanying documents.	
Info18	Product prequalification test results	Results of tests run by DSO.	
Info19	Product prequalification requirements	Detailed description of the flexibility service product and requirements. This is a document.	
Info20	Product prequalification report		
Info21	Volume acknowledged	FSP agrees with the calculated volume related to the delivered flexibility service.	
Info22	Bill	Document, not modelled in CIM.	
Info23	Reimbursement	This information is related to the sending the invoice and payment. It will not be modelled with CIM.	
Info24	Flexibility service volume	Information about calculated delivered volume, from the baseline and measurements.	
Info25	Recalculation request	FSP determinates the deviation in the calculated volume and requests a check of the calculation.	
Info26	Volume validation request	After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement.	

# 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). Improve security of supply. Validate demand response mechanism to prevent congestion in the distribution grid. 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.

#### Summary of use case

- **Settlement** <u>Description</u>: Monetisation of the delivered flexibility product, procured on the flexibility market.
  - Calculate baseline
  - Description:
  - Validate delivered volume
  - Description:
  - Beceiv
  - Receive proposed volume <u>Description</u>:
  - Receive proposed volume
  - Description:
    - Start volume aligment process
  - Description:
  - Start alignement process
     Description:
  - Send acknowledgement
  - Description:
  - Send acknowledgement
  - Description:
  - Receive acknowledgement
  - Description:
  - Monetize flexibility service
  - Description:

Description:

Send the bill

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	Receive the bill
De	scription:
•	Send the reimbursement
De	scription:
•	Receive the reimbursement
De	scription:

#### 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>&gt; Congestion management</buc>
< <suc>&gt; Grid prequalification</suc>
< <suc>&gt; Product prequalification</suc>
< <suc>&gt; Bidding</suc>
< <suc>&gt; Activation - Flexibility market</suc>
< <suc>&gt; Settlement-Flexibility market</suc>
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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## 10.4.2.5.3 Technical Details

# 10.4.2.5.3.1 Actors

	Actors						
Grouping (e.g. dom	ains, 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 <u>distribution</u> 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. <b>Additional Information</b> : This usually is an energy/power exchange or platform. The definition is based on <u>Regulation on the internal market for</u> <u>electricity (EU) 2019/943.</u>					

# 10.4.2.5.3.2 Systems

	Actors					
Grouping (e.g. domair	ns, 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	
	Distribution System	Controls registers of all location where	
DSO smartgrid platform	Operator (DSO)	flexibility is needed, communicates with	
	0 per actor (2000)	bidding platform from market operator	
Virtual power plant	Flexibility Service	Takes care of real-time exchanged	
technical channel	Provider (FSP)	information for activations etc.	
Virtual power plant	Flexibility Service	Takes care of business files exchange (bids,	
business channel	Provider (FSP)	measurements etc)	
	Flavibility Camilaa	System responsible for units activation,	
Virtual power plant	Provider (FSP)	internal baseline calculations, monitoring of	
		available locations	
Diddia a alette ave	Manhat Oranatan	System collecting DSO offerings and FSP bids,	
Bloding platform	Market Operator	organising them and publishing results	
		System collecting DSO activations and FSP	
Settlement system	Market Operator	measurements, evaluating activation success	
		and energy to be paid	
	Flexibility Service	Controller that transmits activation demand	
Unit controller	Provider (FSP)	to technical units	
Marketplace settlement	Flexibility Service		
module for FSP	Provider (FSP)		
Marketplace settlement	Manhat Oranatan		
module for MO	Market Operator		
Marketplace settlement	Distribution System		
module for DSO	Operator (DSO)		
Marketplace settlement			
module for other balance	Uther separate Balance		
groups	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 Asscription		Primary	Triggering	Pre-	Post-	
	name	scenario description	actor	event	condition	condition	
	Settlement	Monetisation of the					
1		delivered flexibility product, procured on	FMO? DSO?				
		the flexibility market.					

# 10.4.2.5.4.2 Steps – Scenarios

#### Settlement BUC

Monetisation of the delivered flexibility product, procured on the flexibility market.











# Scenario step by step analysis

	Scenario							
Scenario name		Settlement						
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
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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		Marketplace		
		settlement		
1.4	Receive proposed volume	module for		
		DSO		
		Marketplace		
1 -		settlement		
1.5	Start alignement process	module for		
		FSP		
		Marketplace		
16	Start	settlement		
1.0	volume aligment process	module for		
		DSO		
		Marketplace		
17	Send acknowledgement	settlement	Info21-Volume	
,		module for	acknowledged	
		 FSP		
		Marketplace		
1.8	Send acknowledgement	settlement	Info21-Volume	
		module for	acknowledged	
		DSO		
1.9	Receive			
	acknowledgement			
		Marketplace		
	Send volume info	settlement		
		module for		
		Markatalaaa		
		warketplace		
		settlement modulo for		
1.10	Receive volume info	othor		
		balance		
		groups		
		Marketplace		
		settlement		
1.11	Monetize flexibility service	module for		
		MO		
		Marketplace		
1 1 2		settlement		
1.12	Send the bill	module	Info22-Bill	
		for FSP		
		Marketplace		
1 1 2	Dessive the bill	settlement		
1.13	Receive the bill	module for		
		DSO		
		Marketplace		
1 1 1	Sand the reimburgement	settlement	Info23-	
1.14	Send the reinbursement	module	<u>Reimbursement</u>	
		for DSO		
		Marketplace		
1 1 5	Receive the	settlement		
1.13	reimbursement	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. 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: 1. Flexibility resource type 2. Connectivity (voltage level, transformer substation, DSO) 3. Location (GPS coordinates) 4. Active power 5 Based on these data, flexibility resource will be	
	Grid pregualification	registered in the flexibility register. Otherwise, grid prequalification test can be required from DSO. This is information to FSP about the grid prequalification	
Info10	report	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: 1. Type of the DER 2. Connection information (DSO, nominal voltage, transformer substation ID, GPS location) 3. Installed power 4.	
Info16	Prequalification information	Document with the prequalification results.	
Info17	Product prequalification request	Request for product prequalification with accompanying documents.	
Info18	Product prequalification test results	Results of tests run by DSO.	




Info19	Product prequalification requirements	Detailed description of the flexibility service product and requirements. This is a document.	
Info20	Product prequalification report		
Info21	Volume acknowledged	FSP agrees with the calculated volume related to the delivered flexibility service.	
Info22	Bill	Document, not modelled in CIM.	
Info23	Reimbursement	This information is related to the sending the invoice and payment. It will not be modelled with CIM.	
Info24	Flexibility service volume	Information about calculated delivered volume, from the baseline and measurements.	
Info25	Recalculation request	FSP determinates the deviation in the calculated volume and requests a check of the calculation.	
Info26	Volume validation request	After delivered flexibility service, volume is determined based on measurements. This volume is a basis for reimbursement.	

## 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           lines. The main scope of EACL-HU-01 is to mitigate voltage variations o         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



#### 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).

	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.				

## 10.4.3.1.1.5 Key performance indicators (KPI)

#### 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.				





## 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



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## 10.4.3.1.3 Technical details

10.4.3.1.3.1 Act
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Actors							
Grouping (e.g. domains, zo	ones)	Group description					
Bidding zone Metering point		The actors are grouped by the two layers of the market structure: the operation area of each participating DSO, and the location of metering points (i.e. HV/MV transformer supply area)					
Actor name	Actor type	Actor description	to this use case				
DSO	<ul> <li>Grid Access Provider</li> <li>Data Provider</li> <li>System operator</li> </ul>	Active actor Responsible for maintaining service quality (e.g. EN 50160) and quantifying flexibility service needs Participates in energy auctions and energy activations	In the present BUC, the DSO is responsible for the operation of the distribution network and all related technical matters.				
TSO	<ul> <li>System Operator</li> <li>Data Provider</li> </ul>	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	<ul> <li>Flexibility/Balancing Service</li> <li>Provider</li> <li>Resource aggregator</li> <li>Producer / Consumer</li> <li>Party connected to the grid</li> <li>Flexibility service provider being aggregator</li> </ul>	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	<ul> <li>Market operator</li> <li>Data Provider</li> <li>Merit Order List Responsible</li> </ul>	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	<ul> <li>Flexibility register provider // consent administrator</li> <li>TSO-DSO coordinator platform provider // coordinated cap. calculator</li> <li>Market interface provider / market information aggregator</li> </ul>	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	<sup>r</sup> scenarios
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	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





## 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	1-02	
1.4	Prequalification results	Prequalification result is sent to the Market Operator (MO)	DSO	MO (Flexi register)	1-03	

<u>Step No 1.1 / Prequalification request</u>

## Business section:

Information sent:

Business object	Instance name	Instance description
FSP initialization data for prequalification	data transfer	FSP initializes prequalification

• <u>Step No 1.3 / Approval of pregualification</u>

## Business section:

Information sent:

Business object	Instance name	Instance description
FSP qualification result	Data transfer	Status of FSP prequalification
		•

<u>Step No 1.4 / Prequalification results</u>

Business section:

Information sent:

Business object	Instance	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

	·			Scen	ario				
Scenario name		Scenario 2: Forecasting							
Step No		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	1-04		
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	тѕо	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		

• <u>Step No 2.1 / Set database for modelling</u>

## 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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• <u>Step No 2.3 / DSO informs TSO on flexibility needs</u>

## Business section:

Information sent:

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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
•	<u>Step No 2.4 / D</u>	SO 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

		· · · · ·		Scen	ario			
Scenario name		Scenario 3: W-1 fle	xibility procurement					
Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R- IDs
3.1		Flexibility market opening, DSO needs announced	Market interface announces flexibility needs		1)Market Operator (MO) 2) MO (market interface)	1) MO (order book) 2) FSP	I-05	
3.2		FSPs submit bids	FSP submit bids to W-1 & D-1 order book		FSP	MO (flexi register)	1-06	



3.3	W-1 és D-1 FSP bid prequalification	FSP bid prequalification by MO	мо	мо		
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)	1-06	
3.5	Clearing	Clearing is executed	мо	мо		
3.6	Results of the clearing are transferred and announced	Market operator shares clearing result with the market interface	мо	MO (market interface)	1-07	

<u>Step No 3.1 / Flexibility market opening, DSO needs announced</u>

## **Business section:**

#### Information sent:

l

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)
• <u>Step</u>	No 3.4 / FSP bids deliver	<u>ed</u>

**Business section:** 

Information sent:

Business object	Instance name	Instance description
FSP supply bid	Data exchange	W-1/D-1 priced bid (+additional parameters)
•	Sten No 3.6 / Results of th	ne 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







scena	mo step	<u>by step analysis</u>							
				Scen	ario				
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	1-08		
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	тѕо	I-05		
4.4		DSO delivers flexibility needs	DSO informs MO of the flexibility needs		1) DSO 2) DSO	1) MO (W-1 & D-1 order book) 2) MO (market interface)	1-05		

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4.5	Flexibility market opening, DSO needs announced	Market interface announces flexibility needs	1) MO (order book) 2) MO (market interface	1) MO (order book) 2) FSP	I-05	
4.6	FSPs submit bids	FSP submit bids to D-1 order book	FSP	MO (flexi register)	I-06	
4.7	D-1 FSP bid prequalification	FSP bid prequalification by MO	МО	мо		
4.8	FSP bids delivered	FSP bids are submitted to D-1 order book	MO (flexi register)	MO (D-1 order book)	1-06	
4.9	Clearing	Clearing is executed	мо	мо	I-07	
4.10	Announcement	Market operator shares clearing result with the market interface	MO (market interface)	MO (market interface)		

• <u>Step No 4.1 / DSO receives data for modelling flexibility needs</u>

**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

<u>Step No 4.3 / DSO informs TSO on flexibility needs</u>

## **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
	Chain Nie A A /	

<u>Step No 4.4 / DSO delivers flexibility needs</u>

**Business section:** 

#### Information sent:

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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
• <u>Step</u>	No 4.6 / FSPs su	bmit bids_

**Business section:** 

#### Information sent:

Business object	Instance name	Instance description
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)
• <u>St</u>	ep No 4.8 / FSP bids delivered	

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General action (clearing) results; List of accepted bids

## **Business section:**

Informat	tion sent:		
Business object	Inst	tance name	Instance description
FSP supply bid	Dat	a transfer	D-1 priced bid (+additional parameters)
•	Step No 4.9	/ Clearing	
Business	s section:		
Informat	tion sent:		
Business object		Instance name	Instance description

Data transfer

## 10.4.3.1.5 Information exchanged

Information on DSO needs

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);			
1-03	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			
1-06	FSP supply bid	W-1/D-1 priced bid (+additional parameters)			
I-07	Clearing result	General action (clearing) results; List of accepted bids			
1-08	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			
	Increasing renewable penetration causes violation of standard voltage bands on MV		
Scope	lines. The main scope of EACL-HU-01 is to mitigate voltage variations of MV feeders		
	by activating flexibility services.		
Objective(c)	The objective of the use case is to keep actual voltage values of MV feeders within		
Objective(s)	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)
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	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.	

## 10.4.3.2.1.6 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





## 10.4.3.2.3 Technical details

## 10.4.3.2.3.1 Actors

Actors					
Grouping (e.g. domains, zones)		Group descriptior	Group description		
Bidding zone Metering point			The actors are grouped by the two layers of the market structure: the operation area of each participating DSO, and the location of metering points (i.e. HV/MV transformer supply area)		
Actor name	Actor type		Actor description	Further information specific to this use case	
DSO	•	Grid Access Provider Data Provider System operator	Active actor Responsible for maintaining service quality (e.g. EN 50160) and quantifying flexibility service needs Participates in energy auctions	In the present BUC, the DSO is responsible for the operation of the distribution network and all related technical matters.	



		and energy activations	
TSO	<ul><li>System Operator</li><li>Data Provider</li></ul>	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	<ul> <li>Flexibility/Balancing Service</li> <li>Provider</li> <li>Resource aggregator</li> <li>Producer / Consumer</li> <li>Party connected to the grid</li> <li>Flexibility service provider being aggregator</li> </ul>	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	<ul> <li>Market operator</li> <li>Data Provider</li> <li>Merit Order List</li> <li>Responsible</li> </ul>	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	<ul> <li>Flexibility register provider // consent administrator</li> <li>TSO-DSO coordinator platform provider // coordinated cap. calculator</li> <li>Market interface provider / market information aggregator</li> </ul>	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				



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		
---	--	--	--------------------	--	--	--

## 10.4.3.2.4.2 Steps - Scenarios

## Scenario 1: Prequalification



## Scenario step by step analysis

		· · · ·		Scen	ario					
Scena name	irio	Scenario 1: Prequa	cenario 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	1-02			
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

• <u>Step No 1.3 / Approval of pregualification</u>

**Business section:** 

Information sent:





Business object	Instance name	Instance description		
FSP qualification result	Data transfer	Status of FSP prequalification		
Step No 1 4 / Pregu	ualification results			

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										
Scent name	ario ?	Scenario 2: Forecas	cenario 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	1-04				
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	тѕо	1-05				



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	
-----	-----------------------------------	---	--	-----	---	------	--

• <u>Step No 2.1 / Set database for modelling</u>

## 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				
<ul> <li>Step No 2.3 / DSO informs TSO on flexibility needs</li> </ul>						

Business section:

## Information sent:

Business object	Instance name	Instance description
Flexibility service	Data ovchango	Quantity, type (capacity/activation), bid price, location, timing of demand;
need	Data exchange	TSO response according to the traffic light concept

Step No 2.4 / DSO delivers flexibility needs

Business section:

Information se	<u>nt:</u>	
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	Scenario 3: W-1 flexibility procurement						
name							





Step No	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R- IDs
3.1		Flexibility market opening, DSO needs announced	Market interface announces flexibility needs		1)Market Operator (MO) 2) MO (market interface)	1) MO (order book) 2) FSP	I-05	
3.2		FSPs submit bids	FSP submit bids to W-1 & D-1 order book		FSP	MO (flexi register)	1-06	
3.3		W-1 és D-1 FSP bid prequalification	FSP bid prequalification by MO		мо	мо		
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)	1-06	
3.5		Clearing	Clearing is executed		мо	мо		
3.6		Results of the clearing are transferred and announced	Market operator shares clearing result with the market interface		мо	MO (market interface)	1-07	

<u>Step No 3.1 / Flexibility market opening, DSO needs announced</u>

## Business section:

|--|

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)
• <u>Step</u>	No 3.4 / FSP bids deliver	<u>ed</u>

Business section:

Information sent:

Business object	Instance name	Instance description	
FSP supply bid	Data exchange	W-1/D-1 priced bid (+additional parameters)	
• S <sup>.</sup>	tep No 3.6 / Results of th	ne clearing are transferred and announced	

Business section:

initorination sent.
---------------------

mormation senti				
Business object	Instance name	Instance description		
Clearing result	promulgation (?)	General action (clearing) results; List of accepted bids		
 A: D 1 flovibility procurement				

Scenario 4: D-1 flexibility procurement

Collection of supply bid in the order book, market clearing in D-1





Scena	ino step	by step analysis						
	Scenario							
Scenario 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	1-08	
4.2		DSO determines flexibility needs	DSO determines the amount and spatial-temporal location of service needs		DSO	DSO		
4.3		DSO informs TSO DSO-TSO data on flexibility needs exchange			DSO	тѕо	I-05	
4.4		DSO delivers flexibility needs	DSO informs MO of the flexibility needs		1) DSO 2) DSO	1) MO (W-1 & D-1 order book) 2) MO (market interface)	1-05	

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4.5	Flexibility market opening, DSO needs announced	Market interface announces flexibility needs	1) MO (order book) 2) MO (market interface	1) MO (order book) 2) FSP	I-05	
4.6	FSPs submit bids	FSP submit bids to D-1 order book	FSP	MO (flexi register)	I-06	
4.7	D-1 FSP bid prequalification	FSP bid prequalification by MO	МО	мо		
4.8	FSP bids delivered	FSP bids are submitted to D-1 order book	MO (flexi register)	MO (D-1 order book)	1-06	
4.9	Clearing	Clearing is executed	мо	мо	I-07	
4.10	Announcement	Market operator shares clearing result with the market interface	MO (market interface)	MO (market interface)		

• <u>Step No 4.1 / DSO receives data for modelling flexibility needs</u>

**Business section:** 

## Information sent:

Weather forecast and	Weather forecast; Grid condition status and outage from maintenance;
historical grid operation	Time series data of consumer/ prosumer/producer plans; Historical data
dataset	for production forecasting

<u>Step No 4.3 / DSO informs TSO on flexibility needs</u>

## **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
	c) N 4 4 4	

<u>Step No 4.4 / DSO delivers flexibility needs</u>

**Business section:** 

#### Information sent:

٠

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		
• <u>Step No 4.6 / FSPs submit bids</u>				

## **Business section:**

#### Information sent:

Business object	Instance name	Instance description
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)
• <u>Step N</u>	Io 4.8 / FSP bids delivered	





## **Business section:**

Information s	<u>ent:</u>		
Business object	Instance name	Instance description	
FSP supply bid	Data transfer	D-1 priced bid (+additional parameters)	
• <u>Ste</u>	p No 4.9 / Clearing		
Business sect	ion:		
Information c	ont		

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	Information exchanged, ID D					
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				
1-08	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				
cope 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 descrip	otion	
The newly cr	eatec	IT environment shall cover activities related to procurement of non-frequency services. The system
shall:		
	٠	accommodate different types of non-frequency services
	٠	enable DSOs to procure non-frequency services in a way that fits to needs of operation of distribution
	grio	
	•	allow access for FSP/units to the platform in order to provide non-frequency services
	•	enable via traffic light system availability for activation of relevant resources
Complete de	script	tion
I Administra	tion	module
	1.	FSP and Units providing Non-frequence services are registered into the system
	2.	The system uses specific identification code (EAN) which is unique to any unit providing flexibility, and
	EIC	code unique for each FSP.
	3.	Each unit needs to specify its reserved capacity and to which FSP provider belongs (if relevant)
	4.	The system also involved system operators (DSOs,TSO)
II Market m	odul	e non-frequency services
	1.	Registration of needs and offers via GUI or API
	2.	Overview of needs and flexibility bids (offered / accepted values)
	3.	Each unit needs to specify its location (nodal area), capacity, FSP provider (if relevant)
	4.	Semi-automatic evaluation (needs-offers matching) supervised by TSO / DSOs
III Availabili	ty for	activation of relevant resources (via traffic light system)
	1.	DSO reports every unavailability of the distribution grid through announcement on the grid events
	2.	Way of reporting is different for planned outages/outages $ ightarrow$ planned events also includes planned
	dur	ration (from – to) which is impossible indicate in case of sudden outages
	3.	As a dedicated communication tool XML messages are used
	4.	This information of grid unavailability is automatically sent through ECP communication to
	the	registered units and FSP
	5.	The system also displays grid unavailability as a traffic light via GUI to the registered units and FSP
L		

## 10.4.4.1.2 Technical Details

	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			

#### 10.4.4.1.2.1 Actors



		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

FSP	DSO	PLATFORM
Registration	stration FSP , est regis Evaluation of parameters	/ Unit stration FSP / Units Register

Administration module

## Scenario step by step analysis

	Scenario							
Scen	ario name	Administration m	nodule – registrati	ation				
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





## Scenario step by step analysis

	Scenario									
Sce	nario name	Market module	Non-frequency s	services						
Ste p No	Event	Name of process/activit y	Description of process/activit y	Service	Informatio n producer (actor)	Informatio n 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			



	1	1	1				[	
			is dedicated					
			XML message					
			containing					
			details on type					
			of service and					
			duration.					
			The platform					
			verifies the					
			relevance of		Platform	Platform		
			offers (in terms				Platform → Platfor m	
2.2	Offers	Data verification	of correct XML	Data verification				
2.3	relevance verification		message					
			format, traffic					
			light status to					
			given units					
			etc.)					
			The					
			platform inform		Platform	DSO	Platform $\rightarrow$ DSO	
2.4	Offers – data	Data delivery	s DSOs on	Data				
	transfer		offers	delivery				
			available					
			DSOs inform					
2.5	o.((		relevant units					
	Otters –	ce Data delivery	on the	information	Platform	FSP	Platform → FSP	
	acceptance		acceptance of	aelivery				
			the service					

## #3 Availability for activation of relevant resources (via traffic light system) Availability for activation of relevant resources

(via traffic light system)



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Sce	Scenario step by step analysis										
				Scenario							
Scenario name		Availability for a	Availability for activation of relevant resources (via traffic light system)								
Ste p No	Event	Name of process/activit y	Description of process/activity	Service	Informatio n producer (actor)	Informatio n receiver (actor)	Information exchanged (IDs)	Requiremen t, R-IDs			
3.1	Report	Report of availability	DSOs reports system availability concerning planned/ unplanned gr id events	Grid report	DSO	Platform	DSO $\rightarrow$ 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 → Platfor m				
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 displa Y	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 $\rightarrow$ 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:						
• also	registration of all participants FSP/DSO/TSO into the system (database includes o reserved capacity of FSP, location and other details)						
•	DSO to report and announce outages (interruptions) / planned outages						
•	FSP to report day ahead contracted capacities (for DSO to consider load in given nodal areas)						
Complete description							
I Administration	nodule						
1.	FSP and Units providing flexibility are registered into the system						





2.	The system uses specific identification code (EAN) which is unique to any unit providing flexibility, and
EIC	code unique for each FSP.
2	Factory with presidents appreciate its presented service and to which FCD presidents belower (if relevant)

- 3. Each unit needs to specify its reserved capacity and to which FSP provider belongs (if relevant)
- 4. The system also involved system operators (DSOs,TSO)

## II Outages/planned outages announcement

- 1. DSO reports every unavailability of the distribution grid through announcement on the grid events
- 2. Way of reporting is different for planned outages/outages  $\rightarrow$  planned events also includes planned
- duration (from to) which is impossible indicate in case of sudden outages
- 3. As a dedicated communication tool XML messages are used
- 4. This information of grid unavailability is automatically sent through ECP communication to
- the registered units and FSP
- 5. The system also displays grid unavailability as a traffic light via GUI to the registered units and FSP

#### III FSP – contracted capacities of Ancillary services

- 1. FSP reports to the system on day ahead basis amount of contracted capacities
- 2. Reports includes namely contracted capacity and duration of service
- 3. As a dedicated communication tool XML message are used
- 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. dom zones)	ains,	Group description						
			Further information					
Actor name	Actor type	Actor description	specific to this use					
			case					
		A natural or legal person who is responsible for operating, ensuring						
Distribution System	Business	the maintenance of and, if necessary, developing the distribution						
Operator (DSO)		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						
	Business	A natural or legal person who is a market participant providing						
Aggregator		flexibility services to any electricity market that represents and						
, 66, 664 (C)		aggregates the capacity of the entities that own a distributed						
		energy resources (DER).						
		IT environment allowing for market parties exchange of market-based						
		flexibility products, providing necessary feedback on						
Platform	IT	Aggregators/Units involved in flexibility provision. Moreover, in gives						
		all participant relevant information on the grid availability through						
		traffic light scheme.						
Unit/Flexibility	Business	Single units (part of the portfolio of the aggregator) proving flexibility						
provider	24311633	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





## Administration module



Scer	cenario step by step analysis										
			Sce	enario							
Scer	nario name	Administration module – registration									
Ste p No	Event	Name of process/activity	Description of process/activity	Service	Informatio n producer (actor)	Informatio n receiver (actor)	Informatio n exchanged (IDs)	Requirement , R-IDs			
1.1	Initial of registration	Registration request	The FSP (units/users) wil I 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 int o 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





## Outages / planned outages announcement



Scenario step by step analysis Scenario Scenario name Outages/planned outages announcement Informati Informati Ste Name of process/activit process/activit Information Requireme on on Event Service producer receiver exchanged (IDs) nt, R-IDs No (actor) (actor) DSOs reports Report system unavailability Grid 2.1 Report of unavailabilit concerning DSO Platform DSO  $\rightarrow$  Platform report planned/ unplanned g rid events The platform selects reported grid events Data Recipient Platform  $\rightarrow$  Platfor processing Platform 2.2 Selection (according to Platform selection m reported data) to individual units Each unit is provided an information detailing Traffic Traffic beginning/end of Traffic light notificati 2.3 light notificati light displa Platform planned outage and Unit Platform  $\rightarrow$  Unit on on beginning of unplanned outage in given time framework

#3 FSP - contracted capacities of Ancillary services



## FSP contracted capacities of Ancillary services



<u>Scen</u>	cenario step by step analysis							
				Scenario				
Scen	ario 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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