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Proceedings of Final Conference in Brussels

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D7.7.3 – Proceedings of Final Conference in Brussels

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Executive summary

After three years and a half development, the CoordiNet project, responding to the "TSO – DSO – Consumer: Large-scale demonstrations of innovative grid services through demand response, storage and small-scale generation" challenge of the Horizon 2020 programme, concluded with a two-day Final Conference held in Brussels on June 16th and 17th, 2022. The event was widely advertised in the preceding months, through social media and the networks of the partners involved in the project, and with the support of a video, virtual posters and a communication kit specifically designed for the event. Finally, the conference, organised in a hybrid format, saw the participation of a total of one hundred twenty-five attendees, representing several stakeholder categories, including local and national governments, regulators, system operators, flexibility service providers and European and academic institutions.

During the two days of the event, the steps of the CoordiNet project were retraced back from the beginning of its journey. On the first day, a special focus was set on the experiences of the three large-scale demonstrators, located in Spain, Sweden, and Greece. The partners of the respective campaigns presented the realised work, their achievements and milestones, highlighting the evolution of flexibility markets in their country from project start to future steps after the conclusion of their demos. Flexibility Service Providers took the stage to complement the experience of DSOs and TSOs involved in the project with the point of view of the consumers. On the second day, the key lessons learnt from the project were presented to the audience, looking in-depth at the defined products and coordination schemes, market platform and architecture, economic assessment and scalability and replicability of the CoordiNet solution. Looking toward the future of electricity markets in Europe, the audience was actively engaged in the presentation of the *Roadmap towards a new market design*, consolidating all the outcomes and insights derived from the CoordiNet experience.

The Final Conference further saw the participation of external keynote speakers, who contributed to defining the contexts of the CoordiNet demonstration countries, presented the envisioned contribution of TSOs, DSOs, consumers, and other energy stakeholders in the scaling up of flexibility exploitation and provided a forward look to the future of electricity markets.

Henceforth, the CoordiNet project concluded with a successful event and, despite the difficulties entailed by the COVID-19 pandemic, achieved its objectives and milestones, produced high-quality communication and dissemination material, and actively engaged relevant energy stakeholders both within and outside the countries of the Consortium. All in all, CoordiNet has been effective in paving the way towards harmonised flexibility markets in Europe.

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1. Introduction

1.1. The CoordiNet project

The CoordiNet project is a response to the call LC-SC3-ES-5-2018-2020, entitled "TSO – DSO – Consumer: Large-scale demonstrations of innovative grid services through demand response, storage and small-scale generation" of the Horizon 2020 programme. The project aims at demonstrating how Distribution System Operators (DSO) and Transmission System Operators (TSO) shall act in a coordinated manner to procure and activate grid services in the most reliable and efficient way through the implementation of three large-scale demonstrations. The CoordiNet project is centred around three key objectives:

1. To demonstrate to which extent coordination between TSO/DSO will lead to a cheaper, more reliable and more environmentally friendly electricity supply to the consumers through the implementation of three demonstrations at large-scale, in cooperation with market participants.
2. To define and test a set of standardized products and the related key parameters for grid services, including the reservation and activation process for the use of the assets and finally the settlement process.
3. To specify and develop a TSO-DSO-Consumers cooperation platform starting with the necessary building blocks for the demonstration sites. These components will pave the way for the interoperable development of a pan-European market that will allow all market participants to provide energy services and opens up new revenue streams for consumers providing grid services.

In total, ten demo activities will be carried out in three different countries, namely Greece, Spain, and Sweden. In each demo activity, different products will be tested, in different time frames and relying on the provision of flexibility by different types of Distributed Energy Resources (DER). Figure 1 presents an approach to identify (standardized) products, system services, and coordination schemes to incorporate them into the future CoordiNet platform for the realization of the planned demo activities.

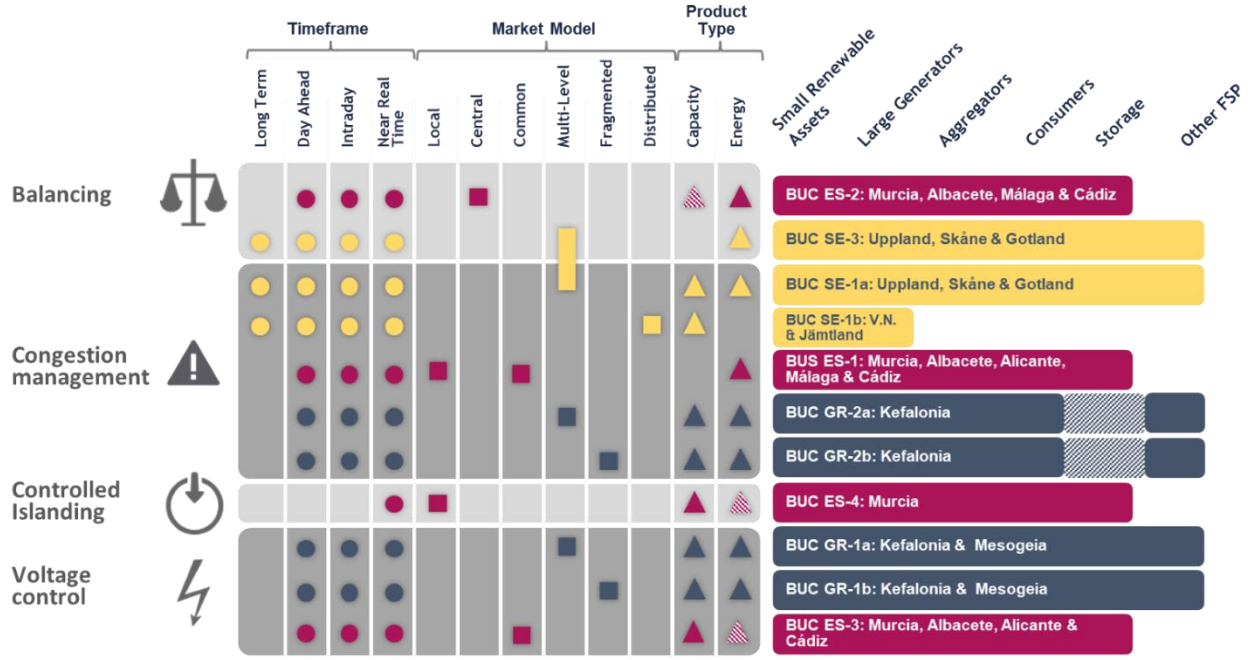

Figure 1: Overall CoordiNet approach: Services, timeframes, coordination schemes and products that will be demonstrated in different countries (Spain in pink, Sweden in yellow, and Greece in grey)

1.2. Scope of the document

This document provides a thorough report of the proceedings of the CoordiNet Final Conference, held in Brussels in hybrid format on June 16th and 17th. The event is the outcome of Task 7.7, aimed at collecting and presenting the final recommendations from the project and its demonstrations during a final conference open to external stakeholders. Thus, the event also served as the final platform for stakeholder engagement with the project, as part of the Stakeholder Forum meetings and activities implemented within Task 7.3 of CoordiNet. This document presents the rationale behind the event's organisation. It describes the content of its sessions while highlighting their links to the work done during the project and the insights derived from it. The proceedings also reserve attention to the active participation of stakeholders during the event.

Chapter 2 of this report presents the concept behind the agenda of the CoordiNet final conference and provides information about its organisation, format, and stakeholder participation. Chapter 3 further elaborates on the sessions held during the event, presenting the speakers, the content of their presentations, and the discussions with stakeholders present at the event. Lastly, Chapter 4 provides the conclusions derived from these proceedings.

Additional information on the CoordiNet final conference can be found in D7.7.2 *Press release on Final Conference in Brussels*, whereas a description of the promotion and communication strategy related to the event is included in D7.7.1 *Communication kit for Final Conference in Brussels*. Finally, an overview of all the Stakeholder Forum activities organised during the project can be consulted in D7.3.3 *Stakeholder Forum Report*.

1.2.1. Notations, abbreviations, and acronyms

AB	Advisory Board
BEMS	Building Energy Management Systems
BUC	Business Use Case
CA	Consortium Agreement
CHP	Combined Heat and Power
CS	Coordination Scheme
DoW	Description of Work
DR	Demand Response
DER	Distributed Energy Resource
DSO	Distribution System Operator
EDSO	European Distribution System Operators for Smart Grids (non-profit association)
EEGI	European Electricity Grid Initiative
ENTSO-E	European Network of Transmission System Operators for Electricity
EPIA	European Photovoltaic Industry Association
EU	European Union
EV	Electric Vehicle
EWEA	European Wind Energy Association

GA	Grant Agreement
FP7	Seventh Framework Programme
FSP	Flexibility Service Provider
LV	Low Voltage
LTP	Liked Third Parties
MV	Medium Voltage
P2P	Peer To Peer
PAS IEC	Publicly Available Specification
RTD	Research and Technology Development.
SO	System Operator
T&D	Transmission and Distribution
TSO	Transmission System Operator
WP	Work Package

Table 1: Acronyms list

2. The CoordiNet Final Conference concept

As one of the final acts of dissemination activities, the Consortium organized the Final Event of the CoordiNet Project. The dissemination team sent out a "save the date" in April 2022 to attract stakeholders' attention to the event and make sure that project partners could attend. In May 2022, the registration form for physical attendance of the event was opened so that stakeholders could start signing up for the event. The link was shared through various outlets including LinkedIn, Twitter, and personal emails. Finally, at the beginning of June 2022, stakeholders were given the opportunity to register to join the event virtually. The registration to the event was also used as a platform to engage stakeholders in the CoordiNet Stakeholder Forum.

To ensure the proper participation of external stakeholders, finding a conference room that could host up to 130 people, close to main transportation facilities was also important. Among the different offers, the most convenient one, when considering the price and services offered and quality, the conference centre 'Blue Point Brussels' was identified.

2.1. Agenda

The Consortium organised the two-day conference following a structure that told the story of the CoordiNet project and showcased their experience, as can be seen in the agenda in Figure 2.

THE COORDINET FINAL EVENT - Agenda	
	Day 1 - 16th June
14h15	**Doors open**
14h45	Welcome by **Marco Baron**, *Project Coordinator*
15h00	Introductory Speech by **Roberto Zangrandi** *Secretary General at E.DSO*
15h10	1st Destination: Greece with **Nikos Hatziargyriou**, *Emeritus Professor in Power Systems at the NTUA*
15h20	2nd Destination: Sweden with Swedish regulator **Elin Broström** *Head of Unit, Department for Market Surveillance and International Affairs, The Swedish Energy Markets Inspectorate*
15h35	3rd Destination: Spain with **Cristina Corchero** *CTO and Founder of BambooEnergy, Serra Hunter Professor at UPC and Head of the Energy Systems Analytics Group at IREC*
15h45	Summary of the CSs, services and products with **Kris Kessels,** *Senior Researcher energy markets at VITO*
15h55	**Coffee Break**
16h10	Demo Leaders' Panel: **Emmanouil Voumvoulakis** *Electrical Engineer at Hellenic Electricity Distribution Network Operator SA (HEDNO),* **Marios Sousounis** *Research Engineer at Independent Power Transmission Operator (IPTO or ADMIE)* **Yvonne Ruwaida**, *Business strategist for Vattenfall Eldistribution* , **Linda Schumacher,** *Project manager for Svenska kraftnät* **Miguel Pardo** *New Business Opportunities Development at e-distribución,* **Arderius Davi** *New Business Opportunities Development e-distribución* , **David Martin** *DSO role responsible at i-DE* , **Alberto Gil** *Senior Electrical Engineer and Mathematician at Red Eléctrica de España*
16h50	Panel focussed on FSPs: **Viktor Gårdö** *Vattenfall AB responsible for demand response as a flexibility service provider for industry customer with battery* . **Jonathan Ridenour**, *NGENIC, independent aggregator for 3 property owners and 400 households,* **Javier Rodriguez** *Head of Operation at Wind, Solar & Biomass Iberia Control Room at Enel Green Power*
17h20	Closing By **Norela Constantinescu** *Head of Section Innovation at ENTSO-E*
17h30	**Walking cocktail**
	Day 2 - 17th June
9h00	**Doors Open**
9h30	**Welcome** by Marco Baron
9h40	CoordiNet Lessons Learnt: **Kris Kessels,** *Senior researcher energy markets at VITO* **, Dimitris Trakas** *Postdoctoral Researcher at the NTUA,* **Carlos Madina** *Project Manager at Tecnalia* **Jose Pablo Chaves Avila** *Deputy Director at Institute for Research in Technology, Comillas Pontifical University*
10h45	**Coffee Break**
11h45	CoordiNet Roadmap by **Rebecca Samuelsson** *Program Director at Energiforsk AB*
12h30	Panel; Where will the CoordiNet Journey Continue? **Natalie Samovich** *Chair ETIP-SNET WG1* **Willem van den Reek** *Product & Market DeveloperProduct & Market Developer at Alliander* **Luciana Sant'Ana Marques Arnoux** *from the OneNet Project*
13h00	Closing remarks by *Project Coordinator* **Marco Baron** and *Dissemination Leader* **Jose Pablo Chaves Avila**

Figure 2. Agenda of the CoordiNet final conference.

The first day of the event revolved around the project's work during its three and a half years of implementation, focusing on the experiences of the three large-scale demonstration campaigns. The first day saw the participation of the demonstration leaders, Flexibility Service Providers (FSPs) and the involved Consortium members. The second day of the event focused on the lessons learnt from the project experience. The conference concluded with a look at what the future holds for flexibility markets in Europe after the conclusion of the CoordiNet project, with presentations from ETIP SNET, Alliander as a Linked

Third Party (LTP) of CoordiNet and the OneNet project. Throughout the two days, many high-level speakers took the floor to deliver keynote speeches on the role of flexibility in our current and future energy system. More detail regarding the presentations and the speakers delivering them can be found in Chapter 3 of this deliverable.

2.2. Participation

The event saw several participants and representatives from different stakeholder groups which included the following sectors:

- Local and National Governments
- Regulators
- Distribution System Operators
- Transmission System Operators
- Flexibility Service Providers
- Academic Institutions
- European Commission and other Horizon 2020 project participants
- Other stakeholders

The total number of participants was one hundred twenty-five, with fifty-nine attending physically and sixty- six listening in virtually. To ensure the event saw adequate participation from external stakeholders, the dissemination team ensured proper promotion on social media, more specifically LinkedIn and Twitter, with various posters being uploaded, encouraging people to sign up and attend the event. Apart from the latter, a LinkedIn event was set up with a more thorough overview of what attendees were to expect. Thereby they could also promote their attendance by clicking on 'going.' This happened in line with a developed communication kit, tailored to attract both physical and virtual participants. More detail regarding the communication kit can be found in CoordiNet Deliverable D7.13, D7.7.1 *Communication kit for Final Conference in Brussels*. Throughout the event, the audience was actively engaged by using interactive slides and the option to send in questions, either through the Q&A box and Mentimeter, which was used for the presentation on the *CoordiNet Roadmap* and described in Chapter 3.6, and was allowed to intervene during the presentations.

Apart from ensuring external stakeholder participation in the audience, the dissemination and the management teams decided that key external stakeholders should be invited to speak and present at the final event. Personalised email invitations were sent out to potential speakers, with some opting to join and give their speeches virtually. More information on the speakers and the topics discussed can be in the following Chapter 3.

Figure 3 to Figure include selected pictures taken on the days of the Final Conference.

Figure 3. Picture from the conference, highlighting the audience.

Figure 4. Picture from the conference, highlighting the audience.

Figure 5. Speakers joining the event virtually.

Figure 6. Group picture with some of the final Conference attendees.

3. The CoordiNet final conference sessions

The following chapter contains a section for each thematic session of the CoordiNet Final Conference, according to the agenda presented in Figure 2. Each section includes a brief explanation of its relevance for the CoordiNet project, the presentation of the speakers and/or panellists, and a summary of the presentations or discussions delivered.

During the event, participants attending both physically and online were able to ask questions to the speakers. These questions are listed at the end of each of the following sections together with the transcriptions of the answers provided orally.

3.1. The CoordiNet destinations

In this first session, keynote speakers from the demonstration countries, and *the CoordiNet destinations*, introduced the national context, current situation and the activities that are following up on the project implementation. The presenters provided an overview of the status of the power system and what are the barriers (or necessary steps) for the implementation of a local flexibility market in their respective countries and also sketch out what are the necessary steps to unlock the DER flexibility at the distribution system and to use it for the reliable operation of distribution and transmission systems.

3.1.1. Spain

The *Spanish destination* was presented by **Cristina Corchero**, one of the founders of **Bamboo Energy**, a Serra Húnter professor at the **Polytechnic University of Catalonia** and head of the Energy Systems Analytics group at the **Institute for Energy Research of Catalonia (IREC)**.

The presentation's focus was on the Bamboo Energy aggregator platform, its participation in the Spanish demonstration campaign and the experiences from the participation in the Local Market BUC. **Ms Corchero** noted that the national regulation on flexibility participation was introduced about one and a half years ago, but not much has happened since then. The Bamboo spin-off strives to change the current situation by engaging actors such as DSOs, utilities, or consumers. However, regulatory barriers remain the biggest obstacle to the uptake of flexibility procurement, as the technological solutions are largely at disposal already. According to **Ms Corchero**, it is very helpful to have the opportunity to exchange experience and views in projects like CoordiNet to eliminate these regulatory barriers.

3.1.2. Sweden

The *Swedish destination* was presented by **Elin Broström**, Head of Unit of the Department for Market Surveillance and International Affairs of the **Swedish Energy Markets Inspectorate**.

In Sweden, **Ms Broström** pointed out, the CoordiNet project has contributed to creating functioning applications, such as the *sthlmflex platform*[1]. In Sweden, there are other drivers for introducing flexibility

[1] More information on *sthlmflex:* https://www.svk.se/sthlmflex

markets, for example, the capacity problems between transmission and distribution grids in some quickly expanding cities. The CoordiNet design allowed passing the unused flexibility services from distribution to transmission level, contributing to addressing those congestion problems.

In the next steps, it will be important to clarify the roles and responsibilities of different actors and stakeholders. Some additional regulatory issues on market monitoring could be improved. For example, the requirements on market bid procurement should explain what is allowed and what is not. There is an open consultation planned for this summer to gather the opinion of stakeholders. Another focus point for future work is the network planning process. The network development plans should take flexibility into account to properly evaluate the investment needs and to bring a better picture of the cost and benefits of investment alternatives. Finally, the competitive procurement of flexibility should not be the only measure adopted. Regulatory incentives for flexibility measures should also be introduced.

3.1.3. Greece

The *Greek destination* was presented by **Nikos Hatziargyriou**, Emeritus Professor in Power Systems at the **National Technical University of Athens (NTUA**).

Mr Hatziargyriou briefly introduced the Greek demonstrator, which investigated how the unlocked flexibility of the distribution system can be used by both TSOs and DSOs to address voltage and congestion issues. The demonstration focused on voltage control and congestion management services using two market models for the interaction between TSO and DSO: the Multi-Level Market Model and the Fragmented Market Model. The examined market model has been tested in three different timeframes including Day Ahead (DA), Intraday (ID) and Near Real-Time in the two demonstration areas of the Greek demo, Mesogia, and Kefalonia.

The results confirmed that the introduction of a local electricity market in the distribution system can enable and increase the procurement of ancillary services from resources located in the distribution grid to enhance network issues such as over-/under-voltages and line thermal overloading. In addition, the introduction allows the DSO to have a more proactive role in the operation of the distribution system while increasing the integration of RES in the system. The flexibility could be used to speed up the connection of the users to the distribution system and solve the network issues in the transmission system. Given that in the future, the RES penetration in the distribution system will increase significantly, reverse power flows will be caused, resulting in congestions and voltage violations. The analysis of the results indicates that the Multi-Level Market Model seems to have more advantages over the Fragmented Market Model since, through the interaction between TSO and DSO, the TSO has access to the flexibility offered by resources in the distribution grid and can use these services either for voltage control or congestion management.

With regards to the next steps following the project, **Mr Hatziargyriou** remarked that there are some challenges with missing technical equipment that would allow electronic control of the power inverters. Further digitalisation of network assets should allow such remote control. Nevertheless, the biggest challenge is the missing regulatory framework for creating flexibility markets. Follow-up research activities should also look more into the resilience of energy networks.

3.2. CoordiNet coordination schemes, services, and products

To set the context for the CoordiNet demonstrators' presentations and panel discussions organised for the Final Conference, a short introduction on the products and Coordination Schemes (CSs) introduced in the CoordiNet project and adopted by the different demonstrators was provided on the first day of the event. The presentation was given by **Kris Kessels**, senior energy market researcher at **VITO/Energyville**, work

package leader of WP6 *Market design and market platform: Lessons learned from demonstrations and recommendations to stakeholders*, and leader of Task 1.3 *Definition of Coordination Schemes and standardised products for grid services*.

First, the stepwise approach adopted by the project towards product definition was described, comprising the following steps:

1. Identification of TSO/DSO needs.
2. Identification of services.
3. Definition of a standarised list of product attributes.
4. Definition of products through ranges of values.
5. Identification of standard products for grid services.

The different products defined were introduced, followed by a description of the CSs, based on the categorised structure defined by the project that considers four main dimensions: system location of flexibility needs, primary buyer of flexibility, number of market layers, and direct access of TSOs to flexibility sources located at the distribution level, as shown in Figure 7. The presentation was concluded with an overview of the combination of services, products and CSs tested in the demonstrators of CoordiNet.

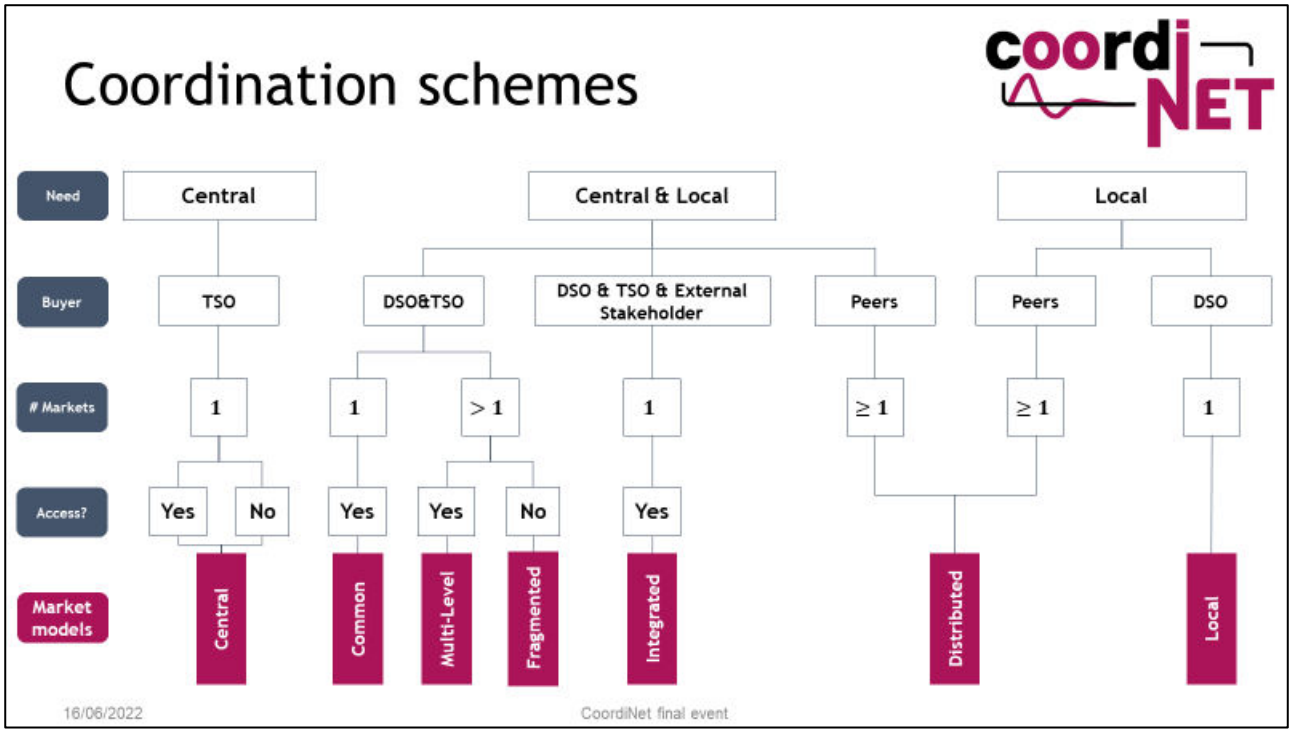

Figure 7. CoordiNet CSs categorisation, as presented during the first day of the Final Conference.

3.3. The CoordiNet demonstration campaigns

At the core of the first day of the CoordiNet Final Conference was the presentation of the experiences and results of the three large-scale demonstrators that operated in Greece, Sweden, and Spain. The partners involved in the demos joined the stage of the Final Conference to describe the respective journeys in the CoordiNet pilot locations, from before the implementation of the project solutions to the current achievements of the campaigns, concluding with considerations on the next steps for flexibility markets in their countries of operation.

3.3.1. Greece

The Greek demonstration campaign was represented by:

- **Emmanouil Voumvoulakis**, electrical engineer at **Hellenic Electricity Distribution Network Operator SA (HEDNO)**, leader of Work Package 5 and the Greek demo, and
- **Epameinondas Floros**, researcher at **Independent Power Transmission Operator (IPTO)** and participant partner in WP5.

Mr Voumvoulakis introduced the objectives of the Greek pilot, including the empowerment of consumers with a more active role in the management of the power system, the creation of services and products to generate new income streams, and the use of existing and new tools developed within CoordiNet to relieve grid constraints and solve congestion and other grid issues. To this end, the need for coordination among all actors in the power system was highlighted as fundamental.

The demo test sites were introduced: the **Mesogia** area, characterised by overvoltage problems during night and morning hours and under low load conditions, and the island of **Kefalonia,** connected to the mainland by submarine cables and affected by overvoltage problems during low demand periods and congestion issues. The demonstrator involved the integration of multiple flexibility sources, such as wind turbines, PV systems, batteries, small Combined Heat and Power (CHP) units, household Demand Response (DR), Building Energy Management Systems (BEMS), and small gen-sets. An overview of the market models, services, and types of products tested in the demo was provided, as well as the software tools developed for both the SOs and consumers (see Figure 8).

Mr Floros concluded the presentation with some key takeaways from the pilot testing. These included the advantages and disadvantages of using **Fragmented** and **Multi-level market models** for congestion management and voltage control considering market timing. Additionally, the importance of data exchange in the near future was remarked, and the need for a common model to standardise communication in flexibility markets was highlighted.

Question: Between the CSs tested in the Greek demo, is there one that has proven a higher potential?

Both **Mr Voumvoulakis** and **Mr Floros** agreed that the Fragmented CS would be easier to implement as flexibility procurement at the distribution and transmission levels is totally separated and the model resembles the current market practices. Nevertheless, this type of market model requires high liquidity. On the other hand, the **Multi-level** CS is more efficient since the flexibility sources connected at the distribution level can also be used in the transmission grid and spare the need for local balancing at the transmission level. This model, however, requires a higher workload in the implementation of communication between market operators and the management of the different market timeframes.

Figure 8. Mr Voumvoulakis, leader of WP5, presenting the CSs tested in the Greek demonstration campaign.

3.3.2. Sweden

The Swedish demonstration campaign was represented by:

- **Yvonne Ruwaida**, business strategist for **Vattenfall Distribution**, leader of Work Package 4 and the Swedish demonstration campaign, and
- **Linda Schumacher**, project manager for the Swedish TSO **Svenska kraftnät** and participant partner in WP4.

Ms Ruwaida introduced the objectives of the Swedish demo, committed to providing SOs with the necessary tools to handle their operation in the fast-changing energy system. The pilots' achievements included the successful setup of three open calls for flexibility services for congestion management, two for the mFRR market and one for a P2P market aimed at avoiding renewables' curtailment (see Figure 9). Moreover, the remarkable achievements of the demonstrator in stakeholder engagement were highlighted, with the organisation of seven national CoordiNet forums, actively engaging more than 500 representatives of different stakeholder groups, from national and local authorities to SOs and FSPs. The progress in SOs operation and coordination, enabled by the CoordiNet experience and developed market platform and flex tool, was highlighted as a major project milestone.

Ms Schumacher highlighted the high levels of FSPs' active participation in the project, which saw the integration of storage, Diesel generators, Electric Vehicles (EVs), and renewable generation plants. Last but not least, independent aggregators and suppliers acting as aggregators were identified as the new game-changers in the tested market models.

Ms Ruwaida and **Ms Schumacher** jointly presented some of the takeaways from the CoordiNet experience, such as the need for availability contracts for FSPs to cover their upfront investments and the importance of providing market information to new potential actors to unlock full flexibility potential and scale up the

investigated solutions. The presentation was concluded with an outlook on the continuation of the work initiated by CoordiNet, with the implementation of the *sthlmflex* and *Effekthandel Väst*[2] markets, the incorporation of flexibility into businesses system operation and processes at **Vattenfall Eldistribution** and **E.ON Energidistribution**, and the establishment of a dialogue channel among DSOs, TSOs, and national regulators.

Figure 9. Ms Ruwaida and Ms Schumacher presenting the achievements of the Swedish demonstration campaign.

3.3.3. Spain

The Spanish demonstration campaign was represented by:

- **Miguel Pardo** from **e-Distribución**, leader of Work Package 3 and the Spanish demonstration campaign,
- **Daniel Davi** from **e-Distribución**, leader of Work Package 3 and the Spanish demonstration campaign,
- **David Martin**, DSO role responsible at **iDE**, and
- **Alberto Gil**, responsible for the WP3 tasks of the Spanish TSO **Red Eléctrica de España**, joining the Final Conference virtually.

Mr Pardo opened the presentation with the objectives of the Spanish demonstration, which included testing different flexibility products and services, developing platforms to facilitate the participation of Distributed

[2] More information on *Effekthandel Väst:* https://www.goteborgenergi.se/foretag/vara-nat/elnat/effekthandel-vast

Energy Resources (DERs) in flexibility markets, and the fostering of DSO-TSO coordination. Among the flexibility resources successfully integrated in the trials were PV and micro-PV systems, EV charging stations, batteries, large generators, and big building compounds, enabled by aggregation and disaggregation supported by **Tecnalia** and **Bamboo Energy.** The role of aggregators in the pilots was highlighted as fundamental, together with their provision of flexibility forecasts and information flexibility activation to the market operators.

Mr Davi introduced the two platforms developed in the Spanish demo, the Local Market Platforms, addressing only DSO level needs, and the Common one, addressing TSO-DSO level issues. **Mr Davi** remarked how the results from the testing of the CoordiNet Common Platform were used as the basis to formulate a proposal for implementing flexibility markets at the national level. The outcomes of the project will overall constitute valuable input to regulation discussions.

Figure 10. Mr Pardo, Mr Davi and Mr Martin representing the Spanish demonstration campaign at the CoordiNet Final Event.

Mr Martin and **Mr Gil** anticipated the necessary next steps for flexibility market scalability after the conclusion of CoordiNet. Regulators at the EU level should enable the functionalities that DSOs, aggregators, and FSPs can cover to foster the uptake of flexibility procurement. Technological neutrality should be promoted, to grant market access to all products. The definition of roles, responsibilities, and models for the exchange of information between market participants was highlighted as fundamental. The provision of incentives for DSOs in procuring flexibility, including remuneration schemes, was recognised as a barrier to the uptake of the tested solutions. Finally, the asymmetry between SOs and FSPs was underlined. To this end, communication campaigns are needed to present the new roles that energy stakeholders could cover. The implementation of regulatory sandboxes is needed to test new and different kinds of resources and scale up the investigated solutions.

The session dedicated to the Spanish demo was concluded by **Mr Pardo** with a summary of the five key successes of the project:

1. CoordiNet successfully implemented and tested flexibility markets in Spain, despite the lack of regulatory framework and network code definitions on the subject in 2018 when the project started.
2. CoordiNet has provided a great example of TSO-DSO coordination, now increasingly automatized and digitalized.
3. CoordiNet tests in a real environment have demonstrated that the project solutions are scalable and replicable.
4. The Spanish campaign enabled the mass deployment of sensors on the LV side of secondary sub-stations.
5. CoordiNet results will provide input to the regulatory and technical debate in the EU and Spain. Regulatory sandboxes should be established to allow accelerated scalability of the proposed solutions.

3.4. CoordiNet customers engagement strategies

The final panel on the first day focused on key stakeholders outside the Consortium, namely FSPs engaged in the CoordiNet project. The session followed the presentations by the demo leaders and took their conclusions to the next level by focusing on customer involvement. Three representatives of FSPs, two from Sweden and one from Spain, were invited to participate in the conference, as will be elaborated in the following paragraphs. The Swedish demo had three open, transparent, and non-discriminatory calls for flexibility services for congestion management that recruited a total of 28 flexibility service providers including four independent aggregators. Two of them, **Viktor Gårdö** and **Jonathan Ridenour**, presented the customer experiences from their respective companies in Sweden. To extend this focus, **Javier Rodriguez** concluded the part on customer engagement strategies with a perspective on the Spanish context.

Question: How did the journey start for **Vattenfall AB** and what regulatory recommendations would you highlight as an aggregator?

Mr Gårdö, representative of **Vattenfall AB** and responsible for DR, underlined the importance of the CoordiNet project to gain experiences for future endeavours because they previously focused on TSO markets. The project inspired him to dig deeper into explored issues, which encompassed not only three markets but also various applications. Thereby, he highlighted the differences between the present TSO and CoordiNet markets. One of his major takeaways concerned the given competitiveness of his company in the market.

The CoordiNet recommendations are crucial. The market does not pay sufficiently and this issue must be tackled. This might be related to how DSOs are regulated and the economic barriers they are facing as, for instance, they are not enabled to use money that was spent on flexibility in an effective way to support customers. Therefore, this barrier was acknowledged as fundamental among the CoordiNet recommendations.

Question: What made **NGENIC** a unique partner for CoordiNet and how did you seize cascading funds?

Mr Ridenour elaborated that cascading funds allowed them to excel in the project. NGENIC is an independent aggregator for three property owners and about 400 households. Their product is a smart, connected thermostat providing services to homeowners. The aggregation of a certain number of these devices can provide grid services, as was tested within CoordiNet. As an aggregator of these units, NGENIC also bears a responsibility on the market, presenting a unique BUC. Their goal was to develop the software and make resources available. The cascade funding allowed them to engage passionate people to push developing opportunities regarding flexibility. The funds allowed them to explore these issues to new extents, improve communication, and get a foothold on individuals driving these technologies.

One of the main challenges for Mr Ridenour has been explaining the concept of flexibility. The idea of a market is usually based on switches, power on or power off. However, for instance, heating systems are more like living organisms. And by including more home appliances, like EVs, this also increases complexity. Therefore, flexibility is not just about a simple light bulb that can be switched on and off; it is about tapping into resources with high variance. Mr Ridenour, on behalf of NGENIC, finished his intervention with recommending increasing trust between FSPs and market operators. Particularly concerning definitions and modelling methods, stakeholders must be on the same page.

Question: What are the main barriers that **Enel Green Power** (EGP) discovered in voltage control during its time with CoordiNet?

Mr Rodriguez, part of the Remote Operation Iberia unit at EGP, coordinated their contribution as an FSP in the Spanish Demonstration of CoordiNet. He presented experiences along the road of the project, focusing on difficulties that had been faced. In the demonstration, the development extended mainly into the field of voltage control (BUC ES3) concerning a wind farm in **Cádiz**.

Mr Rodriguez made significant considerations to the future around the tested flexibility service in Spain. In Cádiz, EGP connected to the electricity grid of e-distribución and learned a lot from the experience, with voltage control bringing the most challenges. Specifically, wind generation poses specific integration barriers that, with the installation of more DERs, increase in complexity, especially considering that most units and providers are equipped with different levels of technology. Therefore, the cascading funds were demonstrated to be a useful tool to allow them to improve their participation. For instance, direct communication with manufacturers was important to understand the procurement of flexibility for voltage control. Thereby, cascading funds allowed to change the existing controllers in one of the wind farms to control the behaviour of reactive capacity to have an actual impact on the grid while exchanging information with DSOs. Moreover, within the tests on the wind farm, the inductive range of reactive power capacity could be increased. The CoordiNet platform thus allowed EGP to follow all the DSO input in real-time, eventually granting the provided services to have a notable impact on the grid.

Reactive power control

Mr Rodriguez concluded with some recommendations, as can be seen in Figure 11. Large investments are required to update older wind farms. Thereby, the value of cascading funds was stressed once again. Additionally, large-scale regulatory sandboxes and pilots are needed, including higher number of generators, to test voltage control. The effects on generation units, which involve the active participation of manufacturers, will have to be understood better. Yet, no manufacturer is currently able to activate capacity in real-time. Hence, to EGP, the relevance of the developed voltage control tools lies more in the long-term market.

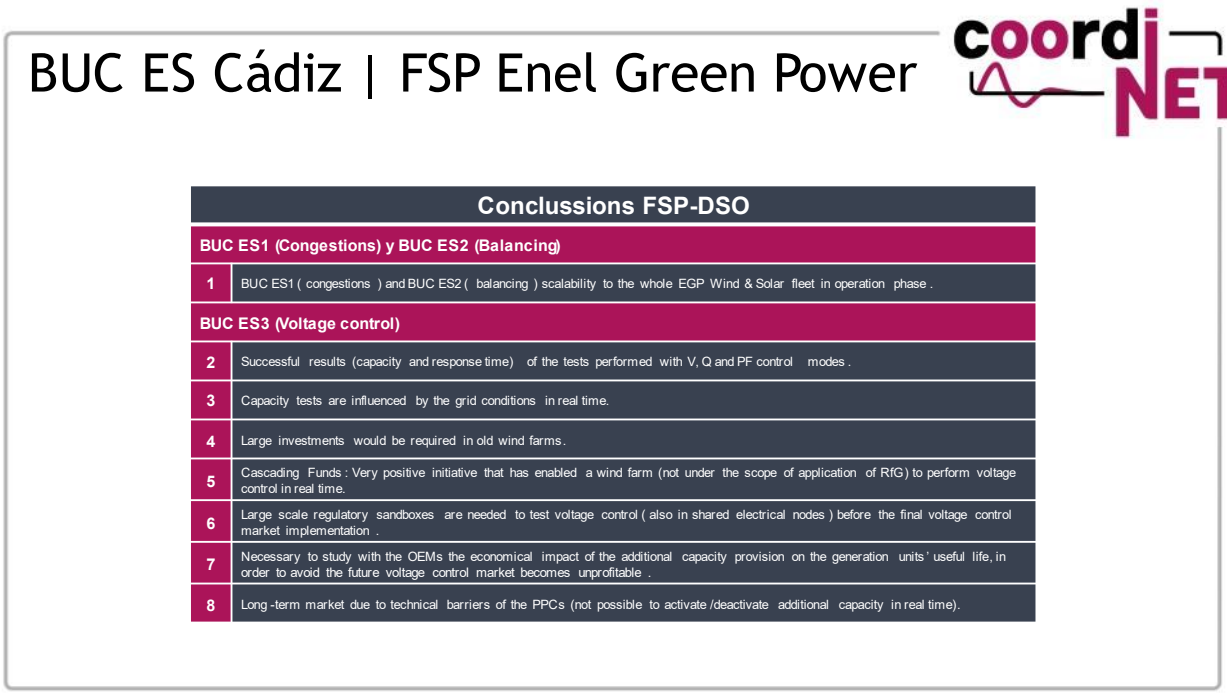

Figure 11. The concluding slide of the Enel Green Power.

3.5. CoordiNet lessons learnt

During this session, the main lessons learnt from the project were shared. In particular, the following topics were discussed by **Kris Kessel** (**VITO**), **Dimitris Trakas** (**NTUA**), **Jose Pablo Chaves Avila** (**Comillas**), and **Carlos Madina** (**Tecnalia**): (1) the CoordiNet products and coordination schemes, (2) the overall market platform architecture, (3) the key findings from the economic assessment, and (4) the main conclusions of the scalability and replicability analysis of CoordiNet solutions and markets.

3.5.1. CoordiNet products and coordination schemes

Kris Kessels presented the key lessons from defining products, CSs, and markets within the CoordiNet project. First, the CoordiNet approach towards product standardization from the beginning of the project and the related recommendation at the end of the project were explained. Next, the CoordiNet CSs proposed in the initial stage of the project were re-iterated and some additional coordination dimensions which were identified throughout the project were introduced. Then, the simulation environment used to compare coordination schemes and selected examples of analyses and outcomes was described. Finally, the main lessons learnt on the coordination schemes and overall market design aspects were described. The main messages are summarized in the next paragraphs.

When starting the CoordiNet project, the goal was to define one or more standard products for each grid service, with commonly defined product attributes and proposed ranges of values, to be further specified during the project. A high level of product standardization across the different demonstrators, or thus across different DSOs and TSOs within different countries, turned out to be unrealistic, as local circumstances and regulation impacted the product definition. **Ms Kessels** emphasised that standardisation is to be rather sought at member state level to ensure further progress. However, an agreement on a common list of attributes can be realistically introduced.

Likewise, the three demos made different choices regarding their preferred CSs. The reasons for these choices lie in regional and regulatory differences, indicating that there is no one-size-fits-all CS. One general observation is that the three demo countries already had established markets at the local level to address specific needs. In addition, integrating the new markets without interference with existing markets has received a lot of attention within the demos. Therefore, **Ms Kessels** underlined that in the CoordiNet vision, several different market platforms will co-exist at the European level. Local differences, different regulatory frameworks, and different maturity levels must be acknowledged. Nevertheless, when these markets mature further, harmonisation might become possible and best practices could be replicated at different locations. Therefore, an important prerequisite of market harmonisation is that the different market platforms are at least interoperable (e.g. via standard interfaces).

3.5.2. Overall market platform architecture

Dimitris Trakas, postdoctoral researcher at the **NTUA**, extended to scope of the lessons learnt by elaborating on the overall market platform architecture defined in CoordiNet. **Mr Trakas** provided concise insights into the characteristics, functionalities, and algorithms of the different blocks to ensure the interoperability of different markets and platforms developed by TSOs and DSOs across Europe. Three of these blocks were considered via the standardised interface within the demos for the CoordiNet platform, as can be seen in detail in Figure 12: *Grid monitoring & operation, Market operation,* and *Aggregation and disaggregation.*

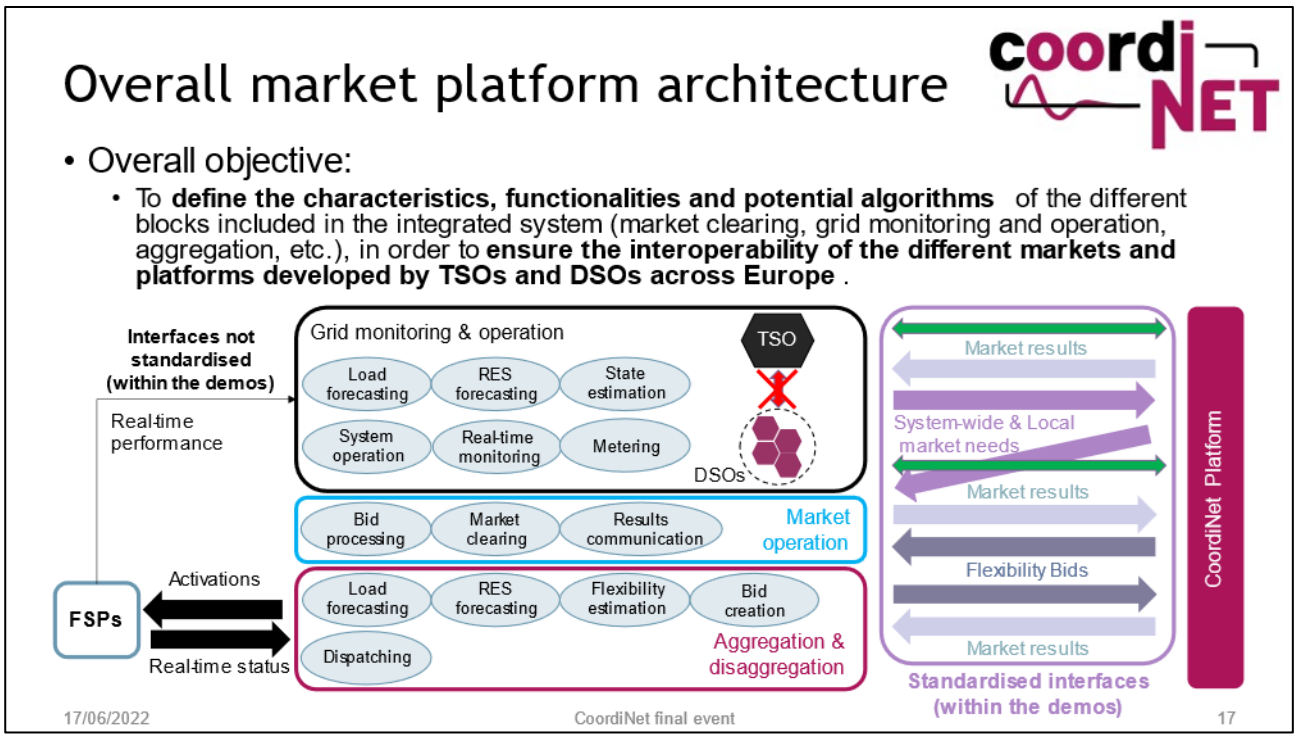

Figure 12. Overall market platform architecture.

Mr Trakas put particular focus on *Grid monitoring & operation*, including load, generation forecasting, real-time monitoring, and system operation. Data is sent systemwide and according to local market needs through the CoordiNet platform to market operators, who process the bid and clear the markets, which again are sent through the CoordiNet platform to aggregation as flexibility bids. In this process, CoordiNet aims at standardising the interface between the platform and the three blocks, while the platform also facilitates TSO-DSO coordination.

Question: Should we strive for a unified market platform in Europe or focus on regional flexibility markets?

Mr Trakas replied by exploring barriers to standardisation encountered within the CoordiNet project. In CoordiNet, different products were defined for the same system service (e.g., congestion management) in the three demonstrations. However, the services depended on the needs of each demonstration and the type of FSPs participating in the markets. Following the project outcomes, **Mr Trakas** suggested developing national markets first while keeping the goal of harmonised markets in mind. Therefore, a solution could be to begin developing flexibility markets in several zones which should be interoperable. However, the challenge today is to standardise products. Hence, for now, more work must be done on national or regional levels.

3.5.3. Economic assessment

Carlos Madina, Project Manager and Senior Researcher at TECNALIA and leader of both WP2 *Markets and platforms to coordinate the procurement of energy services from large-scale and small-scale assets connected to the electricity network* and Task 6.3 *Economic assessment of proposed coordination schemes and products for grid services*, presented the economic assessment of CoordiNet solutions.

Mr Madina began by describing the methodology and the main results of the economic assessment. The analysis consisted of three main pillars: 1) a comparison of the cost of implementing a flexibility market versus using traditional grid-based solutions, such as grid reinforcements or overcoming agreed subscription levels with the overlaying grid, 2) an evaluation of the economic feasibility of aggregators, DERs and other FSPs to participate in those flexibility markets, and 3) a comparison of the ICT platform deployment and service procurement costs for different coordination schemes. The analysis was performed to evaluate coordination schemes that solve both TSO and DSO needs. Likewise, the first two pillars are also evaluated for local markets which aim at solving DSO-specific needs. The main conclusions of the analysis are as follows.

First, **country-specific conditions** strongly affect the performance of CSs. This includes voltage levels operated by each system operator, the number and size of TSOs and DSOs, already existing market structure and legacy systems, and the considered case studies. Second, for **occasional congestion** flexibility may be more economically efficient than reinforcing the grid. Even if this is not the case flexibility might provide a faster, temporary solution until commissioning a grid-based solution. Short-term markets, like the ones in CoordiNet, can be an efficient solution to tackle this issue. Additionally, flexibility is a more efficient solution than remedial actions or accepting blackouts for unexpected events in the system. Finally, regarding **structural congestion,** flexibility should and can be used to postpone grid reinforcements. In this case, long-term markets may be used to procure flexibility. This remains valid until there is enough liquidity in short-term markets. Hence, for structural congestion long-term markets are a better option.

3.5.4. Scalability and replicability analysis

The final part of the CoordiNet lessons learnt was presented by **José Pablo Chaves Ávila** deputy Director at Institute of Research in Technology at **Comillas Pontifical University** and Communication and Dissemination WP 7 leader of CoordiNet.

Mr Chaves Ávila presented the methodology and results of the Scalability and Replicability Analysis (SRA) performed by Comillas as part of Task 6.4. The work consisted of modelling different coordination schemes for procuring congestion management and balancing services. For instance, Figure 13, presents an overview of the quantitative and qualitative methodology taken to draw the following conclusions. On the other hand, Figure 14 explores an extended look into the regulatory compatibility of selected generalized use cases.

Further, different scenarios for local congestion management and different CSs for voltage control were discussed and finally, the results of the regulatory assessment were presented.

Mr Chaves explained that for some scalability and replicability scenarios, the congestion criticalities were not entirely solved even after procuring the maximum available flexibility of FSPs. Since more flexibility is needed, other flexibility options could and should be considered, such as network reconfiguration, control of On-Load Tap Changer, additional or new FSPs, among other remedial actions. Overall, he highlighted that the current national regulatory frameworks throughout Europe still pose barriers to the implementation of use cases as proposed in CoordiNet.

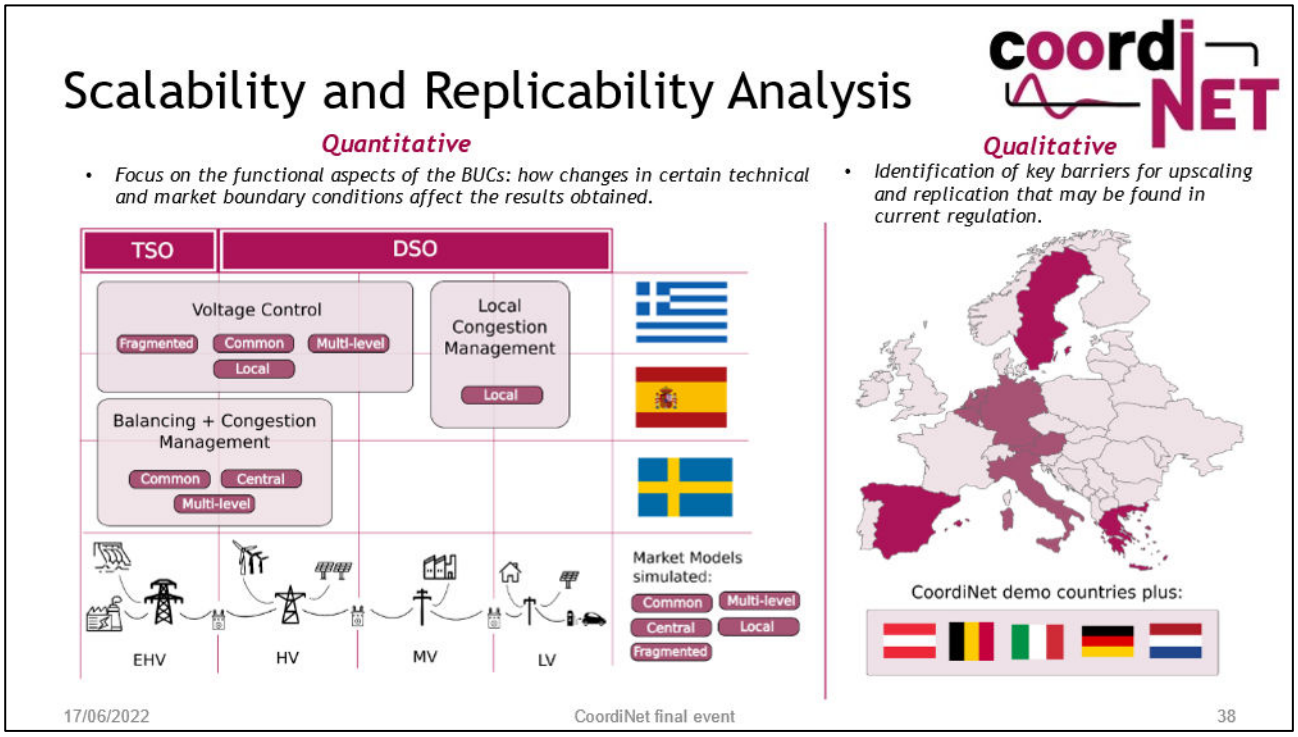

Figure 13. Methodological overview of the scalability and replicability analysis.

Mr Chaves delved deeper into the regulatory scalability and replicability analysis, as depicted in Figure 14. Eight EU Member States were analysed and throughout them, significant barriers to CoordiNet's BUC were noted. The regulatory SRA showed that current national regulatory frameworks still pose barriers to the implementation of use cases proposed in CoordiNet. The three main messages from the conducted analysis are as follows.

First, the SRA tested the limits of the proposed markets showing that for some situations, criticalities can only be partially solved by using flexibility. In workstream 2, for some SRA scenarios, the congestion criticalities were not entirely solved even after procuring the maximum available flexibility of FSPs. Since more flexibility is needed, other options could be considered, such as network reconfiguration, control of OLTC, or new FSP. Second, different Coordination Schemes were tested in balancing, congestion management, and voltage control services. Joint market results, only explored from an economic point of view, ensued in lower flexibility costs. Additionally, for voltage control, the market-based procurement of reactive power support proved beneficial for TSOs and DSOs. Finally, across all workstreams, grid topology proved to be a key parameter influencing market effectiveness. Also, the different types of FSPs were key aspects as their capability (e.g., upward and downward; activation time) varied considerably.

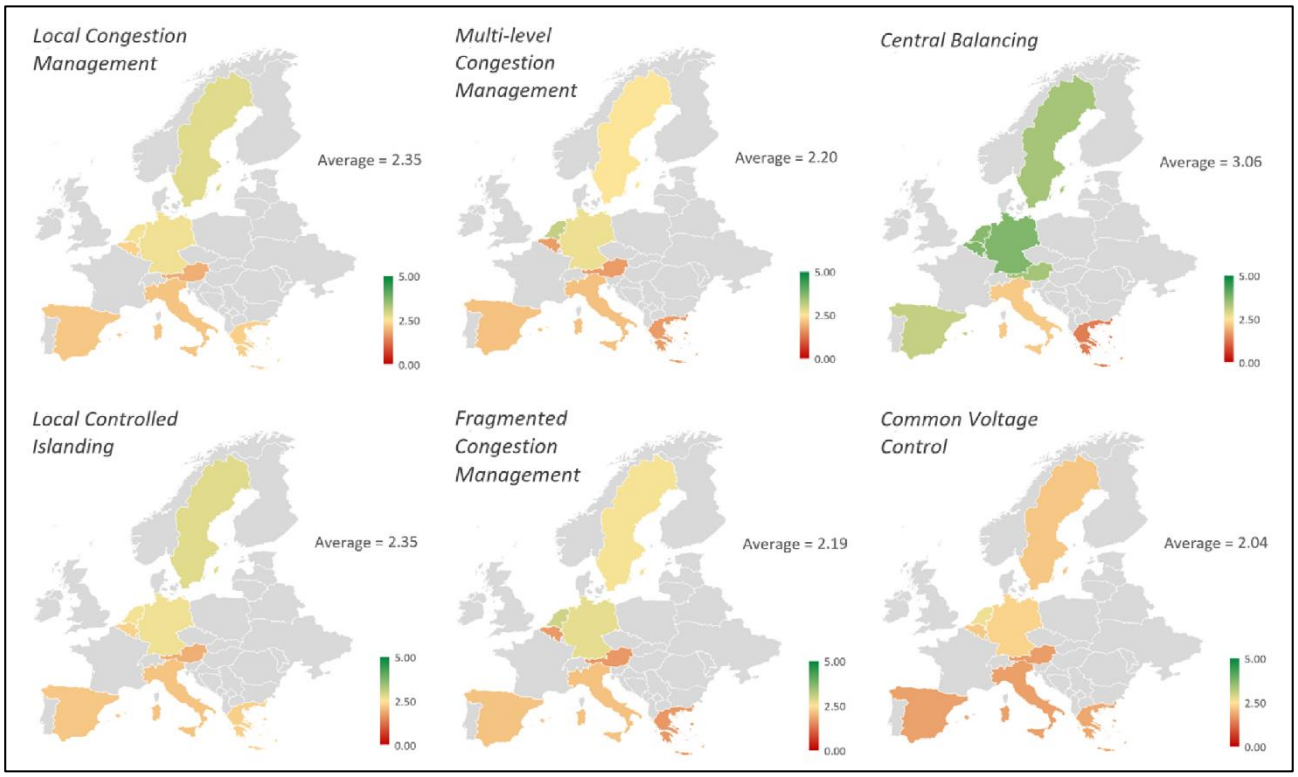

Figure 14. Regulator compatibility of selected generalized use cases.

Question: Being reminded that flexibility is cheaper than grid investments, what kind of measures can be taken to facilitate FSP and particularly small FSP participation in flexibility markets?

Mr Chaves replied with a concrete example. During earlier stages of the development, a part of the costs might be carried by the public funds, e.g., the cost of the flexibility market operator, because flexibility does provide a benefit to the system under different circumstances, as demonstrated. Then, as these markets mature and FSPs pay off the investments they had made by providing flexibility, those costs could be charged to participants in flexibility markets. Hence, new BUCs must be publicly created.

Additionally, the technical requirements for prequalification in joint TSO-DSO markets are very demanding as the services to be procured are critical for the stability of the power system. However, the services procured through the local market do not have a big impact on the overall power system. Therefore, the participation requirements should be more relaxed for new, smaller participants while TSO-DSO cooperation may be addressed separately.

3.6. The CoordiNet Roadmap

Task 6.7 of the CoordiNet project focused on the development of the CoordiNet *Roadmap towards a new market design including the implementation standardized products for grid services*. **Rebecca Samuelsson**, program manager at **Energiforsk** and task leader of T6.7, led the Final Conference session dedicated to the CoordiNet Roadmap.

Ms Samuelsson presented the methodology used to develop the CoordiNet Roadmap and how the demonstrations and project results have been evaluated against four barrier categories for implementation, future development and scale-up of the CoordiNet solutions. These regulatory, market, technological and social barriers, were evaluated qualitatively and clustered in what resulted in the five stops of the Roadmap,

providing recommendations for a market design adapted to include a higher share of Distributed Energy Resources (DERs) and improve coordination between the distribution and transmission grid. Depending on the system and country of implementation, different aspects should be considered and how new flexibility services would imply advantages and disadvantages that are actor- and context-dependent.

The presentation continued with a detailed discussion of the five roadmap stops, fundamental for the establishment of new flexibility market solutions, although not necessarily sequential in order of importance:

1. **First stop, "Incentivizing Flexibility Market Implementation and the Evolution of system operator Roles".** With a focus on the SOs perspective, the presentation discussed the challenges that SOs need to overcome to establish new flexibility markets, their needs in terms of support and incentives, how the SOs' roles and responsibilities will change, and the resulting for increased coordination.

2. **Second stop, "Market Access for all Flexibility Service Providers".** The focus on the second stop shifted to the FSPs' perspective. The importance of striving for easier market access for additional participants to meet the growing demand for flexibility was remarked.

3. **Third stop, "Managing System operator Requirements and Flexibility Service Providers Capabilities Through Standardization".** The stop, bringing together the two previous stops, looked at how market interactions between SOs and FSPs can be facilitated and simplified through the harmonisation of processes and products.

4. **Fourth stop, "Adaptation of Market Phases for New Products and Actors"**. The stop focussed on the adaptations of market phases necessary for a well-functioning flexibility market to suit these new functions.

5. **Fifth stop 5, "Enabling Flexibility Service Providers Contributions to Innovative Market Solutions".** Last but not least, the stop looked closer at the possibility to extend FSPs contributions to other market-based services, such as reactive power for voltage control, and other market concepts, such as P2P markets, also tested in the demos. As these more innovative market-based solutions are less mature than other flexibility services they should be addressed separately, for example by introducing regulatory sandboxes.

The presentation highlighted the main outcomes of the CoordiNet Roadmap and featured practical examples from the three CoordiNet demos to support the recommendations. The audience was actively engaged in the session through a Mentimeter poll. Among the challenges to the implementation of flexibility markets that were identified by the participants were regulatory barriers, stakeholders' coordination, communication among market participants and scalability of solutions, as can be seen in Figure 15.

To address these challenges, the audience suggested the need for, among others, the introduction of incentives, accelerated digitalisation of the power system, update of network guidelines and introduction of regulatory sandboxes, as can be seen in Figure 16.

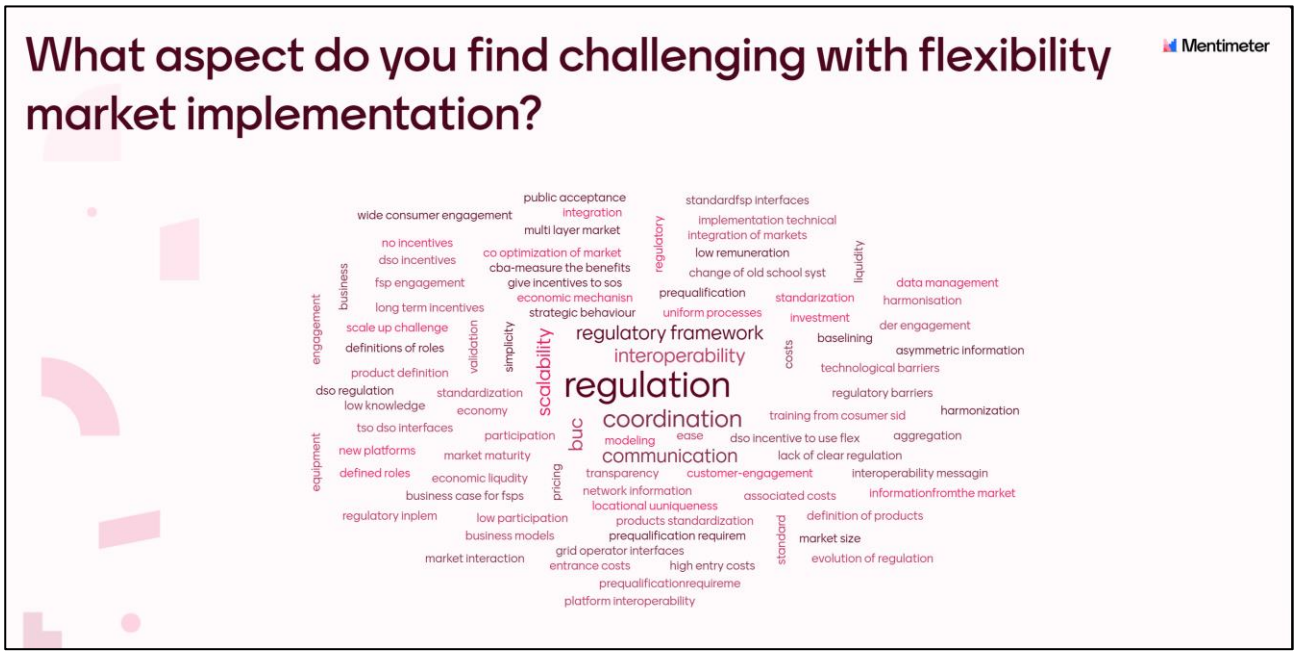

Figure 15. Challenges to the implementation of flexibility markets suggested by the CoordiNet Final Conference participants.

Figure 16. Measures to address challenges to the implementation of flexibility markets suggested by the CoordiNet Final Conference participants.

Question: How do you think this roadmap will be used after the conclusion of the CoordiNet project?

According to **Ms Samuelsson,** the recommendations included in the Roadmap can largely apply to all EU Member States. The use of the roadmap will be especially beneficial for the countries still lagging in implementing flexibility markets and can use them as guidelines for their future planning. **Ms Ruwaida** added that a discussion on the roadmap's recommendations has already begun with the Swedish national regulator and that there is a concrete plan of exploiting the results of CoordiNet by the DSOs in the country.

Question: Which Roadmap stop is the most important for the longevity of flexibility markets?

Ms Samuelsson highlighted that Step One and Two of the Roadmap are the ones calling for most urgent implementation. Afterwards, the other three stops will help fine-tuning the establishment and operation of flexibility markets. **Ms Samuelsson** further remarked how a solid and secure income for FSPs participating in a market is a fundamental element in supporting long-term planning and forecasting. The CoordiNet experience in the demos highlighted how the introduction of availability contracts can mitigate insecurity of income for FSPs and overall lower market entry barriers to increase the durability of flexibility markets.

Question (directed to the Greek and Swedish regulators): Are you currently discussing implementing any of the recommendations presented and under what conditions?

The representative from the **Greek Regulatory Authority for Energy (RAE)** recognised that the recommendations included in the Roadmap are crucial for the current work of regulators and how the future regulatory framework in Greece will build upon the results of the CoordiNet experience in Greece, especially given solving future arising problems in the distribution grid. As a specific example, discussions about regulatory sandboxes in the country were stated to be more and more at the centre of discussion. Similarly, the representative from the **Swedish Energy Markets Inspectorate** confirmed that the material produced by the CoordiNet project will be taken into consideration during their future work, especially in view of the novelty of the presented topics in regulatory discussion.

3.7. The future of flexibility markets

Throughout the final event, several speakers external to the CoordiNet project were invited to bring an additional perspective, place the project results in a wider context and anticipate how the project outcomes should be taken up in the future work on the establishment of flexibility markets.

The invited speakers were:

- **Roberto Zangrandi**, representing the DSO perspective via **E.DSO**,
- **Norela Constantinescu**, representing the TSO perspective via **ENTSO-E**,
- **Natalie Samovich**, bringing on stage the expertise of the **European Technology and Innovation Platform - Smart Networks for Energy Transition** (**ETIP SNET**),
- **Willem van den Reek**, presenting the experience of TSO-DSO flexibility platforms in the Netherlands via **Alliander**, and
- **Luciana Sant'Ana,** introducing the experience of the Horizon 2020 **OneNet** project.

3.7.1. DSO perspective: Roberto Zangrandi

Roberto Zangrandi, Secretary General of **E.DSO**, delivered the welcome speech of the CoordiNet event. **Mr Zangrandi** started by commenting on how the *REPowerEU* and other initiatives put forward by the Commission show clear commitment to increase the pace of the decarbonisation of the energy sector and to decrease the dependence on fossil fuels imports. **Mr Zangrandi** continued by commenting on how these developments will have a strong impact on the electricity sector, as they will require an increased pace of renewable electricity sources connection. Since these connections demand increasingly significant amounts of investment, it is necessary to recall the mantra of the Commission – "Energy efficiency first", being flexibility the main source of efficiency at the disposal of SOs. As the consideration of efficiency naturally must come from a holistic system perspective, it is clear that flexibility sources must be managed in cooperation between all network actors.

Mr Zangrandi emphasised how the CoordiNet project focused on enhancing the cooperation between TSOs, DSOs and consumers in enabling the utilisation of available flexibility resources and on building the platform that could pave the way for the development of wider European flexibility markets. The speech then

remarked **E.DSO's** involvement in the project, building on the significant work done by the association on TSO-DSO cooperation. As part of this effort, in 2019, E.DSO published a report, together with other network operator associations which revolved around the *Integrated Approach to Active System Management* (CEDEC, et al., 2019). The report laid out a vision of the key strategies and tools performed and used by DSOs and TSOs for the cost-efficient and secure management of the electrical systems. There are clear signs that the involved partners can see a direct value in the tested pilots and have the intention to transform them into daily practice. Therefore, the CoordiNet project proved to be an important part of the association's work to enhance the cooperation between the major stakeholders.

3.7.2. TSO perspective: Norela Constantinescu

Norela Constantinescu, head of innovation at **ENTSO-E** and the incoming chair of the **ETIP SNET** governing board, concluded the first day of the CoordiNet final event, thanking **Mr Zangrandi** and **Mr Baron** for facilitating the exchange of views between TSOs and DSOs and remarking the positive impacts this collaboration had. Her intervention was guided by an introductory question:

Question: What are the positions of TSOs with respect to TSO-DSO collaboration concerning the flexibility domain, and what are the missing innovation aspects that should be addressed in the work following up on the CoordiNet project?

Ms Constantinescu pointed out that there are significant challenges ahead of us, such as implementing the *RePowerEU* plan and other policies. This will require the addition of significant electricity generation capacities that will be mostly connected to the distribution grid. On the demand side, new sectors such as electromobility and heat pumps will create additional pressure. These challenges cannot be solved alone, so connectivity is the key. The CoordiNet and INTERRFACE projects were designed to tackle these challenges together and to maximise the potential of our resources to address the short- and medium-term flexibility needs. Many pilots and platforms were put in place, with different functionalities being tested. The step forward from this situation is therefore upscaling these activities beyond regional cooperation. This should also be the role of the OneNet project, promoting the cooperation at EU level. Thereby, it is important to note the common recommendations paper prepared between CoordiNet and INTERRFACE projects.

On the question what aspects should be addressed next, **Ms Constantinescu** pivoted the attention towards greater consumer engagement. Customers should be able to participate in a system with multiple functionalities in which they could decide to participate in different schemes according to their needs. **Ms Constantinescu** also noted the need for further activities to come to a common ground on harmonisation of markets and products to upscale them, and to reduce the costs. Other points to focus on are the integration of flexibility in grid planning, focus on sector integration and power electronic devices connectivity.

3.7.3. Integration with ETIP SNET activities: Natalie Samovich

Natalie Samovich is the chair of ETIP SNET Working Group 1: *Reliable, economic and efficient energy system*. **Ms Samovich** introduced the work of ETIP SNET and in particular, of the Working Group 1. She pointed out that the working group had recently published two papers relevant to the CoordiNet project – one on "E-mobility deployment and impact on grids" and one on "How can flexibility support power grid resilience."

The findings of the report on electromobility are relevant to the results of CoordiNet, as they conclude that smart management of chargers is necessary, especially focusing on bidirectional charging and ancillary services. As these steps should be done as soon as possible, it is time to introduce regulatory sandboxes to introduce them into practice. The outcomes of the second paper (flexibility for grid resilience) highlight the

importance of long-term system operation and grid planning (in particular from the technological performance and security of supply point of view) and the importance of risk management.

Ms Samovich also recounted the implications of the developing internet of things on the electricity grid. The shift in the computing continuum from the centralised cloud data centres to decentralised "edge" applications. This will have an impact on how services are provided to the consumers – more sophisticated services will be possible (such as smart contracts), but the question remains to be how to engage the final consumers properly. Therefore, the business use cases and roles have to evolve with the technological development as well. This trend will also require more attention from the regulators to establish proper governance of the grid edge technologies.

3.7.4. Sharing perspectives outside of the project – the GOPACS platform

Willem van den Reek, product manager at **Liander**, brought on stage the experience of the Dutch GOPACS platform.

GOPACS is a national project operated by DSOs and the TSO in the Netherlands. The platform aims to relieve the congestion issues in the Dutch electricity grid, which are already occurring across the whole territory and are predicted to increase in the future. The use of flexibility enabled by the platform should help to delay the investment in network reinforcements.

After the closure of the day-ahead energy market, the main functionality of the GOPACS platform is to calculate the probable congestion cases and connect them with the supply bids drawn from the regular (energy only) platforms. The system also ensures that the selected solution does not cause additional congestion issues. For the flexibility providers, the benefit of this platform is that it unites the flexibility trading with energy-only trading in standard market platforms – their production bids can be selected in either of these markets, therefore increasing the opportunities. This reduces the entry barriers to flexibility markets and provides more liquidity for them, which is also beneficial for the grid operators. The diagram of the platform's functioning is presented in Figure 17.

Question: In what way does the GOPACS platform consider re-dispatching, and how might flexibility solve increasing congestion issues?

Mr van den Reek explained that the platform facilitates re-dispatching, as it takes geographical conditions into account and is capable of using the market bids for this purpose. Whether flexibility might solve long-term congestion issues in the future or not will be decided by assessments being done per market area. If there is not enough flexibility, then long-term contracts for providers to make the flexibility available at GPACS for a certain timeframe can be used to solve rising congestion issues.

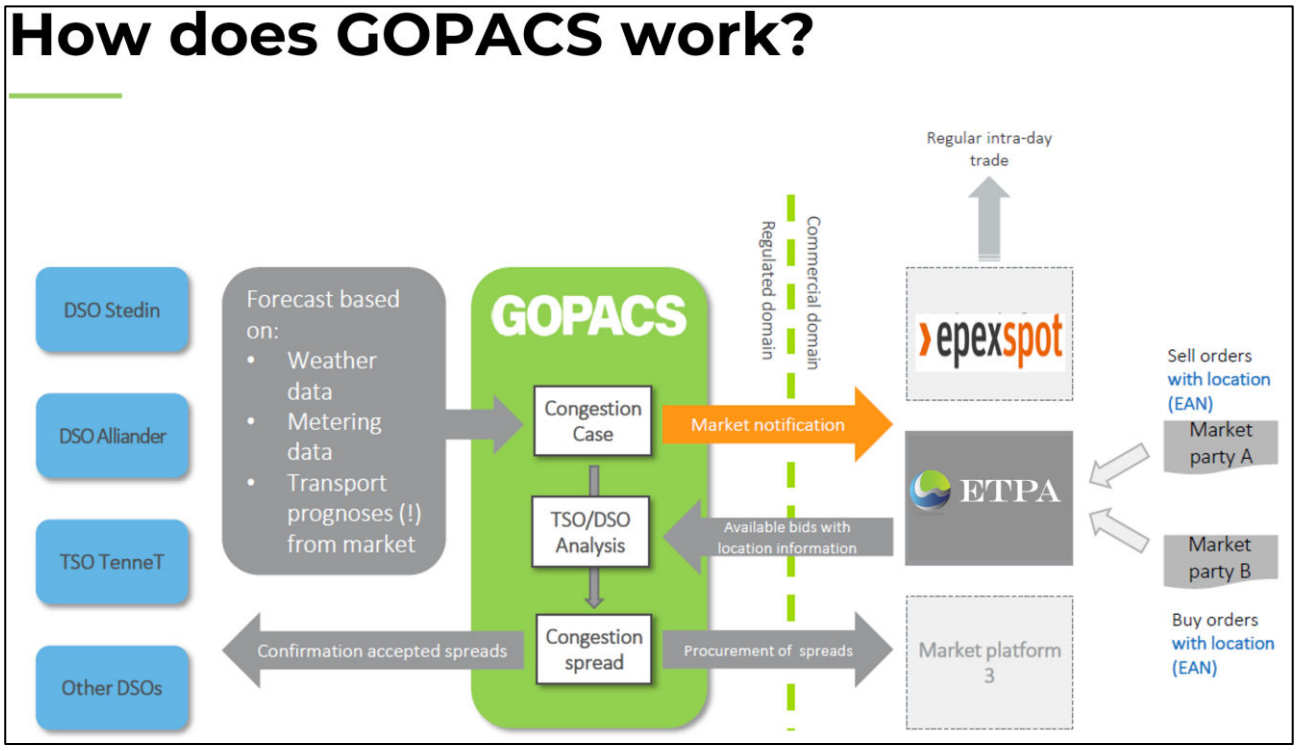

Figure 17. Excerpt from the presentation explaining the functioning of the GOPACS platform.

Question: Are there any regulatory barriers or possible improvements needed for the functioning of the platform, and do you expect stronger impacts from the new European network code on flexibility?

Mr van den Reek elaborated that recently there was a new regulatory framework put in force in the Netherlands, so currently there are not many issues encountered. One thing to improve is the financial side of the procurement of flexibility. Henceforth, he neither expects additional barriers by the new network codes.

Question: How can prosumers participate in the GOPACS platform?

Currently, prosumers cannot directly participate in the platform but they can work together via aggregators, explained **Mr van den Reek**. Thereby, the minimum size of bids is 100 kW, which would limit the participation of smaller players in any case. Nevertheless, GOPACS is unique in how market-based it is. Balancing services have stricter conditions, for instance, with higher penalties for non-delivery of selected bids.

3.7.5. Synergies with other Horizon 2020 projects: The OneNet project

Luciana Sant'Ana Arnoux, Expert in Energy Market Modelling and Game Theory at **VITO** and representative of the Horizon 2020 project **OneNet**, concluded the contributions from external experts. **Ms Sant'Ana Arnoux** presented the vision of OneNet of designing a fully scalable and replicable architecture for the procurement of flexibility and enabling the operation of the whole European network as one single system constituted by a variety of markets addressing local needs and allowing for the engagement of all energy stakeholders.

The close relation between the two projects and the ambition of OneNet to adopt and extend CoordiNet learnings and outcomes was remarked in a few key points, as shown in Figure 18. First, is the application of

the market models and CSs defined in CoordiNet by OneNet. Second, is the deeper investigation of product standardisation and their integration into already existing energy markets. Third, is the extension of the TSO-DSO-consumer coordination addressed by CoordiNet with the inclusion of market operators in the OneNet consortium. Fourth, is the extension of areas of testing, from the three demo sites of CoordiNet to the four clusters of pilots in OneNet. Last, is the consolidation of the market platforms into one single platform in Europe.

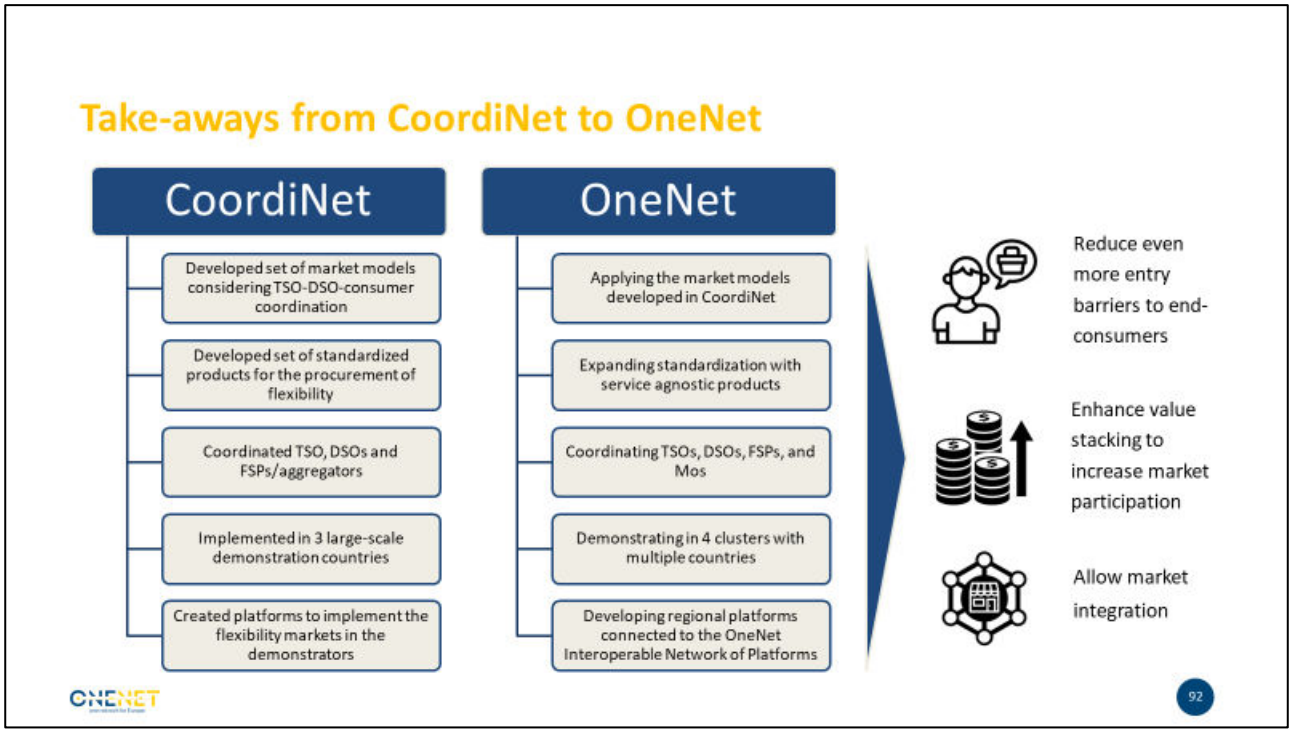

Figure 18. The takeaways from CoordiNet to OneNet as presented by Ms Sant'Ana Arnoux.

Ms Sant'Ana Arnoux concluded the presentation by stressing the gaps that OneNet will strive to close beyond the CoordiNet project, including the definition of roles of market participants, the engagement of new market actors, and the time integration and bid forwarding among different markets. Therefore, OneNet builds on the lessons learnt from CoordiNet.

4. Conclusions

The CoordiNet Final Conference in Brussels proved to be a successful conclusion of the project. The event allowed highlighting the project milestones and sharing its findings with relevant energy stakeholders, involving project partners and key external stakeholders. The event runs as planned to enable physical and virtual audiences to engage. The number of deliverables will add up to sixty-eight deliverables by the end of the project, available for consultation on the CoordiNet public website.[3] The number of physical meetings organised during the project totalled six, despite the complications and travelling restrictions stemming from the COVID-19 pandemic. Nine Work Packages were completed within the project due to the effort of the respective leaders and involved partners, summing up to about 216 people contributing to the project throughout its timeline. Finally, the number of participants for all the final events, including the events that took place at the demonstration sites in Spain and Greece and the Final Conference, counted to more than 300 participants. Therefore, the expected key performance indicators for the dissemination of the project results have been met with the Final Conference.

[3] Link to the public deliverables of CoordiNet: https://coordinet-project.eu/publications/deliverables

5. References

CEDEC, E.DSO, ENTSO-E, Eurelectric, GEODE. TSO-DSO Report-An Integrated Approach to Active System Management. 2019. Available online: https://www.edsoforsmartgrids.eu/wp-content/uploads/2019/04/TSO-DSO_ASM_2019_190304.pdf