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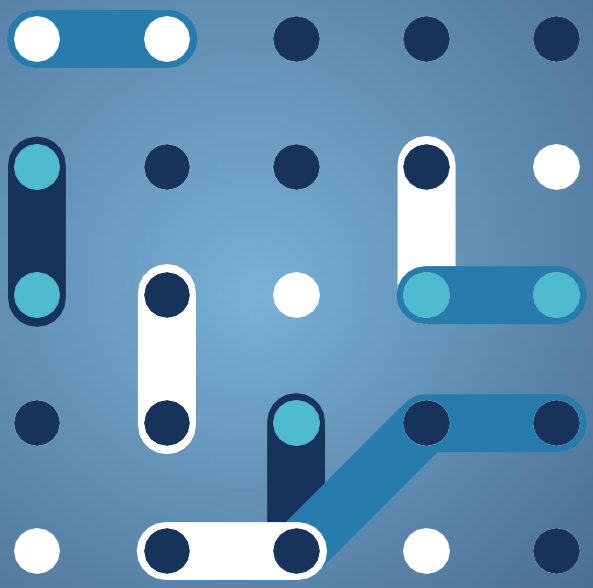
Annual Report 2023

Working Group Regulation



October - 2024

BRIDGE

Regulation Working Group – Annual Report 2023

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AUTHORS

Helena Gerard, VITO – Flemish Institute for Technological Research

Alina Anapyanova, Universität Passau

Anna Pizzamiglio, The Lisbon Council

David Verez, ARCbcn

Diana Moneta, RSE

Jacob Mason, VITO

Josè Pablo Chaves Avila, Comillas Pontifical University

Karine Laffont-Eloire, Dowel Innovation

Laia Guitart, E.DSO

Matteo Troncia, Comillas Pontifical University

Santiago Gallego, I-DE (Grupo Iberdrola)

SUPPORT FROM BRIDGE SECRETARIAT

Fabiola Roccatagliata, RINA Consulting S.p.A.

Mirella Levato, PwC Business Services Srl

BRIDGE WG LEADERSHIP

Helena Gerard *(VITO – Flemish Institute for Technological Research),* WG Chair

Anna Pizzamiglio *(The Lisbon Council),* Action 1 leader

Alina Anapyanova *(Universität Passau)* Action 2 leader

Karine Laffont-Eloire *(Dowel Innovation)* Action 2 leader

Jacob Mason *(VITO)* Action 3 leader

Josè Pablo Chaves Avila *(Comillas Pontifical University)*, Action 3 leader

Matteo Troncia *(Comillas Pontifical University),* Action 3 leader

David Verez *(ARCbcn)*, Action 4 leader

Diana Moneta *(RSE)*, Action 4 leader

Laia Guitart *(E.DSO)*, Action 4 leader

Santiago Gallego *(I-DE -Grupo Iberdrola)*, Action 5 leader

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Directorate B – Just Transition, Consumers, Energy Efficiency and Innovation Unit B5 – Innovation, Research, Digitalisation, Competitiveness

Contact: Mugurel-George Păunescu

E-mail: mugurel-george.paunescu@ec.europa.eu

European Commission

B-1049 Brussels

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Acronyms

WG	Working Group
GA	General Assembly

1. Introduction

1.1 Introduction to the BRIDGE Regulation WG

The BRIDGE Regulation Working Group (WG) was established at the origin of the BRIDGE initiative to foster knowledge sharing among H2020 projects affected or addressing by different regulatory aspects in the Energy domain.

The Regulation WG, as the entire BRIDGE initiative, structures its activities on a yearly basis. In the last years, different topics have been addressed, resulting in most cases on specific reports that can be shared not only within the BRIDGE community, but with a larger audience.

The WG is a live group where projects are joining and leaving as they evolve. This "staff rotation" facilitates a dynamic environment for the introduction of new topics of interest. The WG continuously looks for synergies with other BRIDGE Working Groups, and with those outside BRIDGE (ISGAN, ETIP SNET, …). The WG defines the most important regulatory challenges to be addressed, propose best practices from the BRIDGE projects and formulate recommendations for policy makers. In addition, thematic knowledge sharing sessions are organised to present best practices from projects that are close to final.

1.2 Introduction to the Main Challenges to be Addressed

The topic of energy markets and flexibility is intensifying. Several (regulatory) initiatives, such as REPower EU, the Framework Guideline Demand Response, the Digitalisation of Energy Action Plan, and the Reform EU Electricity Market Design, are driving efforts to meet the sustainability goals for 2030 and 2050. Moreover, consumers are increasingly central to the public debate. The impact of the energy crisis on consumers, the rise of electric mobility and the uptake of energy sharing and related community aspects all illustrate the central role of consumers when designing a robust regulatory framework and market for the future.

The following challenges were addressed by the WG in 2023:

1. **Market access:** today's market access for consumer flexibility is hindered and the value of flexibility via implicit or explicit flexibility mechanisms is still limited. The WG explores the elements that need to be addressed and would need further elaborations, such as the design of flexibility products and services, aggregation models, baseline methodologies, tariff design, market processes (prequalification), submetering and settlement.

2. **Collective flexibility**: The concept of energy communities, providing both community and grid services, is gaining ground and developing in several countries. However, there are several barriers to be tackled as grid services currently need some adaptations to support the participation of energy communities. It is important to understand the potential value of energy communities to the grid, looking at peer-to-peer and energy sharing in the context of overall market design. Specific areas for further exploration include the redesign of grid services, the relationship between energy communities and grid operators, optimal financial models as well as barriers and facilitators for the uptake of energy communities.

3. **Sector coupling/sector integration**: Recently, increased attention is given to the possible synergies between different energy carriers at wholesale level and different services across different sectors (e.g. mobility). The extension from the overall regulatory/market framework towards new energy carriers and new sectors results in potential synergies for consumers, market actors and the overall system. To maximise these synergies, it is important to address some key barriers.

4. **Market coordination and integration:** Supporting system operators in preparing the grid for 2030 is crucial. Several new services, markets and platforms for energy and flexibility have been developed in recent years.

However, the lack of an integrated market and the fragmentation of products, services and processes hinder the realisation of potential synergies in a more interconnected system.

5. **Data spaces:** The relevance of data spaces in the collaboration between regulated and commercial actors, with a focus on defining roles, allocating responsibilities, and clarifying the regulatory aspects within data spaces, is at the centre of this task force work.

The work of the WG is also supporting key ongoing policy initiatives. In particular, this report might provide valuable insights for the ongoing development of the **Network Code for Demand Side Flexibility** and the implementation of the **reform of the EU Electricity Market Design**.

1.3 Overview Action Plan 2023

In 2023, the work of the BRIDGE Regulation WG focused on 6 main objectives, translated into 6 actions (Table 1.1):

Table 1.1: Regulation WG's Action Plan 2023

Action n.	Action title	Note
Action 1	Improve **market access** for consumers to value their flexibility	*Continuation of Action 1 (2022)*
Action 2	**Peer-to-peer and energy sharing**	*Continuation of Action 2 (2022)*
Action 3	Facilitate energy and flexibility market **coordination** and **integration**	*Continuation of Action 3 (2022)*
Action 4	Support the potential synergies coming from **increased sector coupling/sector integration/system integration**	*Continuation of Action 4 (2022)*
Action 5	Support the **system operators to prepare the grid for 2030**	*New Action*
Action 6	Support the **Energy Data Spaces** understanding the related barriers	*New Action*

The following sections present the results achieved during 2023.

1.4 Regulation WG Projects

Currently, the BRIDGE Regulation WG consists of 65 ongoing projects involved in horizontal activities. These projects subscribe to the mailing list, participate in the monthly meetings, and/or receive WG-related news (listed in Figure 1.1 for reference). For details on which projects actively participated in specific WG actions, please refer to the individual chapters of each action in the following sections.

Figure 1.1: List of projects in the Regulation WG

2. Action 1 – Improve Consumers' Market Access to Value Their Flexibility

Action leader: Anna Pizzamiglio (Lisbon Council), EDDIE Project

2.1 Introduction of the Action

The priorities identified in the 2022 Work Plan for Action 1, include the harmonisation of regulations across EU Member States so that they can participate in the flexibility market on equal terms and benefit from the same opportunities. Addressing local needs and clearly defining roles and responsibilities was considered pivotal to prevent potential market inefficiencies stemming from varying regulatory interpretations. Moreover, the work plan highlighted the importance of regulatory experimentation to evaluate strategies aimed at enhancing market transparency and increasing consumer engagement. By exploring diverse regulatory approaches, policymakers aimed to identify effective practices that build consumer trust and promote active participation. It is also essential to develop best practices for market coordination and to promote transparent information exchange.

In the 2023 Work Plan of the Regulation WG, Action 1 focused on examining regulatory barriers that prevent individual consumers from effectively utilising both implicit and explicit flexibility mechanisms to optimise their flexibility. The primary objective was to identify potential solutions to overcome these barriers. Building on the comprehensive results of the 2022 effort, this action focused on improving market access and participation for consumers, with the main target areas being flexibility products and services, aggregation rules, tariff design, market processes and smart appliances.

Looking ahead to 2024, while detailed interim outcomes were not yet available, ongoing efforts included the development of a methodology that would guide future implementation phases. This approach underscored the commitment to continuous improvement and adaptation in response to evolving market dynamics and consumer needs.

2.2 Methodology Adopted in Action 1

Action 1 in 2023 focused on producing a scoping questionnaire, in preparation of a workshop aimed at enhancing market access for consumer flexibility.

This scoping questionnaire was drafted by the Action Leadership in collaboration with partners from the Florence School of Regulation. The first draft, prepared with input from the BRIDGE leadership, was submitted to the Chair of the Working Group to ensure alignment with the BRIDGE focus.

A first update on the survey questions and timeline was presented for the BRIDGE General Assembly .

After extensive team discussions on different scenarios and adjustments to the timeline and methodology, it was agreed that only part of the work package could be delivered to the General Assembly in April this year. The survey will be delivered as the final part of the 2023-2024 work plan, with analysis of the results to follow as the first action of the 2024-2025 period. The focus remains on collecting factual best practices from projects, and the questions have been redesigned to gather information on project developments rather than individual expert opinions.

To identify best practices from BRIDGE projects, this action will leverage on the information provided by various projects participating in the BRIDGE Regulation WG. To date, 27 ongoing projects have expressed interest in contributing to the action.

These projects are: **ACCEPT, BeFlexible, COMMUNITAS, DATA CELLAR, Eddie, ENERGETIC, eNeuron, ENFLATE, EUniversal, EV4EU, HEDGE-IoT, HYSTORE, iFLEX, Mopo, OMEGA-X, PARMENIDES, POCITYF, RE-EMPOWERED, RENergetic, RESCHOOL, ROBINSON, SENDER, SENERGY NETS, STREAM, THUMBS UP, TwinEU, WEDUSEA.**

This list will be updated in September 2024 to include new incoming projects.

The survey will be open for one month and will be sent to the projects that have shown interest in participating in Action 1.

After collecting and analysing the responses, a meeting with the participating projects will be organised in September to discuss the results of the survey. Following this meeting, feedback and contributions will be collected to prepare a workshop as a final deliverable for the action, ideally by the end of 2024.

All contributions will be compiled in a final report highlighting best practices on this topic.

3. Action 2 - Peer-to-Peer and Energy Sharing

Action leads: Karine Laffont-Eloire, DOWEL Innovation (LocalRES project) and Alina Anapyanova, Uni Passau (RENergetic project).

3.1 Introduction of the Action

The 2023 Work Plan of the Regulation WG set out Action 2 to investigate the role of peer-to-peer (P2P) and energy sharing in the overall market design, investigating barriers and their potential to facilitate energy community adoption. Action 2 thus centred on energy sharing and peer to peer trading, while also expanding its focus to include energy communities and their capabilities in conducting energy sharing or P2P trading.

Regulatory background

At EU level

According to the EU Regulation Framework, "active customer" includes final customers or groups who consume, or store electricity produced on their premises, or sell self-generated electricity, or participate in energy flexibility or efficiency schemes, as long as these activities are not their main business[1].

Since the last BRIDGE report was published in May 2023, the regulatory landscape has been enriched by a proposal by the European Commission to improve the EU Electricity Market Design (EMD) and amend the relevant regulations and directives[2]. The directive was published in the Official Journal of the EU on 13 June 2024[3]. It is of specific interest for the BRIDGE projects that have activities related to energy sharing, P2P trading and energy communities. The proposal indeed operationalises energy sharing by defining relevant roles, rights and responsibilities and expanding the right to wider categories of active customers.

According to this proposal, **'energy sharing'** means the self-consumption by active customers of renewable energy either:

- generated or stored off site or on site between them by a facility they own, lease, rent in whole or in part; or
- the right which has been transferred to them by another active customer whether free of charge or for a price.

Article 15a of the proposal then defines the "**Right to energy sharing**":

- All households, small and medium-sized enterprises and public bodies and, where Member States have decided so, other categories of final customers, shall have the right to participate in energy sharing as active customers in a non-discriminatory manner, within the same bidding zone or a more limited geographical area as determined by the Member State.
- Active customers shall be entitled to share renewable energy between themselves based on private agreements or through a legal entity. Participation in energy sharing cannot constitute part of the primary commercial or professional activity of the customers engaged in energy sharing.

[1] Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity

[2] COM(2023) 148 final, 2023/0077 (COD), *Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design*

[3] Directive (EU) 2024/1711 of the European Parliament and of the Council of 13 June 2024 amending Directives (EU) 2018/2001 and (EU) 2019/944 as regards improving the Union's electricity market design

- Active customers may appoint a third party as an energy sharing organiser for purposes of:

    a) Communication on the energy-sharing arrangements with other relevant entities, such as suppliers and network operators, including aspects related the applicable tariffs and charges, taxes or levies.
    b) support in managing and balancing the behind - meter flexible loads, distributed renewable generation and storage assets that are part of the relevant energy sharing arrangement.
    c) contracting and billing of active customers participating in energy sharing.
    d) installation and operation, including metering and maintenance, of the generation or storage facility.

The energy sharing organiser, or another third party may own or manage a storage or renewable energy generation facility of up to 6 MW without being considered an active customer unless it is one of the active customers participating in the energy-sharing project. The energy sharing organiser shall provide non-discriminatory services and transparent prices, tariffs, and terms of services, and for point (d) Articles 10, 12 and 18 shall apply. Member States shall set the framework for the application of the provisions on this paragraph at national level.

The latest version of the proposal also states in its introduction that "**Any payment for sharing of excess production for a price can either be settled directly between active customers or automated through a peer-to-peer trading platform**. Energy sharing arrangements are either based on private contractual agreement between active customers or organised through a legal entity. **A legal entity that incorporates the criteria of a renewable energy community (REC) as defined in Directive (EU) 2018/2001 or a citizen energy community (CEC) as defined in Directive (EU) 2019/944 could share with their members electricity generated from facilities they have in full ownership**."

Peer-to-peer trading of renewable energy had previously been defined in point (18) of Article 2 of the Directive (EU) 2018/2001 as "the sale of renewable energy between market participants by **means of a contract with pre-determined conditions** governing the **automated execution and settlement of the transaction,** either directly between market participants or indirectly through a certified third-party market participant, such as an aggregator".

From the legal perspective, the new definition of *energy sharing* and the definition of *peer-to-peer trading* are not clearly distinguishable. Energy sharing is not limited to the scope of energy communities with the new proposal anymore and can entail payments among those sharing energy. Peer-to-peer trading can equally take place in exchange for a payment, by means of a contract. The difference so far is in the fact that peer-to-peer trading is to be executed in an automated way and is limited to the sale of renewable energies only, as defined in the Directive 2018/2001. It is left to the Member States to decide how they want to implement those definitions and distinguish the two activities in their regulatory framework.

At national level

Several reports recently investigated the regulatory context at Member State level with regard to energy sharing, including:

- Energy Community Repository (2024) ENERGY SHARING FOR ENERGY COMMUNITIES - A REFERENCE GUIDE
- ENTEC (2023) Multi-supplier models and decentralised energy systems
- SolarPower Europe (2023) White Paper on a Framework for Energy Sharing

Those reports highlight the differences between Member States in the way they enable and implement energy sharing. They also provide a detailed analysis of what is allowed in each Member State – however the regulatory landscape is evolving fast (notably with the upcoming entry into force of the new EMD), and regular checks of the most recent national regulatory texts are recommended.

The first report also delivers first-hand information about the status of energy communities (both RECs and CECs) at Member State level.

However, no recent benchmark was found about P2P trading in Europe, probably because P2P is more loosely defined and encompasses various types of contractual interactions (including through an aggregator or directly through an automated P2P trading platform).

3.1.2 Methodology Adopted in Action 2

Action 2 endeavoured to get a better understanding of the barriers EU-funded projects under the BRIDGE umbrella are facing when developing innovative solutions for energy sharing (including through P2P). It also sought to gather lessons learnt from their real-life demonstrations with active consumers or energy communities, in order to derive good practices and recommendations.

The different steps followed by Action 2 are illustrated in Figure 3.1

Figure 3.1: Steps of the methodology adopted in Action 2

Projects participating in the Action were first asked to answer a short survey. Twelve projects answered out of the 25 initially interested. This survey collected inputs on the different types of barriers encountered by projects, their impact, as well as lessons learnt and – where possible – good practices. The results were presented at the first meeting, which focused on barriers. Participants in the meeting were invited to comment on the barriers and then to complete them through an interactive session using MIRO (Figure 3.2). In the second meeting, participants were asked to vote for the most important barriers (10 most important out of the 25 that were synthesised from the first meeting). This enabled the top 5 and Top 10 barriers to be identified. In the same meeting, projects and participants were also invited to present their lessons learnt: The FEDECOM project presented the solutions it develops for P2P trading as well as an overview of the regulatory barriers encountered. TNO presented the key outcomes of the ENTEC report on multi-supplier models and decentralised energy systems, and Joanneum Research presented lessons learnt from Austria on energy sharing and P2P trading. In the final part of this second meeting, participants suggested recommendations to address the top 5 barriers. The third meeting was dedicated to the fine-tuning of recommendations and their ranking. Participating projects also volunteered to work on the priority recommendations and make them more 'actionable': this will be the focus of the coming months in Action 2.

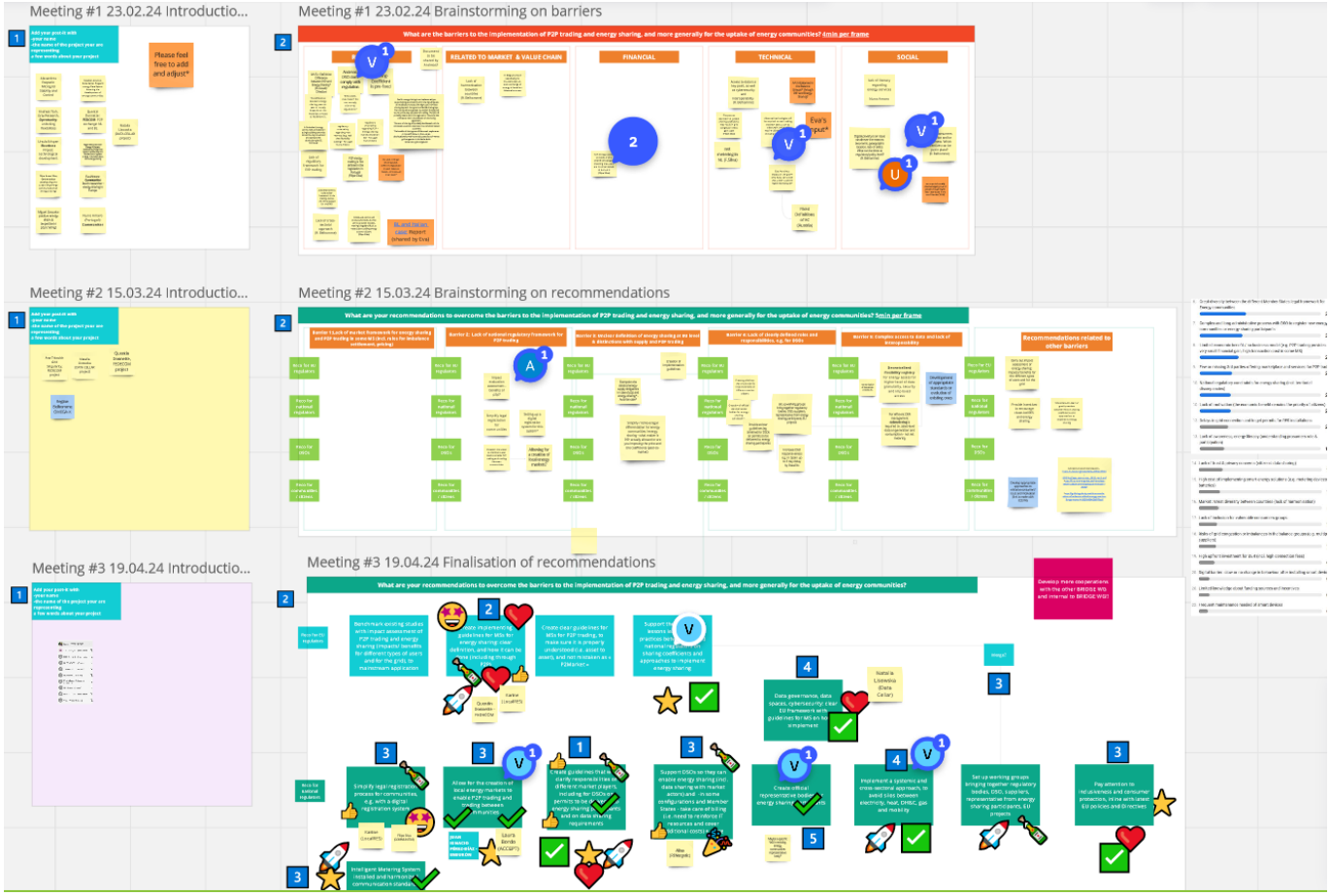

Figure 3.2: MIRO board used in Action 2 for the interactive sessions

3.1.3 Participating Projects in the Action 2

Overall, 13 projects participated in Action 2, either through participation to interactive sessions, or through surveys: **ACCEPT, COMMUNITAS, DATA CELLAR, Eddie, eNeuron, FEDECOM, Flexchess, iFLEX, LocalRES, OMEGA-X, OPENTUNITY, POCITYF** and **RENergetic**.

Most projects are focusing on energy sharing or P2P trading; others are focusing on renewable energy or citizens energy communities and are involving communities as part of their pilots. Nine are developing solutions for energy communities, 4 have demonstrations including energy sharing, and 6 P2P trading (Figure 3.3).

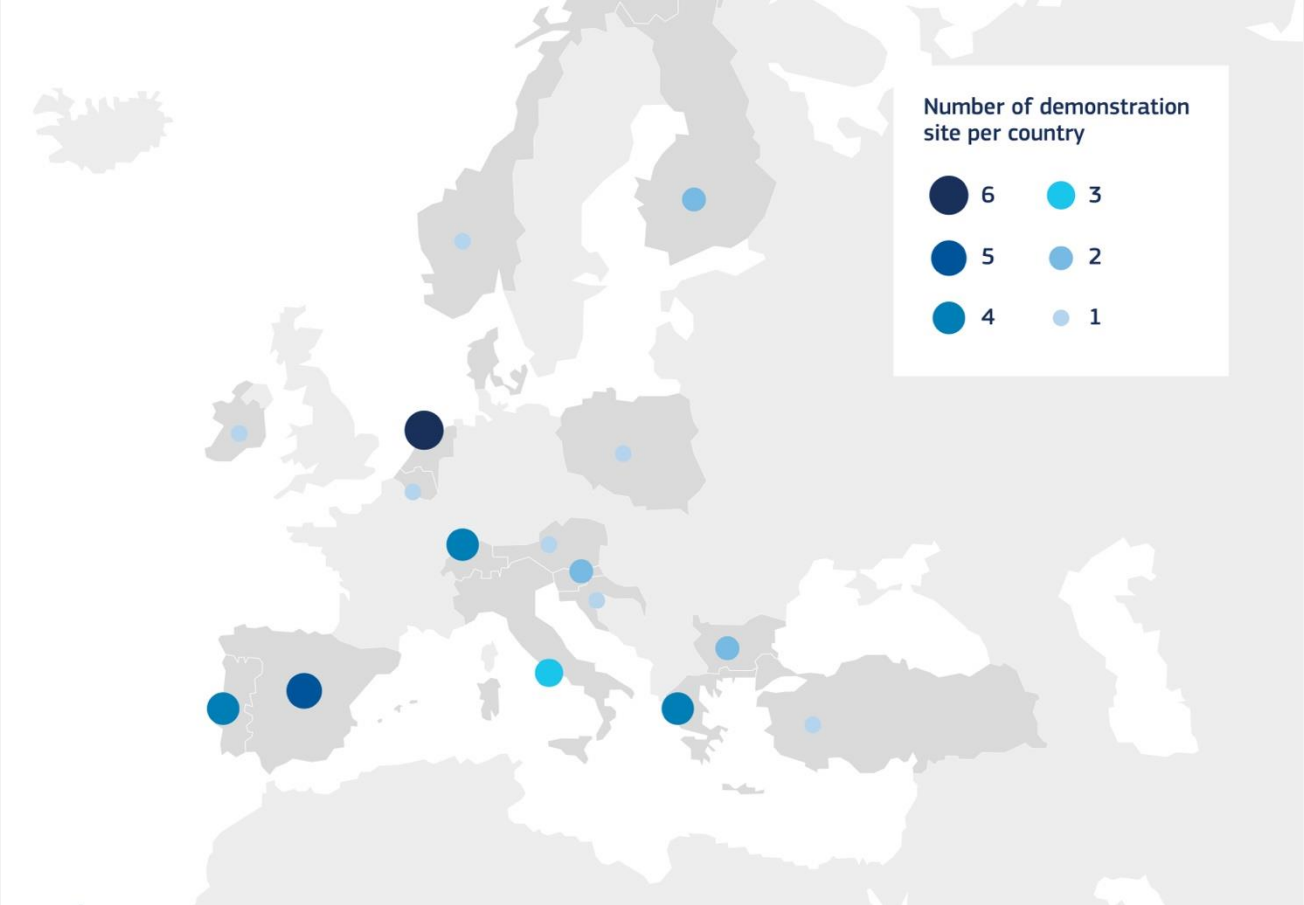

Figure 3.3: Overall number of demonstration sites per country for the projects which answered the survey

This list will be updated early October 2024 to include new incoming projects.

3.2 Barriers

The barriers to energy sharing and peer to peer trading were first identified in the survey, and then collectively discussed during the kick-off meeting of Action 2, using an interactive online board. All the inputs were then clustered into a list of about 20 barriers. While some barriers are of regulatory nature, others are financial, technical or social. Their overall impact on the projects that answered the survey is illustrated in Figure 3.4.

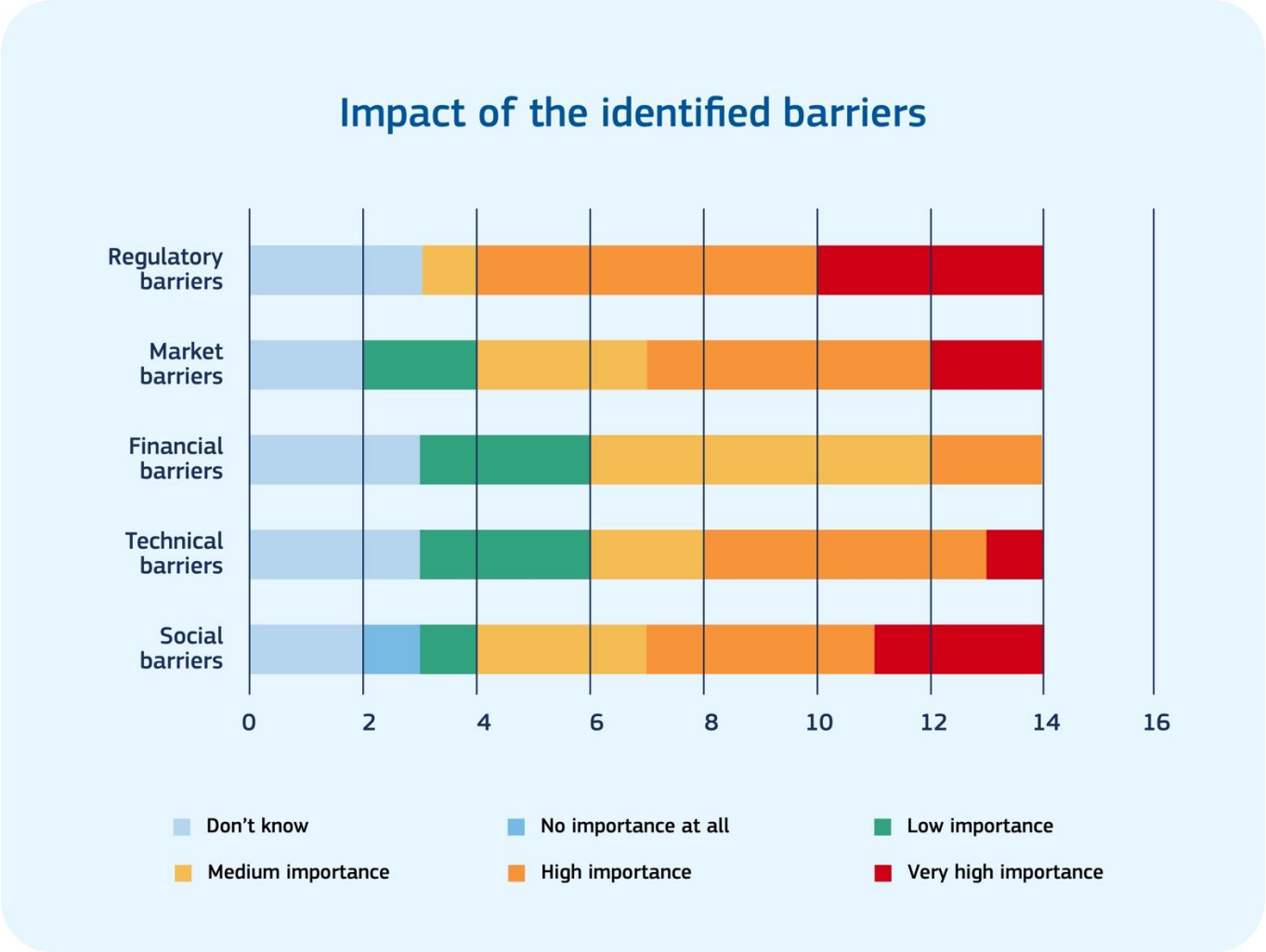

Figure 3.4: Impact of the different types of barriers according to survey respondents

The regulatory framework was deemed as overly complex by some participating projects. The legislative texts adopted at Member State level to transpose the EU directives were considered as too restrictive and not fully aligned with the EU definitions. Additionally, energy sharing and P2P trading focus on electricity, thereby creating silos and missing the opportunity to unlock the potential of sector integration.

Projects participating in the second meeting were then asked to select the 10 most important barriers from the initial list, which resulted in the selection of a top 5, as illustrated in Figure 3.5.

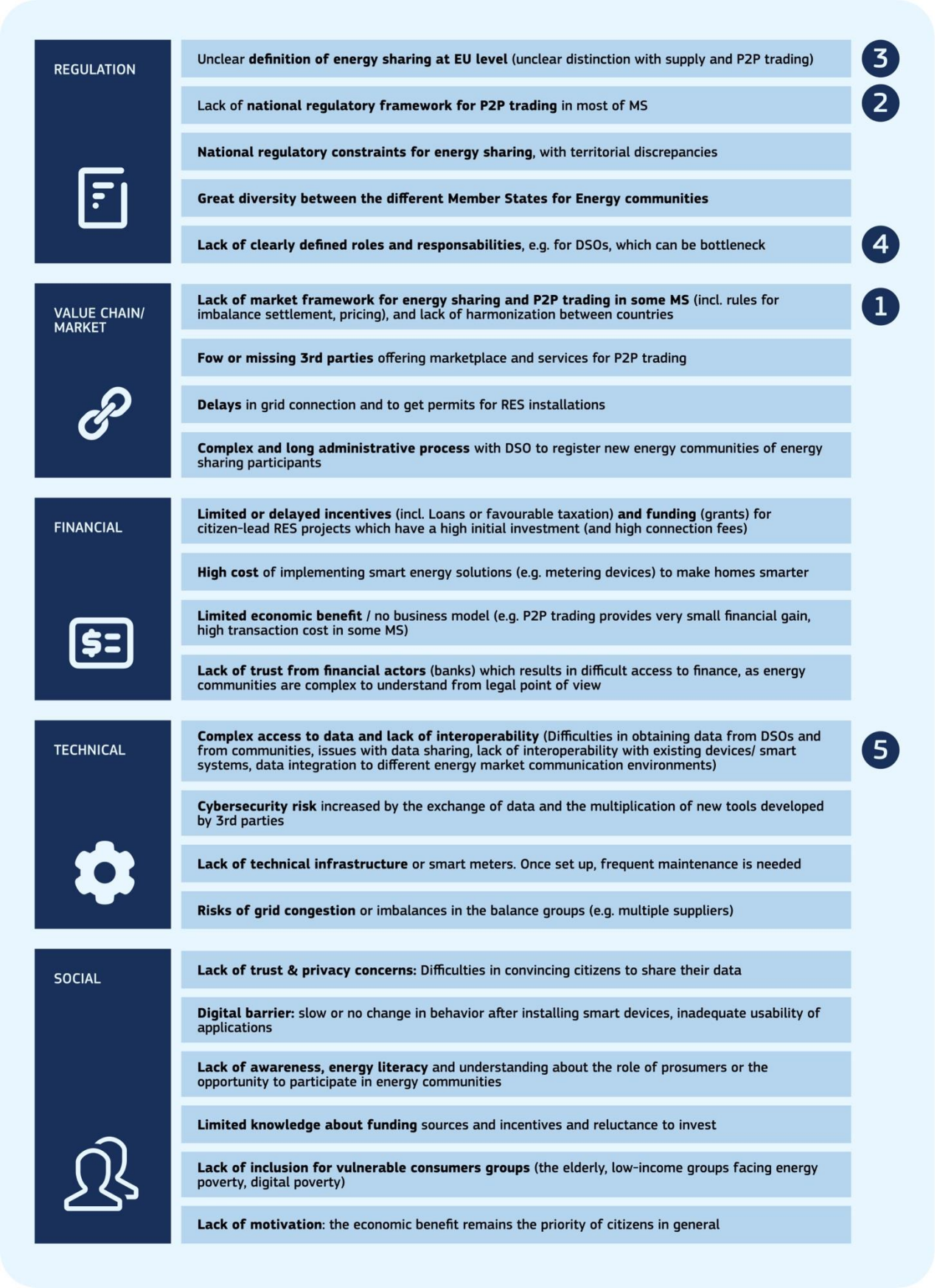

Figure 3.5: Barriers identified in Action 2. Top 5 barriers are the numbered ones

3.3 Lessons Learnt and Good Practices

A few projects communicated lessons learnt from their projects in relation to the barriers previously identified. FEDECOM presented results and good practices in more detail at the second meeting of Action 2.

Most of the lessons learnt correspond to **national regulatory specificities** and are synthesised below (Table 3.1).

Table 3.1: Regulatory specificities per different nations

Nation	National regulatory specificities
Austria	• 3 types of energy communities are defined: citizen energy communities, medium voltage renewable energy communities (regional energy communities), low voltage renewable energy communities (local energy communities). They benefit from reduced grid fees and charges (-30% for MV RECs and -60% for LV RECs). Citizen energy communities have been limited to the grid owned by of one of the larger DSOs. However this is being changed. • Sharing coefficients are pre-determined by DSO: P2P trading is not possible for an energy community.
Belgium	There are different legislations for energy sharing in each Federal State. • In **Brussels**, energy sharing is possible (i) within the same building (ii) within an energy community. Variable network tariffs are applied depending on the location of the exchange (4 differences considered). • In **Flanders**, "energy sharing" concerns the transfer (free of charge, over one imbalance settlement period, i.e., 15 mins) of self-generated, possibly stored, energy injected into a distribution network, closed distribution network, or into the local transmission network. There is no supply licence required to engage in energy sharing since it is not considered to be a sale or a supply of energy – but more of a "self-consumption" through active customers. Only residents within the same building, members of energy communities and customers holding several access points can exercise energy sharing. • Peer-to-peer exchange of energy is based on bilateral contracts, stating the modality of the exchange (price, time, volume). High transaction costs from suppliers for energy sharing exist in Flanders but the energy sharing itself should take place on a cost-free basis, in contrast to peer-to-peer trading, where prices can be charged.
Ireland	Energy communities are not legally recognised yet, and the regulatory environment is unclear as of today. The Clean Energy Package (CEP) encourages consumer empowerment and engagement within the energy sector. In 2022, the CEP was incorporated into Irish law, tasking the Commission for Regulation of Utilities (CRU) with creating a supportive regulatory framework for active consumers and energy communities. Communities can vary greatly in size, the activities they engage in, and how they are resourced in terms of the skills and expertise available to them. What constitutes 'local 'to one community may differ vastly to another community. By taking this approach, the REC has the autonomy to determine the most suitable proximity requirements based on the individual characteristics and needs of their energy community.
Italy	Participants in energy sharing receive cash-back at the end of the month, suppliers are not involved in the process.

The Netherlands	Energy sharing is not implemented yet; a model is being developed, taking into account grid congestion issues (grid congestion represents a technical threat to the growth of energy sharing). Net metering is still in place. Energy communities are not legally recognised yet. Peer-to-peer trading and exchange of energy are implemented only through regulatory sandboxes (e.g. Renaissance project).
Portugal	Regulatory uncertainty remains regarding new markets (e.g., flexibility trading), and for energy sharing/ P2P trading within an energy community. P2P trading is not defined in the legislation yet.
Spain	Energy communities must be either an energy Cooperative or an Association. Energy sharing is allowed through collective self-consumption schemes and is exempted from taxes and network charges. Billing for P2P is an issue as there is a delay to access consumption data (3-day delay). The Spanish regulatory framework distinguishes between **collective self-consumption** and **energy communities**. Collective self-consumption allows any individual or company to produce and consume their own electricity by installing photovoltaic solar panels or other renewable generation systems in their homes, premises, or residential community and it is regulated through Royal Decree 244/2019. The IDAE – The Spanish Institute for Energy Diversification and Saving – has recently published an updated version of its report, "Guide to Collective Self-Consumption"; which includes the figure of the self-consumption manager, crucial for the better management of collective self-consumption, although it also applies to individual self-consumption. The report also includes a section on collective self-consumption in energy communities. Energy communities, defined as renewable energy communities, are energy cooperatives or associations with an open and voluntary participation, and are autonomous and effectively controlled by partners or members. Their primary purpose is to provide environmental, economic, or social benefits and they are regulated through Royal Decree 23/2020. Within an energy community, there may be one or more collective self-consumptions, whereas collective self-consumption is a type of self-consumption, and it is not necessary to form an energy community to carry it out. Additionally, the Royal Decree-Law 5/2023 introduced **citizen energy communities** as a new agent in the system. These are legal entities whose effective control is exercised by the members themselves. These members can be individuals, local authorities, or small businesses, and their participation is always voluntary and open. The main purpose of these communities is to generate environmental, economic, or social benefits for their own members or the locality. In October 2022, the Spanish Government published the Energy Security Plan+, which contains a package of measures which will contribute to a structural strengthening of energy security. Specifically, *Measure 35 - Encouraging renewable energy communities* proposes to establish a legal framework in order to facilitate the development of energy communities. To this end, it recommended the elaboration and approval of a specific royal decree that completes the provisions of Law 24/2013 of the Electricity Sector. Although this royal decree was expected by 2022, it has been postponed several times; there has been a public consultation on it and its approval is still pending. The content of this regulation can be consulted as the *Draft Royal Decree developing the figures of renewable energy communities and citizen energy communities.* For both renewable energy communities and citizen energy communities, the regulation stipulates that they must ensure access to all organised electricity production markets directly or through aggregation in a non-discriminatory manner. However, the norm that will regulate its development is still pending. Additionally, the draft royal decree also states that renewable

	energy communities are not limited to the electricity sector but can also promote energy efficiency and include other energy uses such as transport, heating and cooling supply. Finally, the figure of the **independent aggregator**, defined in Royal Decree 23/2020, encompasses those entities that provide aggregation services and are not related to the client's supplier. However, the regulatory framework has not yet been fully developed and is currently in the proposal stage of legislation.
Switzerland	Energy communities are based on a single building, otherwise the community should own and operate their distribution grid. A new regulation is currently under preparation to allow a free settlement of the price of energy shared among members and reduce network tariff by up to 60% if the exchange occurs on the same voltage level.

A strong disparity can be seen among Member States about the energy sharing coefficients:

- Can be ex-ante vs ex-post allocation, static vs dynamic,
- The timeframes at which coefficients can be changed also differ from monthly to yearly.

As regards **good practices**, projects also mentioned:

- Set up industrial alliances and collaboration with regulatory bodies,
- Monitor legislative and regulatory developments at the national and European levels,
- Install smart meters or intelligent monitoring devices (with consumers agreement) to access consumption data when the DSO cannot share them,
- If there is a legislative blocker to creating an energy community: change the location of demonstration.

The only project that has benefited from a regulatory sandbox to alleviate a legislative blocker is Renaissance, which ended in 2022.

3.4 Recommendations

Recommendations to address the main barriers, which build upon lessons learnt and good practices from the participating projects, were outlined and prioritised during two interactive workshops. Ten recommendations were finally produced.

Some of these recommendations target EU policy makers and regulators, while others target national regulators. They are presented by order of priority in Table 3.2 below.

Table 3.2: List of recommendation in order of priorities

Priority	Recommendation	*EU level*	*MS level*
1	Create guidelines to clarify the responsibilities of the different market players, including for DSOs on permits to be delivered to energy sharing participants and on data sharing requirements.		
2	Create implementing guidelines for MSs for energy sharing: clear definition, and how it can be done (including through P2P trading), making sure that national regulations on energy sharing include necessary provisions on inclusiveness and consumer protection.		
3	Set up national and EU working groups bringing together regulatory bodies, DSO, suppliers, representative bodies for energy sharing participants (to be		

	created if necessary), and EU projects, to share lessons learnt and good practices (incl. on sharing coefficients).		
4	Simplify legal registration process for communities, e.g., with a digital registration system.		
5	Allow for the creation of local energy markets to enable P2P trading and trading between communities.		
6	If not already done, deploy intelligent metering systems and harmonised communication standards.		
7	Support DSOs (e.g., to reinforce IT resources and cover additional costs) so they can enable energy sharing (incl. data sharing with market actors) and - depending on configurations and Member States - take care of billing.		
8	Implement a systemic and cross-sectoral approach, to avoid silos between electricity, heat, DH&C, gas and mobility.		
9	Establish a clear framework at EU level for data governance in the energy sector (data access, ownership, privacy, cybersecurity), with guidelines for MS on how to implement at national level, to build trust and enable new business models for energy sharing *(link to Action on Data Spaces).*		
10	Benchmark existing studies with impact assessment of P2P trading and energy sharing (impacts/ benefits for different types of users and for the grid), to mainstream application.		

The projects participating in Action 2 continued working on these recommendations during summer 2024, to make them more actionable, i.e., each recommendation was broken down into a set of suggested actions. The results of this collective work will be integrated into the activities to be carried out by Action 2 from October 2024 to March 2025.

4. Action 3 – Facilitate Energy and Flexibility Market Coordination and Integration

Action leads: Helena Gerard,VITO (OneNet project) Jacob Mason VITO (OneNet project), Josè Pablo Chaves Avila Comillas Pontifical University (OneNet project); Matteo Troncia Comillas Pontifical University (OneNet project)

4.1 Introduction of the Action

The continued electrification of Europe is important for decarbonising the grid. It has resulted in further decentralisation of electricity generation components and increased control on consumption due to increases in the use of EVs, heat pumps, and the integration of other technological innovations. These developments pose a significant challenge to grid planning and operations as they inherently shift the electricity network away from the traditional centralised system towards a decentralised, consumer-centric network. The introduction of new services, roles and stakeholders requires careful consideration to ensure that electricity and flexibility markets support coordination between all market components and ensure that market players, emerging technologies and multiple energy carriers are all integrated in an efficient way.

Barriers and solutions to achieving coordinated and integrated markets were initially identified within the **OneNet** project, based on a broad assessment of BRIDGE projects working on (aspects) of energy and flexibility market design. Moreover, the results were presented and discussed via 1) a public consultation of industry members and 2) a joint workshop with members from the BRIDGE Working Group on Regulation. The outcome of this BRIDGE workshop is presented in this chapter. With the completion of the OneNet project, a follow-up has been prepared for the BRIDGE members to compare results from the first survey as well as to develop key insights further. This survey, and Action 3 of BRIDGE, will be continued within the project **BeFlexible**.

Methodology adopted in Action 3

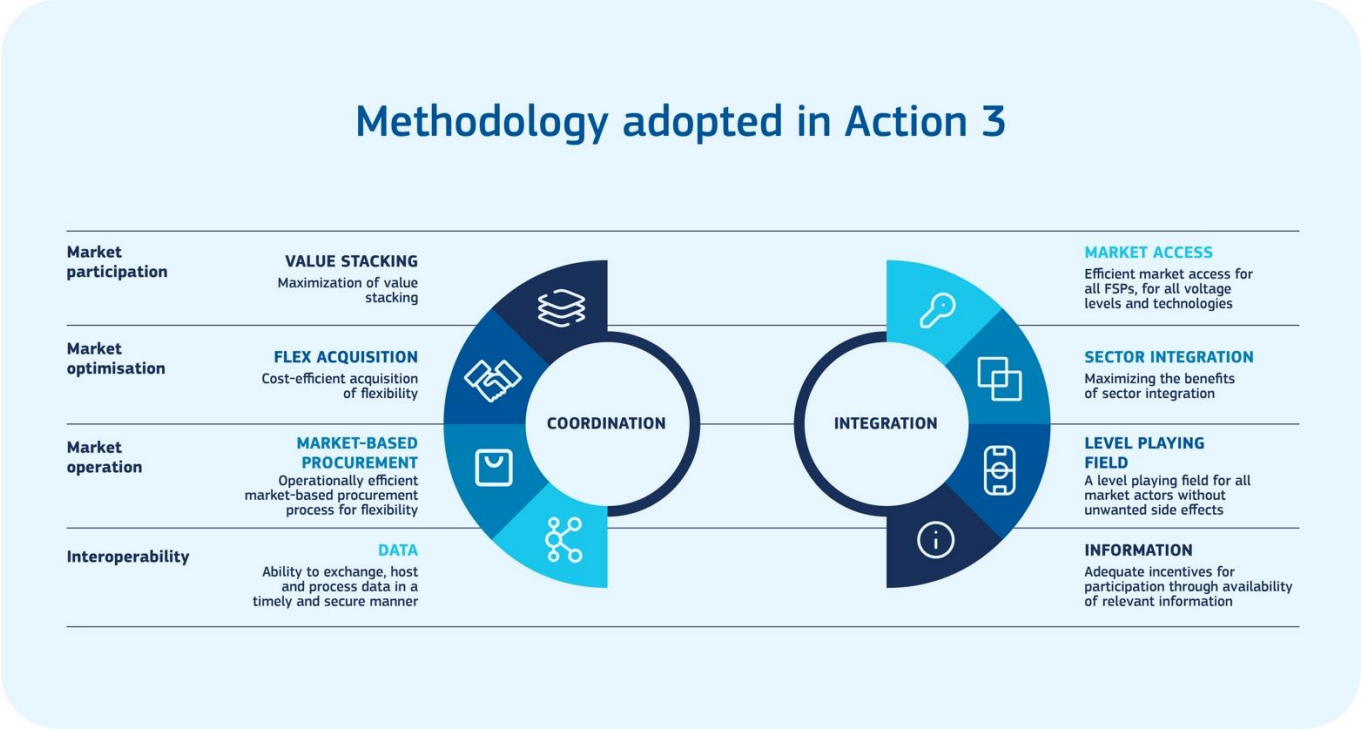

Figure 4.1: Objectives for coordinated and integrated markets as used within the OneNet project framework.

OneNet approached the transition of current electricity and flexibility markets towards fully coordinated and integrated markets on the European level by highlighting existing barriers (Figure 4.1). In addition, solutions have been developed to address the unique challenges of this transition at the local, national, and EU levels. The project looked into these challenges and draw on lessons and best practices from other Horizon and BRIDGE projects..

As part of the project, a roadmap was developed to implement the solutions across the EU. Key external stakeholders – representatives of TSOs, DSOs, FSPs, IMO and consumers – were consulted for feedback.

The results of this survey, presented below, were discussed with the members of the WG during an interactive workshop, held on 29/02/2024. The results of this workshop are presented in this chapter. The action will continue in 2024, where a follow-up survey will be organised to go more in depth on specific topics.

Participating Projects in the Action 3

To identify best practices from BRIDGE projects, this action will use the information provided by various projects participating in the WG.

26 Projects participated in the Action and expressed interest:

BeFlexible, Communitas, DriVe2X, ECHO, Eddie, ENFLATE, EV4EU, FEVER, GIFT, GlocalFlex, HYSTORE, Interconnect, i-STENTORE, LocalRES, Mopo, NATURSEA-PV, OMEGA-X, OneNet, POCITYF, RE-EMPOWERED, RENergetic, SENERGY NETS, SINNOGENES, STREAM, TIGON, WEDUSEA.

This list will be updated through the working year 2024 - 2025to include new incoming projects.

4.2 Barriers

The action started from a consolidated overview of barriers developed within the OneNet project. The barriers are summarised in Figure 4.2. A detailed discussion and explanation of these barriers is available in the report 'Definition of integrated and fully coordinated markets for the procurement of grid services by DSOs and TSOs'[4]

[4] Gandhi, S., Willeghems, G., Lacerda, M., Gerard, H., Kessels, K., Foresti, M., Rehfeld, A., Reif, V., Bindu, S., Chaves Ávila, J. P., Kukk, K., and R. Kielak, 2023. Definition of integrated and fully coordinated markets for the procurement of grid services by DSOs and TSOs. OneNet Deliverable D3.2. Available at: D3.2_OneNet_v1.0.pdf (onenet-project.eu).

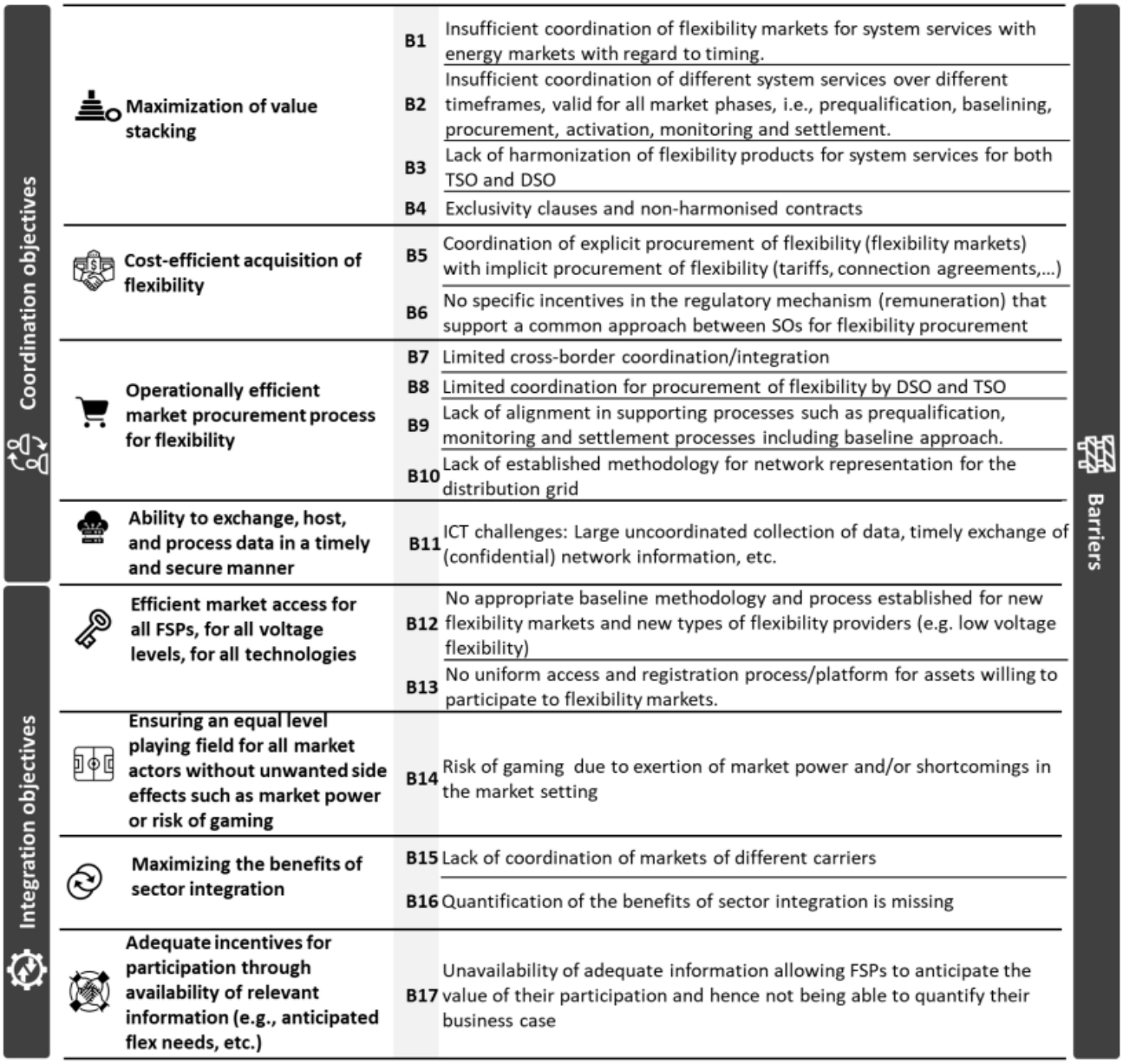

Figure 4.2 Overview of barriers for coordinated and integrated markets – OneNet project (2023)

4.3 Lessons learnt and insights from the Workshop

The workshop comprised two main parts: an introduction followed by breakout sessions. The introduction provided a summary of the OneNet project and an overview of the goal of the public consultation. It also familiarised the attendees with the polling software and gathered general information on certain topics. During the breakout sessions, the attendees were divided into two groups with one focusing on interoperability of systems and products and the second on coordinated and integrated market designs. Only the questions and their results for the market design focus group are presented below due to their relevance to the Action 3 topic.

Introduction Session

After the project and poll had been presented, attendees gave their feedback via Office forms and Mentimeter polls to a short number of questions. Their answers are presented below.

QUESTION 1: According to you, what are the most prominent barriers to market design?

- Data sharing / data quality / data / data management / Interoperability of data / lack of data
- Missing harmonisation / Lack of pan-EU harmonisation/ lack of harmonisation / harmonisation / harmonisation across EU
- Lack of network codes
- Regulatory barriers / lack of legislation / legislation / lack of well-prepared legislation and conservative regulatory environment / regulatory framework and incentives / regulatory barriers connected to lack of transposition of EU legislation / regulation / lack of regulation
- NRA approval
- Consumer awareness
- DSO observability
- Roles and responsibilities definitions
- Lack of diverse implementation
- Low value of flex today
- Risk aversion
- Security
- High access cost
- Liquidity
- Insufficient necessity
- Facilitating individual DER to participate in flexibility
- No clear business use case / no business case
- Lack needs
- Community and peer to peer energy sharing integration
- Overlapping of a private and regulated sector / Different business perspectives
- Many stakeholders
- Market power of big tech
- Technology
- Lack of open standards
- Missing incentives to drive it
- Missing demand
- Costs of interoperability

This question was asked in order to gather insights on what the participants believed were the most pressing barriers without bias from the subjects that would follow throughout the consultation. The participants identified three main groups of barriers to market design:

1. Barriers related to consumers
2. A lack of a clear and stable regulatory framework (some of the participants even mentioned the lack of network codes)
3. Technical aspects of data (such as data quality, data operability, data structure and business models)

QUESTION 2: What are, according to you, the most prominent barriers to interoperability?

- Lack of API standards / Lack of data standards in technologies / Lack of standards / Standards / Lack of standard information models for DER participants / delay in getting a standard
- Interoperability vs facilitating innovation
- Data management
- Missing incentives to develop interoperability / Incentives
- Harmonisation is not always feasible (technically) / Lack of harmonisation between countries
- Communication protocols
- Technological adaptations at FSP side
- Regulatory issues / Regulation
- Automation

- Different needs of stakeholders
- Lack of compelling business models
- Conflict of interests

The participants identified the **lack of standards**, **harmonisation,** and **regulatory concerns** as the most significant barriers.

From the responses to the questions regarding barriers to market design and interoperability, it was clear that although market design and interoperability are two distinct elements, they have much in common. What happens on one side will impact the other side. That's why the OneNet project considered both a priority in the roadmap design and why OneNet did this webinar as a joint initiative with BRIDGE, as the regulatory aspects are relevant for market design and interoperability.

QUESTION 3: According to you, in which topic is the most innovation needed, and which topic should be prioritised?

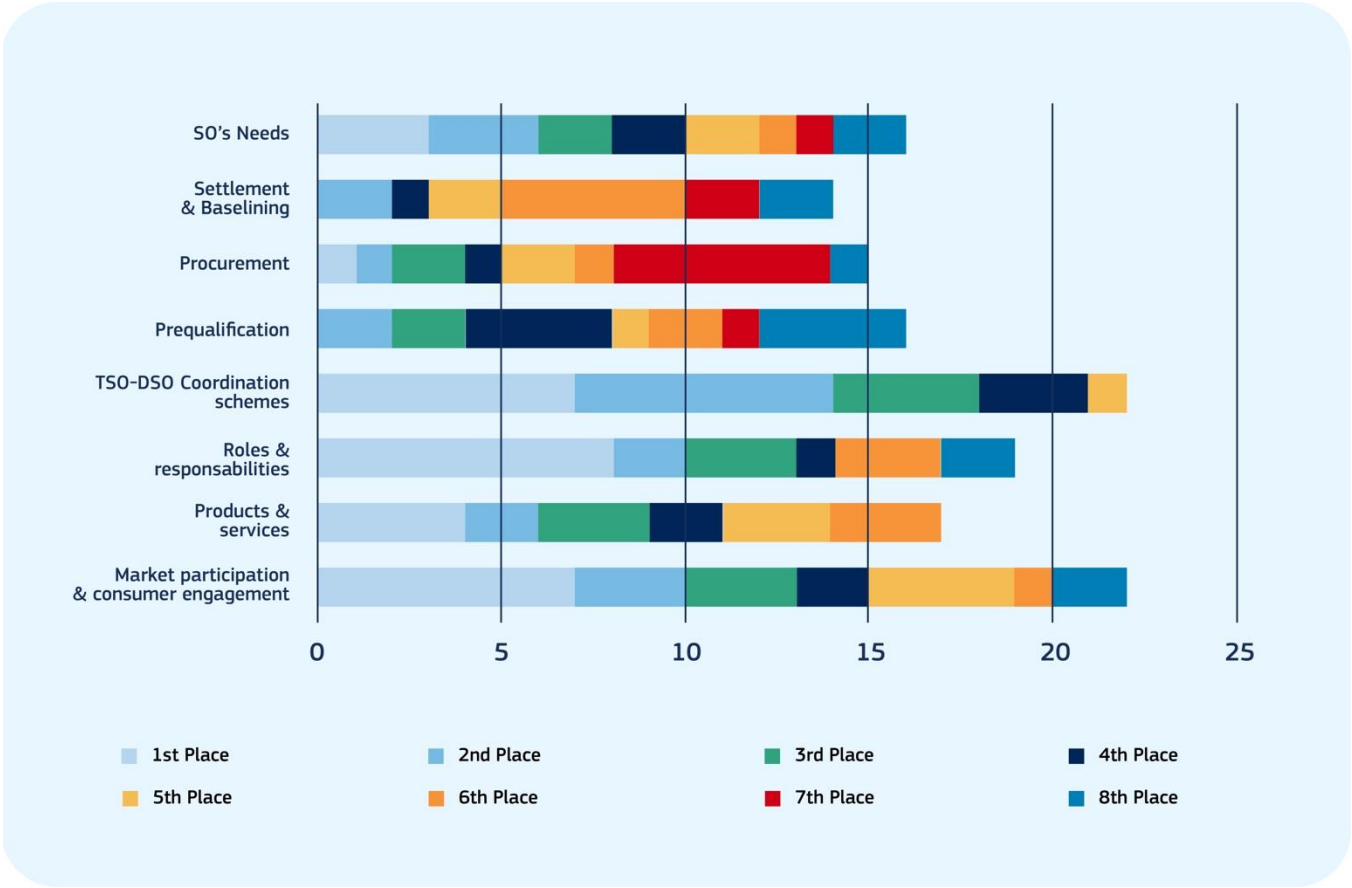

Figure 4.3: Ranked results of Question 3

As can be seen in Figure 4.3, the most important topics were TSO-DSO Coordination Schemes, followed closely by Market Participation & Consumer Engagement and Roles & Responsibilities. This indicated that issues related to market participation factors (from the perspectives of consumers and market operators) were considered to have a larger impact than topics related to market operation (such as prequalification and procurement procedures).

Market Design Session

The participants split into the two breakout rooms. The participants of the integrated and coordinated market design were asked for feedback regarding different aspects of this topic via the polling application Mentimeter. This

working session was further segmented into different subtopics that focused on the key messages presented by OneNet. Each subtopic was accompanied with three pieces of information:

1. The key message developed by OneNet to address the barriers to the subtopic
2. The solutions developed within OneNet to tackle the barriers
3. The enablers of and barriers to the rollout of these solutions

Market Participation & Consumer Engagement

The first subtopic focused on Market Participation & Consumer Engagement within markets as flexibility providers. The first question (Question 4 below) was open-ended, which allowed them to respond with any topic they found suitable.

QUESTION 4: Stepping outside of your roles as a professional within the industry, what are the biggest barriers that prevent you as a consumer from participating?

- Insufficient financial benefit / how can I schedule my energy use without any price signal / No clear initiatives from relevant authorities to highlight the importance of flex market
- Complexity / Too complex / Not knowing where to start / knowledge of the available options
- My technologies at home are not automated / no technology available
- Investment costs
- Lack of interest
- Regulatory issues / complex regulatory and admin procedures
- Lack of turnkey no fuss solution
- No demand from local DSO/TSO

Most respondents to this question answered that the current complexity of engaging as a prosumer in the existing energy market and the need for sufficient financial benefits were the largest barriers to an individual's participation in flexibility markets.

QUESTION 5: From the barriers previously discussed regarding Market Participation & Consumer Engagement, what are the top 3 most essential barriers?

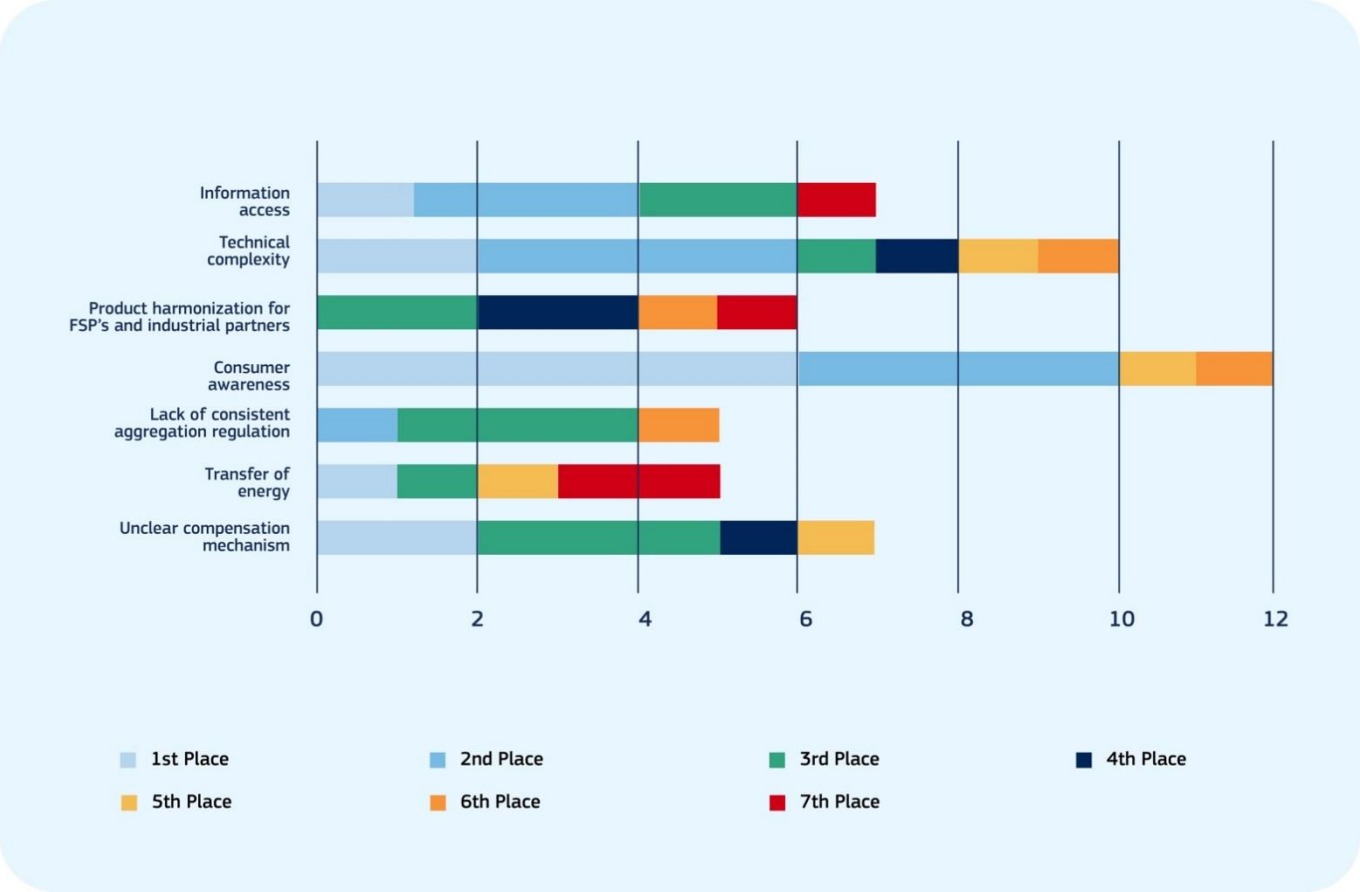

Figure 4.4: Ranked results of Question 5

To gather an understanding of the barriers impacting participation and engagement in the market as a whole, Question 5 was presented to allow the attendees to rank the barriers. As a result, the need to improve consumer awareness is considered the biggest barrier to consumer engagement in flexibility markets (Figure 4.4).

Products & Services

The next subtopic addressed the Products & Services, Question 6 focuses on what should be prioritised during the gap between present day and when the network code on Demand-Side Flexibility is implemented.

QUESTION 6: With the upcoming new network code on DSF, many barriers will be solved. However, today, what has the highest priority for innovation?

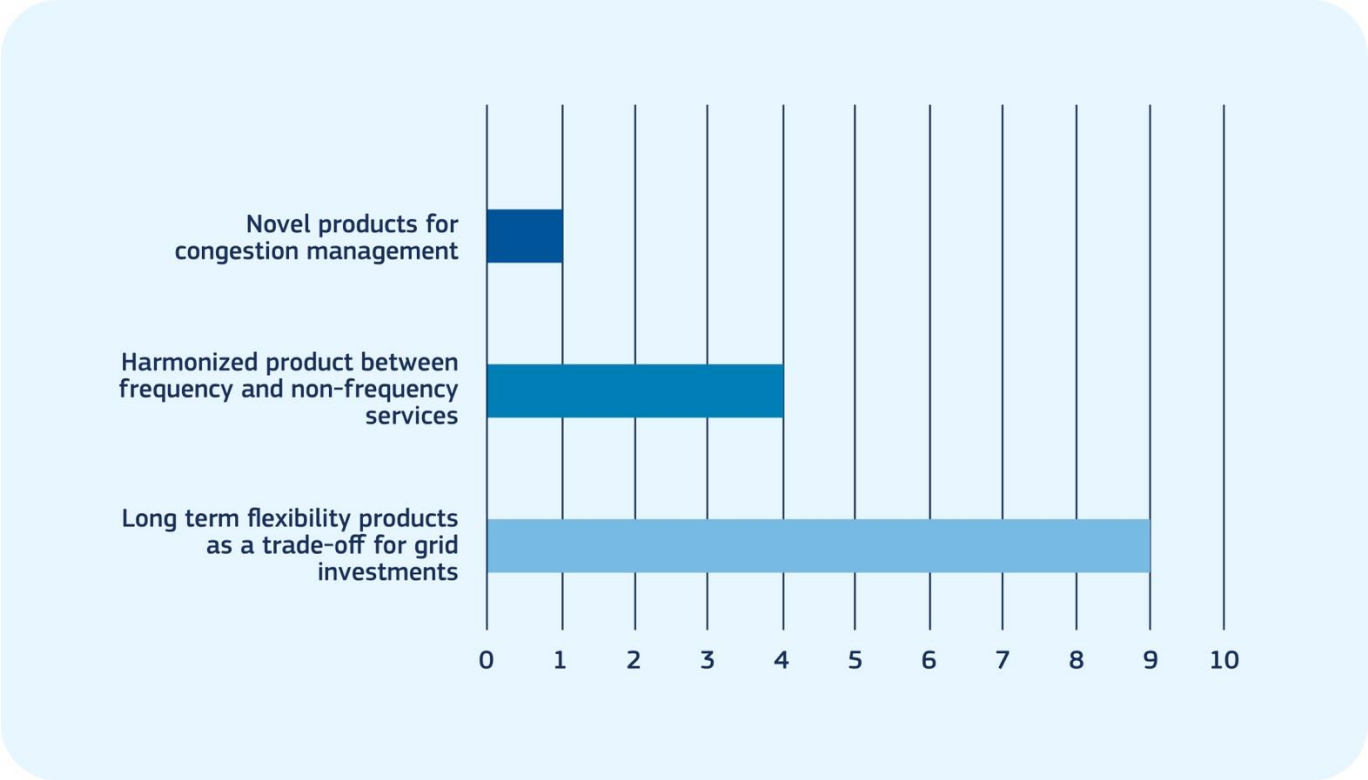

Figure 4.5: Results of Question 6

Long-term flexibility products as a trade-off for grid investments are recognised (Figure 4.5) as the topic with the highest priority for innovation before the network code is in effect.

Roles & Responsibilities

Most participants responded that the third party should take up the role of the independent market operator (Figure 4.6). An independent market operator who is not already buying flexibility on the market certainly has some benefits, such as transparency and independence, which may also increase trust in the market with other market participants.

QUESTION 7: Who should take up the role of the independent market operator?

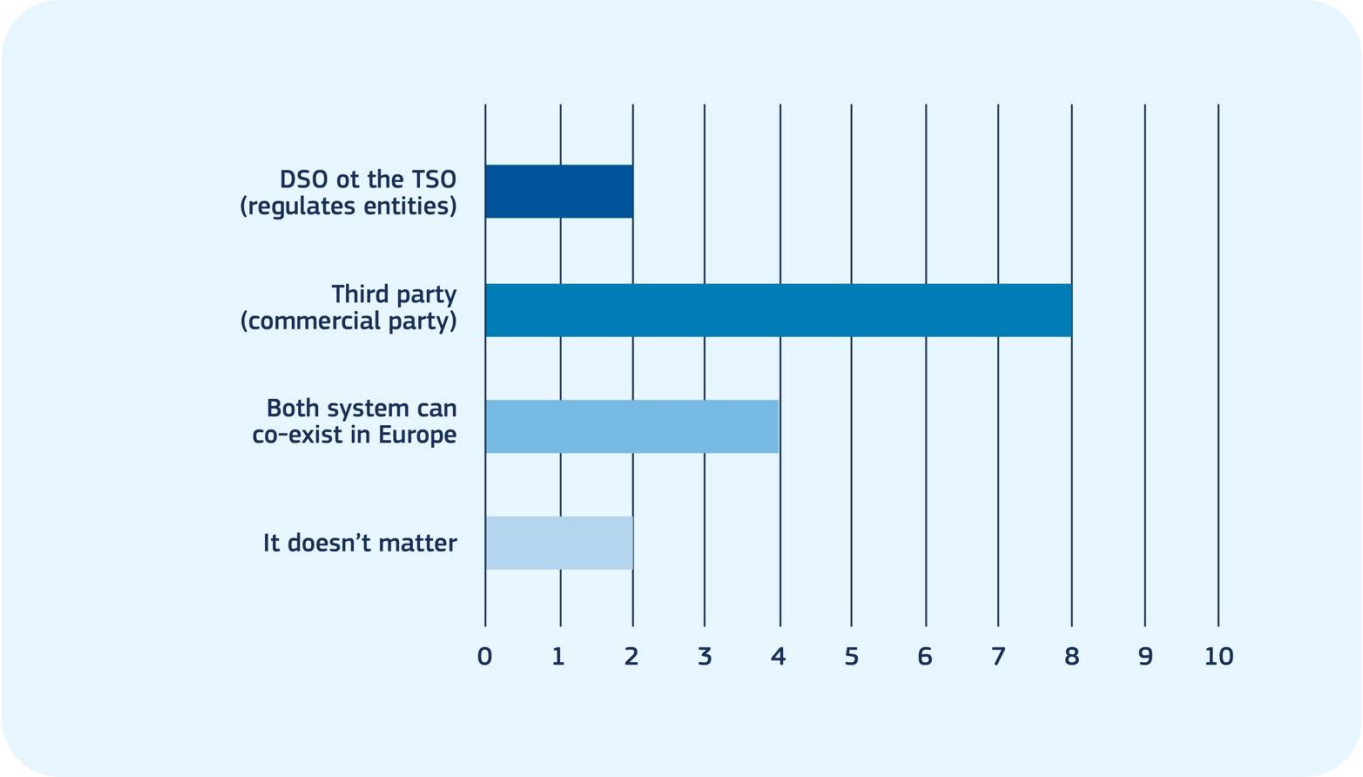

Figure 4.6: Results of Question 7

TSO-DSO Coordinated Flexibility Markets

With regard to achieving efficient TSO-DSO coordinated flexibility markets, the participants indicated (Figure 4.7) that the primary enablers would be clear remuneration (pricing schemes, validation, and settlement) processes for FSPs and having secure and efficient network representation. However, it is essential to note that during the discussions following this question, the attendees clarified that all four drivers were critical to achieving this goal adequately.

QUESTION 8: As a TSO/DSO, what do you consider to be the main drivers for efficient TSO-DSO coordinated flexibility markets?

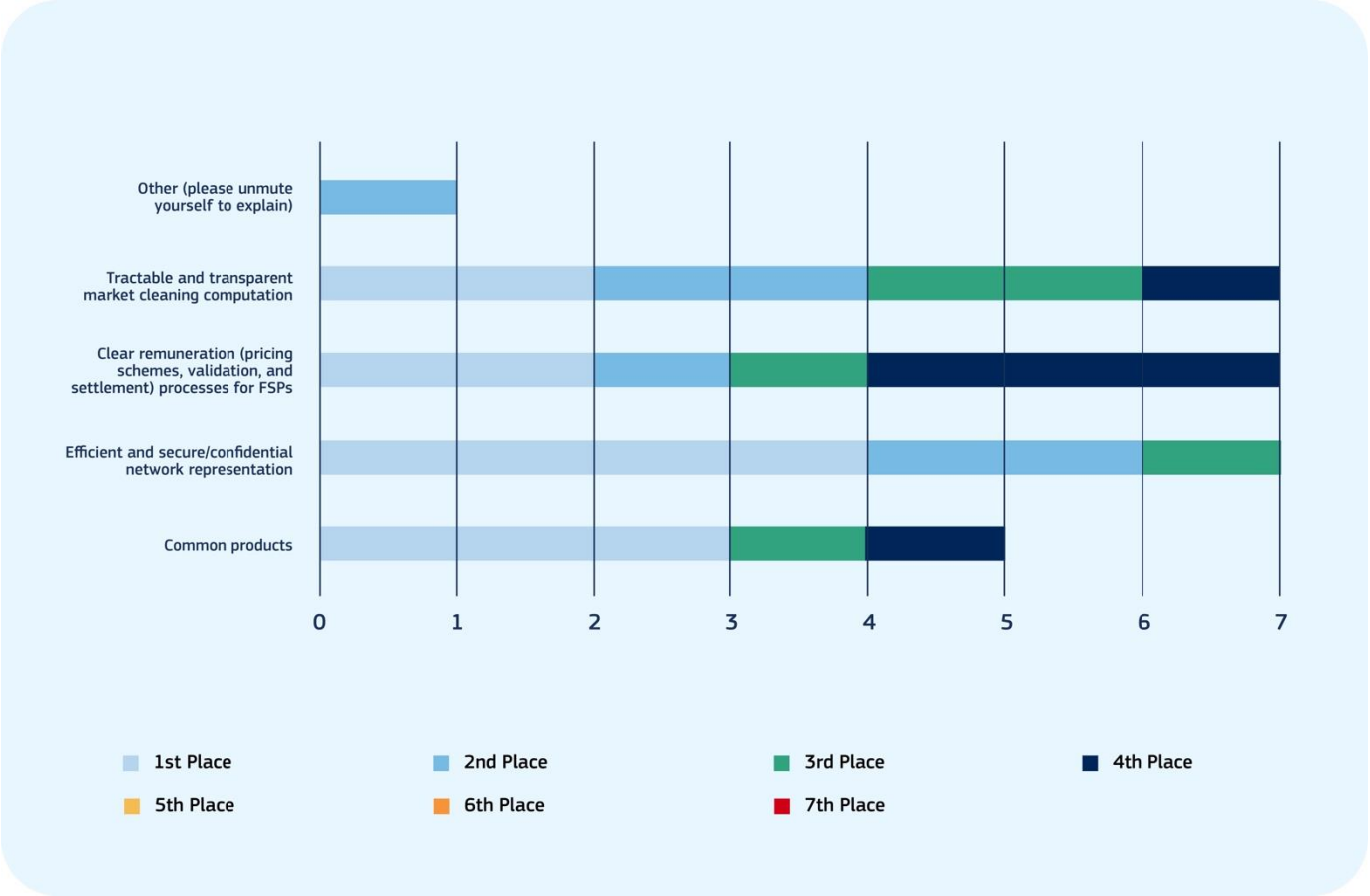

Figure 4.7: Ranked results of question 8

In contrast to the previous question regarding enablers, the audience was split on the most considerable barrier to efficient TSO-DSO coordinated flexibility markets (Figure 4.8). Some believed that TSO-DSO communication was the primary barrier, and others thought it was the difference in flexibility needs between the two parties.

QUESTION 9: As a TSO/DSO, what do you consider to be the main barriers for efficient TSO-DSO coordinated flexibility markets?

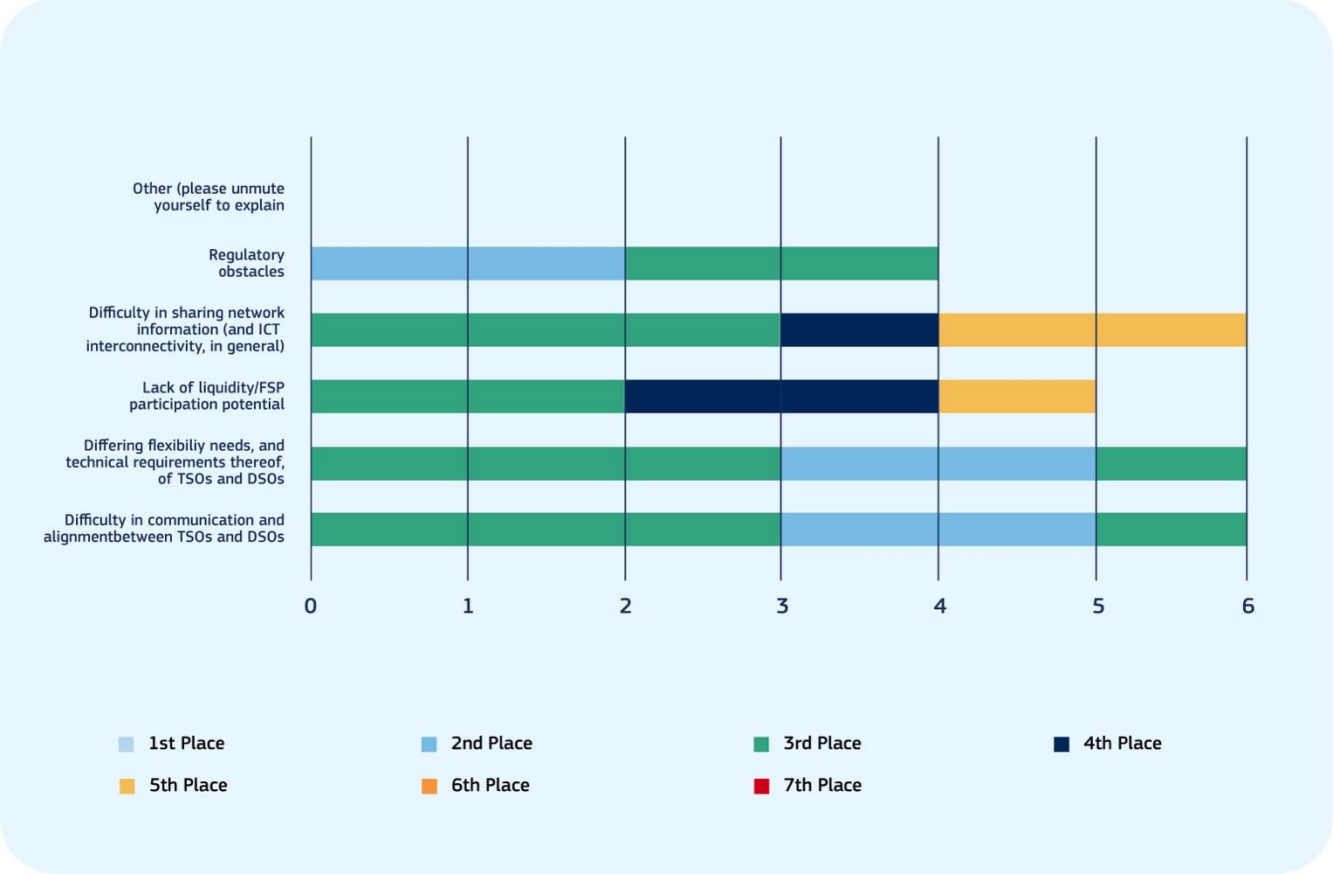

Figure 4.8: Ranked results of question 9

Prequalification

Most workshop participants agreed that the prequalification process should be harmonised at the national level with EU-level coordination via standardised guidelines (Figure 4.9). All members agreed that the main concern with any level of harmonisation was the market variations at the national or local levels across Europe.

QUESTION 10: What level of harmonisation/streamlining do you think is required for prequalification processes?

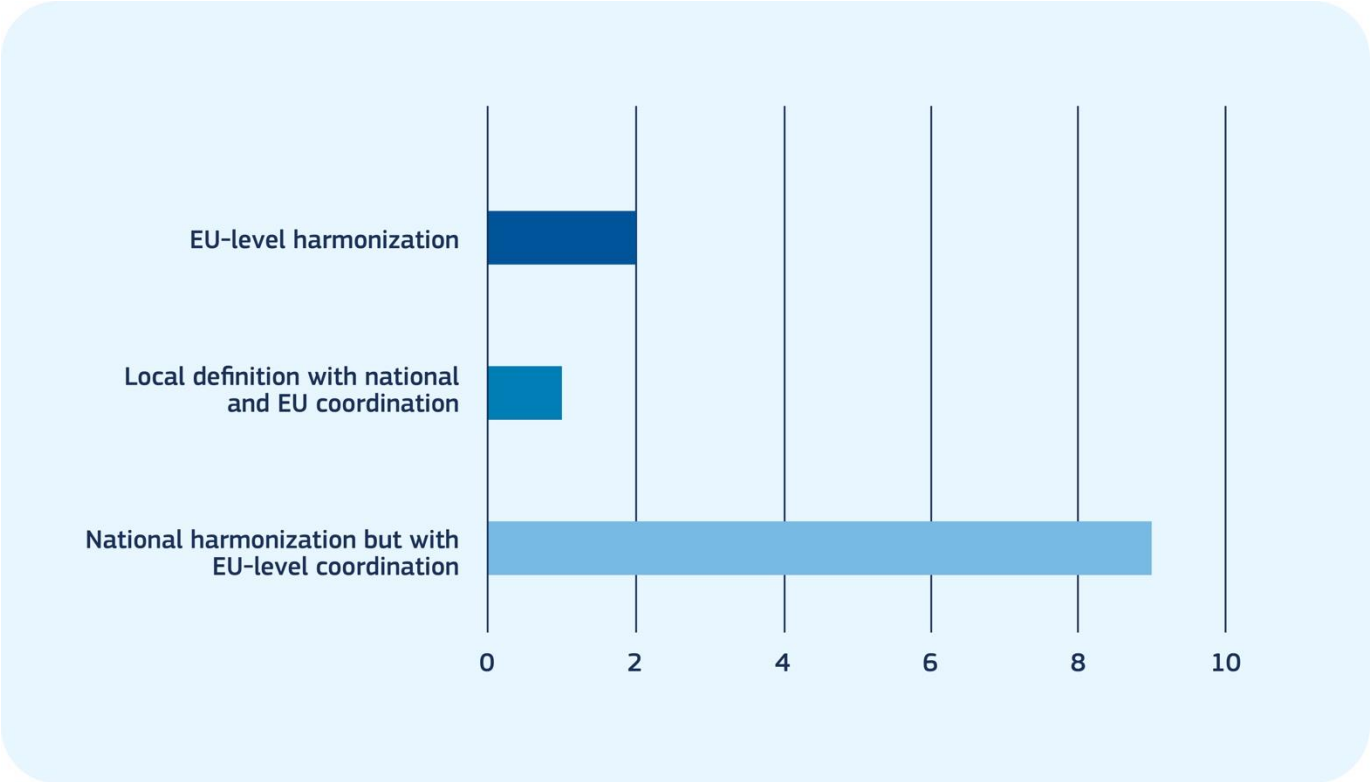

Figure 4.9: Results of question 10

Of those who said their answer would change (Figure 4.10), their reasoning was aligned in that FCR balancing is performed across national borders on the EU level and should, therefore, require harmonisation at the EU level.

QUESTION 11: Would your recommendation differ when considering different products (e.g. balancing, congestion management, voltage control, etc.)?

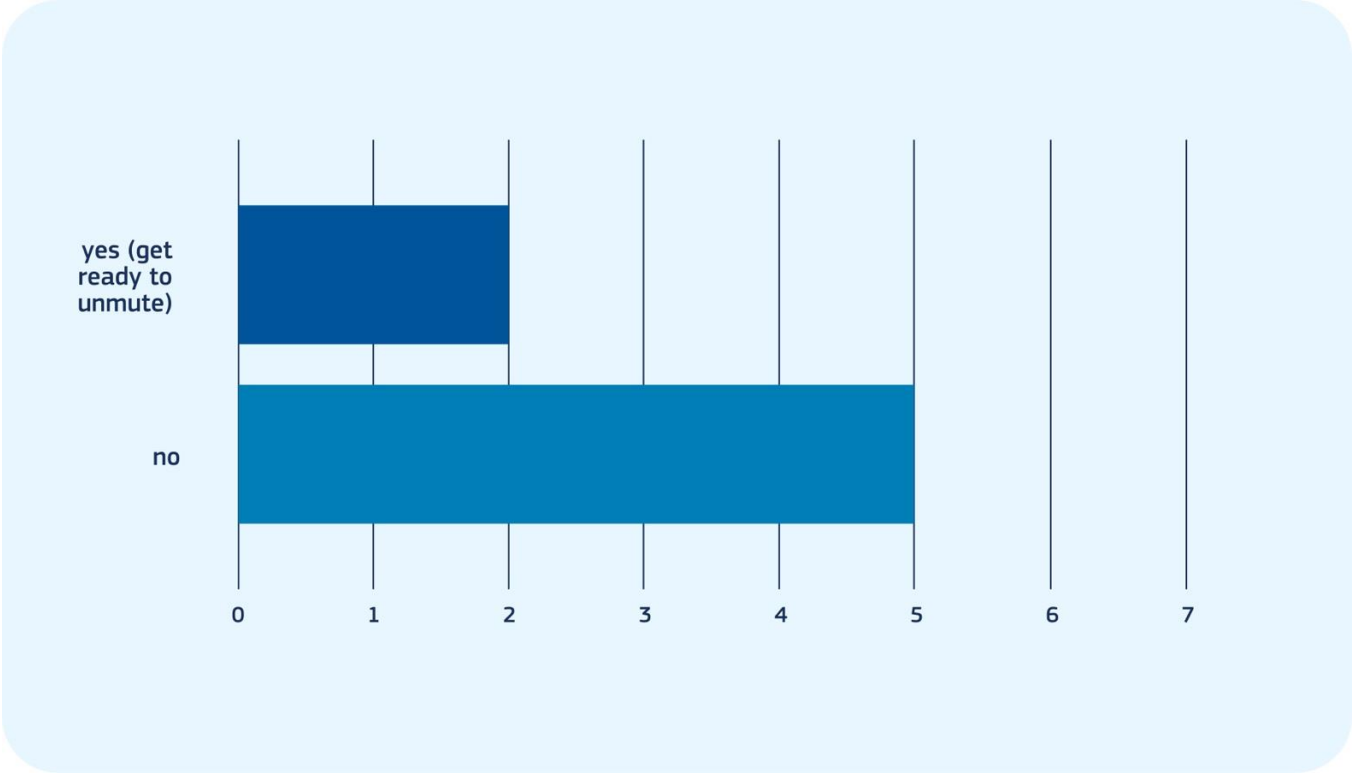

Figure 4.10: Results of question 11

Among the barrier categories working against prequalification harmonisation (Figure 4.11), the highest impact was identified as coming from technical components (or the lack thereof) preventing services from operating across different market systems or keeping different market systems from aligning on technical requirements.

QUESTION 12: What do you consider the main barriers to harmonise, coordinated, and streamlined prequalification processes?

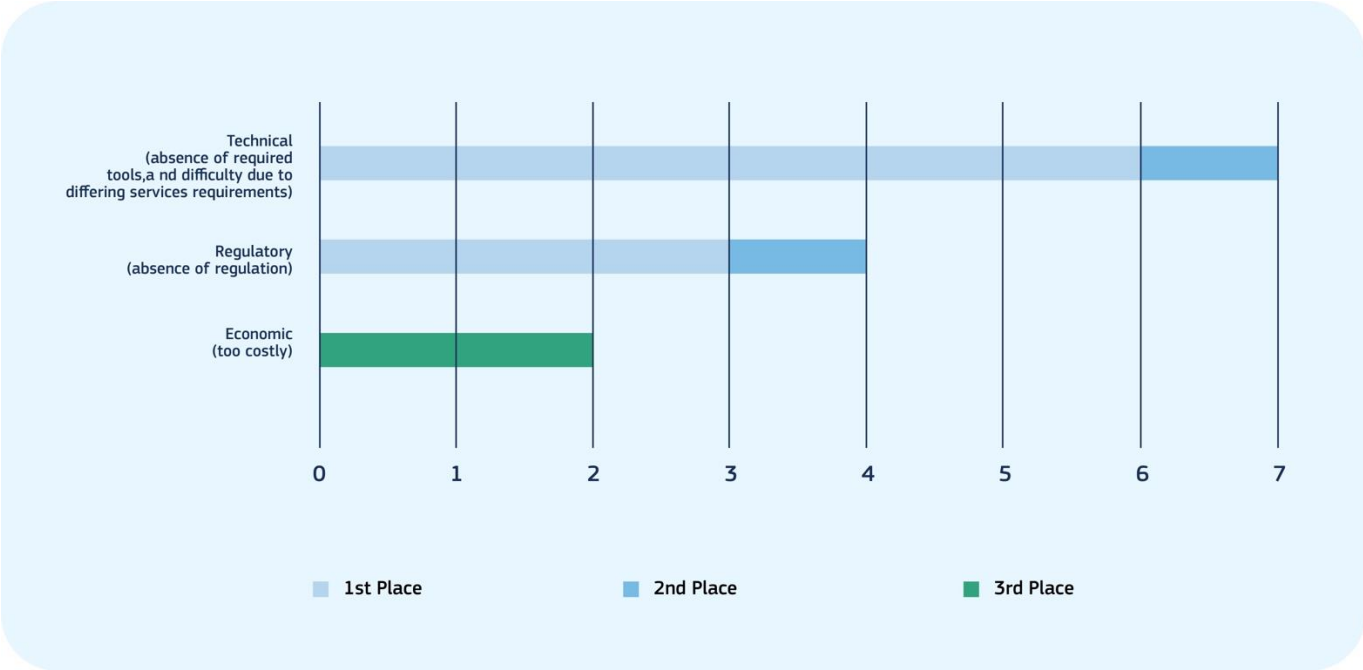

Figure 4.11: Ranked results of question 12

Procurement

All participants agreed (Figure 4.12) that the costs associated with setting up a new flexibility market (or participating in these markets) were not significantly different from those associated with other mechanisms for the acquisition of flexibility or grid reinforcement costs. This indicates that implementation costs are not the primary barrier to implementing flexibility markets across the EU.

QUESTION 13: Are costs associated with setting up flexibility markets and/or participating in them to be prohibitive compared to flex mechanisms or reinforcement?

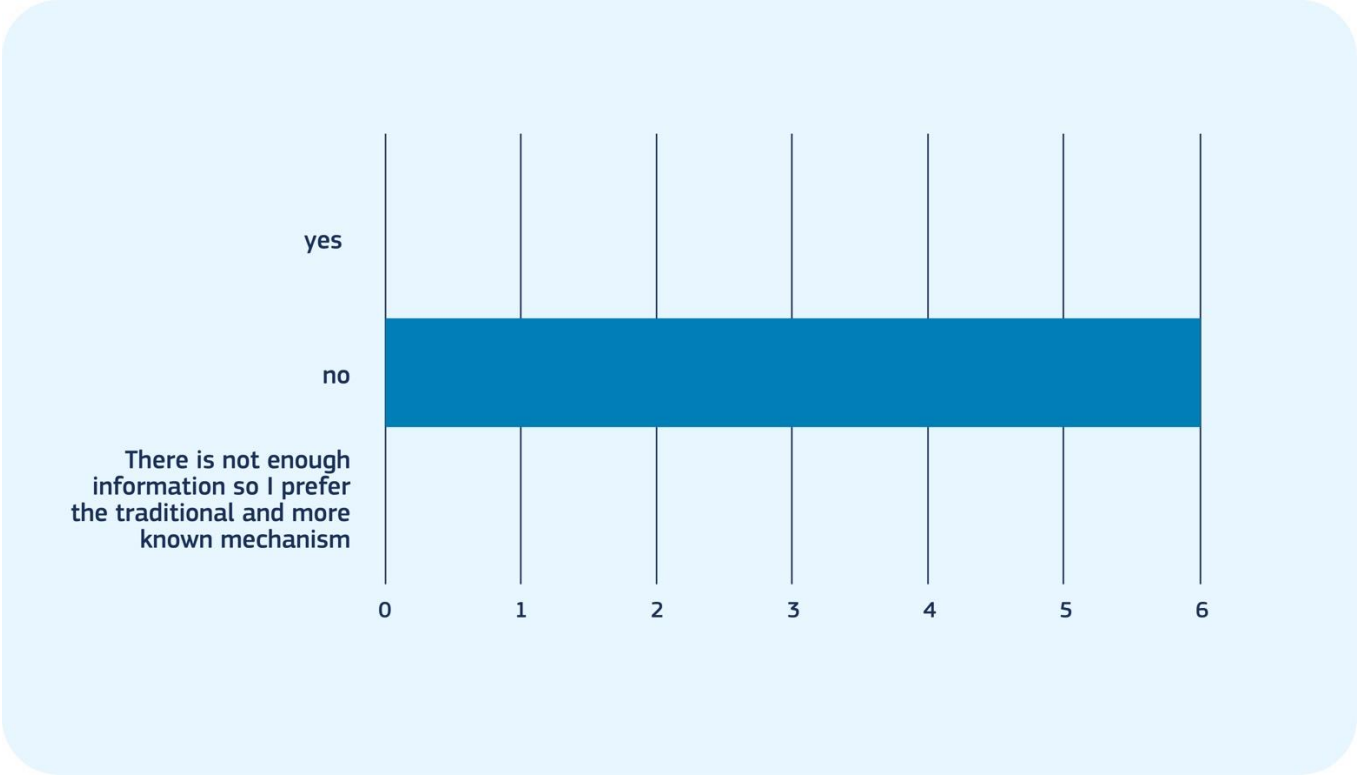

Figure 4.12: Results of question 13

Participants identified several enablers for the implementation of solutions and highlighted the key enablers (Figure 4.13) as crucial for establishing flexible markets at scale. These key enablers include the technical knowhow in setting up flex markets, increasing their replicability and decreasing their costs, the learning from demo activities and network code on demand response. In addition, there was a near consensus that enabling the use of "free bids" would have the least impact of the enablers listed. This is likely to be due to the technical constraints faced by system operators who, when defining flexibility products, must specify a minimum amount of capacity (or change in capacity) that flexibility service providers must include in their bids. This minimum bid size limits the direct participation in the market of some consumers connected to the low voltage network. System operators should put in place mechanisms to facilitate cooperation with flexibility service providers in order to determine the appropriate minimum bid size and to ensure wider market participation.

QUESTION 14: What do you consider the main enablers are for scaling up the setting up of flex markets, increasing their replicability and decreasing their costs?

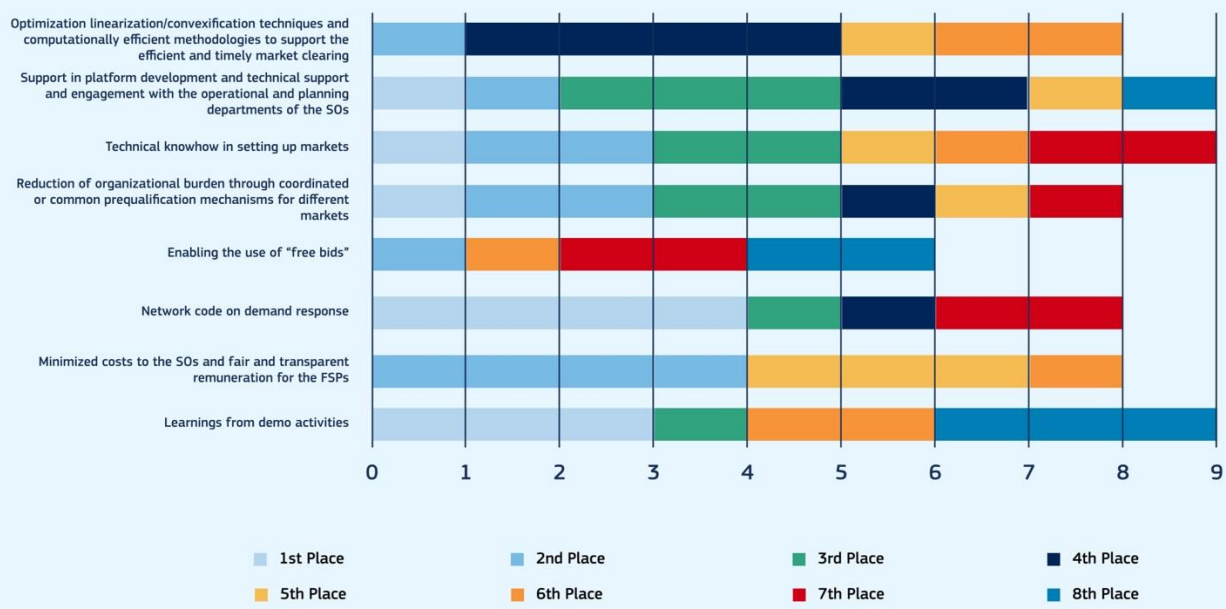

Figure 4.13: Ranked results of question 14

According to the participants (Figure 4.14), uncoordinated market timing is currently the main barrier to coordinating procurement procedures across markets. Aside from this, differences in prequalification processes and aggregation rules were the next most impactful barriers to procurement coordination across markets.

QUESTION 15: What do you consider to be the main barriers for coordinating the procurement between markets, enabling participation of FSPs in multiple markets?

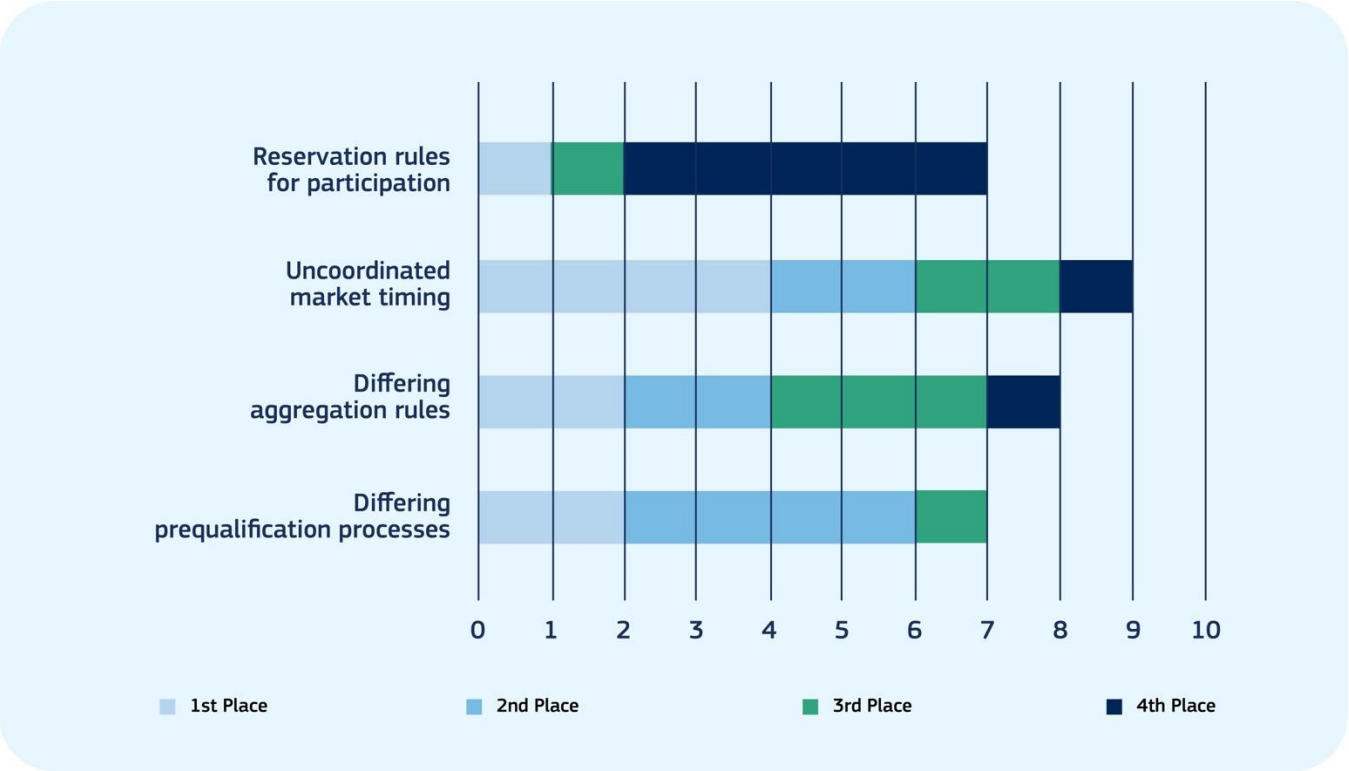

Figure 4.14: Ranked results of question 15

Settlement & Baselining

The workshop participants agreed (Figure 4.15) that baseline methods should be aligned across similar products and services. However, they were divided on whether this means they can differ as long as they follow the same design criteria or if this alignment should imply full baselining of similar products and services harmoniously. As a result, further research and discussion regarding efficient baselining methodologies is required to better understand the nuances and to provide more concrete recommendations on the subject.

QUESTION 16: The network code on DF proposes a list of criteria with which baseline methods should be aligned. Do you agree with this?

Figure 4.15: Results of question 16

5. Action 4 – Support the Potential Synergies from Increased Sector Coupling/Sector Integration/System Integration

Action leads: David Verez, ARCbcn (HYSTORE project), Diana Moneta, RSE (FLOW project), Laia Guitart E.DSO (Interconnect project)

5.1 Introduction of the Action

Traditionally, the EU energy system has been divided into different segments, with different infrastructures for electricity, oil or natural gas being developed and operated in isolation from each other (Figure 5.1).[5] Over the years, this division resulted in the development of unidirectional connections between specific infrastructures and particular end-use sectors, with linear energy flows.[6]

However, the electrification of end uses has connected the different sectors with each other (Figure 5.1.[7] In this context, the model based on unidirectional flows of energy proves to be technically and economically inefficient for delivering a decarbonised energy system.[8]

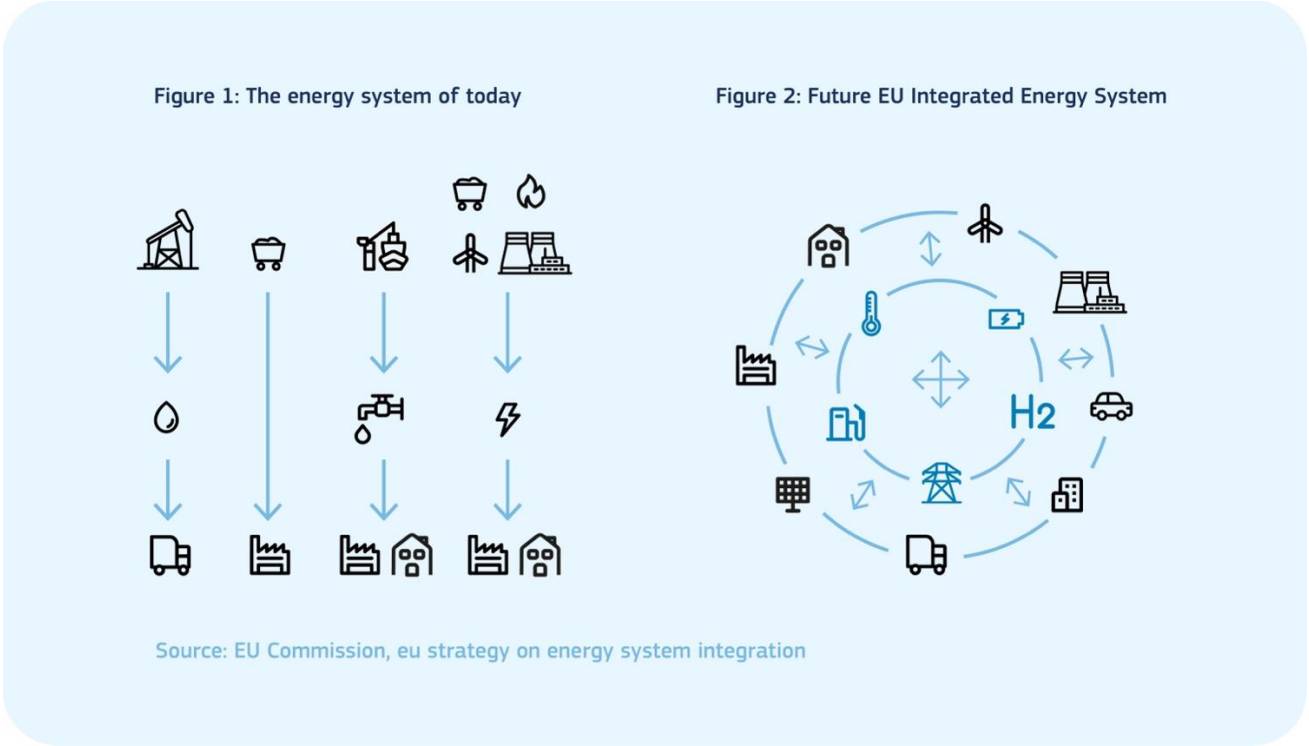

Figure 5.1: Energy system of today v. System integration

[5] Mark O'Malley et al. 'Energy Systems Integration: Defining and Describing the Value Proposition' The International Institute for Energy Systems Integration, Technical Report, 2016, p. 1.
[6] EU Commission, Topics, 'Clean Energy for all Europeans Package' Publications Office, 2019 available in https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_en
[7] IRENA, 'Sector coupling in facilitating integration of variable renewable energy in cities' International Renewable Energy Agency, p.8
[8] EU Commission, 'Powering a climate-neutral economy: An EU strategy on energy system integration,' COM(2020) 299 final, 2020

Evidence shows that the coordinated operation of the different energy systems and infrastructures will reduce the costs of the energy transition by enabling a more effective use of existing assets. As such, achieving the Paris Agreement goals requires a new energy paradigm. In the EU, the integration of the different energy sectors is seen as the foundation for the energy system of the future.[9] However, there are still multiple regulatory, technical and social barriers to the practical implementation of sector coupling.

Methodology Adopted in Action 4

Action 4 aims to support the synergies and opportunities arising from sector coupling by assessing the experience of Horizon 2020 and Horizon Europe projects. This was done following a 3 step methodology (Figure 5.2).

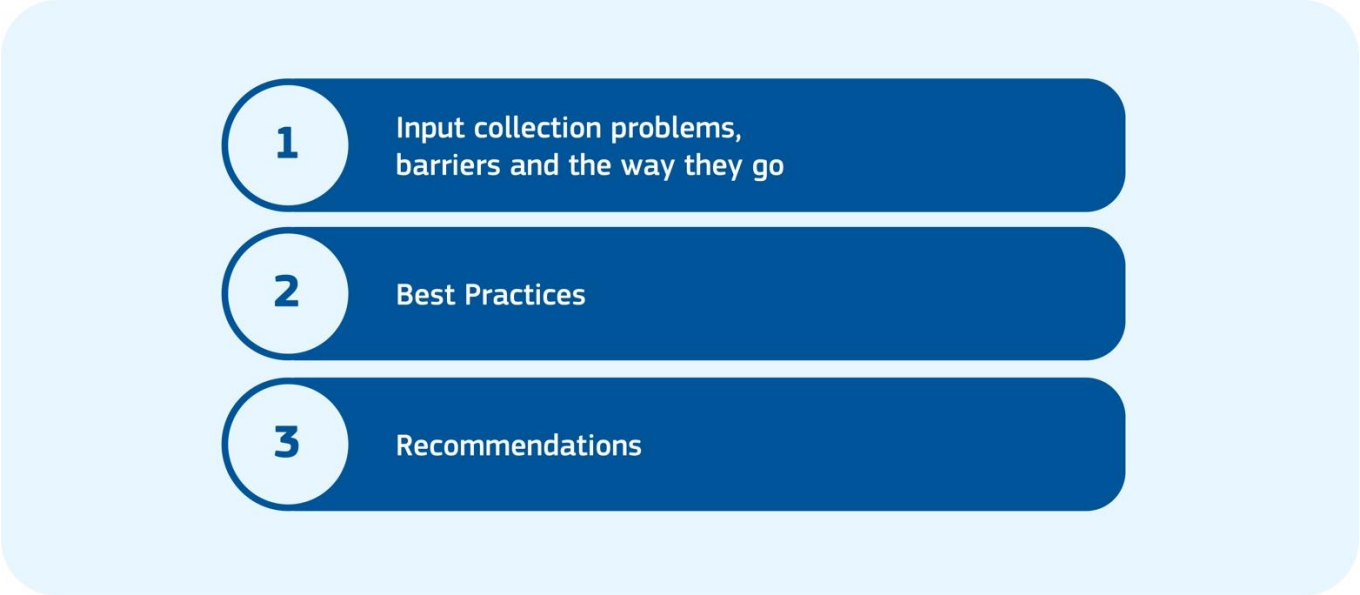

Figure 5.2: Methodology followed by Action 4

Before starting action 4 activities, we had to define the scope of the action considering the fact that there is not a unified definition of sector coupling. After discussing with the different projects, we narrowed the scope of Action 4 to:

> Sector coupling is understood as the increased integration of energy end-use and supply sectors with one another to improve the efficiency and flexibility of the energy system as well as its reliability and adequacy.

Once we agreed on the definition of the scope, we started Action 4 activities following the methodology shown in Figure 5.3.

[9] EU Commission, Topics, EU strategy on energy system integration https://energy.ec.europa.eu/topics/energy-systems-integration/eu-strategy-energy-system-integration_en

Figure 5.3: Steps of the methodology adopted in Action 4

As a *first step*, a brief questionnaire was sent to action 4 contributors to collect their feedback on the existing barriers in cross-sector and cross-coupling integration. The questionnaire was built on the work from 2023 and it was structured on 5 building blogs: Grid regulations, Data Access and Privacy, Data Interoperability, Market Mechanisms, and Coordination between stakeholders. The *second step* involved analysing the feedback to identify the barriers to the integration of the different sectors. The preliminary results were presented in an online meeting to the project representatives and were also presented at the BRIDGE GA in Brussels on April 2024. A meeting to discuss the best practices identified is planned for the final quarter of 2024, and the conclusions and recommendations will be presented in a standalone paper that will be published by the end of 2024.

Participating Projects in the Action 4

Action 4 aimed to support the potential synergies coming from increased sector coupling.

30 projects participated in the Action and demonstrated interest:

ACCEPT, ATTEST, BeFlexible, COMMUNITAS, CREATORS, DATA CELLAR, DRIVE2x, EBALANCE-PLUS, ECHO, EDDIE, ELEXIA, EV4EU, Enershare, FLOW, HESTIA, HYSTORE, INCIT-EV, INTERCONNECT, INTEROPERA, OPENTUNITY, PARMENIDES, RE-EMPOWERED, SCARLET, SENDER, SENERGY NETS, SERENE, SINNOGENES, STREAM, XL-Connect, iFLEX.

5.2 Problem statement

The traditional unidirectional energy flow model is both technically and economically inadequate for a decarbonised energy system, necessitating the integration and synergy of various energy sectors. However, a comprehensive understanding of the primary barriers and best practices for enhanced sector coupling and wider adoption remains elusive.

Survey Overview

This section provides an overview of the survey conducted to gather insights on the barriers for sector coupling/sector integration/system within the EU energy system. The survey is divided into five sections (following the stated methodology), each explained in detail below.

Service provision by e-mobility

This section of the survey aimed to understand the role of electric vehicles (EVs) in providing various services within the energy system. Table 5.1. Action 4 questionnaire. Section 2 – Service provision by e-mobility provides an overview of the questions asked.

Table 5.1. Action 4 questionnaire. Section 2 – Service provision by e-mobility

Section 2 – Service provision by e-mobility	
Does your project demonstrate service provision by EVs?	☐ Yes
	☐ No
If yes, from the list of barriers below, check the ones that you have encountered/addressed in your project.	
Network Regulations	☐
Data Interoperability	☐
Market Mechanisms	☐
Coordination Between Stakeholders	☐
Permitting process	☐
Data Access and privacy	☐
Please add any other barrier that is not listed above that you have encountered/addressed in your project that can limit the service provision by e-mobility.	
Could you briefly detail the barrier(s) identified?	

Figure 5.4 shows the number of projects indicating specific barriers in the service provision by e-mobility. The survey section responses reveal critical barriers in the provision of e-mobility services, with data-related challenges being most prominent. Data interoperability and data access/privacy issues, cited by 80% of projects, stem from the need for standardised data exchange protocols and robust privacy regulations. Network regulations, encountered by 40% of projects, highlight the need for revised grid operational procedures to enhance EV hosting capacity and to update network codes. Market mechanisms, identified by 50% of projects, face barriers such as the absence of dynamic pricing, restrictions on V2X services and complex eRoaming services that increase costs. Coordination between stakeholders, also cited by 50%, underscores the need for better integration with renewable energy systems and the participation of EVs in flexibility services. The permitting process, noted by 30%, includes challenges like hesitancy to open data and unclear market mechanisms. Detailed project feedback emphasises issues such as enhancing grid capacity, achieving data standardisation, and managing increased costs associated with eRoaming and payment methods. Overall, these barriers highlight the necessity for regulatory changes, improved stakeholder coordination and clear market frameworks to support the efficient integration of EVs into the energy system.

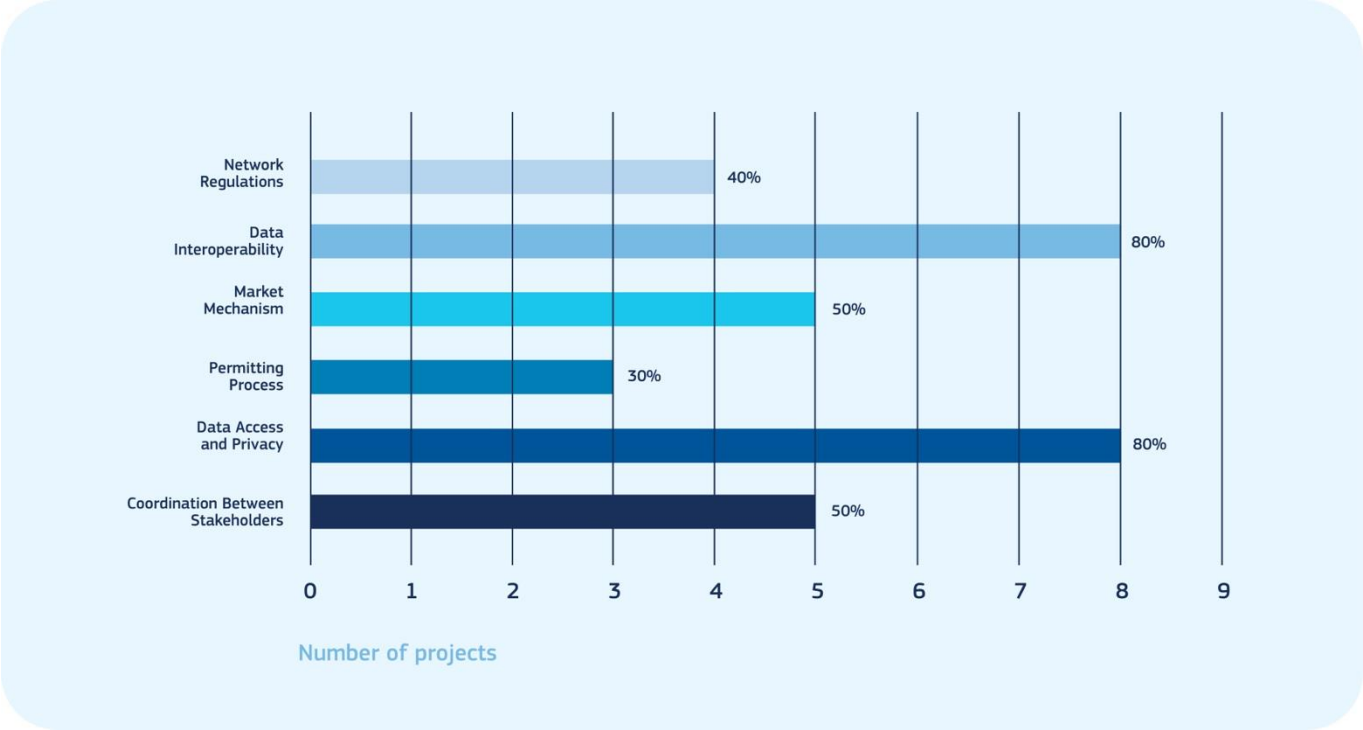

Figure 5.4: Overview of the barriers related to service provision by e-mobility in the reviewed projects. The percentage is based on the total number of projects that identified barriers in the evaluated cross-sector.

Integration with heat

This section of the survey aimed to understand the role of the heat sector in providing various services within the energy system. Table 5.2 provides an overview of the questions asked.

Table 5.2. Action 4 questionnaire. Section 3 – Integration with heat

Section 3 – Integration with heat	
Does your project demonstrate sector integration with heat?	☐ Yes
	☐ No
If yes, from the list of barriers below, check the ones that you have encountered/addressed in your project.	
Network Regulations	☐
Data Interoperability	☐
Market Mechanisms	☐
Coordination Between Stakeholders	☐
Permitting process	☐
Data Access and privacy	☐
Please add any other barrier that is not listed above that you have encountered/addressed in your project that can limit the sector integration with heat.	
Could you briefly detail the barrier(s) identified?	

The majority of the reviewed projects deals with demonstrations of heat integration (9 out of 11). Figure 5.5 present the overview of projects' feedback on barriers to heat integration. Moreover, data interoperability is the most frequently cited barrier, encountered by 83% of projects. This involves challenges in ensuring compatibility and communication between various systems and platforms essential for effective integration. Coordination between stakeholders, identified by 67% of projects, emphasises the need for better collaboration among different energy sector operators, including DSOs and TSOs. Market mechanisms, noted by 50% of projects, face barriers such as regional heterogeneity and the reluctance of heat consumers to participate in demand response initiatives. Limited market access for aggregators and demand response providers in some countries further complicates integration efforts. Data access and privacy, also cited by 50% of projects, underscore the need for secure and standardised data exchange protocols. Network regulations, although identified by only 17% of projects, point to the need for more integrated regulatory frameworks to address the evolving needs of multi-energy systems. Additional challenges include the lack of compatibility and coordination of incentive schemes across different energy sectors and consumer reluctance due to cost concerns.

Overall, addressing these barriers requires improving data interoperability, enhancing stakeholder coordination, developing comprehensive market mechanisms, and ensuring secure data management to achieve effective sector integration with heat (Figure 5.5).

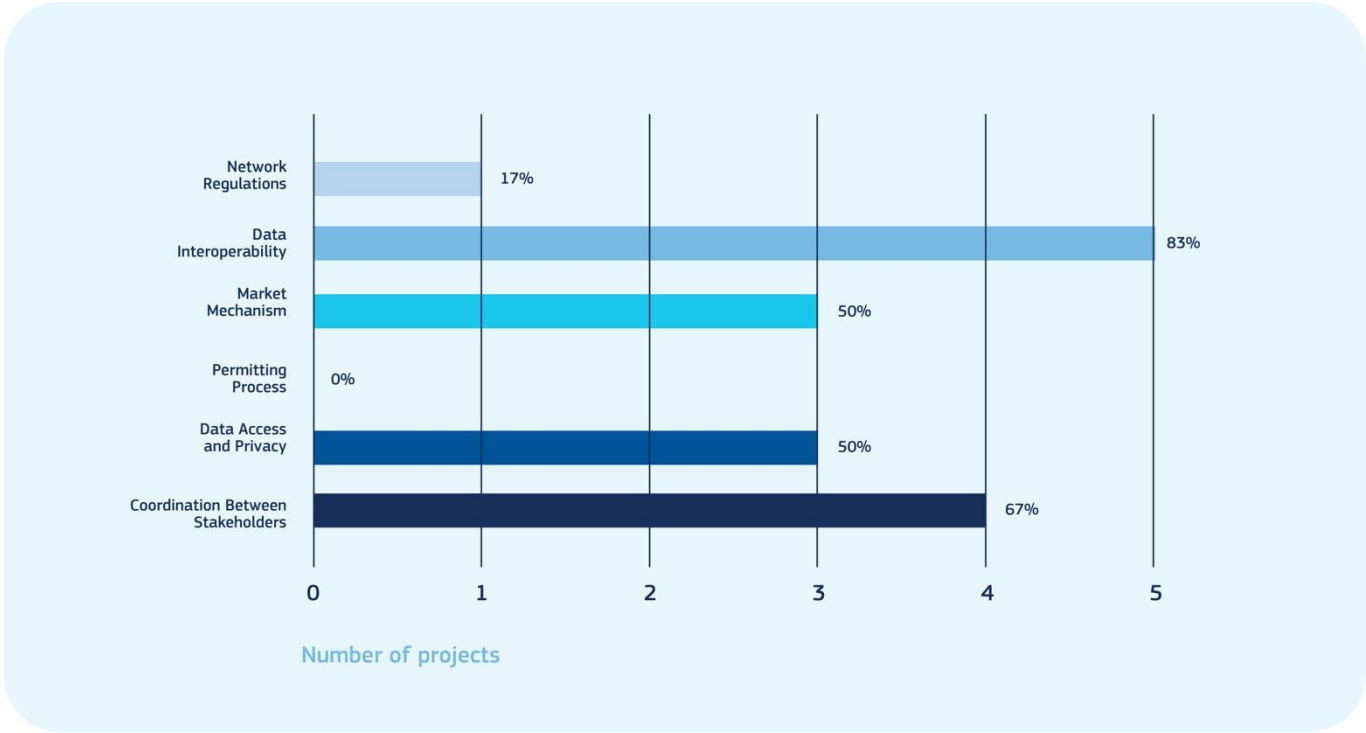

Figure 5.5: Overview of the barriers related to heat integration in the reviewed projects. The percentage is based on the total number of projects that identified barriers in the evaluated cross-sector.

Sector integration at the household level

This section of the survey aimed to understand the role of sector integration at the household level. Table 5.3 provides an overview of the questions asked.

Table 5.3. Action 4 questionnaire. Section 4 – Sector integration at the household level

Section 4 – Sector integration at the household level	
Does your project demonstrate sector integration at the household level?	☐ Yes
	☐ No
If yes, from the list of barriers below, check the ones that you have encountered/addressed in your project.	
Network regulations	☐
Data Interoperability	☐
Market Mechanisms	☐
Coordination Between Stakeholders	☐
Permitting process	☐
Data Access and privacy	☐
Please add any other barrier that is not listed above that you have encountered/addressed in your project that can limit the sector integration at the household level.	
Could you briefly detail the barrier(s) identified?	

This section's questions are about significant barriers in sector integration at the household level (Figure 5.6). Data interoperability, identified by 71% of projects, is the most common issue, involving challenges with various devices using different communication protocols. Data access and privacy, noted by 57% of projects, involve differences in customer consent management among Member States and difficulties in obtaining near real-time data from customers. Market mechanisms, cited by 43% of projects, face barriers such as differences in modelling prosumer energy and the lack of a legal framework for bio-methane and hydrogen. Network regulations, identified by 29% of projects, indicate the need for more integrated frameworks to address household-level integration, including new energy carriers. Coordination between stakeholders and permitting processes, each mentioned by 14% of projects, highlight the need for better collaboration and streamlined procedures. Additional barriers include the size mismatch between household HVAC systems and electricity grid needs, necessitating aggregation, and challenges in forecasting and monitoring energy consumption and production. Addressing these barriers requires improving data interoperability, enhancing stakeholder coordination, developing comprehensive market mechanisms, and ensuring secure data management for effective household-level sector integration.

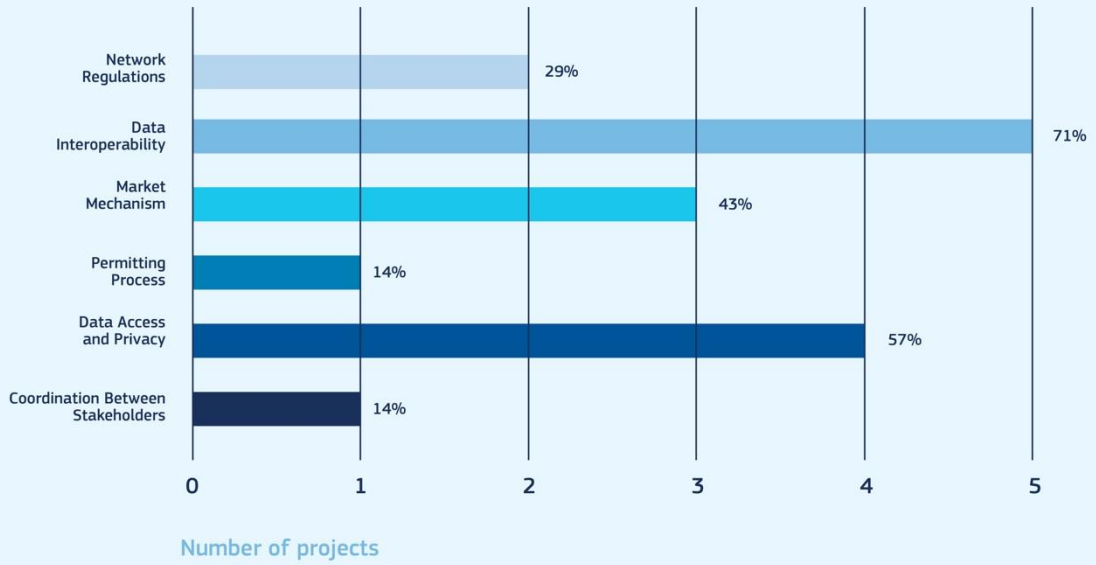

Figure 5.6: Overview of the barriers related to sector integration at the household level in the reviewed projects.

Other barriers

This section aimed to understand the role of other sector integration/sector coupling. Table 5.4 provides an overview of the questions asked.

Table 5.4. Action 4 questionnaire. Section 4 – Other sector integration/sector coupling barriers

Section 5 – Other sector integration/sector coupling barriers	
Does your project demonstrate other sector integration/sector coupling barriers?	☐ Yes
	☐ No
If yes, from the list of barriers below, check the ones that you have encountered/addressed in your project.	
Network regulations	☐
Data Interoperability	☐
Market Mechanisms	☐
Coordination Between Stakeholders	☐
Permitting process	☐
Data Access and privacy	☐
Please add any other barrier that is not listed above that you have encountered/addressed in your project that can limit other sector integration barriers.	
Could you briefly detail the barrier(s) identified?	

The survey responses (Figure 5.7) reveal significant barriers in sector integration and sector coupling, with data access and privacy being the most frequently cited issue, encountered by 50% of projects. This challenge involves managing data across various energy sectors and ensuring secure and standardised data exchange. Network regulations, data interoperability, and market mechanisms, each identified by 25% of projects, underscore the need for improved standardisation and regulatory frameworks. These barriers include differences in standardisation between gas and electricity domains at the European level and inconsistencies in terminology and measurement units among Member States. Additionally, the permitting process, cited by 25% of projects, highlights non-technical challenges such as regulatory restrictions on new technologies and safety concerns. Specific examples include limitations on permitting for V2X services due to slow adoption of standards and concerns about battery degradation from manufacturers.

Furthermore, there are notable differences among Member States in data formats concerning energy consumption exchange data, measurement units (sometimes power (kW), sometimes energy (kWh)), and the lack of agreement on terminology such as "average energy."

Additional feedback points to the lack of monitoring data for heat networks compared to electricity networks and the reluctance of consumers to adopt new energy business models due to their complexity and the digital divide. A more integrated approach to regulations – considering market designs, stakeholder roles, grid tariffs, energy taxes, and renewable support schemes – is crucial to better reflect the evolving energy systems and markets. Addressing these barriers through enhanced standardisation, regulatory evolution, and improved stakeholder coordination is essential for successful sector integration and coupling..

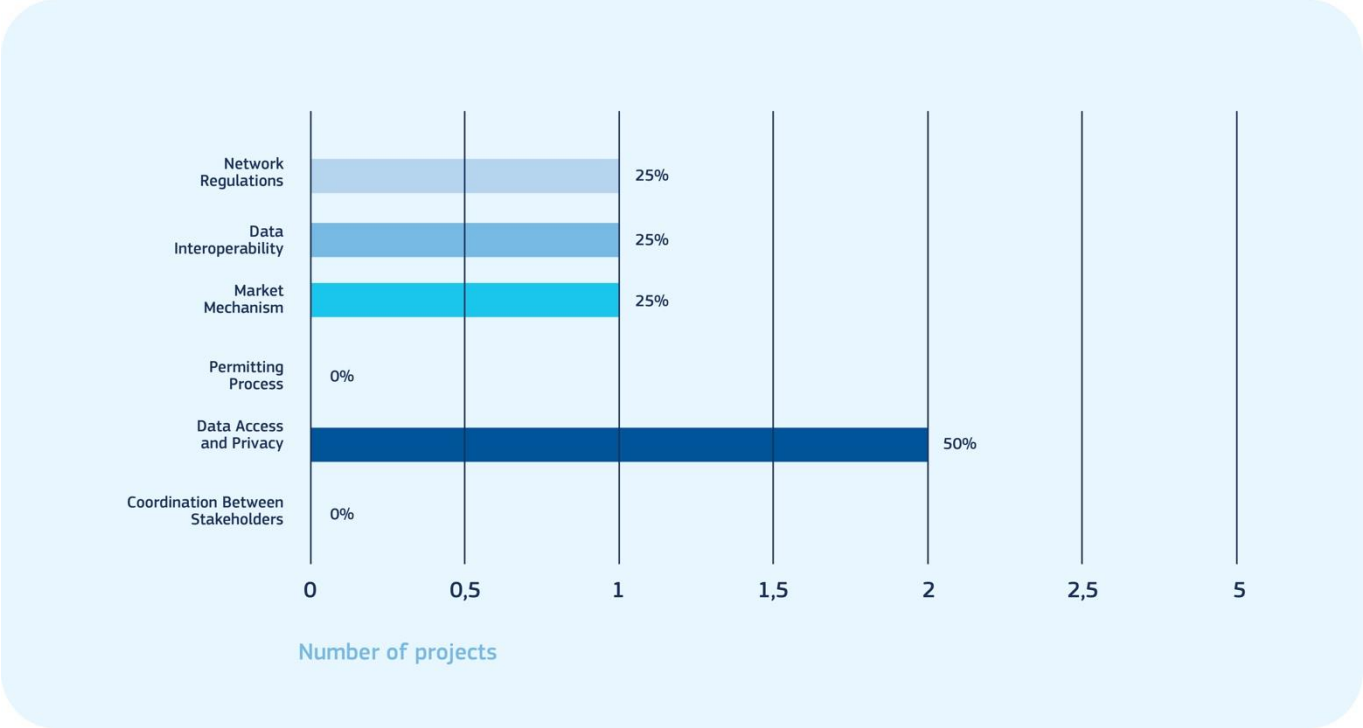

Figure 5.7: Overview of the barriers related to other barriers in the reviewed projects.

5.3 Conclusions and Recommendations

This section summarises the main conclusions that resulted from the Action 4 activities.

The analysis of the survey reveals significant barriers to sector coupling and integration across various sectors. The primary issues identified include data access and privacy, network regulations, data interoperability, and market

mechanisms. These barriers highlight the need for improved standardisation, regulatory frameworks, and enhanced stakeholder coordination. For service provision by EVs, data-related challenges are prominent, with a significant emphasis on the need for standardised data exchange protocols and robust privacy regulations. Network regulations and market mechanisms also present substantial obstacles, requiring updated grid operational procedures and dynamic pricing models. Heat sector integration faces major barriers related to data interoperability and coordination between stakeholders. The need for better collaboration among energy sector operators and the establishment of secure data protocols are critical for effective integration. Market mechanisms and data access/privacy issues further complicate these efforts. Household-level sector integration is hindered by data interoperability and data access/privacy concerns. Differences in customer consent management and real-time data acquisition are significant challenges. Market mechanisms and network regulations also need to be addressed to facilitate smoother integration at the household level. Other sector integration and coupling barriers include managing data across various energy sectors, standardisation differences, and the capacity of electrical grids to absorb excess energy. The complexity of new market business models and regulatory restrictions on new technologies add to the challenges.

From the survey, 50% of projects identified barriers in at least one cross-sector, 29% in two cross-sectors, and 7% in three cross-sectors, with none identifying barriers in all four cross-sectors (please refer to Figure 5.8). Addressing these barriers requires a concerted effort towards enhanced standardisation, regulatory changes, and improved stakeholder coordination. **Best practices and recommendations will be presented in a standalone paper to support effective sector integration and decarbonisation.**

Service provision by EVs	29%	57%	36%	21%	57%	36%
Sector integration with heat	7%	36%	21%	0%	21%	29%
Integration at the household level	14%	36%	21%	7%	29%	7%
Other barriers	7%	7%	7%	14%	0%	0%

Figure 5.8: General results from the survey

6. Action 5 – Support the System Operators to Prepare the Grid for 2030

Action leader: Santiago Gallego (i-DE, Grupo Iberdola), BeFlexible Project

6.1 Introduction of the Action

In the 2023 Work Plan of the Regulation Working Group, seeks to enhance network planning and operations to help operators prepare for 2030. It focuses on identifying innovations to improve processes and tools, with key areas including integrating flexibility, balancing investments with flexibility, managing congestion, and developing remuneration mechanisms for system operators.The action will continue in 2024. The following methodology has been followed and will be further implemented in the coming months, leading to the presentation of a unified and comprehensive outcome of the action.

6.2 Methodology Adopted in Action 5

In 2023, Action 5 started with a joint workshop "***Applicability of different flexibility mechanisms for DSOs and their trade-off with investments***", held on 11 January in cooperation with ISGAN WG6[10].

This workshop was part of the ***'2023.01 Active System Management by Distribution System Operators – Online workshop series***', comprising three workshops.

The workshop focused on the applicability and complementarity of different flexibility mechanisms (market-based, cost-based, rule-based, flexible connection agreements, dynamic tariffs) and the trade-off between investment and the use of flexibility. For this purpose, a questionnaire was sent to the BRIDGE projects listed in the box below:

BeFlexible, COMMUNITAS, Drive2X, ENERGETIC, EUniversal, EV4EU, Gift, OPENTUNITY, OneNet, XL Connect, SENERGY NETS, STREAM.

The survey included the following questions, as presented in the Table 6.1 below:

Table 6.1: Questions from preliminary survey

1	**Please enter your full name**
2	Please specify the country and organisation you represent
3	Please enter your email address
4	Question for BRIDGE WG regulation representatives - Please specify the BRIDGE project you represent.
5	Which type of flexibility mechanisms are currently used by DSOs in your country / studied in your project? ☐ Market-based mechanisms ☐ Cost-based mechanisms

[10] Working Group 6 of ISGAN (http://www.iea-isgan.org/our-work/annex-6/).

	☐ Rule-based mechanisms ☐ Flexible/dynamic connection agreements ☐ Dynamic distribution grid tariffs ☐ Other
6	Please give some more explanations on the flexibility mechanisms selected in question 5 (characteristic of the mechanism, needs covered,...) and/or provide us with appropriate references to public documentation.
7	Which flexibility mechanisms are most suited to solve congestions in DSO grids. Please rank from most to least suitable.
8	Which flexibility mechanisms are most suited to solve voltage issues in DSO grids. Please rank from most to least suitable.
9	Which factors impact the usability of certain flexibility mechanisms to solve local flexibility needs (e.g. congestion management, voltage control)?
10	Is there a standard methodology used in your country / project to weigh network investments vis-à-vis flexibility ? Please explain and point us to appropriate references.
11	Would you like to share some best practices/previous experience regarding "Flexibility mechanisms for DSOs and their trade-off with investments" based on previous work during the workshop? ☐ Yes, I would love to contribute ☐ No, I would rather not contribute
12	If you would like to add any further inputs or comment on one of the questions above, you can use the field below.

There were 5 main takeaways from the workshop:

- DSOs should carefully select flexibility mechanisms (market-based, dynamic connection agreements, tariffs, rule-based) tailored to needs and efficiency – customised to the voltage levels.
- The combination of multiple flexibility mechanisms is essential, with more than 2/3 favouring growth in market-based options.
- Market-based flexibility proves effective for short- and long-term solutions, with long-term solutions especially relevant for DSOs in deferring grid investments.
- There is no standardised methodology to make a trade-off between grid investment and by DSOs – a challenge that is being actively discussed in many countries.
- Anticipatory investments are crucial, especially for enabling use cases like untapped RES potential and e-mobility growth. Future scenario robustness is key.

6.3 Action 5 Next steps

The Action will continue in the coming months. A discussion paper is currently being developed and will be published in 2024. Other future milestones for the action include:

- Work with the interested projects and share lessons among related projects
- A workshop in collaboration with ETIP SNET
- The results of the action will be included in the annual BRIDGE report, alongside Action 3
- A workshop in collaboration with ETIP SNET – Potential joint dissemination efforts with ETIP SNET (WG1), including a paper on infrastructure and network planning, which could also serve as a joint meeting to discuss best practices with the BRIDGE action
- Assess how Action 5 could support the EU Grid Action Plan and its related proposed actions

7. Action 6 – Support the Energy Data Spaces in Understanding the Related Barriers

Action leads: The cross-working group action is currently being managed at a high level by the WG chairship.

7.1 Methodology Adopted in Action 6

For Action 6, in 2023, a first scoping exercise was performed on the priorities with respect to the data space discussion, to identify what regulatory barriers to tackle in support of data spaces, and possible contributions from BRIDGE.

This action involved a meeting which began with a roundtable for the participants to introduce themselves, their projects and their involvement in the working groups. The session was introduced by the chair of the Working Group on Regulation Helena Gerard (VITO) and the chair of the Working Group on Data Management Olivier Genest (Trialog).

It aimed to coordinate a joint approach between the three working groups on the topic of energy data spaces in order to organise a follow up joint workshop among:

- Data Management WG, currently involved in developing a standardised language and Data Exchange Reference Architecture (DERA3.0), as contributing to the discussion and practical steps towards truly interoperable and business process agnostic data exchange arrangements on European scale both inside energy domain and across different domains.
- Regulation WG (Task 6), currently working in data spaces, exploring the regulatory challenges that need to be addressed. This includes understanding the concept of data spaces, identifying the regulatory barriers associated with them, examining the roles and responsibilities of regulated entities versus commercial entities, and exploring the distinctions between real time and validated data.
- Business Model WG (Task 3), currently focusing on investigating data value chains in BRIDGE projects, standardising processes for data valorisation within business models, develop and ad hoc business model canvas, identifying exploitable value from project-generated data, and assessing whether projects effectively extract potential value. This task also explores the use of business model tools to enhance observability in data value chains.

The main conclusions from the last General Assembly on European Data Space topic, were highlighted during the call, specifically:

- collective agreement on the importance addressing topics that go beyond the specific sector, extending into cross-sectoral discussions;
- the need for fostering alignment and integration of new initiatives with the existing cluster of projects rather than creating a separate initiative;
- identification of a possible solution, specifically concerning the mapping ongoing activities, identification best practices, and understanding the projects within the BRIDGE community and outside the initiative (e.g. ETIP SNET).

The Regulation WG Action 6 has identified the following priorities for addressing this discussion:

- The group should focus on defining roles, allocating responsibilities, and clarifying regulatory aspects within data spaces. This approach builds on previous work related to market design options for flexibility, emphasising the increasing importance of data in low and medium voltage scenarios.

- The group intends to support the Data Management Working Group by concentrating on the roles of system operators and other actors in providing data, mapping these roles to various market models, and exploring the implications of data spaces on roles and responsibilities within the value chain.
- The group will delve into the regulatory implications of using data spaces in market design options and aims to identify gaps and areas for further discussion through lessons learnt in the upcoming discussion.

The action will be integrated into the 2024 work plan in coordination with other BRIDGE working groups. The group will explore the regulatory implications of the use of data spaces in market design options, with the aim of identifying gaps and areas for further discussion based on the findings of the upcoming workshop.

Participating Projects in the Action 6

The following projects in BRIDGE participate to this call:

ENERSHARE, OneNet, LocalRES, OMEGA-X, ebalance-plus, eNeuron, DATA CELLAR, EDDIE, InterConnect, DriVe2X, SENERGY NETS, TIGON

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