JOINT PAPER

COORDINATION SCHEMES, PRODUCTS AND SERVICES FOR GRID MANAGEMENT

AUTHORS INTERRFACE

GEORGE BOULTADAKIS - EUROPEAN DYNAMICS

PIERRE MANN – RWTH AACHEN

PAULIUS BUTKUS – ENTSO-E

NATHAN APPLEMAN - ENTSO-E

MIGLIAVACCA GIANLUIGI - RSE

DARIO SIFACE - RSE

MARCO ROSSI - RSE

AUTHORS COORDINET

MARCO BARON – ENEL GI & N

JOSE PABLO CHAVES - COMILLAS

KIRSTEN GLENNUNG – E.DSO

INA VAITIEKUTÉ – E.DSO

NIKOLAUS SAVVOPOULOS - NTUA

PETRA JOSEFSSON – VATTENFALL

ANIBAL SANJAB – VITO

KRIS KESSELS – VITO

Table of contents

Introduction

Our energy system stands before a historic transition driven by new technologies and strong political commitment to the Paris Agreement. The EU has in this regard set ambitious climate and energy targets, aiming to reduce greenhouse gas emission with 40% by 2030[1] and increase the share of renewable energy by 32%. To support these goals the EU adopted a new Energy rule book in 2019, the Clean Energy for All Europeans Package. In its development feedback from research and innovation was seen as important element to ensure coherence in the new legislation. The EU framework program for R&I, Horizon 2020 is in this regard an important input covering among other areas several topics relevant for the energy transition.

A central topic concerns the increasing share of renewables into the grid which will help accelerate the decarbonization. However, it will also spike the need for flexibility in the grid at both distribution and transmission level, due to the variable character of sources such as wind and solar. The electricity directive as well as the revised electricity regulation promotes that network operators procure services from assets connected to the network both at transmission and at distribution level in a coordinated way. To demonstrate how markets and platforms can increase cost-efficiency in network operations and create consumer benefits to those offering flexibility service, the Commission launched under Horizon 2020 call “TSO – DSO – Consumer: Large-scale demonstrations of innovative grid services through demand response, storage and small-scale generation”.

To answer the call the projects CoordiNet[2] and INTERRFACE[3] were chosen with the goal to demonstrate to which extent coordination between TSOs and DSOs can lead to a cheaper, more reliable, and more environmentally friendly electricity supply. The projects which were both kick-off in January 2019 should in parallel define and rest a set of standardized products and related key parameters for grid services. Their work to specify the TSO-DSO-Consumer cooperation shall pave the way for the development of a pan-European market that will allow all market participants to provide energy services and open new revenue streams for consumers providing grid services.

Due to the importance of the issue they respond to the two projects have since the beginning committed to continuous collaboration. The aim is to ensure the exchange among the two projects throughout their work and not only at the very end. The result of the collaboration shall be a joint position paper at the end of the two projects with specific recommendations based on the learnings from both CoordiNet and INTERRFACE. The projects have agreed to base the paper on the Active System Management (ASM) report from 2019[4] which informs the work carried out in both projects. The paper shall furthermore give a shared view on the defined and demonstrated standardized grid services & products as well as discuss the Convergence and divergence of the models for market coordination analyzed in the ASM report and additional proposed alternatives from the projects.

---

[1] European Commission will come forward with a proposal to increase the 2030 GHG target to 55% by June 2021 https://ec.europa.eu/clima/policies/strategies/2030_en

[2] https://coordinet.netlify.app/

[3] http://interrface.eu/

[4] 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

This paper reflects the coordination and work done in the two projects after two years of operation. It will discuss the findings at this stage with regards to products & services as well as coordination schemes. However, it is yet to premature to draw any conclusions regarding the advantages and disadvantages of these based on the demonstration activities. This will instead constitute the discussion in the final paper to be delivered at the end of the projects' lifetime in June 2022.

The paper is structured as a comparison of the two projects which will be briefly introduced in the next chapter. This is followed by a chapter dedicated to the work done in each of the projects regarding grids products and services. Here after follows a presentation of the coordination schemes set out by the ASM report to govern the procurement of such products by the grid operators. This will then be compared to the work done in the projects on the coordination schemes. In the final chapter the paper concludes the coordination after two years and sets out the next steps for the collaboration.

This paper reflects the work carried out in the projects CoordiNet and INTERRFACE. Both projects are funded by the EU framework programme for research and innovation H2020, CoordiNet with grant number 824414, and INTERRFACE with grant number 824330. Within the focus area Building a low-carbon, climate resilient future, they respond to the call LC-SC3-ES5-2018-2020: TSO – DSO – Consumer: Large-scale demonstrations of innovative grid services through demand response, storage, and small-scale RES generation.

The elaboration of the paper constitutes on of the tasks in the CoordiNet project and the official deliverable can be found on the website of the Community Research and Development Information Service (CORDIS).

The two projects

While responding to the same call under EU framework programme for research and innovation; Horizon2020, the two projects assume different approaches to the call topic; TSO-DSO-consumer coordination. In the following the approaches of the two projects will be briefly compared.

CoordiNet

The purpose of CoordiNet is to establish different collaboration schemes between TSOs and DSOs and consumers to contribute to the development of a smart, secure, and more resilient energy system. The project puts emphasis on the analysis and definition of flexibility in the grid at every voltage level ranging from the TSO domain to the DSO domain and to consumer participation. The aim is to demonstrate how DSOs and TSOs by acting in a coordinated manner can provide favorable cooperation conditions for all market players and remove barriers to participation of consumers and smaller market players.

CoordiNet will evaluate a series of products for grid services at EU level to understand to what extent product standardization will be feasible. The project will define and detail mechanisms for the provision of the needed grid services at distribution and transmission level. These will include (if applicable) the reservation, activation, and settlement process.

Figure 1 CoordiNet

The CoordiNet project has the following objectives:

1. Contribute to a smart, secure, and more resilient energy system through demonstrating cost-efficient model(s) for electricity network ancillary services that can be scaled up to include networks operated by other TSOs and DSOs, that will be replicable across the EU energy system, and provide the foundations for the further implementation of the already approved and future network codes, particularly on demand-response and storage. And, consequently,
2. To opening up significant new revenue streams for consumers and generators to provide grid services, and
3. To increase the share of RES in the electricity system.

PILOTS

The proposed CoordiNet mechanisms will be tested at three large-scale demonstration projects across 10 different locations in Spain, Sweden, and Greece.

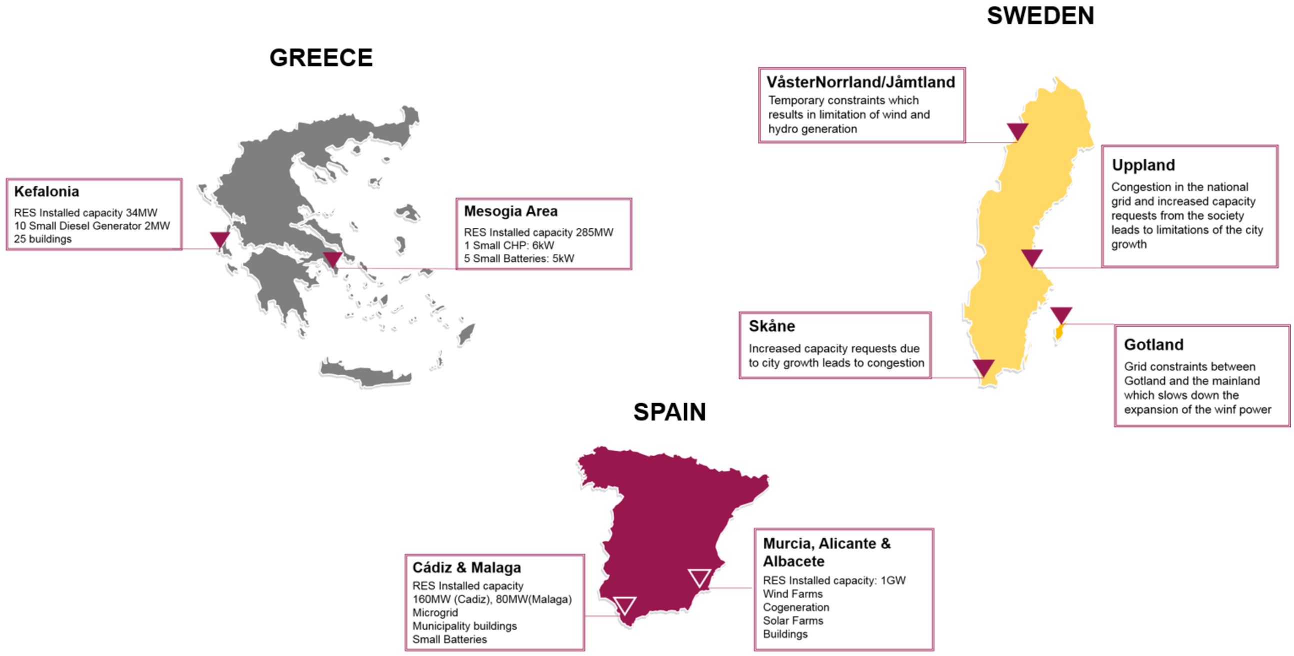


Figure 2: Coordinet demo areas

The three demos will apply different coordination schemes and test a selection of products for grid services defined within the project. Lessons learned from these large field demonstration projects will be used to design the structure of a joined pan-European TSO-DSO coordination platform.

- **GREECE**
  The main objective of the demo is to prepare consumers and RES for a more active role in the management and operation of the power system. New products and services will be tested in the two pilot sites, on the island of Kefalonia and in the region of Mesogia which comprises the Greek capital.
- **SPAIN**
  With pilot sites in Cadiz and Malaga, as well as in Murcia, Alicante and Albacete, the Spanish demo will proof the technical and economic viability of a system that enables flexibility services providers regardless of their size and voltage level to provide flexibility services to DSOs to solve congestions, voltage and islanding operation problems and TSO to solve congestions, voltage, and balancing problems.
- **SWEDEN**
  The Swedish demo sites in Uppland, Jämtland, Skåne as well as on the island of Gotland have vast experience with congestion. The main objective of the demos is to show how the use of flexibility can help ease the constraints that the limited grid capacity puts on the economic development.

INTERRFACE

The purpose of the INTERRFACE project is to develop an interface between TSOs, DSOs, market participants and their customers. INTERRFACE will demonstrate the added value of sharing data among all participants in the electricity system value chain (customers, grids, market), from local, regional to EU level. It will also enable TSOs, DSOs and customers to coordinate their efforts to maximise the potential of distributed energy resources, demand aggregators and grid assets, to procure energy services in a cost-efficient way and create consumer benefits. It will therefore facilitate renewable energy integration and demonstrate global leadership by the EU electricity sector in a way that is cost effective and secure. It will also simulate an integrated wholesale and retail market at local and global levels, engaging consumers/prosumers so as to exploit the DERs capacity and channel it into the common EU electricity market.

The INTERRFACE project targets five main objectives:

1. To create a common architecture that connects market platforms to establish a seamless pan-European electricity exchange linking wholesale and retail markets and allows all electricity market players to trade and procure energy services in a transparent, non-discriminatory way.
2. To define and demonstrate standardized products, key parameters, and the activation and settlement process for energy services.
3. To drive collaboration in the procurement of grid services by TSOs and DSOs, and to create strong incentives to connected customers, by improving market signals and allowing them to procure services based on specific locations and grid conditions.
4. To integrate small scale and large-scale assets to increase market liquidity for grid services and facilitate scaling up of new services which are compatible across Europe.
5. To promote state-of-the-art digital technologies that consumers are familiar with in other everyday transactions (i.e., e-auctions, e-commerce, e-banking, social networks), into the electricity value chain, in order to engage end-users into next generation electricity market transactions, creating incomparable economic benefits by deferring conventional energy infrastructure investments.

Figure 3 INTERRFACE

The INTERRFACE project will design, develop, and exploit an Interoperable pan-European Grid Services Architecture (IEGSA) to act as the interface between the power system (TSO and DSO) and the customers and allow the seamless and coordinated operation of all stakeholders to use and procure common services. State-of-the-art digital tools based on blockchains and big data management will provide new opportunities for electricity market participation and thus engage consumers into the INTERRFACE proposed market structures that will be designed to exploit Distributed Energy Resources (DER).

PILOTS

In order to achieve set goals, three demo areas (and seven demonstrators) will be designed focusing on the following issues:

- **Demo area 1:** Congestion management and balancing issues, locally by involving DSOs, Demand Response mechanisms, storage, and small-scale RES, at system level by integrating TSO/DSO and community and by activating local and cross-border resources to provide flexibility services for system balancing. The expected outcome of this area is to identify the efficiency of using dynamic pricing, to materialise the need of a toolset that offers the optimal call of flexibility sources to solve congestions and balancing and optimise the use of interconnectors between the actors of the energy power system.
- **Demo area 2:** The use of peer-to-peer transactions for activating flexibility based on free pricing. Within this area relevant use cases will be developed and tested for congestion management and balancing, to assess the role of peer-to-peer transactions in future electricity market design and estimate the cost-efficiency they can bring.
- **Demo area 3:** The necessity of an integrated retail and wholesale market which will be based on the existing Pan-EU wholesale market and will consider the DER/prosumers/storage/other assets to couple it with the retail market, with the objective of increasing the cost efficiency and aiming at creating consumers benefits.

Summary of the two approaches

While the two projects respond to the same call, they take different approaches not least in their pilots where the large-scale demonstrations are tested. The INTERRFACE project assumes mainly a top-down approach focusing on services which are relevant to all demos (also considering the bottom-up requirements stemming from the demonstrators needs), whereas the CoordiNet project assumes bottom-up approach leaving the demo needs to define the projects service focus.

Services and Products

Both projects aim to define a list of standardised products and services for flexibility management. In the following the proposed products and services of each project will be described and compared. Their pros and cons will be discussed as well as key parameters for enabling the participation of distributed flexibility assets. Considering that the focus of the ASM report[5] is on balancing and congestion management, products and services related to this will be the main focus of this chapter.

Products and Services in CoordiNet

In the CoordiNet project, grid services are understood as "services provided to distribution system operators and transmission system operators to keep the operation of the grid within the acceptable limits for security of supply and are delivered mainly by third parties" according to the ASM report. While Standard products are "harmonized products for the exchange of grid services with common characteristics across Europe (i.e., shared by all TSOs and by all DSOs or by all TSOs and DSOs)"[6].

In relation to the grid services identified by CoordiNet, one or more products have been identified for each as can be understood from the Figure 4. Of these the CoordiNet demo testing plans to focus on balancing, congestion management, voltage control, and controlled islanding, which will be described in detail below.

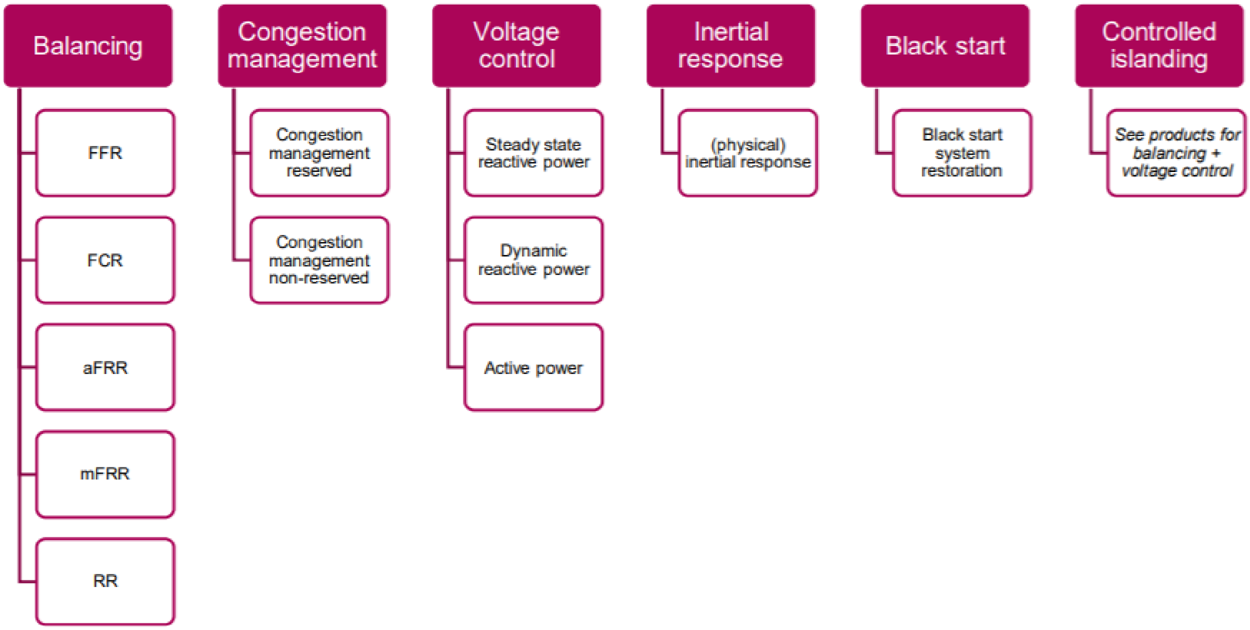


Figure 4: Products and services regarded by CoordiNet

[5] ibid

[6] European Commission, 2017a. Commission regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (No. L312/6).

BALANCING

The CoordiNet project uses the EU guideline on electricity balancing as a definition. This mention that balancing is "*all actions and processes, on all timelines, through which TSOs ensure, in a continuous way, the maintenance of system frequency within a predefined stability range, and compliance with the amount of reserves needed with respect to the required quality*"[7]. The Coordinet project will investigate the following products that can be used for balancing services:

- **Fast Frequency Response (FFR)** - FFR consist of a rapid injection of power or reduction of demand in a timeframe of a few seconds (before governor-driven primary frequency response units can respond) following a contingency that helps arrest the rate of change of frequency and correct supply-demand imbalances[8].
- **Frequency containment reserves (FCR)** – "*FCR means the active power reserves available to contain system frequency after the occurrence of an imbalance*"[9] FCR is a fast-acting capacity which can increase/decrease power output in a very short time period. It is therefore important for short-term balance of power production and consumption. Its goal is to stabilize the frequency within a couple of seconds[10].
- **Frequency restoration reserves (FRR)-** "*FRR means the active power reserves available to restore system frequency to the nominal frequency and, for a synchronous area consisting of more than one LFC area, to restore power balance to the scheduled value*". FRR can be manual or with active activation: **Frequency restoration reserves with manual activation (mFRR)** and **Frequency restoration reserves with automatic activation (aFRR)**.
- **Replacement reserves (RR)** - "*RR means the active power reserves available to restore or support the required level of FRR to be prepared for additional system imbalances, including generation reserves*"[11]. RR are needed to restore system balance when FRR was not able to do so (it is therefore only necessary in case of large imbalances). In addition, it allows FRR units to prepare again for a potential next short-term imbalance intervention and to free up their resources[12].

[7] European Commission, 2017a.
[8] CoordiNet 2019, D1.3, https://coordinet.netlify.app/publications/deliverables
[9] European Commission, 2017b. Commission regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation.
[10] CoordiNet 2019, D1.3
[11] European Commission, 2017b
[12] CoordiNet 2019, D1.3

CONGESTION MANAGEMENT

In the Coordinet project congestion is defined as a condition where one or more constraints (thermal limits, voltage limits, stability limits) restrict the physical power flow through the network. The service of congestion management refers to the process of mitigating grid congestion issues by avoiding the crossover of network capacity[13]. Congestion management services are in the project divided into the two following products:

- **Congestion management reserved** - a capacity-based product procured for congestion management services at a certain availability price which is then activated when the service is needed and called upon by the relevant system operator. This product is defined to cope with structural constraint.
- **Congestion management non-reserved** - an energy-based product procured for congestion management services at an energy price (most likely to be procured closer to delivery given the fact that it is energy based). In contrast to the reserved products, this product copes with sporadic constraints of less predictable character[14].

VOLTAGE CONTROL

According to Coordinet voltage control is used to facilitate the transfer of active power in an economic, efficient, and safe manner across the power system. Voltage is a localized property of the power system and as such it is essential that it does not exceed a certain level locally to maintain the health of grid assets. Voltage fluctuations, however, are inevitable as they are produced by changes in the network, e.g., active power injections and offtakes, and topological changes. This also means that their presence has a "local" character, and that voltage requirements vary across the power system[15]. Coordinet distinguishes the following three different products that can be used for controlling voltage:

- **Steady state reactive power** - aims at providing means to control voltage under normal operation of the system. The product keeps the voltage profile within the safe range. Its provision takes place by injecting or absorbing reactive power according to a voltage set point (measured at the injection point) set by the system operator. Only units that are able to be controlled for the provision of reactive power in function of grid voltage will be able to participate.
- **Dynamic reactive power** - aims at providing means to control voltage under system disturbance. The dynamic reactive power product consists of a punctual regulation of reactive power injection or absorption requested by the system operator. Participation is open to all technologies capable of following the request within specified time scales. In this regard, non-synchronous generators, static compensators, and static VAR compensators among others can participate provided they are controlled carefully to support voltage recovery[16].
- **Active power** - the portion of electricity that supplies energy to the load[17]

[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Ibid
[17] OpenEI, 2017. ISGAN Smart Grid Glossary, https://openei.org/wiki/ISGAN_Smart_Grid_Glossary

CONTROLLED ISLANDING

Controlled islanding is often considered as the final stage of power system defence plans. The difference between controlled islanding and traditional remedial action schemes is that it does not monitor the state of specific transmission lines and generating facilities but looks at the system topology and the loads and generation in areas of the power system. Based on optimization procedures which take into account the known topology and the actual state of the grids, the size of the island and the isolation points are selected. The basis for islanding is not standard but rather depends upon the nature of the grid under consideration[18].

It should be noted that the products that can be used for controlled islanding services are the same as products for balancing and voltage control.

The different products and services will be tested in the demos as follows:

- **Greece:** Congestion management, voltage control
- **Spain:** Balancing, congestion management, controlled islanding, voltage control
- **Sweden:** Congestion management, balancing

Figure 5: Products and Services tested by CoordiNet demos

[18] CoordiNet 2019, D1.3

Products and Services in INTERRFACE

The INTERRFACE project identified the same services and products listed in section 4.1.2 and they have been categorized according to the following classification:

- **Balancing services**
  Balancing services are in the responsibility of TSO. As stated in the aforementioned EC regulation establishing a guideline on electricity balancing[19], balancing consists of taking actions and processes, on all timelines, through which TSOs ensure, in a continuous way, the maintenance of system frequency within a predefined stability range.
- **Congestion management**
  Congestion management is activating a remedial action to respect operational security limits. In this context congestion is defined as "any network situation, where forecasted or realised power flows violate the thermal limits of the elements of the grid and voltage stability or the angle stability limits of the power system".
- **Non-frequency ancillary services**
  According to the Directive of the European Parliament and of the Council on the internal market for electricity on common rules for the internal market in electricity, non-frequency ancillary service means a service used by TSO and DSO for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability.
- **Adequacy**
  It collects the products aimed at providing the essential grid services in case of emergency (e.g. when the market is not able to coved demand).

The analysis of these services[20] has identified the importance of TSO-DSO coordination for the management of the products, even when the service is not used by both the system operators. It is also important to highlight that some products (such has reactive power) can provide different services depending on the voltage level: for instance, TSO typically activates reactive power products for non-frequency ancillary services, while DSO use reactive power for local congestion management.

The focus of INTERRFACE is related to the practical experience of seven demonstration projects which are currently testing balancing and congestion management services in order to investigate the potential of flexible distribution resources to be promoted to market products for one or both the involved system operators.

[19] European Commission, 2017a
[20] INTERRFACE 2020, D3.1 http://interrface.eu/sites/default/files/publications/INTERRFACE_D3.1_V1.0.pdf

CONGESTION MANAGEMENT SERVICES

INTERRFACE project joins the experience of seven demonstrators which cover an area of nine different European countries. In many of them, congestion management is not currently regulated in terms of market service (except for cross-border redispatch) and it represents the main novelty of the demonstration activity. The related reserve can be exploited for congestions at any voltage level, and it normally requires TSO-DSO interactions in order to coordinate its usage and its interference with other services (i.e., active power redispatch for congestion management have an impact on system balancing).

INTERRFACE hypothesized three sub-categories of congestion management services, which have been classified based on their time occurrence which can be related to existing energy markets and TSO planning processes (see Figure 6). Each demo area selected one (or more) congestion management category, by taking into account the foreseen necessities in terms of accuracy in predicting congestions, availability of power reserve, interactions with wholesale energy markets, etc.

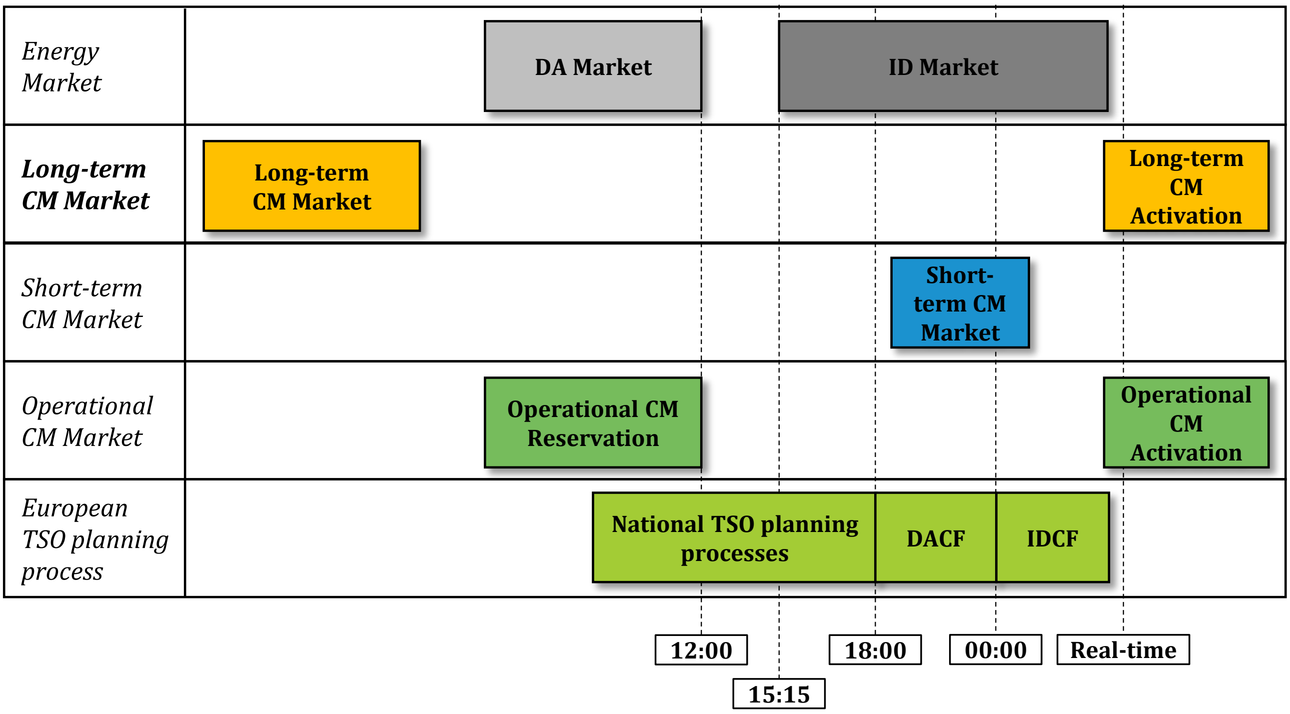


Figure 6: Timeline of energy and ancillary services markets. Day-Ahead (DA), Intra-Day (ID) occurrences with respect to Congestion Management (CM) markets and Congestion Forecast (CF)

- ## Long-Term-Planning congestion management

  Long-term-planning congestion management consists of a service that may serve network reinforcement deferral, network support during construction and planned maintenance, where location-specific flexibility assets are being activated for shaving or shifting peak demand and production to compensate for the lack of grid connections, loads or production units. The considered timeframe is months (or even years) before planned delivery and the related interference with other markets (energy and ancillary services) can be predicted and compensated. Having considered the long timeframe, both the availability (capacity) and related energy are considered for the settlement/remuneration of the service.

- ## Short-Term-Planning congestion management

  Short-term-planning congestion management considers physical network congestions that can be predicted accurately within the same timeframe of wholesale energy markets (day-ahead and intra-day processes). In fact, the current demonstration activities are investigating the interactions of this service with energy markets, exploring also their full integration. For this reason, energy-price-based remuneration of the service has been selected within the settlement process.

- ## Operational congestion management

  Operational congestion management occurs when congestions cannot be accurately predicted in advance. In this case, the provision of the service results to be more cost-effective when the activation of the related products is triggered in real time when the actual necessity is confirmed. Contrarily to short-term congestion management, this denotes the needs of an earlier reservation process, aimed at guaranteeing the reliable delivery of the considered service in areas characterized by significant risk of (non-predictable) congestions. Many demonstrators are currently implementing operational congestion management, which has the potential of being integrated (or interacting) with other real-time markets (e.g., balancing). The existence of a reservation process and the real-time activation leads to a remuneration scheme based on both capacity and activation energy.

Even though the congestion management products are similar, and there are concrete possibilities for developing a management strategy equal for all the demonstrators, their actual implementation depends on country in which they are activated. Being an innovative service, the main differences are driven by the combination of congestion management with existing (and regulated) markets. In fact, according to the description, this service can be integrated mostly with local energy and balancing markets which procedures and timings are country dependent.

BALANCING SERVICES

Contrarily to congestion management, balancing is a currently regulated set of services and reserves and the responsibility of its efficient management is normally in charge of the transmission system operator. Although in many countries, distribution resources can be participating to balancing services already (mostly FRR), some gaps are still experienced and the INTERFFACE demonstration activities propose different solutions.

As it happens for congestion management, balancing is characterized by a sequence of processes which can be significantly affected by extending the perimeter of FRR reserve to the inclusion of resources located on the distribution system:

- ## Prequalification

  Technical capability of distribution resources in providing balancing services, as well as the potential presence of physical bottlenecks between distribution and transmission systems need to be considered.
- ## Reservation, Procurement and Activation of reserve

  TSO-DSO interactions are foreseen to allow the monitoring and management of resources located at distribution level for the exploitation of balancing services. Coordination is also needed for the collection and aggregation of local flexibility bids.
- ## Settlement

  Automatic and transparent settlement procedures need to be developed, especially in countries where distribution reserves are regulated already but settlement is performed manually.

In addition to these points, some demonstrators are also investigating the full/partial integration of balancing services with operational congestion management (which used products very similar to FRR). However, no significant variations with respect to the current, regulated and country-specific balancing management strategy are proposed, except for what concerns TSO-DSO coordination. In fact, some of the most investigated aspects are related to:

- The participation of distribution resources to balancing services, which flexibility might be limited by distribution grid bottlenecks.

- The reservation (or direct activation) of local resources for distribution congestion management, and its impact on the balancing reserve.

Summary of differences and complementarities

Summarising the differences and commonalities of both projects, a similar set of services with only two differences have been identified. Although both projects identify balancing and congestion management, INTERRFACE includes another two high-level services: adequacy and non-frequency ancillary services while CoordiNet suggests additional four. Of those four, voltage control and inertial response are part of the non-frequency ancillary services of INTERRFACE, while black start and controlled islanding could fall under the INTERRFACE service named adequacy.

Similarities are as well noted in the specifications of the products related to the services. When it comes to balancing, both projects depart from the guidelines provided by the European Commission[21], INTERRFACE however with a specific notion regarding the participation of resources connected at distribution level with concern for physical bottlenecks between the two levels. Other concerns presented such as coordination and transparent settlement relate rather to market design and coordination and depend less on the product specification.

In the case of congestion management, which does not yet enjoy its own EU guidelines, different approaches can be seen. The INTERRFACE project identifies three sub-categories of congestion management: long term planning, short term planning and operational congestion management. These are further divided based on the timeframes of the market. In CoordiNet two different products are offered depending on whether the constraints they aim to solve are sporadic or structural. The service concerning structural congestion management can be compared to the short- and long-term planning of INTERRFACE while that sporadic equals INTERRFACE's operational congestion management. The main difference concerns the timeframes where INTERRFACE would distinguish the products also based on the market in which they are offered, whereas CoordiNet would not.

Products with and without reservation seem to be considered necessary by both projects, in order to guarantee product availability. It should be noted that CoordiNet suggests using the same services for controlled islanding as for congestion management, and that the complementarity of the INTERRFACE specification may also be valid here.

[21] European Commission, 2017a.

Coordination Schemes

This chapter describes the coordination schemes applied in the two projects and compare them to the ASM report. There is in general a consensus that one single coordination scheme will never fit all, across the diverse TSO-DSO landscape in Europe. The very same fact has led to the development of a multitude of related, however different coordination schemes corresponding to specific local situations.

AN INTEGRATED APPROACH TO ACTIVE SYSTEM MANAGEMENT (ASM)

The purpose of the ASM report has been to formulate a general baseline harmonising and simplifying the various schemes. The report has been developed by the four associations representing the DSOs at EU level; CEDEC, Eurelectric, GEODE and E.DSO, who is active in the CoordiNet project, together with the body representing the TSOs, ENTSO-E, active in the INTERRFACE project.

The ASM report focusses on TSO-DSO coordination with respect to congestion management and balancing. It recognises that active system management can be used for other purposes but limits it scope to these two services given their importance for ensuring the security of supply. The ASM report supposes three main market models, depending on the management of the merit order list (MOLs) of flexibility bids.

To determine which of the three options should be applied, a few simple questions can guide the classification as illustrated in the roadmap above and described below:

- Is locational information available?
- Is it possible to use balancing bids for congestion management in the distribution system?
- Is there a combined market for TSO and DSO congestion management?

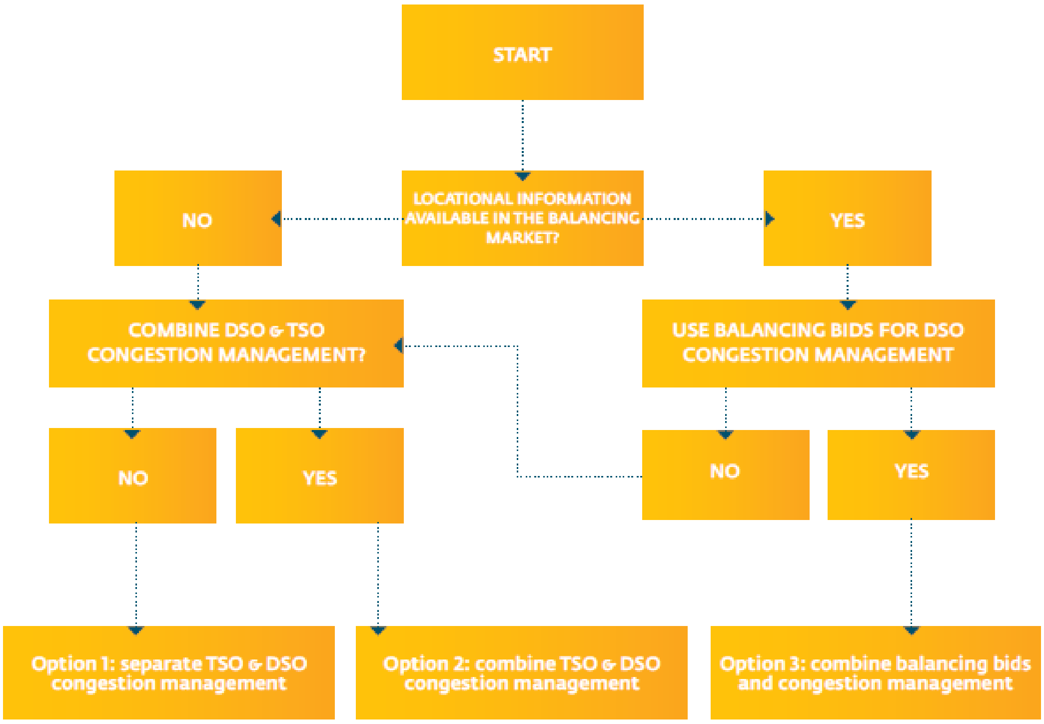


Figure 7: The three possible models for market coordination (CEDEC et. al. 2019)

The structure of the three different options proposed by the ASM report are illustrated and explained below.

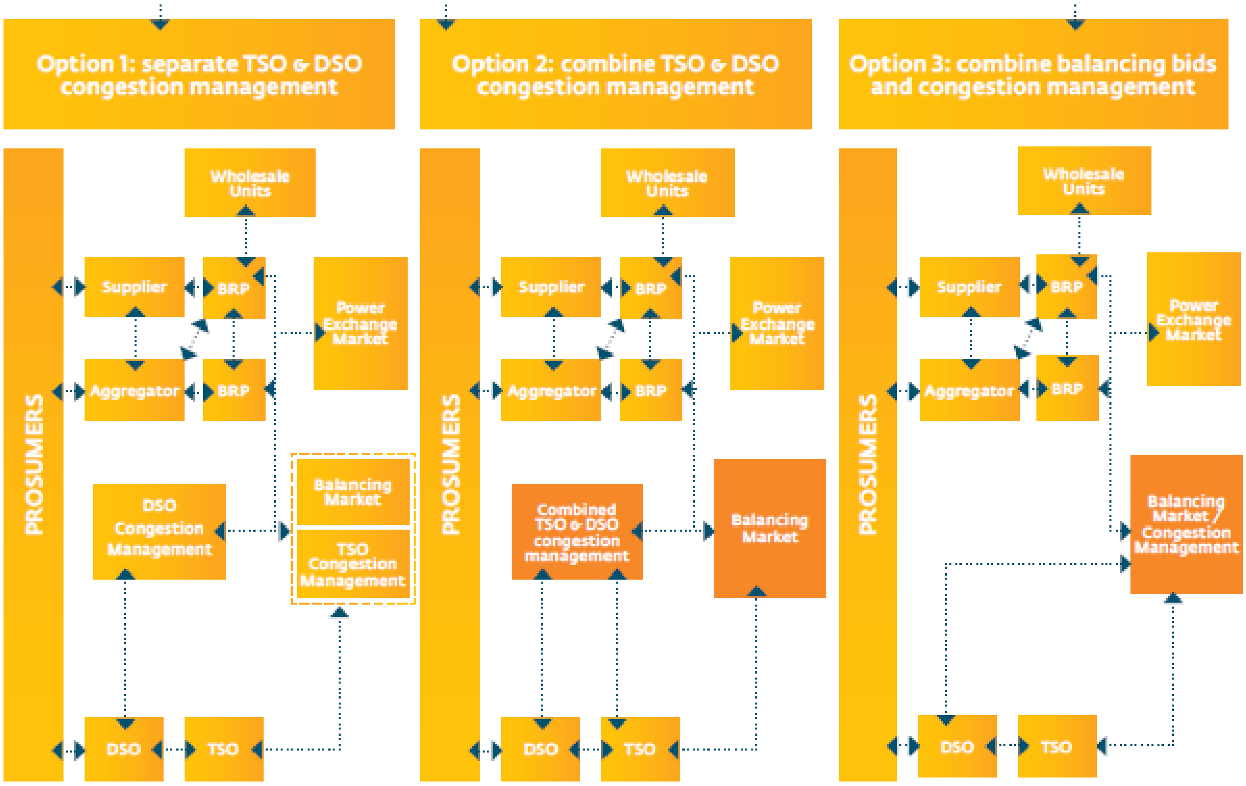


Figure 8: The three possible models for market coordination (CEDEC et. al. 2019).

- **Option 1**
  This model considers a separated TSO and DSO congestion management. This means that local congestion management markets may emerge as a separate response to DSO congestion management independent from the TSO. Meanwhile the congestion management and balancing of the TSO, can take two forms, either separate (1a) or merged operation of their congestion management and balancing (1b). The report underlines that such an option might be needed to catalyse market-based congestion management offers, but that due attention should be paid to market models to avoid market fragmentation in the long run[22].

- **Option 2**
  This option considers a dedicated market for congestion management which covers both TSO and DSO needs (needs which may at times overlap) and thereby allows for the streamlining of the requirements to market processes and rules[23].

- **Option 3**
  The last option proposes a market which integrates the processes for both congestion and balancing. The establishment of a single market would facilitate the access to all bids for TSOs and DSO necessitating their mutual coordination. It should be noted that to apply this model and use balancing bids for congestion management, locational information must be available.

[22] CEDEC et al. 2019
[23] Ibid.

CoordiNet Coordination Schemes

The CoordiNet project has taken its starting point regarding coordination schemes in the SmartNet project[24]. In the work of CoordiNet, the coordination schemes proposed by Smartnet were adapted according to a detailed literature review taking into consideration the current debates on the topic fostered not least by other projects.

The project identifies that coordination is needed, when flexibility services can be offered to various system operators (e.g. flexibility on the distribution level can provide a service to both the DSO and TSO), and when the procurement of a certain flexibility by one system operator affects the operation of the grid of another operator (e.g., the procurement of distribution-level flexibility by the TSO would require coordination with the DSO to ensure that operational issues in the distribution grid related to activation of this distributed flexibility are avoided). Given the interconnection between the DSO-level and TSO-level (an obvious manifestation of this interconnection is captured by their interface power exchange), the procurement of flexibility within each level must at least abide by certain shared constraints (e.g., capacity of interconnection transformers, voltage levels at root nodes, etc.). These constraints must also be followed by the market design and its clearing.

Depending on the needs for coordination, CoordiNet suggests different market designs cognizant of 1) the services needed by the different system operators, 2) availability of flexibility at different grid (voltage) levels, and 3) the need for coordination between the system operators to enable the (joint) procurement of flexibility while keeping the operational safety of all grids involved.

To cover these 3 scopes, CoordiNet proposes four different classification layers to establish the most suitable coordination scheme in a given situation, which are:

- **Need:** The needs of which system operator will be addressed?
- **Buyer:** Which stakeholder(s) buys the flexibility to answer to a certain need?
- **Market:** How many markets are considered?
- **Resources:** Does the TSO have access to DER?

This classification led to the identification of seven different coordination possibilities, which can be understood from Table 1.

[24] https://cordis.europa.eu/project/id/691405

<table>
<tr><th></th><th>NEED
Which SO-need(s) will be addressed?</th><th>BUYER
Which stakeholder(s) buy(s) the flexibility to answer the considered need(s)?</th><th># MARKETS
How many markets are considered?</th><th>RESOURCES
Does the TSO have access to DER?</th></tr>
<tr><td>Local Market Model</td><td>Local need</td><td>DSO</td><td>1</td><td>NA</td></tr>
<tr><td>Central Market Model</td><td>Central need</td><td>TSO</td><td>1</td><td>Yes or No</td></tr>
<tr><td>Common Market Model</td><td rowspan="4">Local and central need</td><td rowspan="3">DSO and TSO</td><td>1</td><td>Yes</td></tr>
<tr><td>Multi-level Market Model</td><td rowspan="2">> 1</td><td>Yes</td></tr>
<tr><td>Fragmented Market Model</td><td>No</td></tr>
<tr><td>Integrated Market Model</td><td>DSO, TSO and commercial parties</td><td>1</td><td>Yes</td></tr>
<tr><td rowspan="2">Distributed Market Model</td><td>Local need</td><td rowspan="2">Peers</td><td rowspan="2">≥ 1</td><td rowspan="2">NA</td></tr>
<tr><td>Local and central need</td></tr>
</table>

Table 1: Categorization structure of coordination schemes considered within the CoordiNet Project

When looking closer at the actual application of these 7 coordination schemes into the different demonstrators, it is possible to identify sub-market models. In this regard the design aspects producing the most relevant differences suggesting the creation of sub-models are pricing schemes and market targets. This is the case of the application of the Multi-level Market Model in Sweden and Greece. The variation can be detected when it comes to the roles of the market participants as well as differences exist concerning timing. Another difference is whether the market is organised symmetrically or asymmetrically. This refers to whether flexibility offers are submitted and cleared all together or if buyers can pick simultaneously with the submission and no clearing mechanism is in place[25].

COMPLEMENTARITY WITH THE ASM REPORT

The main differences between coordination schemes of CoordiNet and those proposed by the ASM lies in the approach. The ASM report focuses on the TSO – DSO communication in general and mainly in the context of balancing and congestion management while it pays little consideration of the specifications of the market model itself, something which is however considered in CoordiNet.

The coordination schemes proposed in the ASM report are based on data information exchange and ICT solutions. Thus, when it comes to identifying which needs a market should cover, who will buy flexibility services, and who will sell it and in which markets, the ASM report suggests to firstly define whether the TSO and DSO will solve congestion problems together or if they join their actions just for the bidding process and the possible interconnection with the procurement of balancing services. Instead, CoordiNet studies

[25] CoordiNet, 2021, D2.1, https://coordinet.netlify.app/publications/deliverables

how the coordination between TSO – DSO can be used as the basis for setting up (joint) markets, as well as their properties, and interactions (including the interaction and interconnection between multiple markets, when non-joint markets are set up). Indeed, the departure point of CoordiNet considers which services are needed by which system operators, and which services can be offered by which flexibility source available at which grid level.

As such, the seven coordination schemes developed within CoordiNet are not in opposition to the ASM report. As they add an extended scope focussing on the design of the market, its hierarchy, and architecture, the CoordiNet project's coordination schemes can be seen rather as complimentary to the ASM report. The proposed coordination schemes for the procurement of grid services within CoordiNet can, indeed, coincide with the market options presented in the ASM report. This can be understood from Table 2 and will be further discussed in the following.

ASM	CoordiNet
Option 1	• Multi-level market model, • Fragmented market model, • Central market model, • Local market model
Option 2	• Common market model, • Integrated market model,
Option 3	• Common market model, • Integrated market model,
Out of scope	• Local market model • Distributed market model • Central market model

Table 2: CoordiNet Market Models compared to the ASM report

As visualised in Table 1, the multi-level and fragmented market models consider separate markets for the TSO and DSO. These two market frameworks therefore fall under option 1 of the ASM report which as well consider separate markets (however, focussed on congestion management). This is true even though in the model of CoordiNet, the separate markets will have to share some common operational constraints to ensure the secure operation of each of the grids. For example, a market such as the multi-level market model which provides services to the transmission system by activating flexibility located in the distribution system, should in its clearing ensure that no violations are caused to the operational limits within the distribution system. Similarly, an activation of flexibility on the distribution level to provide services for the distribution system (such as in, both, the fragmented and multi-level market models) should ensure that this activation would not lead to serious imbalances on the transmission grid by, e.g., regulating the interface flows between the grids.

As for the common and integrated market models, those market designs consider a completely joint market in which flexibility is traded from different grid levels to meet the service needs of different system operators. If this mechanism is implemented solely for congestion management (where for balancing, the TSO maintains a separate market), this would fall under option 2 of the ASM report. While if the traded products in the common or integrated markets are used for both congestion management and balancing, this would fall under option 3 of the ASM report.

The central market model, which considers the TSO to be the only purchaser of flexibility, would not necessitate market coordination other than for making sure that flexibility procurement from the distribution level does not cause any operational issues in the distribution grid (as discussed for the multi-level market model). This can be covered either as part of the market itself (by considering distribution-level constraints in the market clearing) or in a prior prequalification phase. The central market can therefore on the one hand be considered to be beyond the scope of the ASM report. Alternatively, it can be considered to fall under option 1 as TSO and DSO congestion management are separate; with the congestion management at the TSO level being based on a market framework, and that of the DSO based on non-market-based solutions.

In the case of the local market, only distribution-level flexibility to meet DSO level needs is considered, which may suggest that the model is beyond the scope of the ASM report. However, the activation of flexibility at DSO level might still require coordination to make sure that the operation of the transmission system is not affected negatively by, for example, causing unintended imbalances. This coordination could be accounted for with constraints either in a prequalification phase, or by adding constraint to the market clearing. Given that in the local market the DSO runs its own congestion management market, separate from the TSO, this market model could be considered to fall under option 1 of the ASM report, or to be an extension thereof.

Conclusively, the Multilevel Model of CoordiNet would fall under option 1 of the ASM, as well as the project's Fragmented Market Model. On the other hand, the Common Market Model and the Integrated Market Model can be seen as alternatives to or extensions of Option 2 and 3. Meanwhile the Distributed Market Model, the Local Market Model and the Central Market Model taken into account by CoordiNet, are not directly covered in the ASM report as they do not per se imply coordination between separate TSO and DSO markets (beyond the possible need or requirement for maintaining shared constraints). Hence, these models could also be considered to be extensions to the market options presented in the ASM report.

Lastly, it should be mentioned that the coordination schemes proposed by CoordiNet are to be service agnostic, allowing for them to be applied to different services, or even a combination of services. This is as well in line with the recommendations of the ASM report. Indeed, the comparison with the ASM report coordination options (option 1 to 3) presented in this section, was carried out within the scope of congestion management, and balancing as a service. This was done to allow a direct comparison with options 1 – 3 of the ASM report. Nonetheless, these coordination scheme can support the provision of other services, beyond congestion management and balancing, as manifested through the different implementations in the CoordiNet demo sites considering various coordination schemes for different services.

CRITERIA

The 7 proposed schemes will be tested in the three different demos sites as follows:

- **Greece**: Multi-level Market Model, Fragmented Market Model
- **Spain**: Common Market Model, Local Market Model, Central Market Model
- **Sweden**: Multi-level Market Model, Distributed Market Model, Local Market Model (Gotland)[26]

The criteria applied by each demo to the selection of coordination schemes will be explained further after Figure 9.

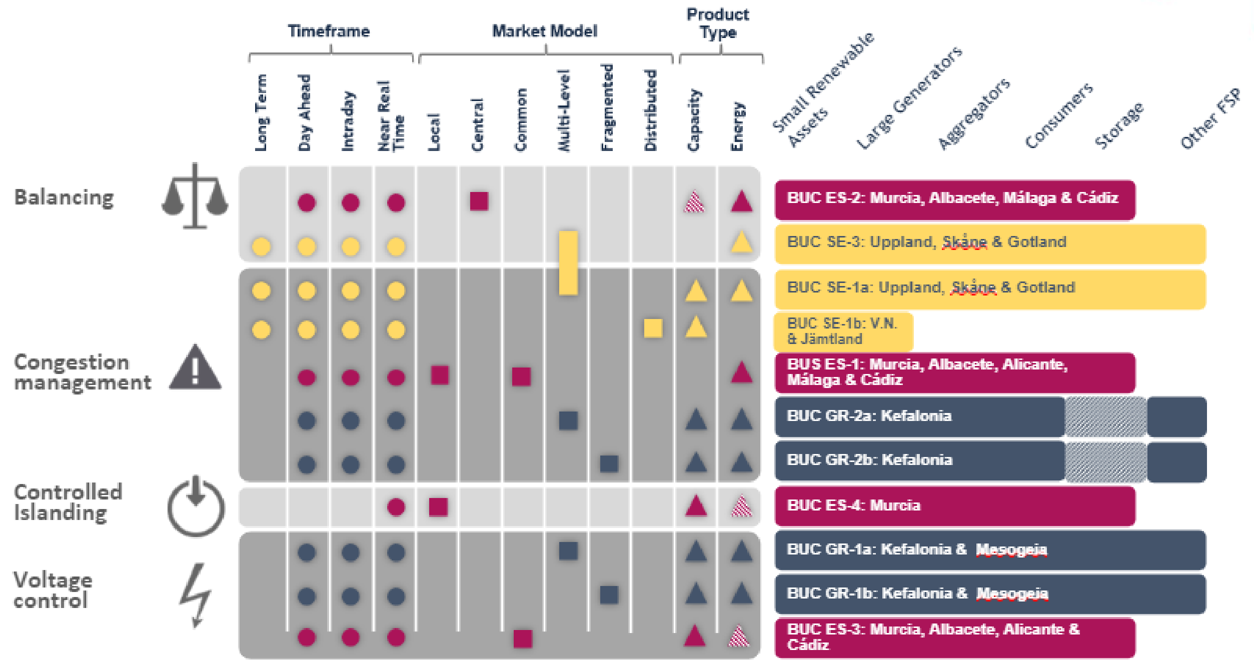


Figure 9: Overview of CoordiNet demo activities

In the case of the Greek demo in Coordinet the focus is on the creation of a local electricity market which will ensure the reliable operation of distribution grid. The overall goal of such a market is to promote the proactive management of the DERs located in the distribution grid. The main criteria for selecting the Multi-level Market Model and the Fragmented Market Model for testing in the demo were in this regard technical and regulatory. Both coordination schemes promote the establishment of a local market that will consider in detail the distribution network components and therefore ensure the secure and reliable operation of the distribution grid. In addition, the coordination schemes ensure the independent operation of transmission and distribution grids by the corresponding TSOs and DSOs, while exchanging only the most critical data, such as offers and flows, in an aggregated form, thus minimizing the complexity of data exchange. Finally, the integration of the proposed coordination schemes with existing market is also taken under consideration, since from a TSO perspective, the current market practices are slightly reformed to integrate the exchanged data with the tested local markets operated by the DSO.

In the case of the Spanish demo three different market models were selected for testing, namely, the Central Market Model, the Local Market Model, and the Common Market Model. The Central Market Model

[26] ibid

is used for balancing and was chosen as it is the already established market. The service is the responsibility of the TSO and the balancing markets are being harmonized at the EU level. The Common Market Model is used for voltage control and congestion management. This coordination scheme was chosen as the activation of both services impacts both TSO and DSO networks. The common market is therefor expected to be the most efficient solution. Furthermore, for congestion management, there was an already established market and the CoordiNet developments are fully integrated into such market. Lastly, the Local Market Model is used for congestion management at LV. This coordination scheme was chosen as the impacts on the TSO is limited. Furthermore, this scheme is expected to have lower implementation costs for congestions at LV in comparison with alternatives. The product attributes can be tailored to specific flexibility of FSPs and network requirements. The market model is expected to have lower requirements in terms of communication and technical requirements in comparison with the common market.

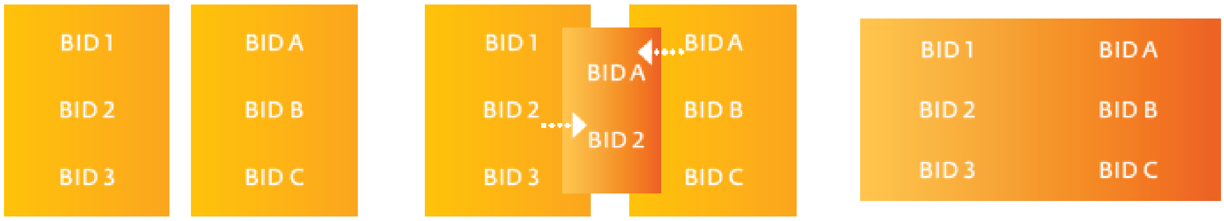
Finally, in the case of the Swedish demo the Multi-Level and Distributed Market Model were selected. The main priority with regards to the selection of coordination schemes was the integration with existing markets and regulation. Emphasis was then laid on time coordination to not disturb the spot market day-ahead and intra-day. Furthermore, the ambition was to fit FSPs, Significant Grid Users (SGUs), DSOs, TSOs in a way that enable the relevant information for a load prognosis, information exchange between DSO and TSO and activation time for FSP (in industries and energy companies can participate day ahead). The first demo run in Sweden underlined the importance of putting DSO-TSO markets in the timeframes of the current energy markets without interference. The first demo run in Sweden demonstrated as well that the dialogue between DSO and TSO created new values in understanding how better coordination can lead to a more efficient grid use.

INTERRFACE Coordination Schemes

The coordination schemes in the INTERRFACE project are based on the coordination schemes in the ASM report. Three different options (see Figure 8) proposed by the ASM report discussed earlier in this chapter can be summarised as below:

- **Option 1: Separated TSO and DSO congestion management**
  Local congestion management markets may emerge separated from TSOs congestion management and balancing (which can themselves be separated or merged). This model may be needed to trigger market-based congestion management offers. However, coordination between market processes (CM, BM, ID) should be a focus to avoid market fragmentation on the long run.
- **Option 2: Combined TSO and DSO congestion management, with separated balancing:**
  A specific congestion management market process is created, gathering TSOs' and DSOs' needs, which may overlap. This would contribute to building a congestion management market process, streamlining the needs expressed towards market processes and the rules of the game (time schedule, data exchange, rules of activation, settlement, etc.).
- **Option 3: Combined balancing and congestion management for all system operators together**
  all balancing and congestion management bids and actions are combined in an integrated market-based process. When the current trend is to build a pan-European platform for balancing, an option could be to integrate congestion management and new related needs in the same process as the existing balancing. A single marketplace at national level for collecting and activating flexibility services would allow TSOs and DSOs to access all bids from market parties and to mutually coordinate activations.

Next to the market coordination options, the level of market integration and coordination under each option can be further analysed depending on the treatment and integration of Merit Order Lists as described in Figure 10.



(A) (B) & (C) (D)

Figure 10: The different level of integration and coordination of Merit Order lists: (A) Separated MOLs with coordination; (B) Overlapping or (C) subset MOLs; (D) Fully integrated MOLs (CEDEC et. al. 2019).

As result, INTERRFACE considered that a closer analysis of various approaches to coordinating or integrating MOLs approaches was necessary to complement the three high-level market design options identified in the ASM report. In doing so, a more coherent approach towards the development of a complete set of market related processes, rules, coordination platforms and data-exchange can be supported across various situations, as reflected in the demo sites. The four degrees of MOL integration are as follows:

- **Option A: Separated MOLs with coordination**
  Which can go from simple notification by the DSO to the TSO after bid activation, to enhanced coordination relying on direct data exchange and sharing of information (e.g., through a datahub and/or flexibility resource register).
- **Option B: Overlapping MOLs**
  Bids from one or more lists can be activated for different purposes (can be done through co-optimization, for instance).
- **Option C: Subset MOLs**
  Would effectively bring about the same result as Option B, as bids with additional information (e.g., location) could qualify for other activation purposes.
- **Option D: Fully integrated MOLs**
  Single market platform where TSOs, DSOs, and market parties can buy/sell flexibilities (standardized single products).

As listed above, for each market coordination option indicated in the ASM report, there are varying levels of integration, both with regards to integrating TSO and DSO procurement (e.g., for Congestion management markets) and to integrating several services (e.g., Congestion Management and Balancing). As a result, 9 variations to the level of integration based how MOLs are exchanged/integrated between markets have been derived in-line with ASM report and are summarized in Figure 11.

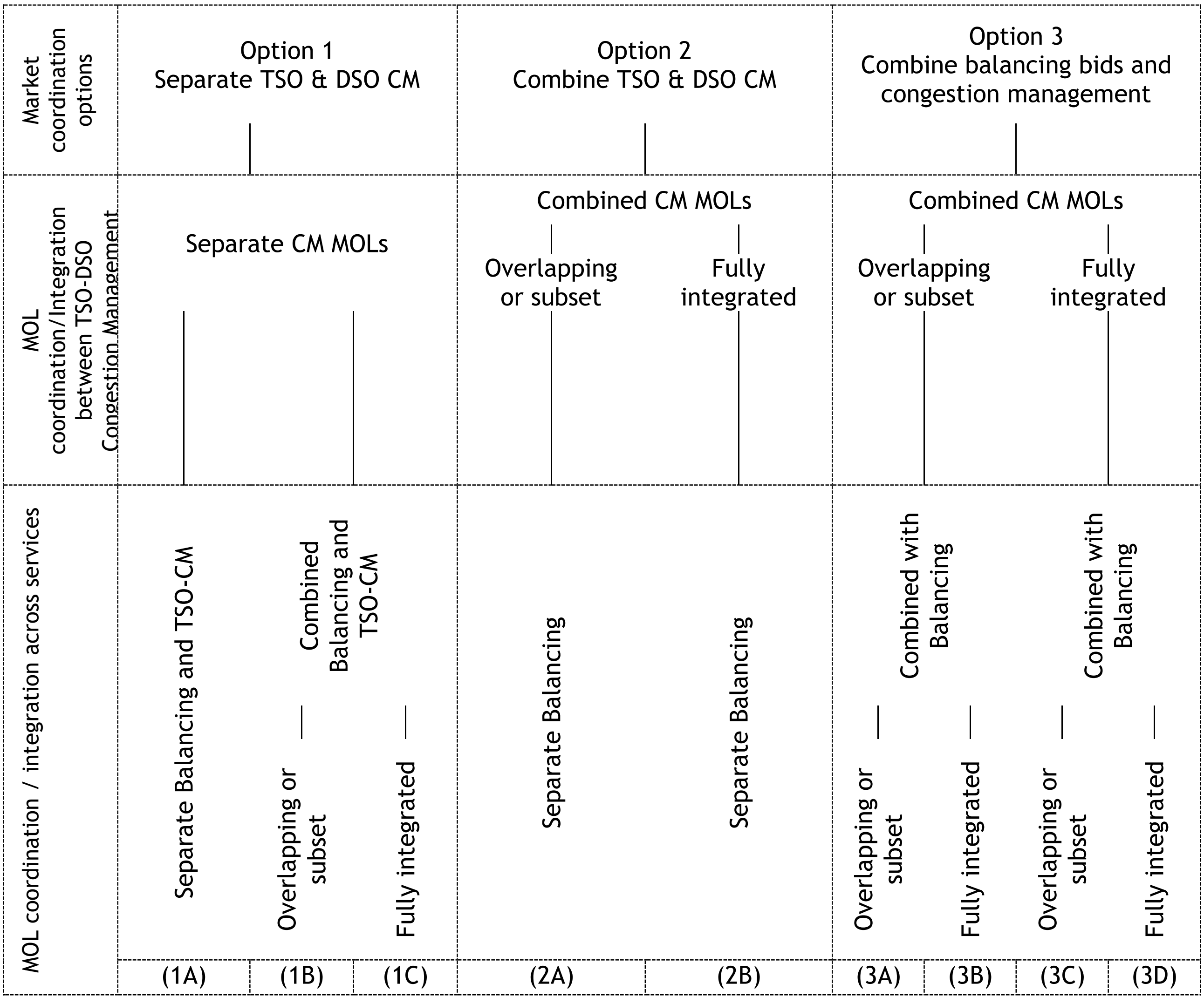


Figure 11: Market Options in INTERRFACE.

Following Figure 11, the market coordination models were described as market options within the INTERRFACE project and represent the range of possible coordination schemes available to demonstration projects. The Option 3D is most advanced in terms of markets integration and coordination, while Option 1A may be the most often chosen option in most countries (namely if congestion management markets exist) and/or demonstration projects today due to the simplicity of design.

The market options in Figure 11, can be represented in a simplified way, as shown in Table 3. Starting from separated markets, meaning that bids are only used on one of the markets, up to a fully integrated market with only one common Merit Order List, all different variations are possible. Nowadays, many pilot projects are working on a combination of CM- and other markets by sharing parts of the bids and adding them on two or more Merit Order Lists of different markets. The same classification can be carried out for the combination of TSOs and DSOs on these markets. Starting from completely separated markets, where the TSO/DSO coordination necessarily needs to take place outside of the market up to integrated markets where TSOs and DSOs can access the same bids on the same Merit Order List. Since the focus of the INTERRFACE project lies in congestion management markets, those markets are specifically highlighted in those market option, though the distinction is suitable for other purposes and can be scaled up to cover other types of markets.

	CM separated from other markets	CM combined with other markets over subset or by overlapping MOLs	CM fully integrated in other markets
TSO	1A	1B	1C
DSO	1A	---	---
TSO & DSO Combined by subset or overlapping	2A	3A	3B
TSO & DSO fully integrated	2B	3C	3D

Table 3: Market Options in INTERRFACE

COMPLEMENTARITY WITH THE ASM REPORT

The main market models considered in the INTERRFACE project are directly based on the options outlined in the ASM Report. Deliverable 3.2 of INTERRFACE[27] further expands on these options by providing a more detailed mapping of possible design choices. As mentioned above, this directly relates to (a) the level of integration of different markets, from separated markets for congestion management and balancing (and Merit-Order Lists, or MOLs), to fully integrated markets with a single MOL; and (b) the type of coordination between TSOs and DSOs for prequalifying and accessing congestion management and balancing bids. The INTERRFACE project goes even further, by providing more detailed considerations on how different market parties such as BRPs, Resource Aggregators, and Resource providers can actively participate in the considered markets, how the IEGSA platform can support the described coordination functions, and the required interactions with existing tools and platforms to effectively enable the necessary interoperability for the full participation of all grid users wishing to offer their flexibility to the market.

In the ASM report, the flexibility resources register is introduced as a vital part of a flexibility platform since information on flexibility resources that are pre-qualified or are seeking participation in congestion management and balancing services could be shared and available to all parties. The flexibility resources register allows TSOs and DSOs to have visibility on which flexibility resources are connected to their grids, so they know what resources are available to them at all voltage levels. Features can also ensure that the use of flexibility does not jeopardise system stability or does not create local challenges through implementation of a traffic concept. In the INTERRFACE Deliverable 3.2[28], a general description of how such a flexibility resources register could interact with existing platforms and tools is provided.

[27] INTERRFACE 2020, D3.2 http://interrface.eu/sites/default/files/publications/INTERRFACE_D3.2_v1.0.pdf
[28] Ibid.

CRITERIA

Choosing the most suitable coordination scheme for their specific purpose is necessary for the demonstrators in the INTERRFACE project. The selection of the respective coordination scheme is mostly based on two separate decisions. The first decision demonstrators have to make is which of the different congestion management services and eventually further services and markets will be tackled. The second decision then refers to the exact coordination schemes that will be tested.

Regarding the first decision the results showed that most of the demonstrators focussing on DSOs prefer operational CM markets. This can be because a flexibility potential and liquidity in smaller market areas is limited. Reservation in operational CM markets allows for a sufficient amount of flexibility in all situations, whereas in short-term CM market a sufficient amount of flexibility potentials is not guaranteed. Looking at the demonstrators that have TSOs within their consortium, short term CM markets are taken into account in each demonstrator. Some of these Demonstrators comprising TSOs in their consortium include operational CM markets as well.

The decision for specific coordination schemes is, among other things, based on soft criteria like existing markets, regulation in the respective market area and complexity. In contrast to TSOs, Demonstrators that focus on DSO congestion management most often do not have an extensive experience in terms of market-based procurement of services from the past. Furthermore, processes for service procurement i.e., congestion handling, are heterogeneous amongst the different DSOs, especially between different countries. This can be traced back to the distinct regulation in place in different European countries. A common European market process as for TSOs cannot be observed, and therefore alignment with other markets and players becomes complex. The limited prior experience in those pilot projects with market-based procurement of services favours solutions with limited complexity, while alignment with existing markets as well as with other network operators is avoided. In summary, demonstrators focusing on the procurement of services by DSOs tend to choose coordination schemes that foresee separated markets and coordination between TSOs and DSOs taking place outside of the market (if at all). Demonstrators that take into account TSOs tend to be more familiar with the topic of market-based procurement of services and energy markets in general. Therefore, in terms of combination with other markets further concepts are taken into account. To increase liquidity and decrease overall costs, coordination schemes that feature combinations with other markets are foreseen in most of the demos. This combination refers to a combination with Intraday as well as Balancing markets.

Besides the integration with other markets, TSO/DSO coordination is an important focus for those demonstrators and is further investigated throughout the various stages of flexibility procurement (grid and product prequalification, activation, measurement, validation, and settlement). A usage of those resources makes a coordination mechanism inevitable. As a general conclusion it can be noted that demonstrators that take into account TSOs flexibility needs tend to use CM markets that are combined with existing markets in order to increase liquidity while introducing TSO/DSO coordination mechanisms to unlock flexibility potentials in the low voltage network.

Summary of differences and complementarities

As the previous description of the projects has showed, the ASM report is a central report for both. In Table 4 the proposed models of the two projects are compared regarding the complementarity with the ASM is.

ASM	CoordiNet	INTERRFACE
Option 1	• Multi-level market model, • Fragmented market model, • Central market model, • Local market model	• 1A • 1B • 1C
Option 2	• Common market model, • Integrated market model,	• 2A • 2B
Option 3	• Common market model, • Integrated market model,	• 3A • 3B • 3C • 3D
Out of scope	• Local market model • Distributed market model • Central market model	

Table 4: Coordination schemes in CoordiNet and INTERRFACE compared to the ASM report

As can be seen from the different presented market models and coordination schemes, the CoordiNet project presents additional and further extensions to the market options presented in the ASM report in terms of market design going also beyond congestion management. In contrast, the INTERRFACE project, which had the ASM report as the starting point for work, develops a generalisation of the options defined in the ASM report. This generalisation focuses on the consideration of an integration of different markets (e.g., congestion and wholesale, or congestion and balancing) and the different options of TSO-DSO coordination.

In line with the focus of the ASM report, INTERRFACE gives focus to congestion management, wholesale, and balancing markets. In contrast, the first classification layer of CoordiNet considers general needs and goes as such beyond coordination for procurement of services related to balancing and congestion management.

When it comes to selecting coordination models for the demo activities, it is seen that existing markets constituted a decisive criterion in both projects. Thereafter, INTERRFACE noticed different preferences in criteria depending on whether demos were TSO or DSO focussed or involve both network operators. The DSO focussed demos opted for coordination models with separated markets, while the demos including TSOs took interest in combined market with the aim to increase the liquidity. A similar trend is more difficult to detect in CoordiNet, where all demos are led by DSOs in close collaboration with the TSOs. Except for two use cases that will test the local market model, all other demo activities focus on market models covering both central and local needs.

Conclusions

At the current stage of work, it can be reported that the projects continue their commitment to collaborate and bring about joint recommendations. This spirit is also detected in BRIDGE where both projects contribute actively. The BRIDGE regulatory WG has proposed a working plan including several tracks and actions. Of particular interest to CoordiNet, INTERRFACE, and this joint paper could lie within actions 1 on product design and action 2 on coordination models and market design (within track 1 and 4 in the working plan).

As part of its work plan, the BRIDGE regulatory WG will be organizing “dynamic knowledge sharing sessions” to share the outcomes of the projects to which the different tracks are relevant. As such, the outcomes of this paper could also be presented in one of these dynamic knowledge sharing sessions. In general, this paper could provide a basis of a broader discussion within BRIDGE – also involving other BRIDGE projects (other projects could comment on the paper – or even contribute to an extended Bridge version).

The BRIDGE Regulatory WG is also asked to support the ongoing exercise by DG ENERGY where a specific task force (cooperation of TSOs and DSOs) is looking at several flexibility related topics. The two projects have in this context identified the following to be relevant for the last paper:

- The role of the market operator as part of the projects' work and in view of the efforts to the update of the HEMRM via BRIDGE Action 7 of WG regulation to which both projects have contributed.

- What minimum sets of rights and obligations should be given to the FSP (access to register, trading solvency, obligation to notify if change of contract, obligation to update other parameters), and more specifically, how to ensure no discrimination based on contract type and baselining methodology as well as confidentiality issues (especially with the inclusion of residential customers).

- The role and volume of data that should be made accessible to third parties (with customer consent) to foster data exchange and new services anticipating the pan-European platform as well.

In addition, the links between the projects have been further strengthen with the kick-off in October 2020 of the OneNet project[29] which responds to the same call. OneNet builds on the experience of CoordiNet and INTERRFACE and counts furthermore on the engagement of many of the same parties enhancing thereby the knowledge sharing. The links with the OneNet project has also been agreed to be further explored in the final joint report[30] which will also discuss the experiences from the demos and anticipate the creation of a pan-European platform.

[29] https://onenet-project.eu/
[30] D7.2.3. of the CoordiNet project