A flexible power system in Europe

Integrated vision for flexibility to enable the clean energy future

eurelectric
powering people

Eurelectric represents the interests of the electricity industry in Europe. Our work covers all major issues affecting our sector. Our members represent the electricity industry in over 30 European countries.

We cover the entire industry from electricity generation and markets to distribution networks and customer issues. We also have affiliates active on several other continents and business associates from a wide variety of sectors with a direct interest in the electricity industry.

We stand for

The vision of the European power sector is to enable and sustain:

- A vibrant competitive European economy, reliably powered by clean, carbon-neutral energy
- A smart, energy efficient and truly sustainable society for all citizens of Europe

We are committed to lead a cost-effective energy transition by:

investing in clean power generation and transition-enabling solutions, to reduce emissions and actively pursue efforts to become carbon-neutral well before mid-century, taking into account different starting points and commercial availability of key transition technologies;

transforming the energy system to make it more responsive, resilient and efficient. This includes increased use of renewable energy, digitalisation, demand side response and reinforcement of grids so they can function as platforms and enablers for customers, cities and communities;

accelerating the energy transition in other economic sectors by offering competitive electricity as a transformation tool for transport, heating and industry;

embedding sustainability in all parts of our value chain and take measures to support the transformation of existing assets towards a zero carbon society;

innovating to discover the cutting-edge business models and develop the breakthrough technologies that are indispensable to allow our industry to lead this transition.

Dépôt légal: D/2021/12.105/48

WG Regulation & Network Customers
WG Retail Market Design
WG Market Integration & Network Codes

Contact:
Louise RULLAUD, Senior Advisor – Distribution & Market Facilitation Team – Infrastructure & Flexibility Lead -
lrullaud@eurelectric.org

Contents

1. EXECUTIVE SUMMARY

- The present report showcases the steps to **procure flexibility solutions via a market-based approach** with concrete examples coming from different countries in Europe. In this respect, Eurelectric has identified a set of key principles that align with the current European regulatory framework and that should guide development of upcoming Network Codes.

- On top of more specific recommendations, the report identifies six overarching principles:
    - **Transparency** for market parties on the overall process and the outcome of DSO decision making but also concerning the definition of DSO needs and the tendering process.
    - **Data visibility,** especially transparent information of network needs under clear rules, to promote market participation and avoid unwanted market behaviour. Data must be visible, free, easily accessible and machine readable.
    - **Coordination** of needs among neighbouring System Operators (whether TSO/DSO or DSO/DSO) and between market processes (e.g. congestion management/balancing).
    - **Value Stacking,** any Flexibility Service Provider should be able to use their asset(s) to provide services to multiple markets and hence access multiple revenue streams while respecting the need to comply with Regulation (EU) n°1227/2011 on wholesale energy market integrity and transparency.
    - **Incentives or adequate remuneration schemes**, set by the National Regulatory Authorities (NRAs), are needed for the efficient provision of flexibility services while traditionally, remuneration schemes induced DSOs to invest only in grid reinforcement. They should be improved to incentivise the use of the most cost-efficient solutions by DSOs, including the procurement of flexibility.
    - **A technology neutral approach** to product definition and the design of the market platforms. This requires an agnostic framework, including for aggregated resources.

- The procurement of distributed flexibility follows this sequence:
    - **The preparatory phase**. DSOs identify their need to solve or prevent congestion. It encompasses the product definition step and the pre-qualification process.
    - **The forecasting & planning phase.** The forecast modelling of grid utilisation to identify potential congestion risks.
    - **The market phase.** The tender process, comprising bid collection and evaluation (both in long-term and short-term contracts).
    - **The monitoring and activation phase**. The activation of the selected bids to solve the congestion and of system operator cooperation in up to real-time.
    - **The measurement, validation & settlement phase.** The validation of the delivery of the flexibility service.

Preparatory phase

- DSOs have several viable options for solving network congestion scenarios: DSO implemented (such as grid reconfiguration), flexible connection agreements, traditional reinforcement (i.e. networks and substations), flexibility procurement, and network tariff design. All options should be considered (even in combination).

- DSOs shall proceed with a national economic assessment methodology to challenge the best solutions from a cost efficiency system point of view, starting from a zero-cost solution (e.g. grid reconfiguration etc). DSOs will go on to identify and publish in a timely and transparent manner their flexibility needs. This methodology will be agreed among NRAs and DSOs, considering their regulatory regime. Independently of the solution recommended by the methodology, DSOs shall publish the positive results of the congestion assessment and aggregate or anonymise them as appropriate. DSOs shall duly justify negative results when requested by the NRA.

- Involving market actors through public consultations at European and national level before confirming the final economic assessment methodology, would incentivise them to better understand and respond to DSO requirements. It will also engage them to provide solutions that effectively respond to assessments, preventing unnecessary situations of lack of liquidity.

- If the results show the flexibility solution as one of the economical and viable solutions, the next step should be the tender's publication and the market test by assessing the range of offered technologies and services to identify the use cases where market-based procurement might not deliver enough resources. The EU DSO Entity should collect best practices at EU level, or wider, with their eventual recommendations sourcing different network assessments that compare flexibility solutions against traditional grid investments. Best practices where flexibility solutions have been used while reinforcements are put in place should also be collected. Such cases help regulators, DSOs, and market parties to find the right incentives and to develop their own methodology for determining optimal investment plans.

- The report analyses three main categories of products for congestion management: (1) a capacity product remunerated on a €/MW basis, (2) an energy product remunerated on a €/MWh basis (3) or a combination of both. EU level harmonisation of flexibility products attributes is required to avoid discrimination among market parties and to find sufficient alignment with balancing and wholesale markets, however, full standardisation of the product may hamper innovation.

- The pre-qualification process should be user friendly, striving to minimise the different steps and to standardise them where possible. Product pre-qualification could take place on an aggregated/portfolio level if technically possible. The inclusion of qualified units in a national flexibility register is recommended.

- Dynamic grid pre-qualification must be seen hand-in-hand with, having or not, any form of restriction on grid connection. Except for situations where there is a connection agreement with restrictions (e.g. if a certain activation in the grid situation leads to congestion), reverting it shall be subject to financial compensation.

Forecasting & Planning phase

- There is no "one size fits all" when defining the most suitable timeframe as it depends on the type of event to address, the alternative options available, and the level of security required by both the DSO and market participants.

- New tools and procedures will be required to improve and refine DSOs' forecasts to assess dynamic and permanent network conditions. Different levels of analysis and modelling of systems are required, including real-time state estimation based on real-time data and sophisticated demand forecasts tools that use metering data and

bottom-up aggregation of various load categories. Such tools, including the necessary information and communication technology and infrastructure expenses, shall be adequately remunerated as stated in article 32(2) of the Electricity Directive (EU) 2019/944.

- Data input from grid participants in general, and Flexibility Service Providers (FSP) in particular, are key to accurate forecasts for load and generation on distribution networks.

- In the early stages of a flexibility market (with potential low liquidity levels) reliability of the services provided need to be closely monitored to maintain the same standards of security and quality of supply as traditional grid solutions. Long term products may be particularly suitable in these early stages to ensure availability when required.

- A natural evolution from long to short term mechanisms is expected as more liquidity and reliability is provided, thus optimising the overall cost-efficiency of the flexibility solutions.

Market phase

- The DSO should exchange information with neighbouring affected System Operators. In this respect, separate platforms for only DSO congestion management could be an effective solution to kick start the market as it may increase liquidity at early stages for small distributed energy resources (DER) which are not usually qualified for the TSO ancillary service market. However, when the market becomes more mature, combined TSO-DSO congestion management with separate balancing seems to be more advantageous and feasible to implement in many Member States.

- Then, once the DSO has launched competitive auctions, it should inform market participants and provide sufficient time for offers. To do so, the market platform and interfaces used to collect them should be easily accessible to all types of flexibility providers, including aggregators, be secure, neutral, and allow easy access to multiple markets.

- Clear rules of bid gathering and selection shall be established, at least at national level. The rules and criteria for bid selection should be fully transparent for market parties and be integrated into automated market processes that maximise market efficiency - especially for short term activations. Beyond economic merit order, technical aspects such as the geographical location of the provider may be considered to ensure efficiency and grid system security.

- DSOs shall publish the market results as soon as possible, in a transparent manner, and provide regular reporting on local market functioning.

- There should be regulatory mechanisms to protect asset providers from unwanted operation by aggregators (e.g. no valid contract) and consumers from being activated in the flexibility market by a different aggregator than the one registered (on the market or the Flexibility Resources Register) as having that asset in its portfolio (e.g. by switching of aggregator).

Monitoring & Activation phase

- Real-time monitoring of distribution grids will become more important. In this respect, the flexibility resources register could play an important role in the monitoring phase.

- The activation of bids for congestion management may require counteractions to maintain the system balanced, performed either by the FSP itself, the SO performing the congestion management action or the TSO. Coordination is required between TSO-DSO or DSO-DSO to prevent double or conflicting activations but also between market processes.

- As a general principle, during the activation phase, the FSP should only be paid for the amount of energy it actually delivers (which is also the amount that determines the costs it incurs) and for no more than what was requested.

- Reliability margins can differ in different situations (e.g. forecasting errors depending on the weather conditions, technical failures, rejections). Hence, DSOs may have to manage the exact volume of service activated to ensure security when calculating their needs to mitigate the risk of non-delivery (especially in an emerging market).

- In emergency states, SOs may need to consider non-market-based fall-back provisions, pre-defined between relevant SOs and market participants, and respective of codes and operational policies.

Measurement, validation & settlement phase

- To ensure network operational security and economic efficiency, flexibility services procured at distribution level have to be effective and reliable. Therefore, their actual delivery must be subject to validation whatever the form of the product. The measurement, validation and settlement processes are performed *ex post* based on data collected during delivery.

- This validation may be performed by the contracting system operator itself or by a third party on its behalf, but the contracting system operator will keep the legal responsibility for the validation by contracted parties.

- In countries where validation and settlement rules have been developed for the participation of distributed resources in certain market mechanisms, they should also be used to the most appropriate extent, if applicable and suitable, for new distribution level flexibility use cases, e.g. congestion management.

- By principle, the main meter, i.e., the meter directly connected to the system operator grid, shall be the main source for measurement of the energy withdrawn from or injected into the grid. This main meter will guarantee the quality of the measurement and may also be used for system observability in some countries.

- Product definition and pre-qualification would define the telemetry requirements (i.e. metering interval). If the telemetry capabilities of the main meter do not match the requirements of a specific product, or in case you have multiple suppliers, certified sub-meters may be used upon pre-approval between the contracted party and the system operator. In case the certified sub-meter is used to validate flexibility services, it is important to consider a link to the measurements of the main meter (whose data are

the only ones reflecting the actual impact on the grid) for validation and settlement purposes.

- DSOs/TSOs are entitled to put in place a penalty regime that ensures the delivery of the flexibility products they have procured. This can consist of financial penalties going beyond the mere non-payment of the non-delivered service or provisions for withdrawing a flexible asset's qualification. However, to factor in uncertainty and natural variations, and to stimulate market development, the DSOs/TSOs could apply a grace factor so that no penalty is applied or even the payment to the FSP is not reduced if the validation process shows that the delivered flexibility is lower than agreed but still above this factor.

- For this to work, the accuracy of the baselining methodology is crucial. It not only impacts the remuneration of the FSP, but also the volume of energy allocated to the assets' balancing responsible party (BRP), exposing it to an imbalance in the settlement price. Different baseline methodologies can co-exist if each is better suited to a particular type of asset/situation/technology, but rules per methodology must be clearly defined at national level. Best practices on baselining should be gathered and harmonised to the furthest extent possible at least across markets at national level, especially among the DSOs/TSOs that are the most advanced in Europe.

2. Introduction

The two fundamental goals of the Clean Energy Package are to ensure efficient integration of renewable energy sources, through effective operation and appropriate development of networks, and to create a European market with non-discriminatory participation of flexibility service providers such as generators, storage operators, active consumers, local energy communities or aggregators (i.e. providers of distributed generation, demand response or energy storage).

In this context, Article 32 of the Electricity Directive (EU) 2019/944 encourages Member States to provide incentives to Distribution System Operators (DSOs) to procure flexibility services under transparent, non-discriminatory, and market-based procedures because most flexibility sources are and will be connected to distribution grids.

Flexibility procurement by DSOs can achieve both goals. Moreover, Article 13 of the Electricity Regulation (EU) 2019/943 states that the resources re-dispatched shall be selected amongst generation, storage, or demand facilities submitting offers using market-based mechanisms and, even under non-market-based mechanisms, shall be financially compensated under established rules. Where non-market-based measures are used, Renewable Energy Sources (RES) and high-efficiency cogeneration should only be subject to downward regulation if no other alternative exists, or if alternatives result in disproportionate costs or risks to network security.

In the spirit of the Clean Energy Package, to empower customers, and to allow for active market participation, market-based solutions are to be sought by default. DSOs should act accordingly within their role as neutral market facilitators.

Market-based procurement of flexibility services should promote efficient use of resources and may be of value to the whole power system. From this perspective, mechanisms should be designed so that any contracted resources can offer services to other parties - DSOs or Transmission System Operators (TSOs) - and to any available market, in particular when DSOs do not need them or requests from other parties are cost-

efficient and compatible with DSO needs. This requires proper coordination at least among System Operators (SOs) on an equal footing.

Market-based procurement for local flexibility can be applied within different timeframes. Either through the implementation of a competitive tender for long-term provisions (e.g. flexibility to optimise infrastructure investments when facing more structural congestions or to ensure that firm capacity is in place to respond to more sporadic congestion) or closer to a real-time market to address short-term needs (e.g. flexibility to carry out more efficiently planned maintenance or for other sporadic congestion situations). Short-term procurement of flexibility should always be open to all resources, including those that have been subject to long-term contracts.

Local procurement and activation of resources must be coordinated between local products/markets, actual balancing markets, and the wholesale market. In addition, it must be accompanied by proper monitoring to avoid market fragmentation, abuse of market power and the gaming of risk.

DSOs must be transparent on the methods used to assess their needs and identify opportunities for flexibility services. And flexibility products for congestion management need to be sufficiently standardised to better enable bids by market participants across different markets, though if needed specific products may also apply.

In addition, and per article 71 "Transposition" of the Electricity Directive (EU) n°2019/944, Members States should have brought into force regulations and administrative provisions necessary to comply with the provisions of its article 32 "by 31 December 2020", though there seems to be a delay in the implementation of this article by most Member States.

Regarding those provisions, Eurelectric has already provided a set of high-level recommendations on the use of flexibility in distribution networks (Eurelectric recommendations on Article 32 of the Electricity Directive, April 2020).

Last but not least, the Electricity Regulation (EU) 2019/943 also provides the basis for the development of new EU regulation on distributed flexibility if necessary - (Article 59 (1) (e) of the Electricity Regulation (EU)2019/944). In this regard, a policy discussion is emerging about the relevance of a Network Code in the area of distributed flexibility and more particularly, "rules implementing Article 57 of this Regulation and Articles 17, 31, 32, 36, 40 and 54 of the Electricity Directive in relation to demand response, including rules on aggregation, energy storage, and demand curtailment rules".

Eurelectric also underlines the importance of involving the EU DSO Entity in the Network Code's drafting process, as well as all relevant stakeholders, from the beginning, as required by the new procedures set up by the Electricity Regulation (EU) 2019/943 (Art. 59 § 3 and 10). Hence, the whole spectrum of stakeholders in the power sector, including wholesale and retail markets, should be included in the process. Market players will bid their flexibility and are key stakeholders needed to ensure an efficient and market-friendly approach.

Moreover, the Electricity Directive (EU) 2019/944 (article 23 & 24) lays down that "the Commission shall adopt, by means of implementing acts, interoperability requirements and non-discriminatory and transparent procedures for access to data" which refers to "metering and consumption data as well as data required for customer switching, demand response and other services." In this respect, the Implementing Act on interoperability requirements, and non-discriminatory and transparent procedures for access to demand response data, might support the procurement of distributed flexibility.

2.1. Objectives of the report

- Develop a **comprehensive and integrated approach** on the procurement of distributed flexibility by DSOs and TSOs and how the interactions between markets parties and system operators should be tackled.

- Create **guidance on the "journey" for DSOs** to fully meet the expectations of policy makers in respect of the use of flexibility and per **Article 32 of the Electricity Directive** (EU) 2019/944.

- Contribute to and prepare the ongoing discussion on the future regulatory framework of **standardised market products for demand side flexibility**.

- **Establish overarching principles** related to demand side flexibility (e.g. a technology-neutral approach to solutions).

- **Define a common terminology** regarding the procurement of flexibility (e.g. definition of "flexibility"; "activation of the flexibility resources" or "dispatching of flexibility resources").

2.2. Scope of the report

To ensure efficient operation and planning of their network, DSOs now need to combine solutions for network reinforcement with congestion management. The solutions may include a combination of variable connection agreements, a rules-based approach, market-based procurement, or an adaption of network tariffs. The latter is out of the scope of this report but was the focus of another recent Eurelectric study.

- **Flexible connection agreements**

One solution for DSOs to manage grid congestion is to secure flexibility through connection agreements. A basic response is to apply connection fees that are geographically differentiated (higher in highly congested areas, lower in areas without congestion); a more elaborate solution is to apply flexible connection agreements, where contractual conditions for accessing the grid are not fixed once for all but depend on the current network situation. If the right conditions are applied, these local arrangements can help reduce network investments and create a win-win situation between network users and DSOs. For example, instead of planning the grid to provide generators and consumers with a firm physical connection to the grid 100% of the time, contractual agreements could – when required – introduce conditions for variable network access or a flexible connection agreement for generators or consumers. Based on financial incentives (e.g., cheaper connection costs and/or pre-defined conditions for the activation of flexibility) these parties could agree to limited access when the network is constrained.
For generators, it may be allowed to connect more capacity than the existing grid can sustain for 100% of the time. Also, for generators and storage, local connection agreements could include requirements to use specified technical solutions that support the grid (such as in Network Code Requirements for Generators). These connection agreements are out of the scope of this report.

- **Market-based approach vs. rule-based approach**

Article 31 'Tasks of distribution system operators" states that:
(7) [...] the distribution system operator shall procure the non-frequency ancillary services needed for its system in accordance with transparent, non-discriminatory and market-

based procedures, unless the regulatory authority has assessed that the market-based provision of non-frequency ancillary services is economically not efficient and has granted a derogation".

On the procurement of distributed flexibility, article 32 of the Electricity Directive states that: "Distribution system operators shall procure [them] in accordance with transparent, non-discriminatory and market-based procedures unless the regulatory authorities have established that the procurement of such services is not economically efficient or that such procurement would lead to severe market distortions or to higher congestion."

In the present report, the procurement of distributed flexibility is tackled following a market-based procurement perspective as Eurelectric believes that such a process should follow a market-based approach by principle.

However, in case of emergencies, or when the market fails to deliver appropriate flexibility services, SOs will implement rule-based solutions i.e. rule-based curtailments as a consequence of technical requirements from connection codes that are available in last resort or emergencies. This specific case is further explained under the chapter dedicated to the "Monitoring and Activation Phase".

- **DSO and TSO procurement of distributed flexibility at distribution level**

The flexibility from an asset connected at distribution level should be able to be procured for a SO's needs. The market access principles that are described in the chapter dedicated to the "Preparatory Phase" are critical enablers to value stacking, and these should be embedded across DSO and TSO markets.

This report also explores the possible implications of TSOs procuring distributed flexibility services from market players connected to the distribution system.

- **Network tariffs**

Some NRAs are assessing the incorporation of local congestion into network tariffs[1]. Network tariffs reflecting congestion at geographical level (or in real-time) may lead to excessive complexity and costly solutions, and to difficulties of social acceptance, since they may be perceived as unfair. Congestion can be dealt with by flexibility markets or other means, rather than through dynamic network tariffs[2], though these may help minimise congestion by incentivising efficient grid use.

Although network tariffs are out of the scope of this report, Eurelectric[3] believes that the best way to contribute to the management of congestion and to optimise network expansion is combining flexibility markets with static Time of Use (ToU)network tariffs[4].

[1] One example of this is a pilot project in the US by ConEdison. In a similar way the British Regulator has assessed and rejected consumption credits for areas with heavy generation, as well as alternatives for implementing nodal prices.

[2] **Dynamic** ToU network tariffs apply different prices to dynamic, not pre-defined, time periods. In theory, this could allow adjusting prices for using the network in close to real-time grid conditions and would provide economic signals to solve non-structural congestions. In practice, there are no real, full-scale applications of dynamic ToU tariffs in the EU.

[3] Eurelectric report, October 2021 "The Missing Piece: Powering the energy transition with efficient network tariffs"

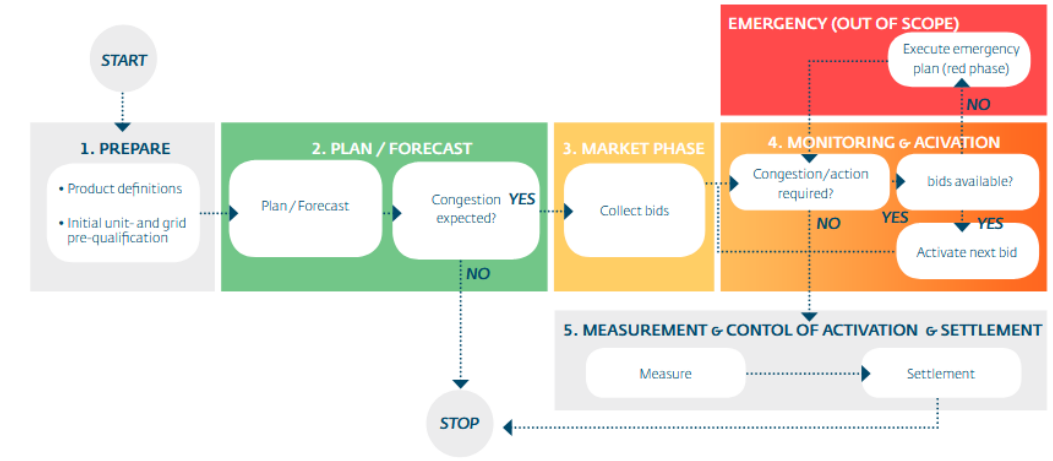
[4] Static ToU network tariffs apply different prices for pre-defined, time intervals, i.e. higher 'on-peak' prices and lower 'off-peak' prices.

Dynamic ToU tariffs are excessively complex for DSOs, retailers, and customers in view of their unproven and improbable benefits.

2.3. Methodology

The TSO/DSO Report on Active System Management released in 2019 (ASM report) that Eurelectric co-drafted together with ENTSOE, E.DSO, CEDEC and GEODE, provides a sequence of the different phases identified in the congestion management process:

- **The preparatory phase**. DSOs identify their need to solve or prevent congestion. It encompasses the product definition step and the pre-qualification process.
- **The forecasting & planning phase**. The forecast modelling of grid utilisation to identify potential congestion risks.
- **The market phase**. The tender process, comprising bid collection and evaluation (both in long-term and short-term contracts).
- **The monitoring and activation phase.** The activation of the selected bids to solve the congestion and of system operator cooperation in up to real-time.
- **The measurement, validation & settlement phase**. The validation of the delivery of the flexibility service.



(scheme from ASM report, April 2019, applicable to the congestion management process)

The present report follows the same sequencing to explain the different possible use cases for the procurement of distributed flexibility. By doing so, it is intended to showcase the different steps to procure flexibility solutions with concrete examples coming from different countries in Europe.

The objective is not to define a fully harmonised and standardised European process for the procurement of distributed flexibility but to illustrate how such a process may be concretely implemented following some high-level principles.

In a nutshell, the process to procure distributed flexibility on a market-based approach is described as follows in the report:

The present report showcases various flexibility solutions, for which some are already up and running (Flexible Power, Piclo, French local flexibility market by Enedis, and GOPACS). The Drafting Team has had the opportunity to run a series of meetings with external experts who presented different models or solutions to procure flexibility services.

In particular, the report highlights various models currently implemented in different countries (UK, France, Netherlands) as well as a platform project in Germany:

- The Dutch congestion model (supported by GOPACS for Distributed Flexibility only) (NL)
- Piclo Flex (UK)
- Enedis local flexibility market (France)
- The Enera platform (Germany)
- Flexible Power (UK)

	Country	Leading entities	Timeframe procurement	Headlines of the solution
Dutch congestion management Model (supported by GOPACS for Distributed Flexibility only) (NL)	NL	4 DSOs (Liander, Stedin, Enexis and Westland Infra) TSO (TenneT)	Long term	It is **not** a market platform (i.e. no flexibility offers are cleared on GOPACS) but a TSO-DSO coordination platform (it acts as an intermediary between the needs of network operators and markets)

Piclo Flex	UK	Independent software company with 6 DSO members (UK Power Networks (UKPN), Scottish and Southern Electricity Networks, Electricity North West Limited, Northern Powergrid, SP Networks and Western Power Distribution)	Long-term	**Objective:** providing visibility to SOs and access to GWs of flexible assets across their networks via a dedicated, online and independent platform ("marketplace"). 4 business models: - Outsourced procurement (preparatory phase: qualification verification + competition visibility; market phase: competitive auction) - Market access (preparatory phase: ensure API integration with SO and qualification; takes care of data transfer for market /monitoring & activation/measurement & settlement phases). - Contract exchange - Third party services (not yet up and running).
Enedis	FR	DSO (Enedis)	Long-term	**Objective:** an open market for distributed flexibility (aggregation allowed), with information for FSP to develop their assets portfolio (location information, metering eligibility tool) Objective: organising calls for tender to procure its own needs of flexibility services on a market-based approach.
Enera Platform	DE	2 DSOs (EWE Netz and AVACON Netz) TSO (TenneT) Power Exchange (EPEX Spot)	Short-term (in the intraday timeframe)	**Objective:** making decentralised flexibility available through wholesale market processes and enabling flexibility solutions to avoid uneconomical curtailment of excess of RES. Network operators can buy flexibility in the intraday time frame to proactively alleviate congestion.

				NB: The Platform is not working anymore as it was part of a wider Research & Development project which ended in December 2020 (SINTEG Research program).
Flexible Power	UK	5 DNOs (Western Power Distribution, Northern PowerGrid, Scottish and Southern Electricity Networks, SP Energy Networks, Electricity North West)	Long-term	**Objective:** offering a single point of information for FSPs in respect of the Distribution Network Operators (DNOs)' flexibility service requirements. Flexibility Service Providers (FSPs) can access flexibility locations, requirement data, procurement notices and documentation published by all five DNOs on one joint interface (website); Possibility to declare assets and their availability for FSPs, receive re-dispatch signals and view performance and settlement reports.

3.Preparatory phase

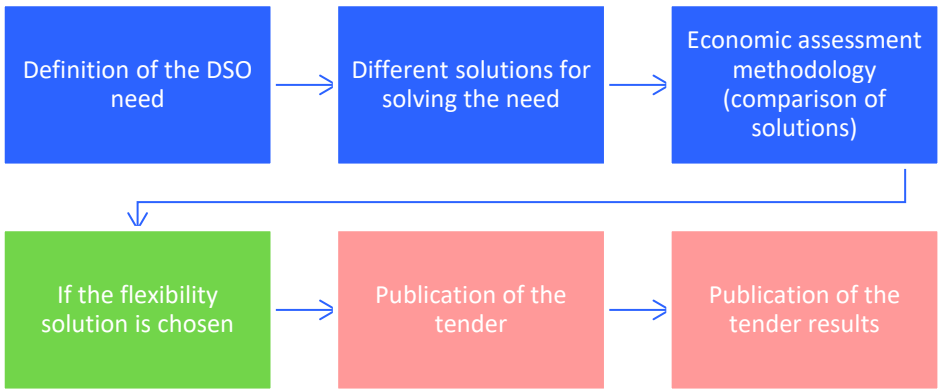
3.1.Flexibility need

The use of flexibility by DSOs does not only refer to the need for investment deferral but also to bring solutions for congested areas (as per Netherlands, Ireland & France), reduce re-dispatch and curtailment of renewables (as per Enera), joint TSO-DSO optimisation of regional master plan to host renewables (ReFlex project in France), long-term and short-term outage management, etc. Such needs by DSOs open opportunities for Distributed Energy Resources to bring support to the DSO network.

Developing successful markets requires confidence in those opportunities and the market parties need to have transparency in the process and outcomes of DSO decision making. By providing more information to the growing distribution flexibility market about current and future network requirements and flexibility opportunities, DSOs enable flexibility services providers to address the opportunities to support the electricity system and bring forward investment in green technologies. This transparency should be a guiding principle for both the definition of DSO needs and the tendering processes. The principle is that DSOs provide as much transparency as possible to the market to achieve the right balance between improved liquidity and preventing market abuse and gaming behaviours.

When DSOs are looking to solve or prevent network congestion, all options (or a combination of options) should be considered. The solutions may include reconfiguration of the network, flexible connection agreements, traditional reinforcement (i.e. networks and substations), procurement of distributed flexibility, network tariff etc.

3.1.1. DSO own existing solutions (such as grid reconfiguration and reinforcement)



First, as a preliminary point, operating requirements (voltage and current) in the distribution grid should be fully defined in each country. This is the basepoint to identify a need for flexibility in a transparent and non-arbitrary way. For example, when (under what conditions) and where (at what grid level) the N-1[5] security criteria should be fulfilled.

According to article 32 of the Electricity Directive (EU) 2019/944, DSOs should challenge the best solutions from a cost efficiency system point of view, starting from a zero-cost solution (e.g. grid reconfiguration etc.). DSOs will go on to identify and publish in a timely and transparent manner their flexibility needs.

The above needs would require a product that needed to be defined for the type(s) of congestion expected in each country.

3.1.2. Comparison of different solutions for solving congestions

Reinforcement schemes aimed to alleviate constraints on the network can involve replacing a number of different assets or installing new assets. Most conventional reinforcement will involve some combination of the four options below.

Source: https://www.westernpower.co.uk/downloads-view-reciteme/316336

[5] The principle of N-1 security in network planning states that if a component – e.g. a transformer or circuit – should fail or be shut down in network operating, the network security must still be guaranteed.

In addition to traditional grid reinforcements, there are alternative solutions to efficient provision of network services, for which more tailored remuneration schemes are needed.

To further develop the last point, we consider that economic assessment methodologies can provide indicators for DSO regulated investment decisions. Assessing the cost effectiveness of different options available for each DSO in their country will allow comparison of flexibility solutions against traditional grid investments or DSO own smart solutions in the grid.

Methodologies to assess and compare the appropriateness of these different solutions will help DSOs guarantee the quality of supply conditions and optimise their investments to deliver secure, sustainable, and affordable electricity to meet the changing needs in their networks. Those methodologies and calculation parameters[6] shall be made publicly available and the resulting decisions subject to regulatory scrutiny. More specifically, when the DSOs are assessing their own needs, they shall publish results of the congestion assessment and aggregate or anonymise them as appropriate.

Such comparisons to be done by DSOs could include value factors such as capital cost deferral, the value of lost load, network losses, etc. Several risks and uncertainties will have to be taken into account such as the future grid needs and the risks in flexibility procurement[7] and the fact that flexibility is a risk transfer from DSO "own forces and tools" to flexibility service providers.

Where demand forecasts are uncertain, using a flexibility solution can allow CAPEX investment decisions to be deferred to when better data is available, reducing the stranded asset risk.

It is also important to understand the risk of delays and having inefficient use of assets from the DSO perspective and implement incentives covering that risk properly. Another important aspect in this comparison is the speed of delivery: whereas grid reinforcements can take many years to be completed and are often characterised by multiple delays, market-based procurement can be arranged at very short notice. So one option can also implement market-based flexibility procurement to bridge the time until network reinforcements are complete.

Direct and indirect impacts must also be taken into account such as the reduction of curtailment of distributed generation[8] or network losses. Flexibility can, thus, directly benefit grid users (e.g. solar panel owners) who would be able to feed in more energy to the grid. The value here is determined by avoided investments and maintenance costs in voltage control.

The following should be also considered:

- Cost of running competition and ongoing monitoring, activation, settlement.

[6] Market parties require enough data in order to assess the CBA and make their own decisions accordingly. For example:

- an analysis of the periods of congestions with the amount of flexibility needed in those moments
- the cost of reinforcement of the grid if no flexibility was use
- the cost they considered for delivering flexibility and the methodology used to derive this cost

[7] Traditional grid reinforcement is a safer option than flexibility procurement, and therefore, this risk should be taken into account in the contracting and remuneration scheme and penalty scheme.

[8] Although the curtailment of RES with zero variable cost comes at no cost from a collective point of view, it is subject to regulatory constraints: cf. for example Article 13(5)(a) of Regulation 20219/943, which puts a limit on the global annual volume of RES curtailment.

- Risk premium compared to traditional reinforcement which leads either DSOs to take a higher risk or over-procure (although with more confidence/experience/knowledge this may not be as much as previously thought).

- The amount of flexibility required and the cost of availability and activation of such flexibility to calculate the total cost (CAPEX and OPEX) of the flexibility option for each period.

- An efficient regulatory model with appropriate remuneration – It is important to notice that such methodologies may vary from one country to another due to national regulatory frameworks and grid characteristics[9]. However, it is important to start comparing flexibility on equal footing with conventional grid solutions such as grid reinforcement.

Considering all the above, we recommend the following:

- Adequate remuneration schemes are needed for the efficient provision of flexibility services while traditionally, remuneration schemes induced DSO to invest only in grid reinforcement. They should be improved to incentivise the use of the most cost-efficient solutions by DSOs, including the procurement of flexibility.

- To efficiently incentivise the implementation of flexibility in distribution, and in particular to support the investments made by the DSO in advanced grid monitoring and visibility and management systems, which are necessary to implement much of the content of this paper, a fair remuneration scheme should be applied. This point is especially relevant at the distribution grid level when grid monitoring is not fully implemented (e.g., different between voltage levels) and DSOs should prioritise these investments, i.e. where and how it is implemented across their grids.

- NRAs should implement the necessary mechanisms to make feasible a transfer from a solution with a known expense (CAPEX) to one comprising both capital and operational expenditure with a highly variable expense (flexibility as OPEX).

- An output-based incentive, where NRAs can set DSOs' goals based on parameters relevant for attaining a particular distribution task. These target parameters could be based on various performance factors, such as more efficient capacity released, the facilitation of low-carbon technologies or the minimisation of congested time for the network or could be based on a yard-stick regulation method where the most efficient DSO is the most rewarded.

- The EU DSO Entity should collect and bundle best practices at EU level, or wider, with their following recommendations related to different network assessments that compare flexibility solutions against traditional grid investments. The EU DSO Entity may also collect best practices where flexibility solution has been used to overcome the time needed to put the reinforcements in place. Such best practices would help regulators, DSOs and market parties to find the right incentives and to develop their own methodology to determine the optimal investment plan.

- Implementation of such DSO network assessment would be ultimately implemented at national level considering their national regulatory framework and grid

[9] In some countries DSOs operate 132kV while in others, it is a TSO responsibility; grid topology might be different and geographical characteristics are different.

- particularities. This process should be improved steadily and consider national experiences. These assessments will allow flexibility providers to plan more effectively for the future in terms of the flexibility they wish to deliver. This will help encourage a more competitive and liquid market for flexibility to develop, resulting in further savings for customers.

- Involving market actors in the regulatory assessment ahead of the final economic assessment methodology through public consultations at European and national levels would incentivise them to better understand and answer DSO requirements. It will also engage them to provide solutions for the deployment of these assessments in a much more effective way, for instance preventing unnecessary situations of lack of liquidity.

3.1.3. Next steps if flexibility is a viable and economical solution

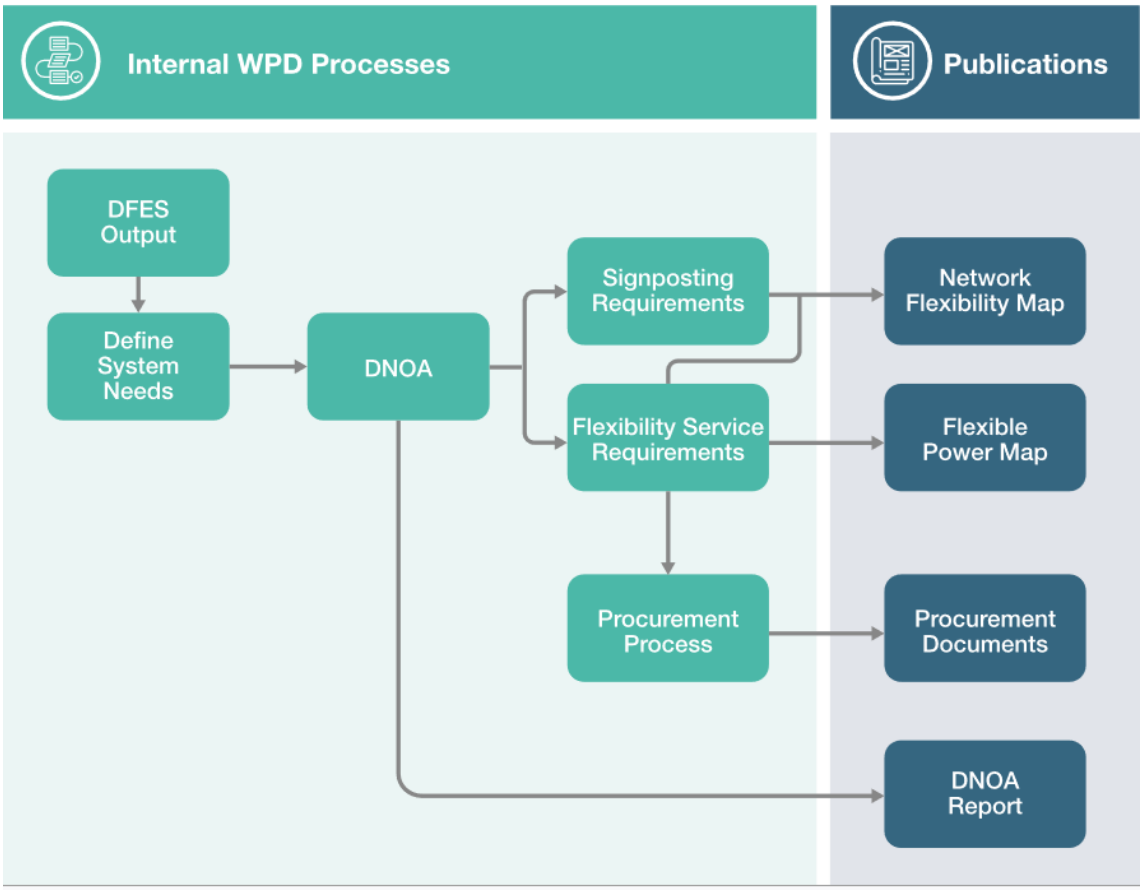
Independently of the solution recommended by the methodology, DSO shall publish the positive results of the congestion assessment and aggregate or anonymise them as appropriate. DSO shall duly justify negative results when requested by the NRA.

If the results show the flexibility solution as one of the economic viable and possible solutions, the next step should be the tender's publication and the market test by assessing the range of offered technologies and services in order to identify the use cases where market-based procurement might not deliver enough resources. The outcome of such an assessment would help outline the specificities of the locally applicable market-based solution. If no market solutions are available, DSO would have to use another solution according to their internal assessment.

Western Power Distribution's network options assessment (DNOA)

The decision making process of Western Power Distribution for determining the optimal solution for each constraint is described in the "Distribution Network Options Assessment" (DNOA). It is a public document that aims at providing "more information to the growing distribution flexibility market about current and future network requirements [...], to help flexibility providers identify the opportunities to support the electricity system and bring forward investment in green technologies."

The DNOA process is used to both look backward and identify which services should have been procured to help mitigate them, as well as look forwards to ensure they continue to provide value. The DNOA is published on a biannual basis, leading to two rounds of Flexibility Service Procurement each year.



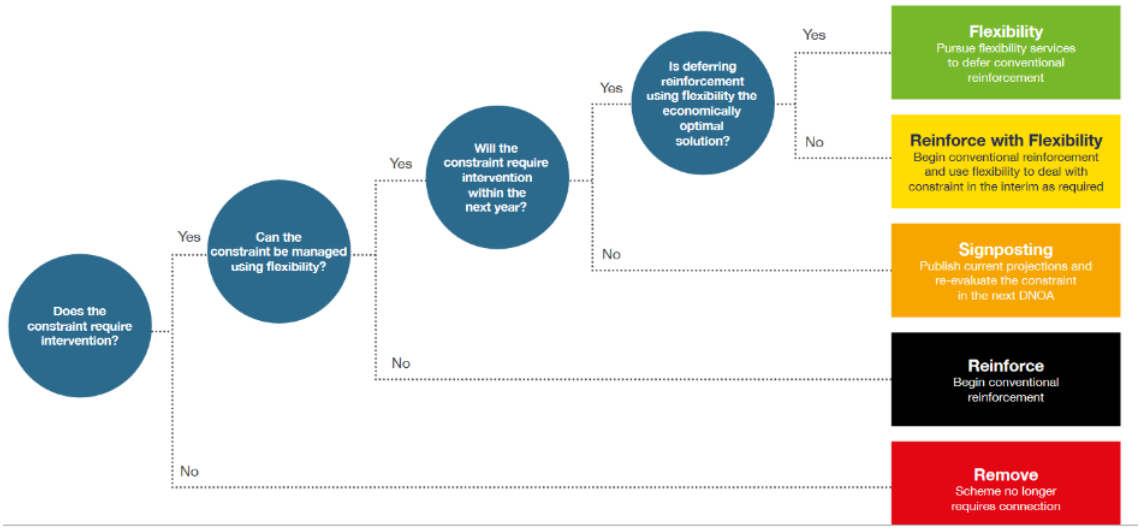
DFES- Distribution Future Energy Scenarios = A set of scenarios developed by Western Power Distribution to represent credible future paths for the energy development within certain areas)

Different options are possible (see figure below):

- Reinforcement of the grid
- Reinforcement with flexibility
- Flexibility solution
- Signposting
- Removal

Firstly, the schemes that do not require any intervention are removed from future DNOAs. Among the schemes which do require intervention, if the constraint cannot be managed using flexibility, then traditional reinforcement is pursued. If the constraint can be managed using flexibility but no intervention is required within the next year signposting is published.

The schemes which require flexibility services within the next year are put through cost-benefit analysis (CBA) to determine if flexibility can be used to defer reinforcement. If CBA indicated reinforcement should not be deferred, reinforcement works will begin as soon as possible. For these schemes, flexibility is used as required to manage the constraint and provide additional network security before the reinforcement is completed.



3.2. Value stacking

Value stacking refers to the possibility for a Flexibility Service Provider to use their asset(s) to provide services to multiple markets and access multiple revenue streams while respecting the need to comply with the Regulation (EU) n°1227/2011 on wholesale energy market integrity and transparency[10].

Hence, it is important to set up some market access principles at EU level for value stacking, while allowing enough freedom to adjust to locational conditions at a Member State level:

- **Data visibility:** Market participation shall be promoted by transparent information of the network needs and include locational information. In line with the principles, the data must be visible, free and easily accessible, and machine readable. Cybersecurity and data privacy need to be prioritised in all the information exchange processes, guaranteeing a resilient supply chain by involving all actors, and ensuring compliance with EU legislation such as the upcoming network code on cybersecurity, General Data Protection Regulation (GDPR) and e-Privacy. The right to protect sensitive information and the promotion of voluntary sharing of privately held data should prevail. Besides, data-sharing should always consider a sufficient disclosure of data without compromising grid security; therefore, to avoid

[10] Capacity withholding (financial or economic) may, at certain circumstances and without proper justification, be considered as market manipulation as an attempt to influence the price or the interplay of supply and demand of a wholesale energy product.

malicious purposes, grid weak points information could be aggregated, anonymised and disclosed as a geographical area. The risk of market abuse and system security must be considered by National Regulatory Authorities (NRAs) when validating which System Operator (SO) information is made available, as market parties and NRAs must have trust in the flexibility market. Care will need to be taken when making data transparent, especially at lower voltage levels where there would be typically fewer market participants. Analysis of offer and bid data, in combination with clear market rules for parties providing services, will make it possible to reveal and follow up unwanted market behaviour, and hence minimise the risk of market abuse.

- **Exclusivity:** where technically feasible, exclusivity in market contracts must be minimised, to allow assets to participate in multiple markets. This will not only avoid lock-in so that FSPs can access multiple revenue streams, but from a Network perspective, it will also increase liquidity in markets. If DSOs pay an availability payment for capacity reservation, the FSP has to be available when requested by the DSO. Releasing the resource by the DSO of the availability commitment at the earliest stage possible will increase liquidity. Technical feasibility will be dependent on the different products being procured in the different markets. It is recommended that product definitions are created collaboratively across transmission and distribution system operators and that they are made as compatible as possible. How should the price be optimised when multiple parties are requesting the same output from the same unit? A unit should not be paid twice for delivering the same output in principle. Very good system coordination is required to offer a blended solution (e.g., pricing optimisation between the parties – DSOs and TSOs - seeking for the same asset output, and or with compensation arrangements between them when this occurs). Another solution may be to not arrange anything (the first who activates pays). A blended solution may optimise results, but it could also be the most complex one.

- **Contracts:** more broadly than exclusivity, the Terms & Conditions (T&Cs) of different markets should be made as coherent as possible. A range of options are available, including one contract for all network services, but this will ultimately be dependent on the market and will be determined at a national level. At a European level, it will be sensible to have best practices and principles for compatibility of T&Cs in contracts, potentially established by the EU DSO Entity together with ENTSO-E. With FSPs likely to be participating in different countries, this will help to increase liquidity.

- **Market platforms and all relevant interfaces:** the platforms or interfaces that FSPs will need to use to access markets is critical to ensuring participation across markets. Stakeholders regularly mention that a common barrier to providing Network services is having to have multiple and costly IT/Communication systems to participate in multiple markets. Generally speaking, any platform or interface arrangement must enable easy access to data and market information, be secure and allow easy access to and a real-time clearance of multiple markets. A range of different options exists, which will depend on the National framework. These could include a combination of a single platform for providing multiple services to different buyers, multiple platforms but with common protocols and standards, direct access via common Application Programming Interfaces (APIs), multiple marketplaces but with a common coordination platform, etc. In this sense, technical requirements could be adapted according to the technical parameters and size of the assets as long as it does not lead to any discrimination.

- **Standards**: where possible, commonly used international standards and open APIs should be used. Besides, the promotion of interoperability will allow an efficient operation among different market players, and it would not lead to a change in technology already in place. This includes between the FSPs and the marketplaces/platforms, between FSPs and the Networks, between different marketplaces/platforms and between TSOs and DSOs. This should be balanced against the need to boost liquidity (by providing access to less sophisticated market participants) by making interfaces as simple and cheap as possible.

- **TSO-DSO coordination:** TSO and DSO markets must be coordinated to allow value stacking.

3.3. Product definition

Flexibility products must fulfil system operator's needs (i.e.: peak times or unplanned events requiring short notice or sporadic activations for small timeframes (short-term); peak times or planned outage, maintenance operations (medium-term); investment deferral in network planning scheduled to manage foreseen network constraints (long-term)) to perform economically efficient grid operation. Flexibility capabilities should not discriminate based on the capacity of the assets.

The characteristics of the needs are different for DSOs and TSOs (range, voltage level, product size, duration, and especially location). These requirements should be clearly specified at national level to enable successful product design, development, and a high volume of potential providers to guarantee flexibility markets perform efficiently. This cannot be successfully performed without a sufficient degree of transparency to enhance the mutual understanding of system operators' requirements and market parties' capabilities.

PicloFlex's key operational parameters

In PicloFlex, the short-term activation product is determined per competition area at the time of the tender. Besides location and voltage level, the key operational parameters are the service window (and the contract duration during which this service window holds) and the minimum and maximum running time. All other technical parameters are validated during the prequalification process.

Flexibility products for different purposes should be sufficiently aligned (interoperable), to permit the market-based allocation of flexibility services with the objective of an efficient allocation that maximises the value of the flexibility by enabling bids by market parties.

For congestion management, the product is defined for a given period. Such flexibility products can either be:

1. a capacity product remunerated on a €/MW basis, either commitment to be available for the system, or power reservation for optional activation by the SO
2. or an energy product remunerated on a €/MWh basis (direct activation by the SO)
3. or a combination of both.

These different kinds of products are described in detail hereafter:

- **capacity availability product (€/MW basis):** a flexible asset is committed to being available to inject or withdraw a given power level that can relieve congestion. Whether and upon which triggering signal the asset is effectively dispatched doesn't matter here (e.g., it may be dispatched by provider's initiative because it is in the money on the spot market – in that case, the network operator doesn't have to pay for the activation since it has already been triggered by the market – or it may be activated by the network operator). What the network operator remunerates

is the mere availability of an asset that is useful for its local congestion management, and which may have otherwise been under maintenance or may have not existed at all (because its fixed costs wouldn't be covered without this additional remuneration). A possible implementation of such a product is a Contract for Difference (CfD) on an existing capacity remuneration mechanism, but also applicable for DSO request, not just at TSO level.

- **capacity reserve product (€/MWh basis):** flexibility assets are committed to being at the exclusive use of the network operator under contractual terms for injecting or withdrawing a given additional power upon request. This amount of power is therefore not allowed to be simultaneously offered on other markets. What is remunerated is the option for the network operator to activate the asset when it needs it to solve congestion, possibly with certain requirements on activation dynamics – but not the activation itself, which is remunerated separately.

- **activated energy product:** a flexible asset either submits a bid to the network operator for modifying its baseline or modifies its baseline upon request for activation from the DSO at a pre-defined price (if that is the contractual arrangement). This bid is not necessarily associated with a pre-existing availability commitment. The network operator only remunerates the power variation corresponding to the bid in case it activates this bid.

Product standardisation increases market liquidity. However, it should be considerate of specific needs, future developments and may iterate over time as technologies and needs change.

To comply with the provisions of the Electricity Directive (EU) 2019/944, there is a need to standardise products for congestion management in the short term, and the plans for long-term congestion management shall be prepared considering such standard products, at least at a national level.

However, EU harmonisation of flexibility products attributes is required to avoid discrimination among market parties and to get sufficient alignment with balancing and wholesale markets. Minimal common definitions are also important to avoid complexity while always considering national specifications.

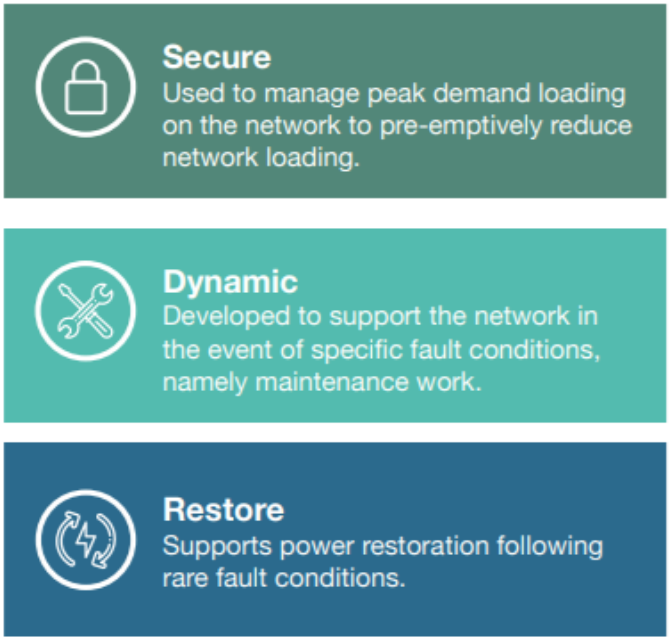
A minimum standardisation level across Europe could ease aggregators to participate in several countries, which would decrease optimisation costs for FSPs and increase market liquidity. Nevertheless, standards must not only be open to evolvement but also to certain trials that are currently happening by all parties involved, and it could then in turn lead to a modification of the product standard. This implies that any standard must be rigid enough to provide a common base for products but should also be subject to dynamic development.

For all use cases we analysed, it can be said that products are standardised, i.e., Piclo Flex, Flexible Power, Enera, the French model and GOPACS.

Western Power Distribution's main flexibility products

In the UK there are four main flexibility products at the moment which are standardised across the industry (but only the three on the left picture are currently procured by Western Power Distribution). The customer-facing brand for flexibility services established by WPD in 2017 is known as Flexible Power. The Flexible Power website allows businesses to confirm their eligibility for flexibility products and to begin the procurement process. This process involves registering to be added to WPD's dynamic

purchasing system, responding to a tender, setting up the API comms link required to receive stop/start signals, using the participant portal to declare asset availability and then receiving payments for utilised availability on a monthly basis.



Product definition should be a process developed in collaboration with the market parties to make sure that the market can deliver the best solution to meet the technical challenge on the grid and ensure that liquidity in these new local flexibility markets is maximised.

Products should be defined at all possible voltages in a technology-neutral manner considering all possible use cases (i.e., congestion management in different voltage levels). Products should be simple and easy to understand.

Depending on the liquidity and on the DSO's needs, flexibility products can require flexibility contracts with high reliability, and they are necessary for DSO to fulfil the requirements.

Long term contracts would probably be initially needed for investment deferral as established in art 32 (1) and (3) of the Electricity Directive (EU) 2019/944. Moreover, these contracts might solve market problems associated with low liquidity in the markets in comparison with the short-term markets.

The following considerations related to the flexibility contracts between DSOs and flexibility service providers should be taken into account:

1. Standardisation should be flexible enough to allow for innovative product designs from both the DSO, according to their needs, and also the retailers and aggregators that offer to provide such services to asset owners, for instance:

- Availability contracts in different markets for non-simultaneous delivery periods;
- Contract minimum percentages of availability, allowing for simultaneous contracts in multiple markets, while ensuring minimum levels of service;

- Possibility to bid in other markets, even if there is an availability contract but for which the DSO did not require activation for a certain delivery period (e.g. if for the same delivery period there are different time limits to bid and the DSO time window to bid for activation closed, the agent/asset may bid in other markets where the time gate closure occurs later, while still complying with the availability contract with the DSO in the first place).

2. This requires coordination between system operators (TSO-DSO and DSO-DSO) in particular communication of their needs and real-time communication before activation, which may be easier with a common platform and standard products.

3.4. Flexibility Resources Register

The Flexibility Resources Register offers a possible solution to ensure seamless TSO-DSO data exchanges, provide visibility of flexibility potential (benefit for TSO/DSO) and could, if so decided at national level, provide visibility of flexibility needs (benefit for flexibility providers). In fact, this would potentially improve competition and liquidity since the flexibility resources would be visible to all system operators to which they can provide a service.

The Flexibility Resources Register could include the following high-level groups of information (which overall would be available only to the TSOs/DSOs procuring flexibility):

- Identification information (e.g., grid connection point, geographical location, type of connection, competent Balancing Responsible Party (BRP)/Balancing Service Provider (BSP), competent FSP).
- Prequalification information (e.g., measurement information). Can be different for different products.
- Deliverable flexibility including real-time status (e.g., "traffic light" representing resource availability, other performance-related information).
- Contractual information for relevant parties (e.g., agreement duration, responsible D/T-SO).
- Settlement-related information (e.g., baseline, value stacking, financials).

3.5. Product and grid pre-qualification

In the ASM report, "product pre-qualification" is about checking whether the unit can (technically) deliver the product it wants to sell/ deliver' while "grid pre-qualification is about whether the unit(s) connected to the grid can realise the product delivery, considering the technical characteristics of the unit and the capabilities of the grid."
In addition to firm pre-qualification commitments from the connecting system operator, there are two ways of enabling more flexibility service providers being qualified:

(a) conditional or static grid pre-qualification, where the pre-qualification is dependent on certain conditions being met in a given moment.
(b) dynamic grid pre-qualification, where the pre-qualification can be granted over time based on the operation or status of the network.

The aim of both concepts is to increase the pre-qualified capacity when new information on the grid is available.

The pre-qualification process should be user friendly, striving to minimise the different steps standardise them when possible. Pre-qualification could take place on an aggregated/ portfolio level if technically acceptable.
Product prequalification could take place on an aggregated/ portfolio level if technically acceptable and the inclusion of qualified units in a national flexibility resources register is recommended.

An EU-level framework would allow a minimum level of standardisation of the prequalification process and the accompanying requirements for the DSO. To develop appropriate prequalification processes, best practices in relation to analysis and processes establishment should be considered to minimise the requirements of service providers while still maintaining system security on transmission and distribution networks. Flexibility products would be designed at national level and, therefore, a process for their prequalification would consider national specifications. Different services would have different prequalification processes. [11]

Dynamic grid pre-qualification must be seen hand-in-hand with, having or not, any form of restrictions on the grid connection. With the exception of situations where there is a connection agreement with restrictions, if a certain activation in the grid situation leads to congestion, reverting it shall be subject to financial compensation.

4.Forecasting phase

To use flexibility services, DSOs need to assess dynamic and permanent network conditions to establish how much flexibility capacity is required, when it is needed and where on the network flexibility providers can be located.

It will be important for DSOs to improve and refine their forecasts for electrification, distributed generation and storage, demand response and combined technologies that lead to significant changes in grid usage patterns, so as to proactively determine the development of the distribution system. New tools and procedures will therefore be required in this changing environment. DSOs need to ensure that the capability of the distribution system is expanded in a cost-effective manner using smart solutions and intelligent asset development, as appropriate, to meet the requirements of the clean energy package, and the increased ambition of the Green Deal.
Part of such solutions will be required just by the new challenges ahead, disregarding the procurement or not of flexibility. However, the specific choice of using flexibility services (where it applies) also requires new tools and new developments.

The costs, enabling and supporting any network flexibility option, should be considered properly as part of the economic assessment methodology.

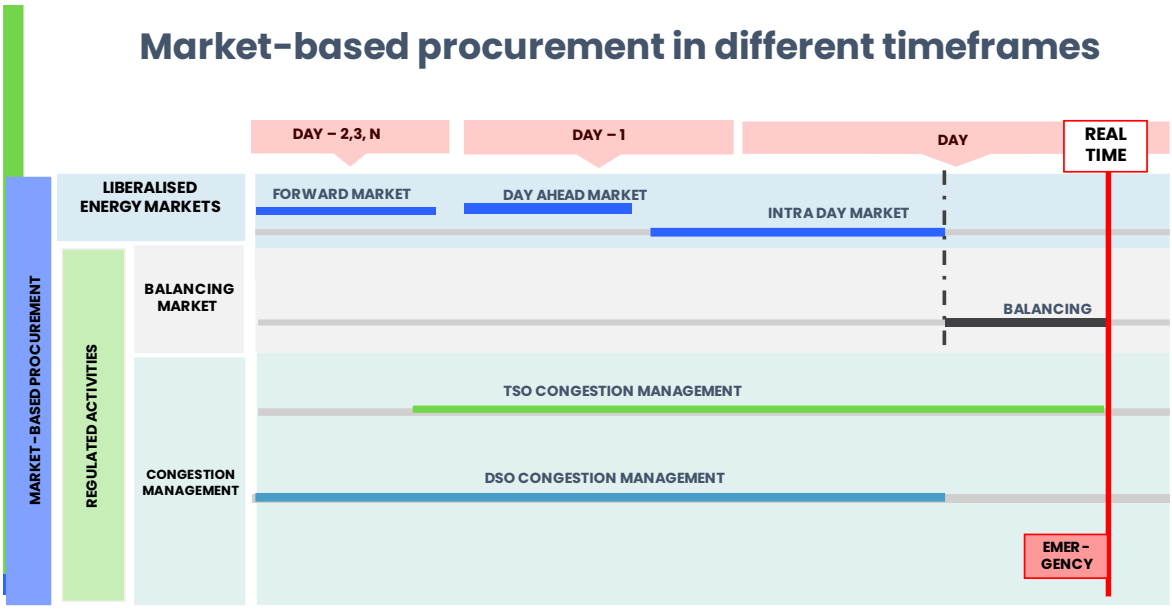
DSOs will develop sophisticated tools to forecast the grid's state and the flexibility demand in a specific area. Different levels of analysis and modelling of systems are required, including real-time state estimation based on real-time data and sophisticated demand forecasts tools using metering data and bottom-up aggregation of various load categories. As stated in article 32(2) of the Electricity Directive (EU) 2019/944, DSOs shall be adequately remunerated for the procurement of such services to allow them to recover at least a reasonable amount of corresponding costs, including the necessary information and communication technology expenses and infrastructure costs.

[11] Recommendation extracted from the "Roadmap on the Evolution of the Regulatory Framework for Distributed Flexibility", a joint report by ENTSO-E and the European Associations representing DSOs (CEDEC, E.D SO, Eurelectric, GEODE), June 2021

On the one hand, planning for flexibility makes explicit the requirement for reliable forecasts and on the other hand, more accurate predictions can improve the quality of flexibility required in the system.

The use of different timeframes is very relevant since they should consider the level of security required by both the DSO and market participants depending on the type of event to be managed and the alternative actions available to the DSO. In this sense, higher liquidity reduces the risk and allows for shorter-term procurement cycles, but for locational specific issues with low liquidity or longer-term investment deferral, short term timeframes may present higher operational risk. However, it should be noted that no one size fits all and there may not be a single preferred timeframe.

Regarding the type of needs, long-term products are more suitable for structural congestions, while short-term ones are preferably for unforeseen events. However, the length of the contract shall be distinguished from the length of the product as it depends on the period when the need has been forecasted. Hence a long-term product for structural congestion may require a short-term contract for the duration of the congestion.



4.1. Long term forecast

Long term products are in general most suitable for solving situations that require a high level of certainty (low risk). This is especially relevant in the case where low liquidity is expected in the market and it takes these long-term products to ensure that capacity is available when required. These markets will evolve to include shorter-term markets with a better match to address real needs.

Competitive tenders are the most suitable mechanisms for acquiring flexibility under these conditions, even if only one flexible provider responds.

As the markets are beginning and in their early stages (with potential low liquidity levels), the reliability of the services provided will need to be closely monitored to maintain the same standards of security and quality of supply as traditional grid solutions. Long term

products may be particularly suitable in these early stages to ensure availability when required.

4.2. Short term forecast

Short term markets can provide efficient solutions based on the participation in the markets of a large number of FSPs. Liquidity is key at this stage.

Since DSOs are primarily focused on safety and reliability standards based on meeting peak demand/peak generation, a natural evolution from long to short term mechanisms is expected as more liquidity and reliability is expected to be provided, thus optimising the overall cost-efficiency of the flexibility solutions.

In the forecasting phase, data input from grid participants in general, and FSPs in particular, is useful to refine more accurate forecasts for load and generation on distribution networks. The reliability of the need for market-based flexibility improves, and flexibility could be procured in a timely manner.

Looking at synergies between forecasting tools applied by TSOs and DSOs can help DSOs improve forecasting. For example, through common design, data exchange and cooperation between different system operators.

At the same time, some levels of analysis and modelling of systems are required, including real-time state estimation based on real-time data and sophisticated demand forecasts tools using metering data and bottom-up aggregation of various load categories.

Flexible Power 's forward looking forecast

Western Power Distribution develops forward looking forecast on load growth that constitute the Distributed Future Energy Scenarios used to assess the flexibility needs. Looking forward helps to identify the proposed intervention technique using estimated flexibility market information.

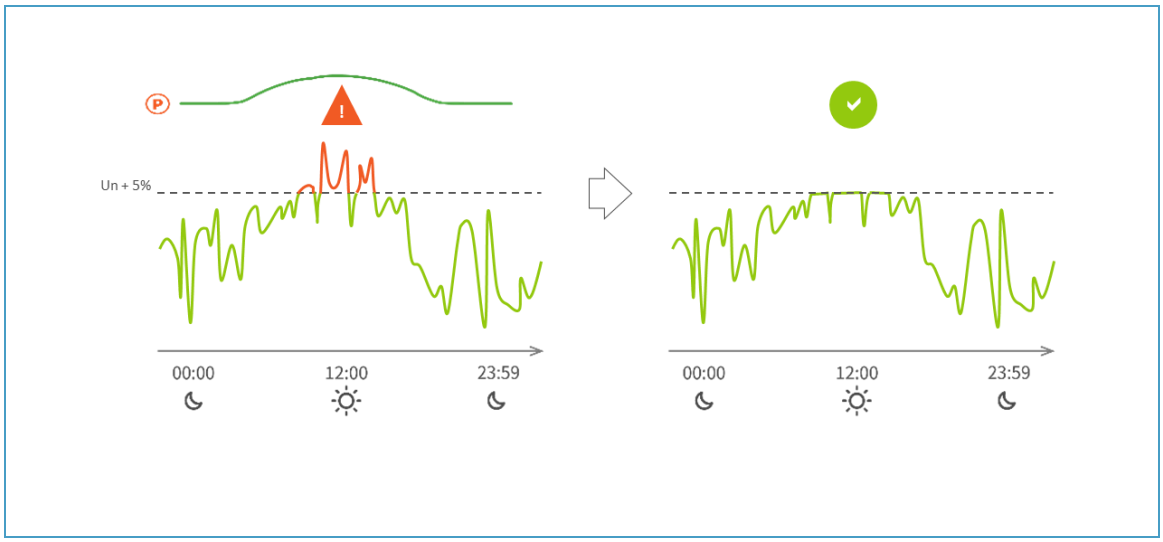
Enedis' prognoses

In the implementation of the congestion management process in France, Enedis makes prognoses using production and consumption forecasts, based on day-ahead and near real-time timelines, which help the dispatch centre use the different available methods to alleviate congestions.

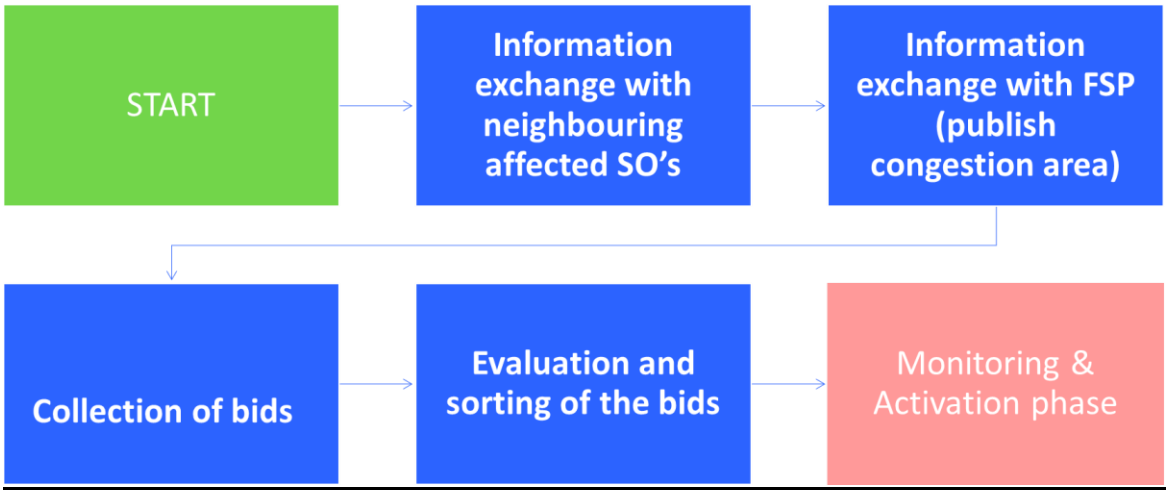
Prognoses are done using production and consumption forecasts:

- **Day-ahead**
- **Near real-time (every 30 minutes)**

Following the prognoses, the Dispatch centre uses available levers to alleviate the identified constraints (topology change, flexibility…).



5. Market phase



5.1. Information exchange with neighbouring affected SO's

The flexibility procurement mechanisms for services provided by resources connected to the distribution grids should be designed so that any contracted resources at distribution level can offer services to other parties, DSOs or TSOs, and any available market, as they may be of value for the whole power system when the DSOs do not need them. This requires proper coordination at least among system operators.

Though these assets may also be of value in other markets, and value stacking may ultimately lead to lower bids in each market with benefits resulting from there, there is a matter of reliability of the assets under contractual terms that should be respected between System Operators so that grid management is not jeopardised. When it comes to the physical fulfilment, there is a priority that should be respected among System Operators – local before regional and regional before national - and this type of grid validation is required to prevent demands on an asset that is already "taken". When the availability is contracted by a market party, the availability can only be withdrawn from the market in an emergency.

Blocking of bids of market parties by the DSO can only occur in emergencies. Besides, contractual and legal arrangements should foresee penalties to prevent opportunistic behaviours that endanger grid stability and may lead to higher costs.

In the ASM report, 3 options are described with pros and cons as possible market models for balancing and congestion management. These could include a combination of a single platform for providing multiple services to different buyers, multiple platforms but with common protocols and standards, direct access via common APIs, multiple marketplaces but with a common coordination platform, etc.

- **Option 1** refers to a separated TSO and DSO congestion management.
- **Option 2** refers to a combined TSO and DSO congestion management, separated from balancing.
- **Option 3** refers to a combined balancing and congestion management for all system operators together.

Eurelectric believes that a separate platform for only DSO congestion management could be an effective solution to kick start the market (**option 1**). This model may increase liquidity at early stages for small DER which are usually not qualified for the TSO ancillary service market, for instance until distribution system operating optimisation does not interfere with the transmission system operation. This is currently the model in the UK for congestion management. This does not mean that option 1 is considered as a target model in the long run.

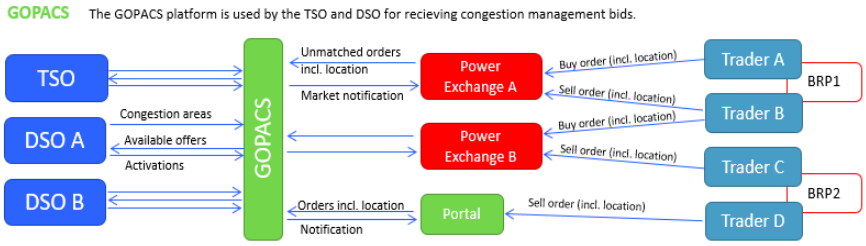
For solving congestions, it is important to build in TSO-DSO coordination by design as well as simplified access for FSPs to the market through a single-entry point. Hence, a combined TSO and DSO congestion management (**option 2**) may be preferred in the long run.

However, other solutions – i.e., combining TSO congestion management and balancing (**option 3**) or not – can be chosen depending on the market design conditions implemented in each Member State. Member States should be able to choose the most suitable one.

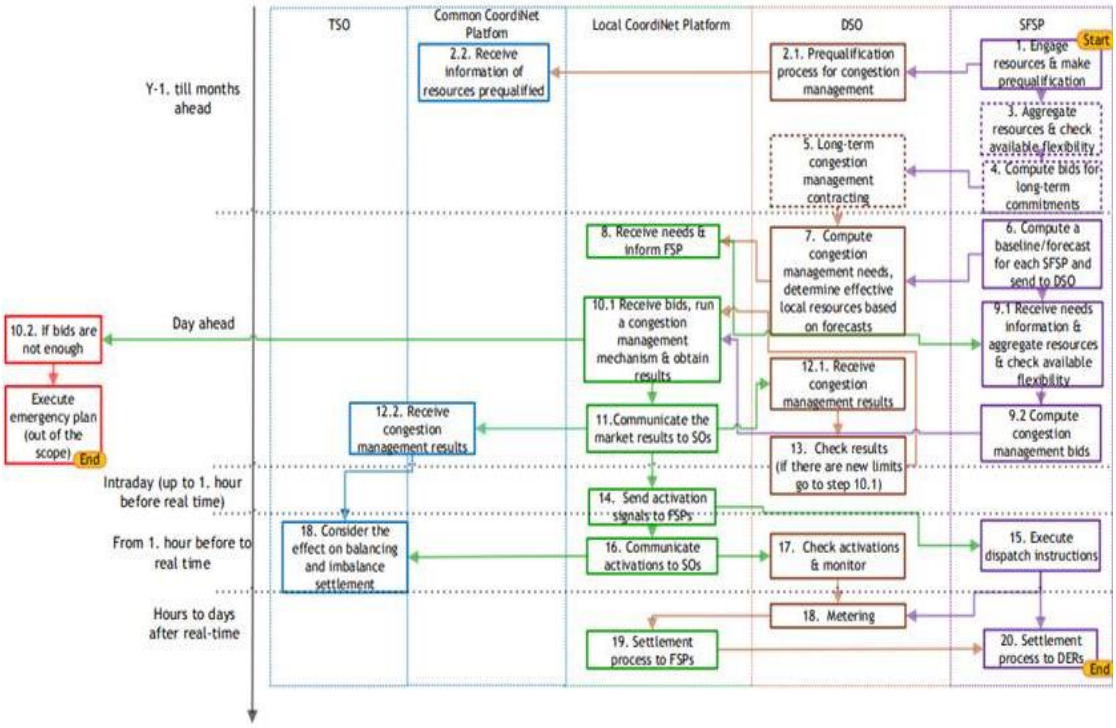
Option 2 combined TSO and DSO congestion management, with separated balancing, seems to have generally the most advantages and to be more feasible to implement in many Member States. This solution implies extensive coordination between TSOs and DSOs which facilitates access to the provision of the congestion management services and simplifies operations and settlement. It also allows a clear separation between the two processes of balancing and congestion management (where this is relevant) leading to easier identification of the respective costs of the two processes. Additionally, it does not affect price disturbances on the balancing market.

GOPACS use case for congestion management bids

In the **Netherlands, GOPACS** platform is used by TSO and DSO for congestion management (Option 2)



Coordinet use case for congestion management



The Spanish demonstration campaign of the CoordiNet project participated by Endesa, Iberdrola and REE aims at demonstrating the feasibility of procuring several system services, by means of different coordination schemes between distribution system operators (DSOs) and the transmission system operator (TSO).

In particular, congestions are solved by a Common TSO-DSO Congestion Platform to manage flexibility from resources whose potential impact on the transmission grid might be relevant, and a Local DSO Congestion Platform for managing flexibility from resources whose potential impact on the transmission grid might be low.

In both platforms, TSO receives the congestion management results to consider their effects on the balancing. The previous figure shows the flowchart for Local DSO Congestion Platform.

The Spanish demonstration campaign of the CoordiNet project, involving Endesa, Iberdrola and REE, aims at demonstrating the feasibility of procuring several system services by means of different DSO and TSO coordination schemes.

In particular, congestions are solved by a Common TSO-DSO Congestion Platform to manage flexibility from resources whose potential impact on the transmission grid might be significant, and a Local DSO Congestion Platform for managing flexibility from resources whose potential impact on the transmission grid might be negligible.

With both platforms, the TSO receives congestion management results to consider their effects on balancing. The previous figure shows the flowchart for a Local DSO Congestion Platform.

5.2. Information exchange with the Flexibility Service Provider (publish congestion area)

There are different layers of information across the different phases, some already addressed in the preparatory and forecast phases. In the market phase, the DSO should publish all relevant information about the needs it is addressing, and what it is procuring, with a detailed description of the product, including which characteristics (e.g. ramp times), if there are price limits (elastic needs), for which specific area (with all the elements describing the "congested area" to which this refers to), in which conditions the service must be delivered and what service level agreements may apply, and how the bidding process occurs.

This also applies to "voluntary" bids (not based on previously engaged contractual obligations).

Transparency could attract new parties to offer their services increasing the liquidity. A good balance should be found between providing enough information to increase liquidity and avoiding market manipulation, considering however that market monitoring and supervision are tasks of the competent authorities, so market design rules should not include too strict barriers under the pretext of avoiding opportunistic behaviours and market abuse.

The DSO should inform market participants (e.g. through the flexibility platform) when launching competitive auctions, providing sufficient time for market participants to submit their offers.

- This info exchange with the FSP should occur:
    - **Ahead in time (e.g. from several years in advance to D-1),** either for procuring availability (firm capacity) or to inform the market that there will be procurement of an "activation", so that the market may react timely and plan the investments to be made. For this to occur, this process must be transparent and with the involvement of stakeholders, from the beginning. Also, relevant stakeholders should be able to regularly evaluate the functionality of the platform.
    - **Closer to real-time where the DSO requires voluntary bids**. This should be based on standardised products, congested areas and conditions previously published by the DSO and/or defined in the procurement contracts.
      When the DSO can influence the need for flexibility (e.g. when checking the real need of an unplanned maintenance) and the DSO has no contracted "firm" capacity it is possible the DSO first checks the availability of potential FSPs.

    - **Closer to real-time where the DSO requires activation without necessarily requesting for bids,** under an availability contract designed for activation without need for bid, but with a pre-notification. In these situations where activation occurs without an explicit bidding (e.g. pre-contracted activation at a determined price), the availability of the asset must be ensured before activation. By exception the DSO could check the actual availability of the asset, so it may be able to timely react using other means (opening a bid ladder for instance) in case the targeted asset is unavailable.

- Other information exchanged with the FSP:
    - Call for service providers to bid if they have availability contracts under which they are obliged to bid in close to real-time markets for activation (those with availability contracts);
    - Notification to the other service providers registered in the flexibility register that a voluntary bidding process will open (if applicable)
    - Communication (e.g. website) that a voluntary bidding process will open for any service providers/assets that are able to provide the service required and willing to register in the platform
- A combination of the above-mentioned options is also possible

The possibility to aggregate units that are all located in the congestion area is an essential feature to ensure a level playing field between FSPs.

5.3. Collection, evaluation and sorting of bids

Market participants should be given sufficient notice on the start of the collection process and enough time to submit their bids. The market platform and interfaces used to collect should be easily accessible to all types of flexibility providers, be secure, neutral and allow easy access to multiple markets. A range of different options exists which will depend on the National framework and the market maturity itself, as they are described in section 5.1.

Clear rules of bid gathering and selection shall be established at least at national level. The rules and criteria for bids selection should be made fully transparent towards market parties. As for the disclosure of bids information per se, this should be published while complying with European Legislation on Data Protection and e-Privacy.

Beyond economic merit order, technical aspects such as the geographical location of the provider (even within the same CA, as there may be different levels of effectiveness) will be considered in bid selections to ensure grid and system security.

The evaluation of the bids is done by both the system operator to whose grid the flexibility providing unit is connected and the system operator procuring the service (e.g. TSO procurement of a flexibility provider connected to a DSO grid). The evaluation of the bids should be done according to clear and transparent criteria to identify the cases in which bids can be rejected (e.g. in case of inconsistencies with product specifications, local congestion issues, etc.). Such selection criteria should be, where possible, integrated into automated market processes to maximise market efficiency, especially for short-term activation products.
When evaluating and before activating bids connected to other grids, the system status and system needs in neighbouring electricity grids must be considered. Information exchanges between system operators should be in line with the principles set in 5.1.

Information from the flexibility register could be helpful in this step. Once a bid has been accepted or rejected, the FSP is timely informed.

Aggregated bids should always be considered as well:

- An aggregator should be able to break down into smaller aggregated bids to match the Congestion Area (the settlement should be done in an aggregated manner).
- Rules should consider the possibility of multiple aggregators related to an asset provider, depending on the legal national framework (e.g. aggregator for EV

charger behind-the-meter), to prevent market abuse and set clear responsibilities.

- There should also be regulatory mechanisms to protect asset providers from unwanted operation by aggregators (e.g. no valid contract) and to prevent a consumer to participate in the flexibility market with a different aggregator than the one registered on the platform (market or the Flexibility Resources Register) having that asset in its portfolio (e.g. by switching of aggregator).

Bids may be rejected for multiple reasons such as:

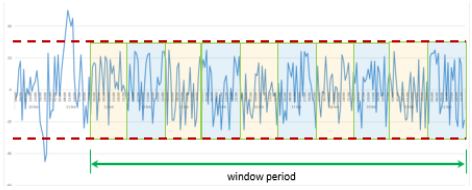
- Failure to prequalify as a party/unit, according to the defined criteria (e.g. Systematic deviation to a predefined bandwidth for prognosis purposes)
- Assets (individually or as part of an aggregated portfolio) located outside the geographical boundaries of the Congestion Area
- Not meeting product specifications (e.g. min-max bid, ramping time)

GOPACS use case for congestion management bids

Deviations from prognosis within a predefined threshold may be a condition to a service provider being able to bid:

Accuracy requirements

- To avoid gaming the accuracy (% deviation from measured values) of the individual transport prognoses and group prognoses provided can be made conditional for market parties who would like to participate in the bidding process. For this, an adjustable window period and accuracy percentage can be used per congested area (e.g. a maximum of 25% deviation in the last 10 days).
- Only individual connections or groups of which the prognoses are proven to be accurate (e.g within the 25% bandwidth) during the period of the window defined (e.g. 10 days) are allowed to make a bid.



ENEDIS use case

Criteria are known in advance and Enedis provides a tool for a provider to be able to check if it is eligible for a certain CA.

There is also a monthly verification of some criteria by Enedis, and mechanism for changes in aggregated portfolios:

Enedis ensures monthly that:

- ❑ Customers agreement are still valid (in case of customers moving in/out)
- ❑ Assets are still connected and connection agreement still valid
- ❑ Registered assets have enough capacity to supply flexibility services

Enedis **allows market players to modify their assets portfolio by adding/removing assets**. Noticeable removals may trigger flexibility services tests.

To be accepted bids have also to **meet technical criteria** such as :

- ❑ Location (only eligible assets can participate → Enedis supplies a tool to check the eligibility of an asset for each area: https://flexibilites-enedis.fr)
- ❑ Customers agreement for each asset
- ❑ Capacity
- ❑ FAT
- ❑ Resting time between activation

System operators should provide full transparency on the criteria used to select bids.

Ideally, there should be an aggregated metric (a score) that combines all the criteria per unit (technical and economical), to allow sorting them (so that, for instance, the service provider can also add more effective units). However, due to lack of experience, this may not be easy to implement so there should at least be ex-post information on the reasons that led to the choice of certain bids to solve the congestion. Data protection should, however, be considered (personal and commercially sensitive).

Market results (e.g., volumes and prices of the accepted bids) should be made public as soon as possible and regular reporting (e.g. annual) on local markets functioning should be provided by DSOs.

6. Monitoring and activation phase

6.1. Real-time monitoring of the grid

After collecting and evaluating the bids in the market phase, the flexibility bids are activated, and the congestion is monitored.

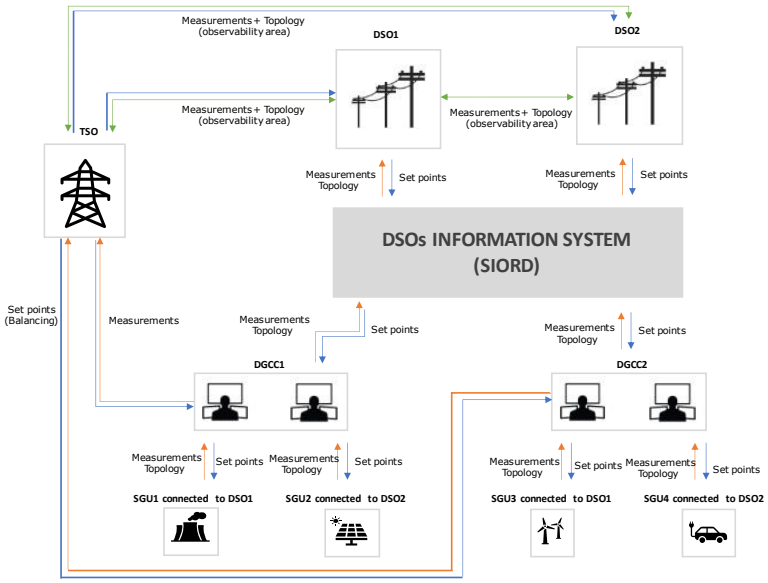
One way to assess the impact of activating the resource in relation to the current status of the grid could be to use the Flexibility Resources Register, if possible, during the monitoring and activation phase. Monitoring of flexibility assets in real-time is required for sufficient observability by DSOs on their grids. Real-time monitoring will become mandatory as the market develops but perhaps not from the start if there are very few and small providers. Technical requirements could be adapted according to the technical parameters and size of the assets, even to avoid hampering the participation of small assets as long as it does not lead to any discrimination. Monitoring of network conditions is also needed, as is monitoring of variable renewable energy sources to feed forecasting models.

Example: SIORD

SIORD is an initiative of all Spanish DSOs (i.e. Endesa, Iberdrola), to share FSP real-time information through a common platform to unify, simplify and minimise the cost of exchanging information coming from increased network digitisation and close monitoring of the grid electrical variables. Its development follows the national implementation of the Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation and the corresponding Key Organisational requirements, roles and responsibilities (KORRR).

The main characteristic of this platform is that it offers a robust technical solution, reducing at the same time the operational and connection costs of the Significant Grid Users (SGUs), both demand and generation, that need to be monitored in real-time by the Control Centers. SIORD allows communication through a common channel for all DSOs instead of using dedicated communication channels with each DSO, which would be clearly inefficient.

In addition to the more general purpose of coordination of the SGUs with the Control Centers, SIORD represents a solution for the exchange of information in real-time between the SGUs and the DSOs participating in the future markets for flexibility, proposing a communication solution that is more efficient and complementary to the existing standard between all parties. The fact that the platform has been jointly developed by all Spanish DSOs, guarantees that flexibility providers can participate with the same opportunities, regardless of where they are connected to the distribution grid. TSO will continue receiving real-time information through the corresponding DSO where the SGU is connected to.

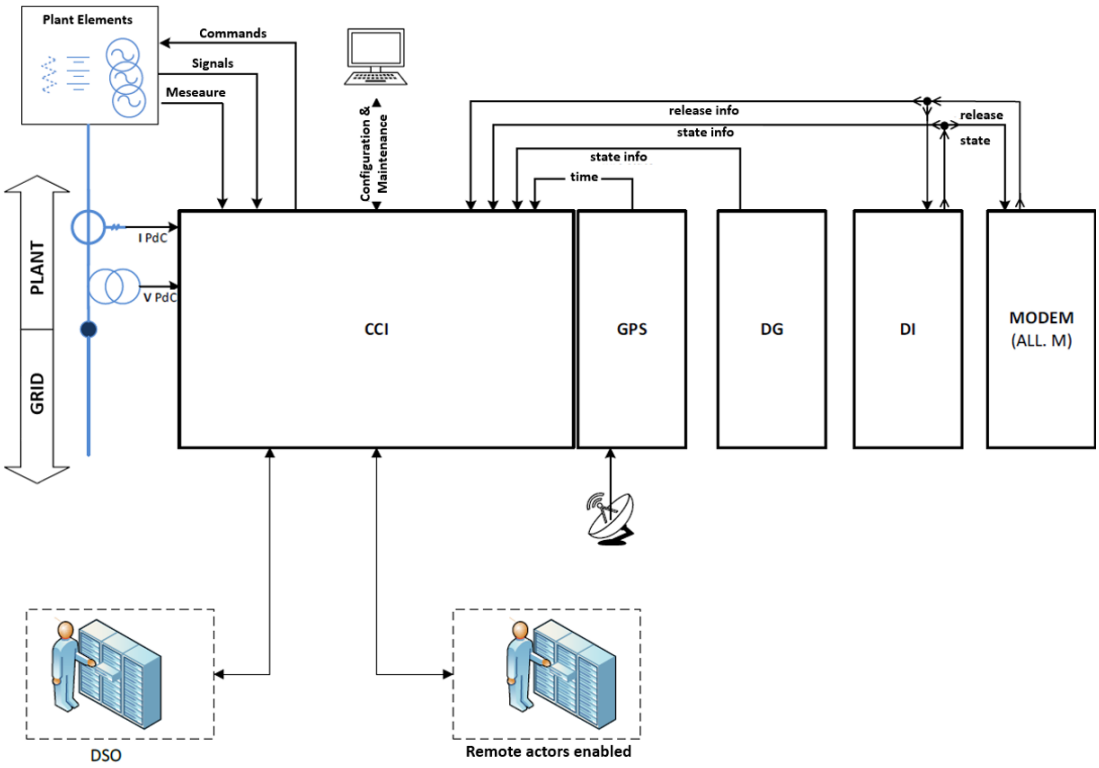


TSO: Transmission System Operator
DSO: Distribution System Operator
SGU: Significant Grid User
DGCC: Demand and Generation Control Center

Example: Enel Flexibility Lab

The Enel Flexibility Lab is an initiative of Enel Group aimed at enhancing collaboration with all stakeholders involved on the path of integrating new flexibility services and designing local flexibility markets for the electricity distribution system management, such as providers of flexibility services, manufacturers of related technologies, energy communities, DSOs and TSOs.

The Enel Flexibility Lab with its four facilities located in Milano Barcelona, Bari and Malaga is open for collaborations on three main use cases related to flexibility services on DSO networks, such **Network Observability & DERs Control, DERMS & Market Platforms, Electric mobility dispatches**.



In reference to the first use case, to facilitate DER connections to the grid, the Italian Electrotechnical Committee (Comitato Elettrotecnico Italiano), the Italian body for the standardisation in the fields of electrotechnics, updated the standards for the connection of DERs to MV and HV grid with new rules for observability and controlling of distributed generation resources.

In this vein, the Central Plant Controller (Controllore Centrale di Impianto – CCI) is a specific use case, defined within the Italian Rule CEI 0-16 for MV grid users with nominal power higher than 1MW and new connected plants participating in dispatching services. It aims to:

- Exchange information with the DSO (and with the TSO through a DSO/TSO interface) for appropriate network observability, in compliance to IEC 61850 standard (actual);
- Exchange information between DERs and the DSO/Aggregator to receive local set-points and to regulate flexibility services (future functionality).

This standardisation follows previous experiments about the Regulation Interface for Energy (Interfaccia di Regolazione dell'Energia" – IRE) in some European/Italian Funded Projects testing Flexibility (Isernia Project, Grid4EU, EUSysFlex). The Flexibility Lab has started testing CCI prototypes in the Italian Enel Flexibility Lab facilities.

6.2. Activation of bids in Real-time

The activation of bids for congestion management may require maintaining system balance. This can be done by:

- **the service provider**, who delivers the bid and takes responsibility for the imbalance created
- **the system operator** performing the congestion management action, meaning asymmetrical dispatch instruction, or
- **the TSO,** who combines counteractions actions with its balancing task (where applicable), including the imbalance netting among countries defined in the Electricity Balancing Guideline.

Operational and commercial arrangements would need to be put in place between system operators and FSP's where conflicting activation requirements can arise in terms of the direction of the services.

Coordination between different market processes would aim to avoid discrepancies and liability issues such as double activation of the same bid, or counter effect that could endanger the system as well as link together different marketplaces to avoid market fragmentation.

Where the FSP may have the ability to monitor the activation of flexibility assets at the sub-level, the DSO may agree to accept this. However, as is stated in chapter 7.1, the contracting system operator, the DSO in this case, will keep the legal responsibility for the validation of the final data. Opportunistic behaviours must be efficiently prevented and controlled.

In local areas with significantly high penetration of variable weather dependent RES, forecasting errors may require reliability margins to be built in during the market phase to overcome congestion forecasting uncertainty. DSOs may have to manage the exact volume of service activated post-market phase to ensure security when dimensioning their needs to mitigate the risk of non-delivery (especially in an emerging market).

Non-delivery by market parties will be considered in the contracts and the NRAs must have a role to play to validate the contractual arrangements or to develop standard contractual clauses and to organise the boundaries.

Normally localised congestions are resolved first given the lower number of participants that may be able to resolve localised congestion. However, wider system implications should be taken into account and the full suite of solutions available to the DSOS can be considered.

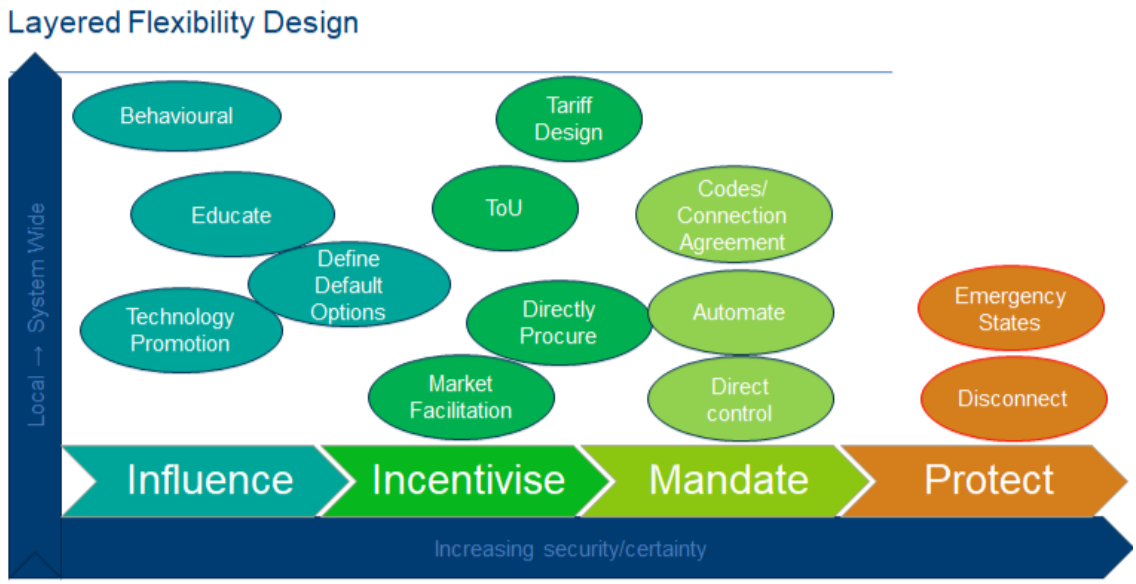
It is important that, before flexibility is activated, there is a SO to SO check (at least under certain thresholds to be determined) to ensure that there is no negative impact on another SO operation area and then the FSP is fully informed so that it can take the required action properly and in time. This checking should not cause unnecessary delay to the FSP's actions.

Some aspects of activation, such as when the FSP is released from its obligation, need to be defined, both in terms of time and in terms of what type of product and payment (availability vs. activation).

6.3. Emergency actions performed in case of emergency state

Emergency states may emerge due to adverse system events, reliability or emergency issues with flexibility service providers or communications systems, market platform or data exchange failures. SOs may need to consider non-market-based fall-back provisions, pre-defined in market arrangements, respective Codes and operational policies.

Prioritisation rules for direct activation in a non-market-based manner to maintain system security may need to be pre-defined between relevant system operators and market participants. This could consist of priority access to DERs on respective systems, fallback market prices so that a default Merit Order List (MOL) is in place for emergency states. In the following picture, we can see how flexibility can be used and designed from influence to emergency states.



Source: ESB Networks

7. Measurement, Validation & Settlement phase

The measurement, validation and settlement processes are performed *ex post* i.e., after the delivery period based on the data collected during this period. They are distinct from the pre-qualification processes performed *ex ante*, that aim at checking the technical ability of the asset to fulfil the requirements of the contracted product.

To ensure both network operational security and economic efficiency, flexibility services procured by the DSO or TSO at distribution level have to be effective and reliable. Therefore, their actual delivery must be subject to validation whatever the form of the product (cf. capacity availability product, capacity reserve product, activated energy product).

7.1. Metering data

Data from meters used for billing in the energy market will be an important source of information in establishing baselines and validating whether the procured flexibility service has been delivered.

By principle, the Main Meter, i.e., the meter directly connected to the system operator grid, shall be the main source for measurement of the energy withdrawn from the grid or injected into the grid. This main meter will guarantee the quality of the measurement (validated data) and may also be used for system observability in some countries. There may however be some exceptional cases where, upon the DSO's consent, relying only on main meter data for settlement may be insufficient.

For example, in Portugal, Electric Vehicle charging points with public or semi-public access, the metering data from EV chargers, behind the main meter of the consumption point (e.g. supermarkets or hotels), is sent to the DSO that recalculates the net consumption to bill the consumer, while the EV charging consumption is billed separately. Both the main meter and the charging point meter (submeter, as it measures a subtotal consumption only) are used for settlement purposes.

Product definition and product pre-qualification would define the telemetry requirements (metering interval). If the telemetry capabilities of the main meter do not match with the requirements from a specific product or in case you have multiple suppliers, certified submeters may be used upon pre-approval of the contracted party and the System Operator.

Data from certified submeters can be useful. Certified sub-meters can be both system operator owned or privately owned by the end-customer, the flexibility provider or a third-party operator. In case the certified submeters are owned by the flexibility provider or a third-party operator, it is important to avoid lock-in effects. Such a lock-in effect would hurt competition and the ability to optimise the value derived from flexibility procurement. Data from certified submeters can be used as long as they respect minimum technical requirements set in national legislation.

In case the certified submeter is used to validate flexibility services, it is recommended to consider a link to the measurements of the main meter (whose data are the only ones reflecting the actual impact on the grid) for validation and settlement purposes. This could for example be implemented through monitoring the gap between power variations observed at the main meter and the submeter when flexibility is activated; in case no noticeable effect is systematically observed at the connection point, this could be an indication of an adverse effect and could lead to the penalisation of the FSP, subject to clear rules approved by the NRA.

However, it should be recognised that there may be concerns regarding the unchecked use of submetering. A situation in which flexibility is activated on the sub-metered connection and is intentionally compensated on another part of the connection constitutes an opportunistic behaviour as it does not help the system but will receive compensation for flexibility.

In deciding whether to allow using data from other sources than the main meter such as certified submeters, the system operator should take into account the risk of opportunistic behaviour, i.e., the risk that the contracted flexibility is counter-balanced by an increase in the consumption for similar devices serving the same aim. For instance, this could happen

by default if the flexibility is provided from a heating pump or electric radiator at home and/or in the same building where there are separate heat or electric radiator sources. The heat pump or the electric radiator may not provide the flexibility required but it may be automatically compensated by other devices. Thus, flexibility products must be allowed to be designed so that the main metering point is the reference point where delivery is determined. Additionally, an assessment of cost and benefits of certified sub-meter vs. main meter settlement should be carried out.

Therefore, the system operator may propose guidelines for the use of submetering. Such guidelines could include different rules for households and industrial installations.

If submetering is deemed aligned with DSOs needs, and in order to get experience and develop the necessary guidelines, Member States or NRAs could introduce submetering stepwise, with an initial experimental phase where the amount of flexibility procured through sub-metered devices would be limited and the system operator could monitor closely the effects at distribution system level.

Even when an electronic metering system is currently available and used for settlement, a potential loss of data due to faults or problems in the system must be always considered. Even if this type of failure is limited to a small percentage of cases, to avoid legal problems and disputes a solution must be agreed in advance, considering possible data losses in bilateral contracts between providers and DSOs, or be found through the addition of rules for settlement, for instance acknowledging to the FSP a fixed amount of delivered flexibility regarding the contractual baseline.

7.2. Validation and settlement principles

The validation may be performed by the contracting system operator itself or by a third party on its behalf, but the contracting system operator will keep the legal responsibility for the validation by the contracted parties. In any case, the applicable rules have to be approved by the NRA and they must be aligned with the validation rules deriving from the upcoming Implementing Acts on data access and interoperability, which are meant to be "based on existing national practices" (Art 24(3) Electricity Directive).[12]

In countries where validation and settlement rules have been developed for the participation of distributed resources in certain market mechanisms (e.g. balancing markets operated by the TSO), they should also be used, to the largest possible extent if applicable and suitable, for the new flexibility use cases that appear at distribution level, e.g. congestion management by DSOs. Nevertheless, the framework must remain open for additional methods to take into account DSOs' uses and distributed assets specificities.

For availability and reserve products, several means can be envisaged to check the actual delivery, e.g., continuous monitoring, statistical monitoring, or (if possible unforeseen) activation tests (different from the product prequalification that is done previously). The right balance should be found by DSOs/TSOs between operational burden and incentive strength.

For the validation and settlement of activated energy products, the accuracy of the baselining methodology is crucial because it not only impacts the remuneration of the FSP, but also the volume of energy allocated to the assets' BRP, exposing it to the imbalance

[12] Final Report Towards Interoperability within the EU for Electricity and Gas Data Access & Exchange: https://ec.europa.eu/energy/sites/ener/files/documents/eg1_main_report_interop_data_access.pdf

settlement price. In principle, the BRP should be shielded from a defaulting execution of a flexibility order and, more in general, from actions undertaken by BSPs on its assets (production or consumption units). Multiple methodologies exist to assess the counterfactual situation that would have happened without the flexibility activation (which is in any case impossible to know with certainty, in particular for Demand Side Response); different methodologies can co-exist if each of them is better suited for a particular type of asset/situation/technology, but the associated rules per methodology must be clearly defined at national level. Best practices on baselining should be gathered, and harmonised to the largest extent possible at least at national level across markets, especially among DSOs/TSOs that are most advanced in Europe, with the following principles in mind:

- Baselines should not be subject to manipulation opportunities. This requires in particular that they rely on elements that are fixed **before** the activation, and cannot be changed afterwards;

- TSO/DSO coordination is key to ensure that the flexibilities that have been activated by a System Operator (e.g. activation of ancillary services) are properly taken into account in the baseline.

Example of a common baseline approach

Under the Open Networks project (Baseline Methodologies), DNV GLs market and stakeholder assessment produced the following recommendations for a common baseline approach:

Product	Main recommendations
Sustain and Secure Scheduled	More experience needs to be gained by all DNOs before moving to the standardisation of the validation process (including baselines, if applicable). **Interim technology-specific validation mechanisms; a zero baseline or technology specific de-rating factors** have been recommended, these should be agreed between FSP and DNO at contract stage.
Secure Dispatched (week-ahead)	**Default - Historical baseline without SDA** Mid 8 of 10 for weekdays, mid 2 of 4 for weekends. Excludes prior event days and outliers. **Alternative – Nomination**. To be used for • dispatchable generation • connections with dominant dispatchable generation • if accuracy levels of historical baselines are (too) low • in case historical data is not available.
Secure Dispatched (real-time), Dynamic and Restore	**Default - Historical baseline with SDA** Mid 8 of 10 for weekdays, mid 2 of 4 for weekends. Excludes prior event days and outliers. **Alternative – Nomination.** To be used for • dispatchable generation • connections with dominant dispatchable generation • if accuracy levels of historical baselines are (too) low

Source: Energy Networks Association, "Open Networks WS1A - P7 Baseline Methodologies" - Interim Report, July 2021

Enedis' baselining method

Enedis uses the load curve from its meters to measure, validate and settle flexibility activations, by comparing the measured load curves with the baselined curves modelling assets behaviour in absence of activation. **Multiple baselining methods are available** and each type of asset (production, demand, storage) will have access to several methods. **Market players decide the method used for baselining for each of their assets:**

- Methods **based on historical data** (either using fixed days or " statistically nearest" days)
- Methods **based on assets fore**casts (production and load – with ex ante qualification to ensure quality of forecasts)
- Method **based on neighbouring producers** (for RES producers)
- Method **based on mirror groups** → Enedis developed this specific method ("Panels Method") for aggregated residential customers.

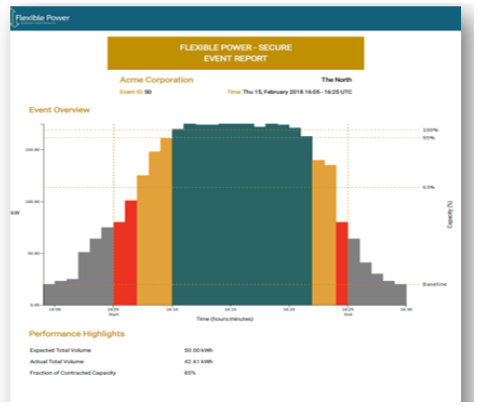
As a general principle for the activation phase, the FSP should only be paid for the amount of energy it actually delivers (which is also the amount that determines the costs it incurs for this delivery) and for no more than what was requested.

DSOs/TSOs are entitled to put in place a penalty regime that ensures the delivery of the flexibility products they have procured. This can consist of financial penalties going beyond the mere non-payment of the non-delivered service and/or of provisions for withdrawing a flexible asset's qualification. However, in order to take into account uncertainty and natural variations, and to stimulate the market in a phase where it has not yet matured, the DSOs/TSOs could apply a grace factor so that no penalty is applied or even the payment to the FSP is not reduced if the validation shows that the delivered flexibility is lower than agreed but still above this factor. The factor could vary depending on the maturity of the flexibility market in a particular MS and the precision of the validation method. Furthermore, DSOs/TSOs can define a minimum threshold of delivery, below which the FSP will receive no payments.

Flexible Power's grace factor

Flexible Power for instance considers a 5% grace factor, after which it reduces the payment itself.

- Minute by minute data is collected via the Flexible Power API
- A simple baseline is used
- A tailored payment mechanic was designed to encourage full delivery (5% Grace Factor, then 3% reduction in payment for 1% reduction in delivery)
- Reports are automatically produced after each event. Visible to both DSO and FSP
- Events are rolled up into a monthly invoice



Any penalty regime must be carefully designed so that it fulfils the following requirements:

- prevent opportunistic behaviours by FSPs;

- ensure there is a continuous incentive to improve performance, without threshold effects (e.g. through linear financial penalties);
- take into account the accuracy with which assets can fulfil an activation order and, to enable participation of a wide range of demand-side resources, make tolerances asymmetric if appropriate;
- not discourage the development of flexibility services by imposing disproportionate risks to FSPs;
- reflect the reasonable socio-economic cost of the non-delivery of flexibility. Visibility of potential penalties is essential for market parties.

The assessment of what is considered opportunistic behaviour should be interpreted narrowly. It mainly aims at situations in which market parties do not (fully) deliver the product they had committed to as agreed in good faith and get a benefit from it (e.g. by selling on the market energy that was supposed to be kept at disposal of the grid operator) – leading to potential system challenges for grid operators.

Enedis 'system of penalties

Enedis applies penalties if activation is below a threshold of 80% with respect to the order given by the SO:

Flexibility activation are a **success** if they are above a **80%threshold** : $\frac{Volume_{activated}}{Volume_{offer}}$

In case of failure, **penalties are applied on both energy and capacity**. Penalties **reflects collective costs due to flexibility failure and the market player expected gain:**

$$Penalty = \frac{1}{Probability\ of\ activation} \text{x market player's expected remuneration x} \frac{Volume_{activated}}{Volume_{offer}}$$

7.3. Example of a service settlement

The performance of the asset providing flexibility is calculated as a percentage, considering the difference between what was expected from the flexibility service provider and what has been performed, during the dispatching time and taking also into account the dispatching order from the distribution system operator operational centre (e.g. DERMS, SCADA).

The Platform in charge of settlement (e.g. Piclo) must be fed with "Meter data" (from the Smart Meter Management System-SMMS) and "Dispatching data" (coming from the Operational Tool/DERMS). The "Baseline data" will be attached to contractual obligations and inserted at the Platform Data Base.

- **Meter data**: data registered by the meters correspondent to the Point of Delivery (POD) having legal metrological validity. The format and resolution depend on the SMMS, energy in kWh. In case of unavailability of some data (due to metering faults) the missing values will be estimated according to the billing rules;

- **Dispatching data:** datasets considering the dispatching orders given by the distribution system/operator when requesting flexibility ('+' for generation increase or demand decrease, '-' for generation decrease or demand increase; the format). The resolution depends on the DERMS that shall be coherent with the meter data format;

- **Baseline data**: The baseline is a number assigned to an asset or a group of assets (Flexible Unit, FU) reflecting its injections/withdrawals 'as usual' behaviour, in case it was not required to dispatch flexibility.

The algorithm used for calculations depends on contracts' terms and national legislation.

Title	References	Date time of file	Date time of meter data	Estimate / Actual	Direction	01	02	03	04	05	...
Meter data (MW)	12345678910	01/02/2021 9:00	01/01/2021 9:00	Estimate	+	1.908	'1.908	'1.908	1.602	1.602	...
Baseline (MW)						n/a	n/a	n/a	1.581	1.581	...
Meter-baseline (MW)						n/a	n/a	n/a	0,021	0,021	...
Dispatch						n/a	n/a	n/a	1,000	1,000	...
Performance (%)						n/a	n/a	n/a	2%	2%	...
Performance Factor (PF)						n/a	n/a	n/a	0	0	...

As in the example above, the "Meter-baseline" is calculated considering the difference between Meter data (the actual flexibility provided by that asset) and Baseline data (the 'as usual' output/withdrawn that shall be calculated).

Then, considering the variation was requested by the DSO over the baseline, the performance is the percentage of the Dispatch data that has been provided by the asset for the analysed 15 minutes.

In the case of the example, instead of providing the sum of the baseline plus the variation requested (+1MW), which is 2.581 MW, the flexible service provider injected 1.602 MW, resulting in 0,021 MW on top of the baseline. Therefore, the FSP has performed 0,021 MW of the 1MW, which is a 2% of the variation requested.
The Meter-baseline approach has been used as an example while other alternatives could be applicable depending on the specification of the flexibility products.

eurelectric
powering people

ANNEXES

LIST OF ABBREVIATIONS

API	Application Programming Interface
ASM	Active System Management
BRP	Balancing Responsible Party
BSP	Balancing Service Provider
CAPEX	Capital Expenditures
CBA	Cost Benefit Analysis
CfD	Contract for Difference
DER	Distributed Energy Resource
DERM	Distributed Energy Resources Management System
DGCC	Demand Generation Control Center
DNO	Distribution Network Operator (UK)
DNOA	Distribution Network's Options Assessment
DSO	Distribution System Operator
DSR	Demand Side Response
FSP	Flexibility Service Provider
GDPR	General Data Protection Regulation
KORRR	Key Organisational Requirements, Roles and Responsibilities
MOL	Merit Order List
NRA	National Regulatory Authority
OPEX	Operating Expenses
POD	Point Of Delivery
RES	Renewable Energy Sources
SCADA	Supervisory Control and Data Acquisition
SGU	Significant Grid User
SO	System Operator
STATCOM	Static Compensator
SMMS	Smart Meter Management System
T&Cs	Terms & Conditions
ToU Tariff	Time of Use Tariff
TSO	Transmission System Operator

GLOSSARY

Term	Definition	Source
ACTIVATED ENERGY PRODUCT	One of the three main categories of products for congestion management. Flexible asset either submits a bid to the network operator for modifying its baseline or modifies its baseline upon request for activation from the DSO at a pre-defined price (if that is the contractual arrangement). This bid is not necessarily associated with a pre-existing availability commitment. The network operator only remunerates the power variation corresponding to the bid in case it activates this bid.	Eurelectric source
ACTIVE CUSTOMER	A final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a Member State, within other premises, or who sells self-generated electricity or participates in flexibility or energy efficiency schemes, provided that those activities do not constitute its primary commercial or professional activity.	Article 2 (8) of the Electricity Directive (EU) 2019/944
ACTIVE SYSTEM MANAGEMENT	A key set of strategies and tools performed and used by DSOs -and -TSOs- for -the -cost efficient and -secure- management of the electricity systems. It involves the use and enhancement of smart and digital grids, operational planning and forecasting processes and the capacity to modulate, in different time frames and distinct areas, generation and demand -encom-passing flexibility -instruments -(toolbox)- to -tackle challenges impacting system operation, thus ensuring proper integration of Renewable Energy Sources (RES) and a high share of Distributed Energy Resources (DER), as well as the integration with energy markets.	ASM report
AGGREGATOR	A market participant who performs the aggregation activity.	Eurelectric (based on the Electricity directive (EU) 2019/944)
AGGREGATION	Function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market.	Article 2 (18) of the Electricity directive (EU) 2019/944
ANCILLARY SERVICES	A service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including TSO congestion management and DSO local congestion management.	Eurelectric (based on the Electricity Directive (EU) 2019/944)

APPLICATION PROGRAMMING INTERFACE (API)	A set of routines, protocols and tools for building software applica-tions.- Basically,- an- API specifies -how- software- components should interact. In addition, APIs are used when programming graphical user interface components.	ASM report
BALANCING (BAL)	All actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality.	Electricity Regulation
BALANCING MARKET (BM)	The entirety of institutional, commercial and operational arrangements that establish market-based management of balancing.	EB GL
BALANCING RESPONSIBLE PARTY (BRP)	A market participant or its chosen representative responsible for its imbalances in the electricity market.	Electricity Regulation (equals to the one provided in EB GL)
CAPACITY AVAILABILITY PRODUCT	One of the main categories of products for congestion management which is a capacity product remunerated on a €/MW basis, either with a commitment to be available for the system, or power reservation for optional activation by the SO	Eurelectric
CAPACITY RESERVE PRODUCT	One of the main categories of products for congestion management which is an energy product remunerated on a €/MWh basis (direct activation by the SO)	Eurelectric
CONGESTION	A situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows.	Electricity Regulation
CONGESTION AREA	Areas for which the DSO assesses the regular necessity for Local congestion management, and for which it may procure flexibility products to address such need.	Eurelectric
CONGESTION MANAGEMENT (CM)	Activating a remedial action (grid reconfiguration or flexibility services activation) to respect network operational security limits, either in a preventive or in a curative way. In the ASM report there is a differentiation between local (distribution) congestion management (D-CM) and transmission congestion management (T-CM).	Eurelectric (based on ASM report)

CURTAILMENT	Act of reducing or restricting energy production or demand from a generator or a demand connection to the electrical grid, by the System Operator" on a non-market-based approach.	Eurelectric
CUSTOMER	Wholesale or final customer to electricity market	Electricity Directive (article 2)
DAY-AHEAD (DA)	A market timeframe in which commercial transactions are executed one day ahead of the day of delivery of traded products	ASM report
(FLEXIBILITY SERVICES) DELIVERY PERIOD	The period of delivery during which the flexible service provider delivers the requested change of power in-feed to, or the requested change of withdrawals from the system.	Inspired by EB GL
DEMAND RESPONSE	The change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014, whether alone or through aggregation.	Article 2 (20) of the Electricity Directive (EU) 2019/944
DEMAND-SIDE FLEXIBILITY (DSF)	Flexibility at the system user side, this includes active customers, flexible demand, generation and storage assets. DSF is "behind-the meter" or "behind-the connection", meaning that the measurements on connection level typically also include other (flexible or non-flexible) load or generation.	Inspired by USEF (re-used in EG3 report), EC – ASSET study on DSF
DISTRIBUTED ENERGY RESOURCES (DER)	Geographically distributed generation, load and storage connected to the distribution system (at voltage levels below the typical bulk power system).	Eurelectric
DISTRIBUTED ENERGY RESOURCES MANAGEMENT SYSTEM (DERMS)	A software platform that is used by DSOs and by any other market agents to plan and optimise flexibility services to be procured and organise the real-time operation with DER in providing these services.	https://www.next-kraftwerke.com/knowledge/derms (inspired of)
DISTRIBUTED FLEXIBILITY	The ability of distribution-connected assets to deviate from their baseline electricity consumption or production level and profile; in the particular framework or congestion management such flexibility occurs in response to the needs of system operators	Eurelectric adaptation from the definition provided in the TSO/DSO Roadmap on

		Distributed Flexibility
DISTRIBUTED GENERATION	Generating installations connected to the distribution system.	Article 2 (32) of the Electricity Directive (EU) 2019/944
DISTRIBUTION	The transport of electricity on high-voltage, medium-voltage and low-voltage distribution systems with a view to its delivery to customers but does not include supply.	Article 2 (28) of the Electricity Directive (EU) 2019/944
DISTRIBUTION SYSTEM OPERATOR (DSO)	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.	Article 2(29) of the Electricity directive (EU) 2019/944
ELECTRICITY MARKETS	Markets for electricity, including over-the-counter markets and electricity exchanges, markets for the trading of energy, capacity, flexibility services, balancing and ancillary services in all timeframes, including forward, day-ahead and intraday markets;	Electricity Directive (with changes)
ENERGY FROM RENEWABLE SOURCES	or 'renewable energy' means energy from renewable, non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas	Article 2(31) of the Electricity Directive (EU) 2019/944
ENERGY STORAGE	In the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier;	Article 2 (59) of the Electricity directive (EU) 2019/944
E-PRIVACY	Regulation concerning the respect for private life and the protection of personal data on electronic communications.	EDPB statement on e-Privacy
FINAL CUSTOMER	A customer who purchases electricity for own use.	Article 2(3) of the Electricity directive (EU) 2019/944
FLEXIBILITY	Ability of a market participant to set the level of injection and/or consumption of an individual asset or a set of aggregated assets at a chosen value, in order to deliver a service to a system operator and to facilitate mainly DSOs daily network management and network development planning.	Eurelectric

FLEXIBILITY BID	An offer made by a market party (voluntary) to buy or sell electricity and the availability to do so.	ASM report
FLEXIBILITY PRODUCT	A product that can be used for different purposes and -should -be- sufficiently -aligned (interoperable), -to- permit- the -market-based procurement of- flexibility services- Such -flexibility -products- can -either -be- an- option-- (availabil-ity) or be committed for real-time -direct activation.	ASM report
FLEXIBILITY RESOURCE	All market participants offering energy from distributed generation, engaged in demand response, operators of energy storage facilities and engaged in aggregation.	Proposal inspired by EU Directive Art. 32 (1), (2)
FLEXIBILITY RESOURCES REGISTER	Contains structural information on connection points associated to service providers that can provide flexibility services to system operators.	ASM report
FLEXIBILITY SERVICE PROVIDER (FSP)	A market participant providing services by flexibility resources	Eurelectric
GDPR	General Data Protection Regulation.	Regulation (EU) 2016/679 (General Data Protection Regulation)
GRID MANAGEMENT	Operating and maintaining the grid. This includes TSO congestion management, DSO local congestion management and DSO grid capacity management.	USEF (re-used in EG3 report), adapted by Eurelectric
FLEXIBILITY GRID PRE-QUALIFICATION (SO COOPERATION)	Checking between system operators whether the grid can manage the delivery of the product that the unit wants to sell/deliver (Local congestion management, congestion management), according to the relevant agreement and applicable framework.	ASM report
SYSTEM OPERATORS	Means TSO and DSO	Eurelectric
INTRADAY (ID)	Timeframe of the electricity market after intraday gate opening time and before intraday gate closure time, where for each market time unit, products are traded prior to the delivery of the traded products.	Based on CACM Article 2 (37)
INTEROPERABILITY	The ability of two or more energy or communication networks, systems, devices, applications or components to interwork, to exchange and use information in order to perform required functions.	Based on the Electricity directive

LOCAL CONGESTION MANAGEMENT	Activation of a remedial action taken by DSO (grid reconfiguration or flexibility services activation) to respect network operational security limits, either in a preventive or in a curative way.	Eurelectric
LOCAL CONGESTION	A situation causing flow restrictions on DSO network elements which cannot accommodate those flows.	Eurelectric
FLEXIBILITY MARKET	Market mechanisms used by DSOs to procure DSO distributed flexibility	Eurelectric
KORRR	Key organisational requirements, roles and responsibilities in relation to data exchange. Following from SO GL	System Operation Guideline
MARKET	A regular gathering of people/parties for the purchase and sale of commodities (electricity in this report).	ASM report
MARKET PARTICIPANT	A natural or legal person who buys, sells, or generates electricity, who is engaged in aggregation or who is an operator of demand response or energy storage services, including through the placing of orders to trade, in one or more electricity markets, including in balancing energy markets.	Electricity Regulation (article 2)
MERIT ORDER LIST (MOL)	A list of (electricity) bids sorted in order of their bid prices, used for the activation of those bids.	ASM report (based on EBGL)
NON – FREQUENCY ANCILLARY SERVICES	A service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability.	Electricity Directive (article 2)
FLEXIBILITY PRODUCT PRE – QUALIFICATION	The process to verify the compliance of a flexibility service provider with the technical requirements set by the transmission or distribution system operators.	based on Electricity Regulation (with changes)
PLATFORM	A (distributed) software functionality, needed by actors to perform their tasks, corresponding to their roles and responsibilities, which – as part of an ecosystem – interacts with other relevant actors in the energy system.	ASM report
PRODUCTION	The production of electricity	Electricity Directive (article 2)
REAL-TIME (RT)	The actual time in which a process or event occurs, the actual moment of operation.	ASM Report

REDISPATCHING	A measure, including curtailment, that is activated by one or more transmission system operators or distribution system operators by altering the generation, load pattern, or both, in order to change physical flows in the electricity system and relieve physical congestion or otherwise ensure system security	Electricity regulation
SECURITY	Both security of supply and provision of electricity, and technical safety.	Electricity Directive
SUPPLY	The sale, including the resale, of electricity to customers.	Electricity Directive
SYSTEM OPERATION GUIDELINE (SO GL)	Refers to Commission's Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation.	SO GL
TRANSMISSION	The transport of electricity on the extra high-voltage and high-voltage interconnected system with a view to its delivery to final customers or to distributors, but does not include supply	Electricity Directive
TRANSMISSION SYSTEM OPERATOR (TSO)	A natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	Electricity Directive
VOLUNTARY BID	Bids from FSP, who had not previously established contracts with the system operator to do so, to offer certain established products (or flexibility products) to address the needs of flexibility requested by the system operator, for certain congestion areas in a predefined delivery period".	Eurelectric

CONTRIBUTORS

Project managers:

- Rita MOTA (EDP)
- Hélène ROBAYE (Engie)
- Carolina VEREDA (Endesa)
- Paul de WIT(Alliander)
- Louise RULLAUD (Eurelectric secretariat)

Drafting team:

Aurélien BERNARD (EDF)	Filipp MAROTT SUNDRAM (Dansk Energi)
Randolph BRAZIER (ENA)	Grainne O'SHEA (ESB Networks)
Almudena DIAS MONTESINOS (Enel)	Andrea POMPA (Edison)
Santiago GALLEGO (Iberdrola)	Zuzana SADLOVA (CEZ)
Bruno GEORIS (Engie)	Markus WATSCHER (TIWAG)
Joachim GRUBER (NETZE-BW)	Hartwig ZIEGLER (EON)
Torsten KNOP (EON)	
Wouter LE RÜTTE (Eneco)	

Union of the Electricity Industry - Eurelectric aisbl
Boulevard de l'Impératrice, 66 – bte 2 - 1000 Brussels, Belgium
Tel: + 32 2 515 10 00 - VAT: BE 0462 679 112 • www.eurelectric.org
EU Transparency Register number: 4271427696-87