



2024 Market Monitor

For Demand Side Flexibility

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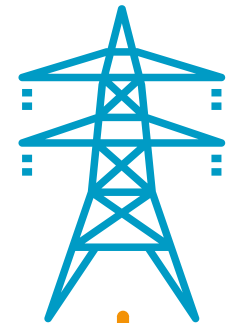
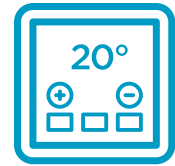
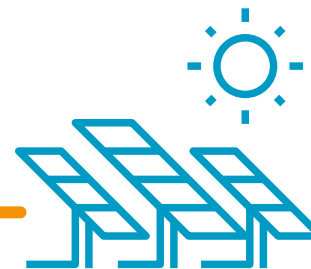
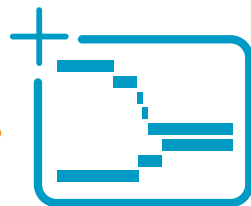
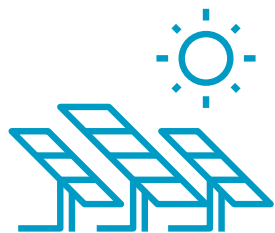
This report provides an overview of the accessibility and participation of demand side flexibility across 30 European markets. The report covers ancillary services, distribution system flexibility, residential flexibility, capacity markets and wholesale spot markets.



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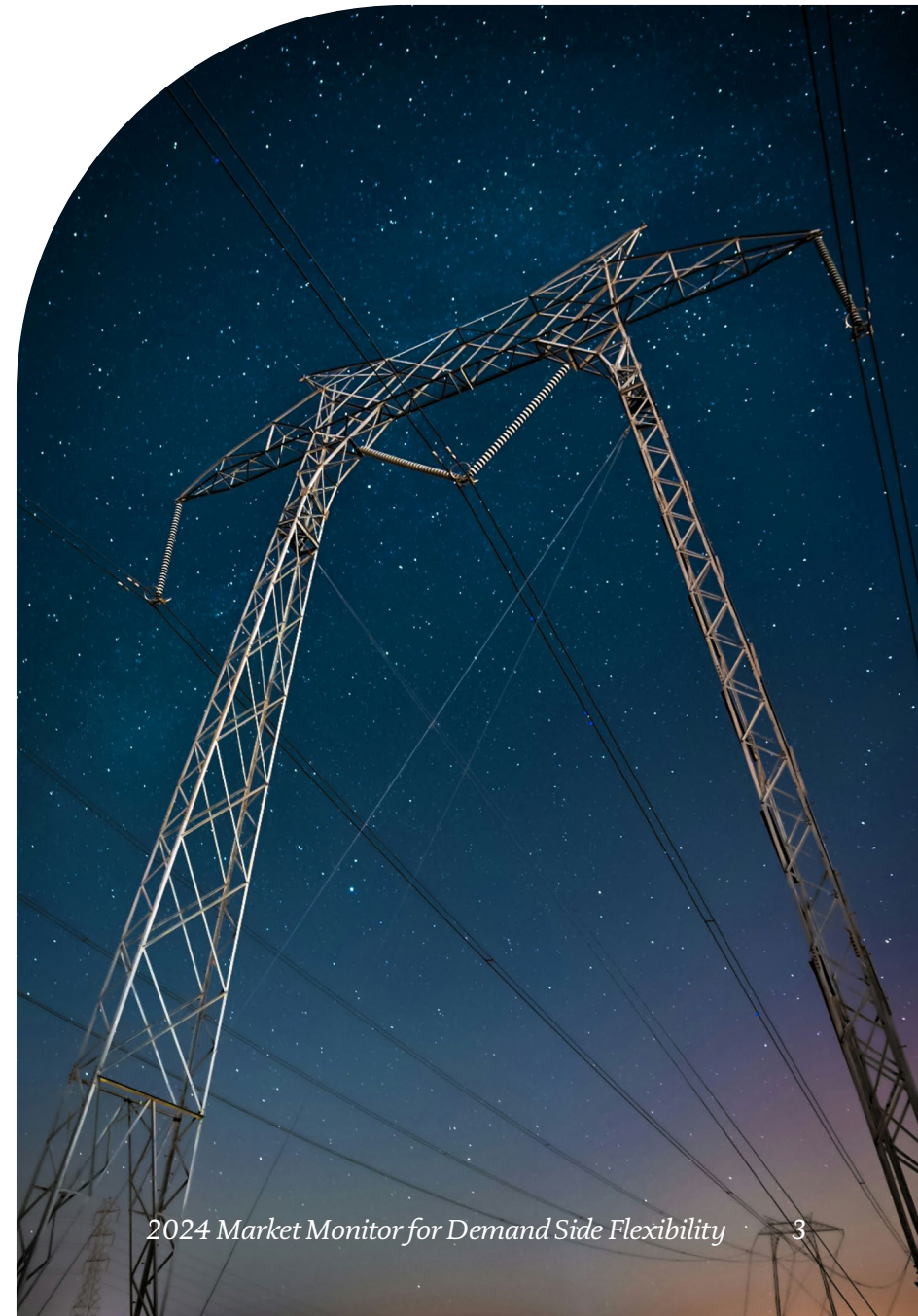
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THE 2024 EUROPEAN MARKET MONITOR FOR DEMAND SIDE FLEXIBILITY

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GLOSSARY 29





Executive summary

- + Purpose, scope and definitions
- + 2024 European Market Monitor
Map for Demand Side Flexibility
- + Country ranking and score

2024 Market Monitor for Demand Side Flexibility



Michael Villa
Executive
Director
smartEn

After decades of stagnation, electricity demand rose 1.2% (31TWh) between 2023 and 2024. Electrification must continue, but in a smart, flexible way—otherwise, decarbonisation will come at the cost of affordability and competitiveness.

The 2024 Market Monitor for Demand-Side Flexibility warns that a smart, flexible electrification of demand is not happening, at the speed needed to tackle the challenges ahead.

This is a pivotal moment: if flexible demand is not fully activated and the business models offered by the Flexible Demand Management Industry, represented by smartEn, are not scalable and profitable across Europe, the cost-effective, consumer-centric and digitally-enabled clean energy transition is at risk.

We are confident this smartEn and LCP-Delta report, combined with the new EU institution's focus on competitiveness, affordability, security, and innovation, will provide the ideal market and regulatory conditions for the demand-side flexibility potential to flourish—now.



Jon Ferris
LCP Delta
Head of
Flexibility

Awareness of the need for electricity system flexibility has never been as high as it is today. Although wholesale prices have fallen since 2022, they remain elevated compared to pre-crisis levels. And while everyone has now heard of the “dunkelflaute”, volatility isn't just reflected in price spikes. The sudden acceleration in solar generation has resulted in ever increasing frequency of negative price periods. Flexibility has not kept up with the speed of change in the generation mix. As the electrification of demand continues, the need for demand side flexibility to supplement grid-scale batteries in the energy system is rising up the political agenda.

Despite the reform of the Electricity Market Design entering into force in 2024, many of the requirements of the Electricity Regulation and Electricity Directive from the 2019 Clean Energy Package have yet to be implemented. ACER will submit the proposed Network Code on Demand Response to the European Commission by March 2025, and will be reviewing the ENTSO-E methodology for national assessments of flexibility needs.

More companies are entering the flexibility sector, and are seeking value in new markets. Independent access to trade flexibility in wholesale markets is the new frontier, needing co-ordination between retailers and aggregators. For all the progress that has been made, the pace of implementation has been too slow, and the bar is being raised further.

Demand Side Flexibility Market Monitor

Purpose, scope and definitions

What the Market Monitor is, and how to use it:

This report provides a high-level summary of 30 European markets and their accessibility to demand side flexibility.

Using this report, you can benchmark countries against each other and track their progress on enabling demand side flexibility (DSF).

The findings are based on our primary and secondary research across each market with findings challenged by internal and external experts.

This report reflects the independent view of the authors.

Scope of Market Monitor:

- Accessibility of DSF in ancillary services
- Accessibility of DSF in DSO services
- Accessibility of DSF in Capacity markets and Resource Adequacy Mechanisms
- Accessibility of DSF in wholesale markets
- Presence of tariffs incentivising implicit flexibility
- Future development and accessibility of DSF
- TSO spend on ancillary services accessible to DSF

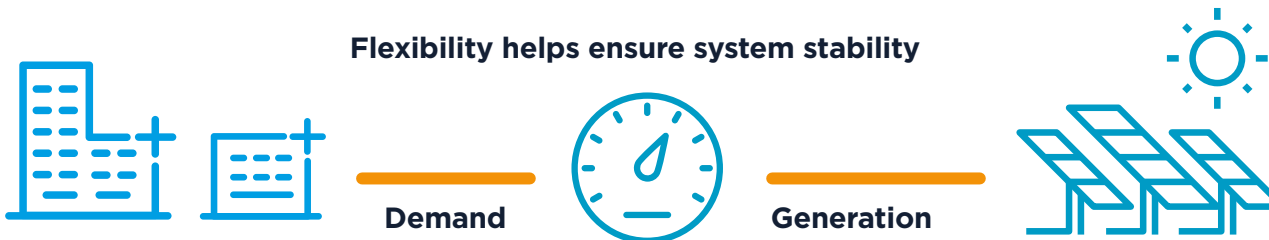
What is flexibility?

Flexibility is the ability of electrical generators and consumers to alter their output or consumption on demand. It can be provided by assets ranging from large front of meter generation to residential appliances.

What is Demand Side Flexibility?

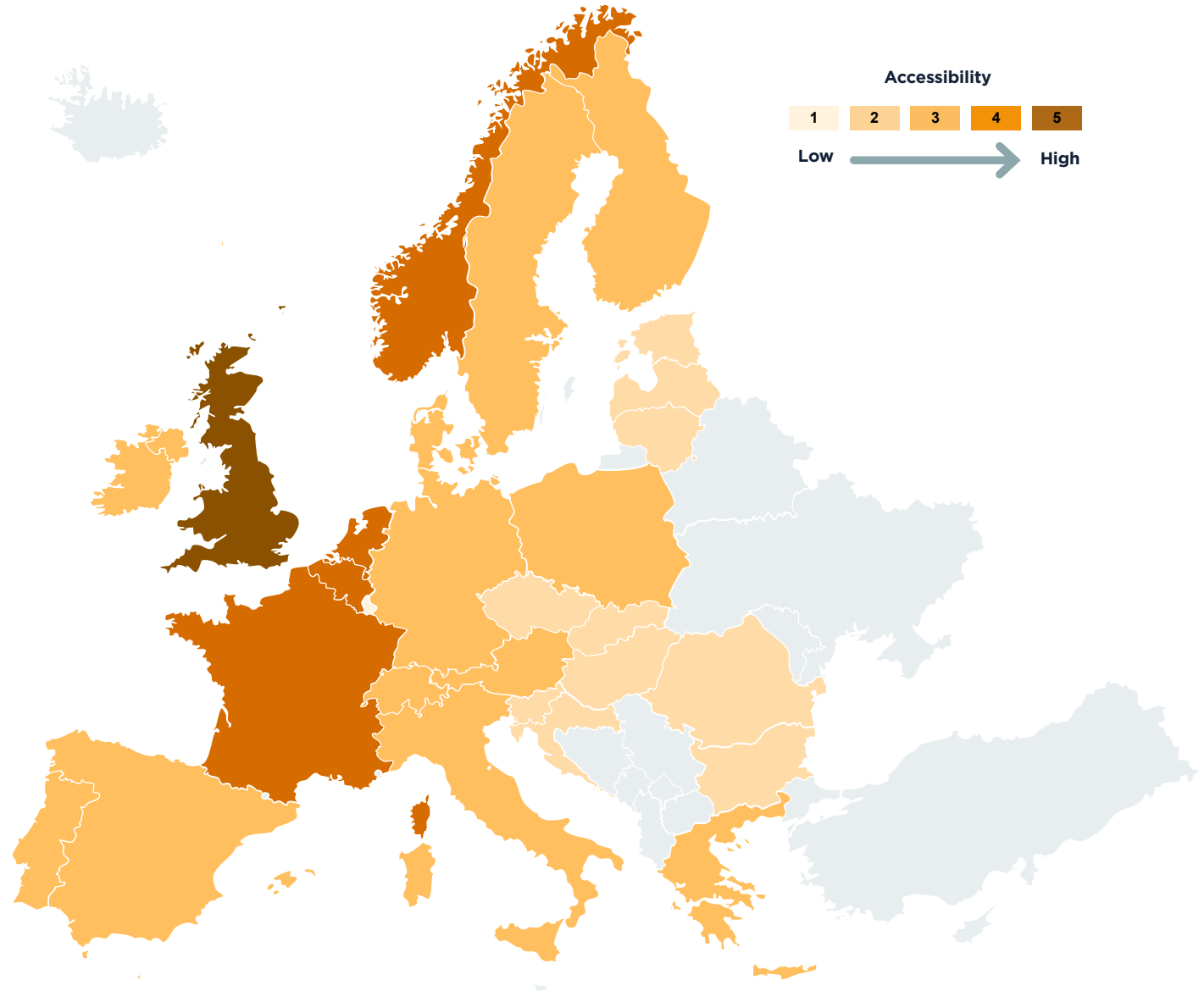
DSF is the deviation from the planned consumption, generation and/or use of storage in response to price signals or instruction, from residential, commercial or industrial customer sites, individually as well as through aggregation.

Flexibility helps ensure system stability



2024 Market Monitor for Demand Side Flexibility

- + Accessibility of DFS in ancillary services
- + Accessibility of DSF in Distribution System Operator Markets
- + Accessibility of DSF in Wholesale Markets
- + Accessibility of DSF in Resource Adequacy Mechanisms
- + Presence of Implicit Flexibility
- + Future Development of the Accessibility of Demand Side Flexibility



Development of DSF across Europe

With this 6th edition of the Market Monitor on Demand Side Flexibility (DSF) an overarching theme in our conversation has been around increased participation of residential assets, and the increasing need to engage DSF assets in wholesale markets.

Despite existing barriers, 2024 saw a significant rise in residential assets engaging in ancillary services, particularly in Sweden, Great Britain, and France. Additionally, there was widespread adoption of wholesale reflective dynamic tariffs to encourage implicit flexibility among residential consumers.

With a few exceptions, particularly Poland, there have been limited improvements in the accessibility of DSF in ancillary services. In some countries, particularly in Northern Europe, this could be attributed to already accessible value streams and may simply reflect the significant changes of the past five years.

Although widely discussed, wholesale markets remain largely inaccessible for independent flexibility service providers. Enhancing independent access to these markets will be crucial for increasing the profitability of DSF.

However, in most countries this lack of progress reflects the slow implementation of the Electricity Market Design (EMD) and stringent technical requirements that are a legacy from an electricity system dominated by coal and gas. To further the challenge for DSF providers there is a severe lack of clarity and transparency from most countries.

Calls to action

1

Open all markets to distributed energy resources

While the Electricity Market Directive already provides the regulatory framework, inadequate implementation prevents fair and unobstructed renewable energy, energy storage and demand side flexibility from accessing all wholesale markets, ancillary services and capacity mechanisms.

2

Provide transparent price signals to consumers

With increased electricity price volatility and network congestion, retail tariffs reflecting both wholesale electricity prices and cost-reflective network tariffs are crucial. This will enable consumers to leverage their flexibility and manage costs while having a positive impact on the electricity system.

3

Encourage System Operators to procure clean and affordable sources of flexibility

The lack of widespread market-based procurement of flexibility by system operators is leading to sub-optimal system management, leading to costly alternatives such as redispatch, excessive curtailment, or avoidable grid investments.

Summary score guide

Our research evaluated the development of European demand side flexibility:

How to interpret the rankings :



Early Markets

'Low' scoring countries typically are markets which are not established, are yet to open fully to DSF or have limited activity.

- These markets have few, if any, value streams open commercially to DSF.
- These markets often have limited need for DSF due to low renewable targets, bilateral contracts with generators, or lack a transmission system (as is the case with Malta).
- With time these markets will develop the need for DSF, however commercial interest will remain limited over the next 3 years.



Emerging Markets

Countries scoring 'medium' are undergoing development to open more fully to DSF.

- Some value streams are open to DSF but there are often significant barriers in high minimum bid sizes, challenging metering requirements or regulatory constraints.
- Despite the (current) lack of accessibility to DSF these countries present an opportunity in the next 2-3 years.
- These countries are aiming to join the coordinated EU markets for ancillary service (MARI, PICASSO) over the next two years.



Maturing Markets

Countries scoring 'high' are more developed markets for DSF. This does not necessarily mean there are no barriers to participation.

- Maturing markets have most (if not all) markets open to DSF, although barriers to entry are still present.
- Local flexibility is developing, with some example of commercial offerings (e.g. the Netherlands) at distribution level.
- Even at their current stage of development, some markets have the potential to grow further due to increasing renewable targets (e.g. France, Germany and Great Britain).

Country summary 1/2

Ranked in order of accessibility of ancillary services, then alphabetically

| Country | Accessibility of DSF in ancillary services | | | | | Accessibility of DSF in DSO markets | | | | | Accessibility of DSF in wholesale markets | | | | | Accessibility of DSF in capacity markets | | | | | Presence of residential implicit tariffs | | | | | Future development of DSF | | | | |
|----------------|--|---|---|---|---|-------------------------------------|---|---|---|---|---|---|---|---|---|--|---|---|---|---|--|---|---|---|---|---------------------------|---|---|---|---|
| Belgium | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Finland | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| France | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Great Britain | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Germany | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Ireland | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Netherlands | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Norway | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Poland | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Slovenia | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Sweden | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Austria | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Czech Republic | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Denmark | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Greece | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

Country summary 2/2

Ranked in order of accessibility of ancillary services, then alphabetically

| Country | Accessibility of DSF in ancillary services | | | | Accessibility of DSF in DSO markets | | | | Accessibility of DSF in wholesale markets | | | | Accessibility of DSF in capacity markets | | | | Presence of residential implicit tariffs | | | | Future development of DSF | | | |
|-----------------|--|---|--|--|-------------------------------------|---|---|--|---|---|--|--|--|--|--|--|--|---|---|--|---------------------------|---|---|--|
| Slovak Republic | ■ | ■ | | | | | | | ■ | ■ | | | | | | | ■ | ■ | ■ | | | | | |
| Switzerland | ■ | ■ | | | ■ | ■ | | | ■ | | | | ■ | | | | ■ | ■ | | | ■ | ■ | | |
| Bulgaria | ■ | ■ | | | | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | | |
| Croatia | ■ | ■ | | | | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | | |
| Estonia | ■ | ■ | | | | | | | ■ | ■ | | | | | | | ■ | ■ | ■ | | ■ | ■ | ■ | |
| Hungary | ■ | ■ | | | ■ | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | | |
| Italy | ■ | ■ | | | ■ | ■ | ■ | | ■ | ■ | | | ■ | | | | ■ | ■ | ■ | | ■ | ■ | ■ | |
| Latvia | ■ | ■ | | | ■ | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | | |
| Lithuania | ■ | ■ | | | | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | ■ | |
| Portugal | ■ | ■ | | | ■ | ■ | ■ | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | ■ | |
| Romania | ■ | ■ | | | | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | ■ | |
| Spain | ■ | ■ | | | ■ | | | | ■ | ■ | | | | | | | ■ | ■ | | | ■ | ■ | ■ | |
| Cyprus | ■ | | | | | | | | ■ | | | | | | | | ■ | ■ | | | ■ | | | |
| Luxembourg | ■ | | | | | | | | ■ | | | | | | | | ■ | ■ | ■ | | ■ | | | |
| Malta | ■ | | | | | | | | | | | | | | | | ■ | | | | ■ | | | |

A person in a blue shirt is holding a glowing lightbulb. The lightbulb is illuminated from within, and a string of small lights is attached to it. The background is dark, making the lightbulb stand out.

Introduction

- + Methodology
- + Scoring System

Methodology

The market monitor is based on extensive primary and secondary research

Demand Side Flexibility Market Monitor

Our approach was as follows:

- Interviewed over 100 industry contacts with knowledge of demand side flexibility across all markets, including: TSOs; DSOs; Energy Suppliers; Aggregators; independent specialists; technology companies and; industry associations.
- Used LCP Delta’s FlexTrack platform to calculate TSO spend. The platform collects and standardises individual value-stream prices and volumes from European TSOs and ENTSO-E.
- Calculated the annual capacity or energy volume, average price and total market value for each value-stream with available data.
- Assessed and scored each country against seven categories.
- Aggregated scores to produce an overall country ranking.
- Proofed and ensured consistency across the scores, valuations, and rankings, subjecting the results to internal and external challenges.

This report is based on LCP Delta’s qualitative primary and secondary research and quantitative data analysis across 30 countries and more detailed research into twenty of those countries.

Detailed Country Reporting

Alongside the Market Monitor maps, LCP Delta carried out more detailed research in order to produce detailed country reports.

We focused on twenty countries to give a range of examples of markets actively developing demand side flexibility. Countries with country profiles are:

- | | | |
|------------------|---------------|---------------|
| • Austria | • Hungary | • Slovenia |
| • Belgium | • Ireland | • Spain |
| • Czech Republic | • Italy | • Sweden |
| • Denmark | • Netherlands | • Switzerland |
| • Finland | • Norway | |
| • France | • Poland | |
| • Germany | • Romania | |
| • Great Britain | • Slovakia | |

Scoring system 1/2

| Category | Feature: | Scoring system: | Description: |
|--|---|---|--|
| Accessibility of DSF in ancillary services | <ul style="list-style-type: none"> Can DSF participate? Is aggregation allowed? Is the Min. bid size \leq 1 MW? Is an agreement with the customer BRP required? Is there an a-symmetrical product design? Is there daily procurement? Remuneration mechanism. | 1 - 5 based on the availability and accessibility of DSF in ancillary services and capacity markets. | Countries scoring highly indicate that not only are markets open to DSF, but that aggregation is allowed and an agreement with the customers balancing responsible party (BRP) is not required. If the score is low, then DSF is either not permitted or only with high barriers to entry. |
| Accessibility of DSF in distribution system flexibility markets | <ul style="list-style-type: none"> existence and development of DSO market trials. Presence and development of commercial DSO markets. MW awarded in commercial DSO markets. | 1 - 5 based on the presence, scale and commercial offering of DSO level platforms that enable flexibility. | High scoring countries have both accessible, commercial DSO offerings and high volumes of produced flexibility. |
| Accessibility of DSF in wholesale markets | <ul style="list-style-type: none"> Can DSF legally participate in the day ahead and intraday market? Are there regulations that implement the legal accessibility of DSF? Can DSF can participate without the agreement of the asset's BRP? | 1-5 based on the legal and regulatory accessibility of DSF into wholesale markets, without the requirements to be the customers BRP. | Countries with a high score allow residential and C&I assets to participate in wholesale markets without the agreement of the assets BRP. Countries with lower scores may only allow larger transmission connected assets to participate or have stringent entry requirements. |
| Accessibility of DSF in resource adequacy mechanisms | <ul style="list-style-type: none"> Existence of a capacity market and/or resource adequacy mechanism. Frequency of auctions held. Can DSF participate freely, and if so, is independent aggregation allowed? Is the Min. bid size \leq 1 MW? Volume of DSF and frequency of assets activated when holding a contract. Recent auction prices and de-rating factors. | 1- 5 based on presence, accessibility and DSF awarded in capacity markets and resource adequacy mechanisms. | To achieve any score a country must have an active capacity market. Those countries with high scores have accessible capacity markets. The highest scores were awarded to those the largest % of DSF and high corresponding spend on DSF. |

Scoring system 2/2

| Category | Feature: | Scoring system: | Description: |
|--|--|--|--|
| Presence of residential implicit tariffs | <p>Variable energy component with 2x time frames.</p> <p>Variable energy component with 3x time frames.</p> <p>Energy component based on wholesale price.</p> <p>Variable component for network charge.</p> <p>Presence of heat pump specific tariff.</p> <p>Presence of EV specific tariff.</p> | 1-5 based on presence of residential tariffs that enable implicit flexibility. Note, scores not based on number of each tariff. | <p>Countries with the highest score offer customers the largest range of tariffs and are beginning to development asset specific tariffs.</p> <p>Countries with a lower score typically only offer variable tariffs that do not reflect the wholesale price, nor are asset specific.</p> |
| Future development of demand side flexibility | <p>MW of residential assets installed.</p> <p>MW of front of meter batteries installed.</p> <p>Pan-EU market coupling.</p> <p>Opening of capacity markets.</p> <p>Future increased accessibility of DSF in ancillary services.</p> <p>Future increased accessibility of DSF in DSO services.</p> | 1 - 5 based on a planned development of DSF and future potential. | <p>High scores highlight the countries that have the most potential to increase accessibility of DSF in the future in a range of value streams.</p> <p>Those with the highest score are likely to make progress in the next 1-2 years.</p> |

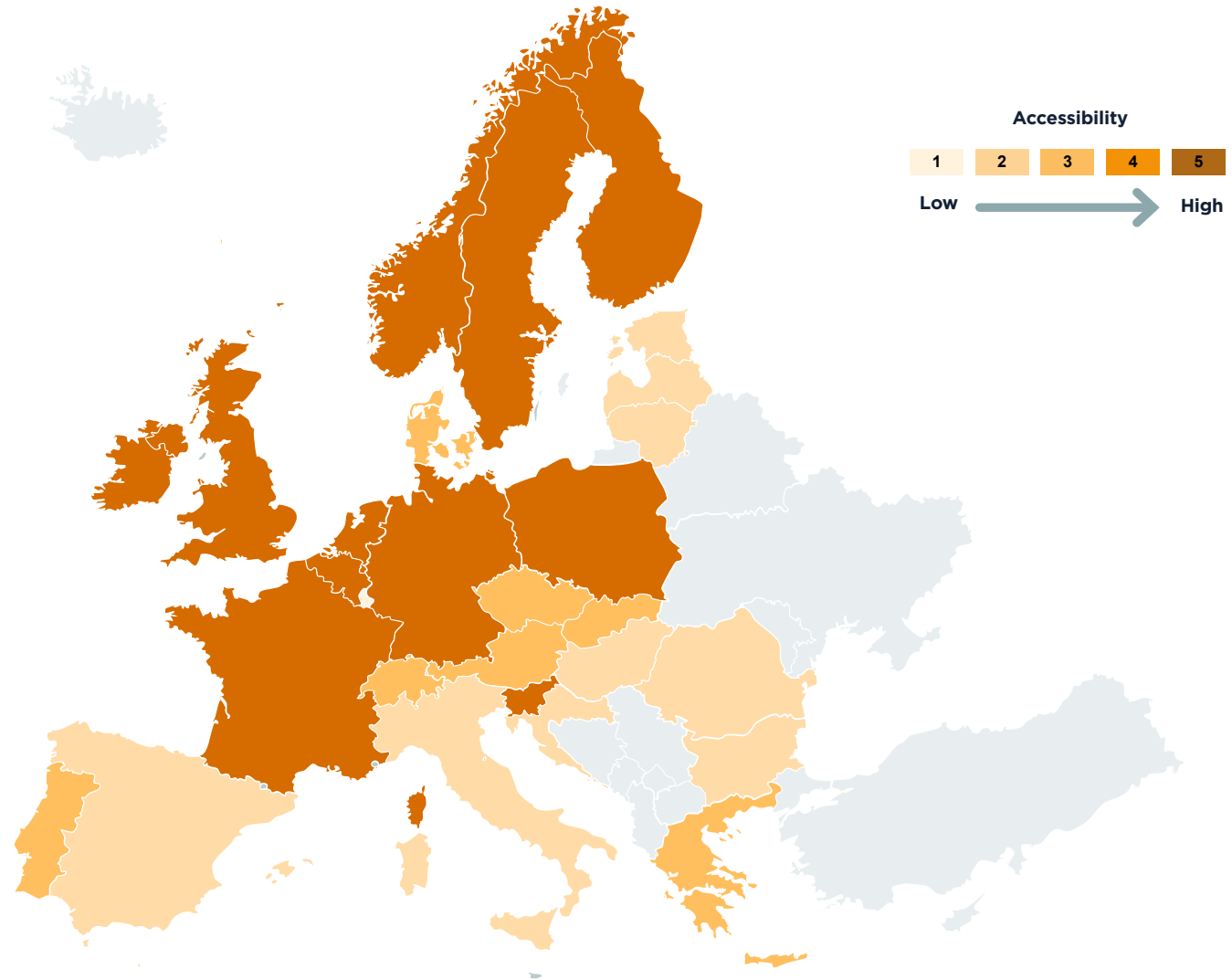
The background image shows a vast solar farm with rows of solar panels stretching towards a horizon under a dramatic, cloudy sunset sky. In the foreground, a small white power substation with a red door and metal railings is visible. The overall scene is a mix of natural and industrial elements, emphasizing renewable energy.

The 2024 European Market Monitor for Demand Side Flexibility

Accessibility of DSF in Ancillary Services

Scoring system

- Is the market commercially operational?
- Can DSF participate?
- Is aggregation allowed?
- Is an agreement with the customer BRP required?
- Min. bid size 1MW or less
- Asymmetrical product design
- Daily procurement
- Pay as clear - availability
- Pay as clear - utilisation



Please note this map refers to the regulatory access of DSF into ancillary services, not the level of activity from flexibility providers.

Accessibility of DSF in Ancillary Services

Overall Description

Across Europe there have been small developments to improve the accessibility of DSF in ancillary services. As countries enable greater access for DSF, major year-on-year developments are becoming less likely.

Despite the original aims of the pan-European flexibility markets to bring standardisation across Europe, there have been many delays in accession and frequent differences in national markets. This has resulted in national variations to entry requirements and procedures despite overall DSF accessibility.

Countries with high scores have a wide range of value streams open to DSF. Those with the highest score have minimal barriers to entry including a low minimum bid size and access for independent aggregators.

This map does not represent DSF participation which varies significantly between countries. Reasons for this variation include prices, asset technical requirements, legal costs, maturity and competitiveness.

Northern Europe

Northern Europe has seen the most progress over the past 5 years with most value streams open and accessible. However, the need to have an agreement with the customer's BRP is still present in some markets, presenting a barrier to independent, and often smaller, flexibility providers.

Norway, Sweden, Finland, and Denmark are progressing with joining the Pan-Nordic market. All countries are currently participating in the aFRR availability market. A trilateral mFRR availability market opened in 2024, excluding Norway. The mFRR utilisation market has been delayed from Q4 2024 to Q1 2025.

Great Britain has continued to roll out new products with Quick Reserve and Balancing Reserve being launched in 2024. Both are open to DSF and independent aggregators although technical barriers still limit DSF suitability.

The most significant change in France was the commercial opening of aFRR, although there are still barriers for aggregated DSF participation.

Southern Europe

DSF accessibility is lower in Southern European countries with accessibility in most value streams restricted to commercial and industrial loads due to legal and regulatory conditions.

In particular, progress has been slower than expected in Spain and Italy with limited participation from DSF in markets dominated by large generation and grid connected batteries, respectively.

Cyprus is going through a transitional market so is currently largely inaccessible for DSF.

Eastern Europe

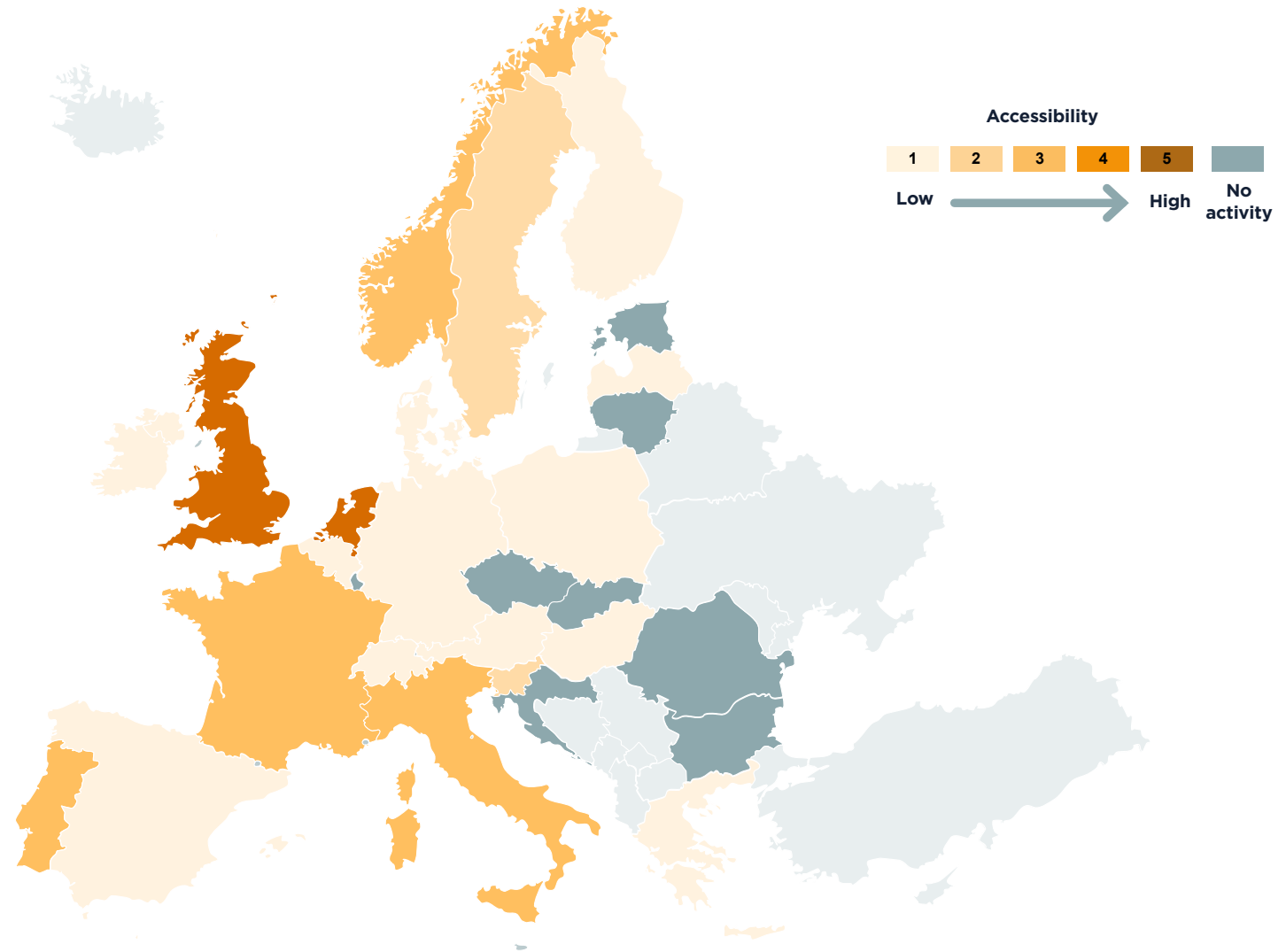
Eastern Europe is 'leapfrogging' more developed markets with markets rapidly transitioning from closed to accessible.

Poland has seen the most changes with market reforms increasing accessibility of DSF in FCR, aFRR and mFRR. Bulgaria and Slovenia have also increased accessibility in 2024 with changes to procurement processes.

Accessibility of DSF in Distribution System Operator Markets

Scoring system

- Presence and development of DSO trials
- Presence and development of DSO commercial offerings
- Contracts awarded (in MW) to DSF assets via DSO commercial offerings



Accessibility of DSF in Distribution System Operator Markets

Overall description

The leading countries in DSO markets have seen no change, with Great Britain and the Netherlands still leading the way.

Outside of selected countries there is a general lack of incentives for DSOs to introduce flexibility markets. DSO markets are by their nature very location specific, making a single, uniform approach difficult.

To encourage more standardisation in DSO markets the Network Code for Demand Response is currently being drafted by ACER. This code is aiming to establish a harmonised aggregator framework that will include elements on settlement, compensation, and baselining methodologies. It will also define the Terms & Conditions for establishing local flexibility markets.

Countries with the highest score have the most procured DSF in commercial markets. Middle scoring countries are still developing trials.

Northern Europe

Great Britain has gone through a period of standardisation with all six DSOs agreeing on uniform entry requirements and procurement processes. This, along with a move towards day ahead procurement for DSO markets, enables easier access to DSF, especially for smaller residential assets.

GOPACS continue to procure commercial flexibility in the Netherlands with TenneT (the Dutch TSO) being the largest buyer of flexibility.

In Norway eight DSOs (covering ~2/3 of total customers) are procuring DSF for grid management. Sweden's Stockholm Flex was active in 2024 but will not continue in 2025.

Southern Europe

Overall DSO markets are less developed with pockets of innovation and activity.

While still an emerging opportunity, Portugal is performing trials following the structure in . Procurement is still in the early phases with very lenient pre-qualification procedures.

Eastern Europe

There is limited market activity in Eastern Europe. The conclusion of EU-wide projects such as Horizon and One-Net have caused many countries to have a lower score in the 2024 maps. Without EU funding, strong national incentives or constraint issues it is unlikely DSO markets in Eastern Europe will develop in the short term.

Slovenia is the exception to this with a commercial DSO offering. Participants are remunerated for utilisation but procurement is not market based and relies on bilateral agreements.



Accessibility of DSF in Wholesale Markets

Overall description

Independent access to the wholesale market - access for providers that are not Balance Responsible Parties (BRP) for the supplier - has gathered significant attention in the past year. Market access, where evolving, is limited.

Article 17 of EU Directive 2019/944 sets out that demand response from final customers, both directly and via aggregation, must be able to participate in a non-discriminatory manner in all electricity markets. All EU member states are required to incorporate this directive into national law. Not all Member states, however, have done this by the end of 2024, and not all European countries are EU members.

Countries with the highest scores have implemented laws and regulations that enable the participation of DSF at all levels to access the wholesale market without a BRP agreement. These countries are the exception, with access to wholesale markets restricted to transmission connected assets the norm across Europe.

Northwest Europe

France and Great Britain are the only two countries where residential and commercial/ industrial assets can participate in the wholesale market without the agreement of the assets' BRP. This is enabled through the NEBEF framework in France, and the P415 BSC modification in . Belgium is also relatively accessible with independent access to participate in the wholesale markets allowed for high and medium voltage. Low voltage assets can participate as of 2024, although an agreement with the assets' BRP is required.

In the Nordics, participation without a BRP agreement is limited to transmission connected assets. However, Sweden has a live proposal (submitted September 2024) to enable independent access to markets for residential assets.

Southern Europe

The Southern European countries have typically, with the exception of Italy, completed the incorporation of the EU internal market directive to make DSF legally feasible, but regulations are still a hindrance to participation across the board.

Large transmission connected demand sites can participate in wholesale markets, but it is still a general requirement that DSF must either become a BRP or partner with the BRP to do so.

Eastern Europe

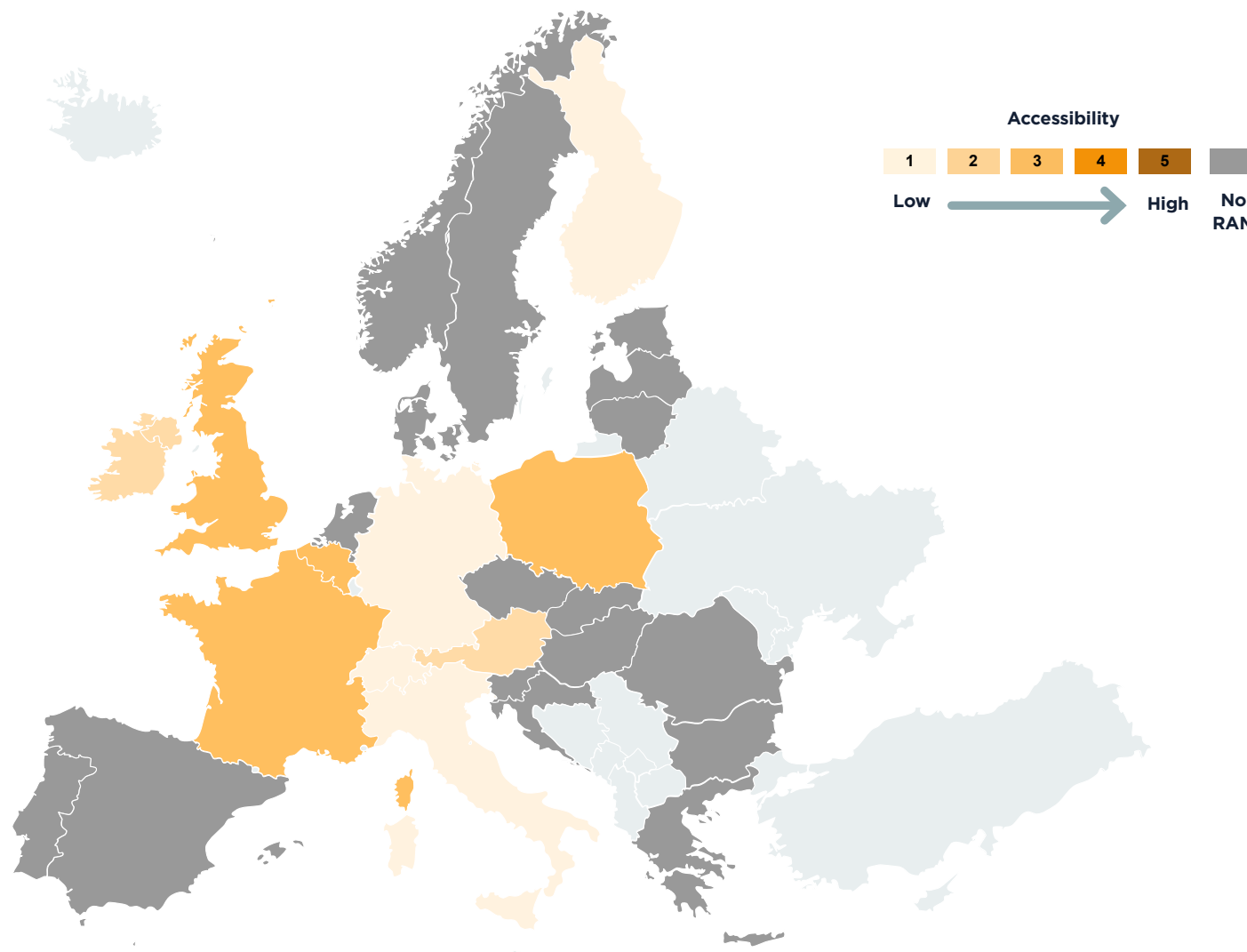
Incorporation of Directive 2019/944 is patchy across Eastern Europe. Poland and the Czech Republic still only provide access to wholesale markets for suppliers and large transmission connected demand sites.

Hungary legally allows DSF to participate, but regulations still need to be put in place to facilitate full market access.

Accessibility of DSF in Resource Adequacy Mechanisms

Scoring system

- Existence of a capacity market and/or resource adequacy mechanism
- Frequency of auctions held
- Can DSF participate freely, and if so, is independent aggregation allowed?
- Is the Min. bid size ≤ 1 MW?
- Volume of DSF and frequency of assets activated when holding a contract
- Recent auction prices and de-rating factors



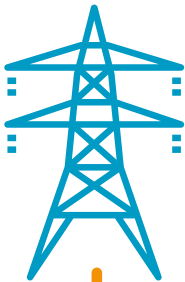
Accessibility of DSF in Resource Adequacy Mechanisms

Overall description

Resource adequacy mechanisms (RAMs), most commonly in the form of Capacity Markets (CM) but also strategic reserves, are not present in all European countries. However, with increased renewable generation and reduced thermal generation, new and reformed capacity markets are emerging.

Where accessibility of DSF in capacity markets is drawing increasing attention there are location and design differences that make certain markets more appealing for DSF by price, de-rating factors and activation.

To have a high score a country's capacity market must be accessible to DSF with minimal barriers to entry, and critically, be awarding contracts to DSF.



Northern Europe

Belgium, France, Ireland and Great Britain all have CMs that are open and accessible to DSF. France is especially strong for the inclusion of DSF with dedicated tenders (AOE). Although Ireland has the highest recent auction prices at -€150/kW/yr, DSF revenues are hindered by harsh de-rating factors of ~20%. Great Britain and Belgium have more lenient de-rating factors making the actual revenues higher than Ireland despite lower clearing prices.

Finland and Sweden operates strategic reserves, but no DSF participates. In Sweden, this mechanism will expire in 2025, but the TSO proposes to have an extended, revised, strategic reserve until establishing a CM in 5-8 years.

Austria operates a strategic reserve where no DSF currently participates but are incorporating rule changes in 2025 to better enable participation.

Germany announced plans for a CM from 2028 onwards. DSF participation is likely to be incentivised with a decentralised element of the CM being considered.

Southern Europe

Italy opened a CM in 2019 which is legally open to DSF, however, no contracts have been awarded to DSF in any auction. Costly hardware, lack of premiums and the inability to stack with other services are major barriers for DSF participation.

Spain is planning the launch of a CM in 2025, taking a similar shape to that of Ireland and Belgium. It is expected that DSF will be able to participate, and independent aggregation will be allowed.

Eastern Europe

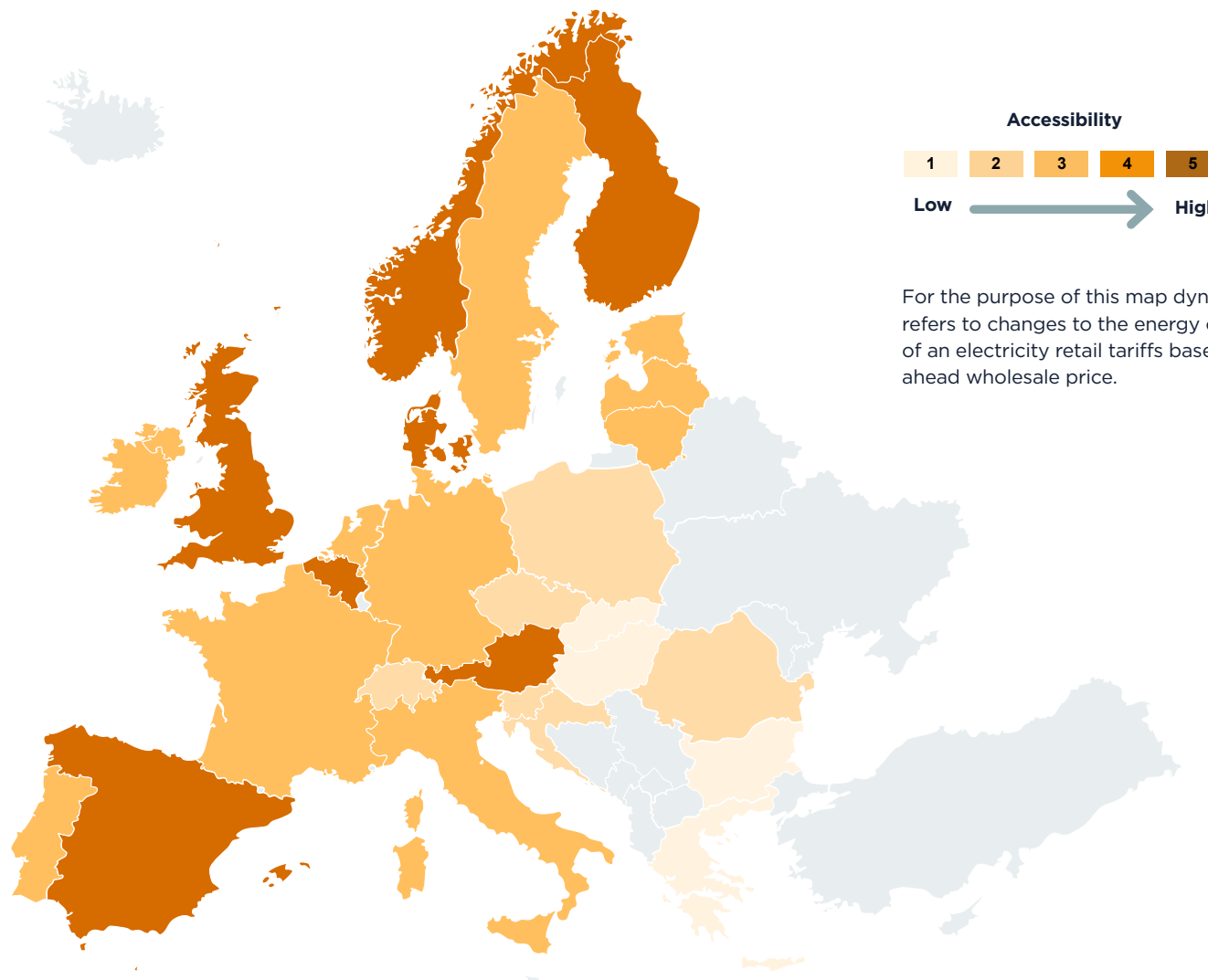
Poland operates a CM with heavy participation of DSF and independent aggregation. 1,088 MW was procured in the latest Y-5 auction and a quarterly average of 371 MW in the Y-1 auctions. Clearing prices are like that of Great Britain but Poland has a 100% de-rating factor which provides higher revenues.

Lithuania has announced plans for a RAM introduction from 2025, but no formal plans are in place. Estonia is considering a strategic reserve from 2027 onwards.

Presence of Implicit Flexibility

Scoring system

- Electricity tariff with 2 time of use price bands
- Electricity tariff with 3 time of use price bands
- Energy component based on day ahead wholesale price
- Variable component for network charge
- Presence of heat pump specific tariff
- Presence of EV specific tariff
- Smart meter rollout
- Consumer uptake of day ahead wholesale reflective dynamic tariffs ahead wholesale price.



This map has evolved from previous versions to reflect the increase of variable energy tariffs, asset specific tariffs and emergence of network congestion reflective tariffs.

Presence of Implicit Flexibility

Overall description

Implicit flexibility, or the ability to save money by changing the time of consumption based on a tariff, is the predominant form of flexibility for domestic consumers.

The first iterations of these were 'static variable' tariffs with two or three static time bands. With the advancement of smart meters and increasing price visibility, tariffs reflective of the day ahead wholesale market have emerged. These tariffs are more sophisticated with greater ability for consumers to save.

In the latest developments there has been an emergence of asset specific tariffs - most commonly targeting heat pumps or electric vehicles. These tariffs offer bespoke propositions with benefits for both the customer, energy retailer and/or asset provider.

It is these more advanced tariffs that enable countries to achieve higher scores with the leading countries having the widest range of offerings.

Northwest Europe

Nordic countries have the largest number of dynamic tariffs that are reflective of day ahead wholesale markets. Norway and Finland lead with >90% uptake of day ahead dynamic tariffs, whilst Sweden has a larger proportion of monthly variable tariffs. However, despite the abundance of dynamic tariffs there are limited static variable or asset specific tariffs.

Great Britain leads Europe with the largest range of offerings. Germany presents an unusual case. Looking across Germany there is a wide range of tariffs types available, however, due to the very minimal smart meter roll out and municipal structure, in practice consumers have much more restricted access to tariffs.

Variability in network tariffs (primarily to reduce congestion on the distribution network) is becoming increasingly common. Denmark has the most variability with 4 within day bands in addition to seasonal variability.

Southern Europe

Due to a regulated tariff that is reflective of the day ahead wholesale prices, Spanish consumers have opportunities to harness implicit flexibility. Spain is the outlier, however, with most other Southern European countries having minimal uptake of dynamic tariffs. Italy is the only notable exception with high uptake of monthly variable tariffs.

Eastern Europe

Eastern Europe is making steady progress in offering flexible tariffs having had very little activity just a few years ago.

Poland, Lithuania and the Czech Republic stand out as having static variable and day ahead wholesale tariffs. Latvia and Estonia are also worth highlighting due to the significance of day ahead wholesale tariffs, even if other tariff types are unavailable.

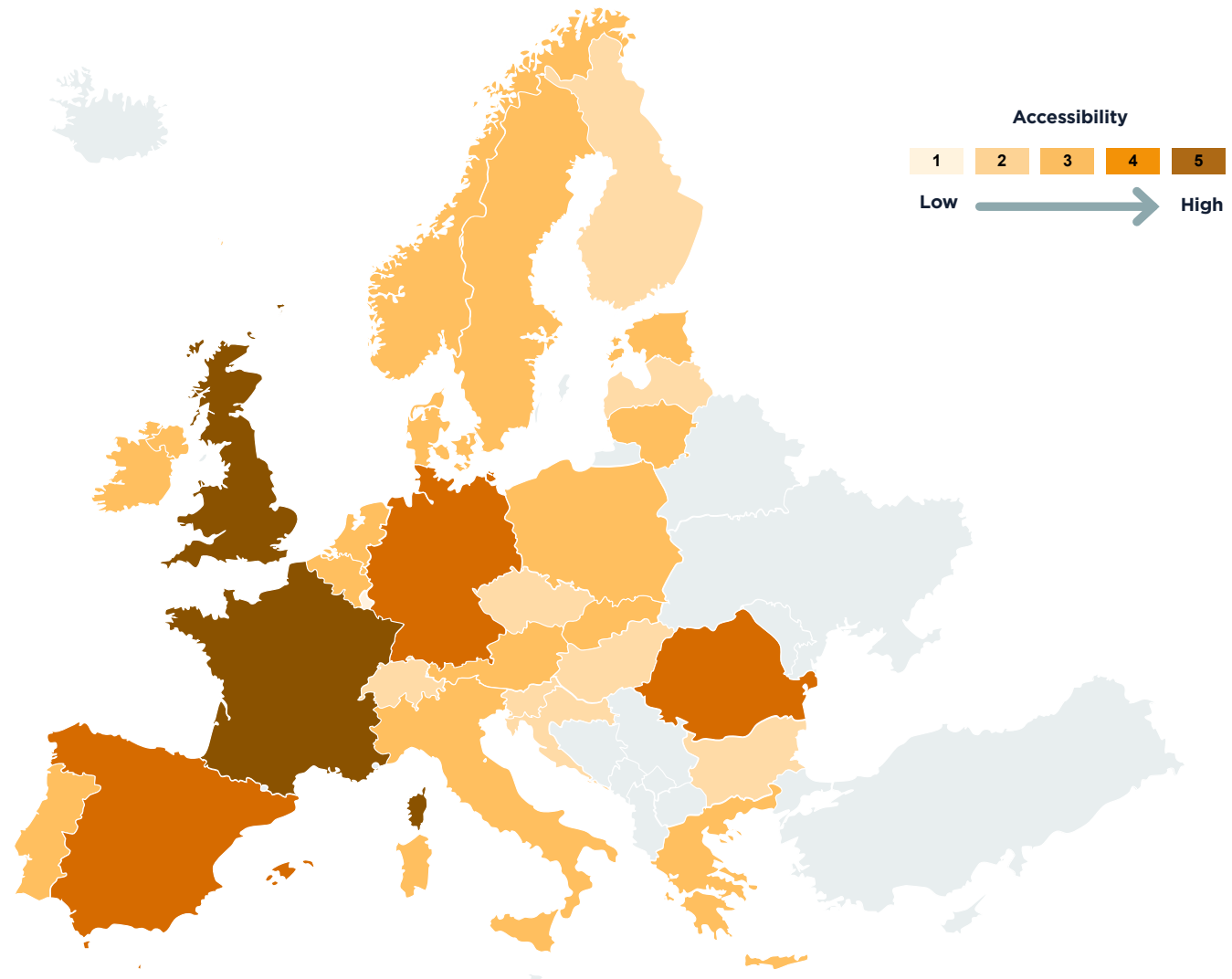
Presently no Eastern European country has asset specific tariffs but the speed of development in this region is encouraging.

Future Development of the Accessibility of Demand Side Flexibility

Scoring system

- Number of flexible residential assets installed
- Installed capacity of front of meter batteries
- Accession to Pan-EU market coupling
- Opening of capacity markets
- Future increased accessibility of DSF in ancillary services
- Future increased accessibility of DSF in DSO services

New to the 2024 edition we have included metrics relating the installations of Front of meter batteries and flexible residential assets. The growing capacity of the former could negatively impact the revenue potential of DSF as value streams are increasingly saturated by large batteries. The latter is a positive indicator of the development of DSF.



Future Development of the Accessibility of Demand Side Flexibility

Overall description

Large renewable targets (led by France, Great Britain, Germany and Italy) in relation to current installed capacity and a rapid rise in residential assets (led by France and Germany) is driving future development of DSF. Over the coming years we are likely to see more service providers working within the current regulations to combine both implicit and explicit flexibility opportunities at both the commercial/industrial and residential level.

There are likely to be fewer widespread changes in TSO markets in the immediate years with large developments focused on Eastern Europe. This is partly due to value streams already being open to DSF, but also signals a slow down of significant changes to accessibility of DSF.

New value streams are emerging, for example the Servicio de Respuesta Activa de la Demanda (SRAD) in Spain. However, the accessibility to DSF is limited, if not prohibitive in these new value streams.

Northern Europe

While delayed, the Pan-Nordic coupling should be completed in 2025 signalling a fully cohesive and accessible Nordic region.

Increased accessibility in wholesale markets – particularly in France and Great Britain – is likely to increase both value opportunities and customer offerings.

Southern Europe

Due to the current lack of accessibility, the future potential in Southern Europe is larger. While accession to all pan-EU coupled markets should be completed in 2025 and 2026, there have already been significant delays by many member states.

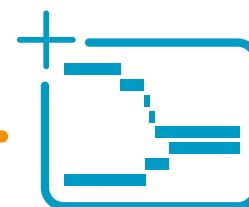
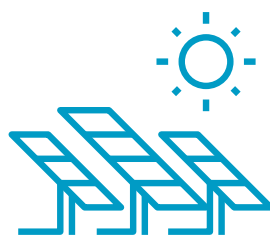
The launch of a proposed capacity market in Spain in 2025 could offer an additional value stream, although detailed accessibility criteria are still to be determined.

Eastern Europe

The opening of ancillary services to DSF saw Poland's future development score reduce – although this is an overwhelmingly positive event.

There is the potential for a new capacity market in the Czech Republic following an amendment to the Electricity Law. Details are unclear with implementations likely in the medium to long term.

Progress in the Baltic region is encouraging with markets opening to DSF, aggregation and, in some countries, independent aggregation. Where the legal right to participate is being enabled, participation from DSF is minimal and isolated to commercial and industrial assets. Residential flexibility is developing via implicit tariffs with explicit offerings not expected in the immediate future.



Key terms

| Name | Description |
|------------------------|---|
| Ancillary Services | Services procured by a transmission system operator to support the transmission of electric power from generators to consumers. They are used to maintain the proper flow and direction of electricity, address imbalances between supply and demand, and help the system recover after a power system event. |
| Availability contract | Price and volume of balancing capacity reserved in EUR/MW/hrs and MW. |
| Independent aggregator | Independent aggregators are market participant engaged in aggregation who is not affiliated to the customer's supplier [or BRP]. |
| Utilisation contract | Price and volume of balancing energy activated in EUR/MWh and MWh |

Acronyms

| Acronym | Name | Description |
|---------|---|--|
| aFRR | Automatic Frequency Restoration Reserve | Reserve service, the primary purposes of which are to continually: (1) balance the supply and demand, and (2) maintain system frequency. The use of aFRR enables activated FCRs to deactivate and be ready to use in case of new disturbances. |
| BRP | Balancing Responsible Party | Entities responsible for maintaining supply and demand on the energy markets. Each BRP must strive to be balanced in real time. Each BRP is financially responsible for the imbalances of its own market positions, which must be settled with the connecting TSO. |
| C&I | Commercial and Industrial | Non-domestic customers. |
| CEP | Clean Energy Package | A set of eight EU directives and regulations that provides an update to the European energy policy framework, aiming at facilitating the energy transition and providing a modern European energy market. |
| DA | Day ahead | The day before delivery. Generally used in the context of electricity spot market auctions. |

Glossary

Acronyms (continued)

| Acronym | Name | Description |
|---------|--------------------------------------|---|
| DSO | Distribution System Operator | The operating managers (and sometimes owners) of energy distribution networks, operating at low, medium and, in some EU member states, high voltage levels (LV, MV and HV). |
| EBGL | Electricity Balancing Guidelines | The EBGL was created as a result of an EU Regulation that aims to enable countries to share balancing resources. |
| FCR | Frequency Containment Reserve | Active power reserves which are automatically controlled to maintain system frequency as supply and demand constantly changes. |
| FoM | Front of meter | An asset connected directly to the electricity network, instead of behind a customer meter. |
| ID | Intraday | The day of delivery. Generally used in the context of electricity spot markets. The term may be used to describe either a set of auctions happening immediately prior to and during a delivery day, or to a continuously traded spot market. |
| mFRR | Manual Frequency Restoration Reserve | Reserve service which is activated when a serious grid imbalance or congestion issues arises. The primary purposes of mFRR are to resolve: (1) major or systematic supply and demand imbalance, (2) a significant frequency variation, and (3) major congestion issues. This reserve service is activated manually. |
| RR | Replacement Reserve | Replacement reserves enable activated FRRs to deactivate and be ready to use in case of new disturbances. This is an ancillary service used in approximately half of the EU countries. |
| TERRE | Trans European Replacement Exchange | The European implementation project to create a common marketplace across Europe for exchanging Replacement Reserves. |
| TSO | Transmission System Operator | The operating manager of the transmission system and party responsible for maintaining system balance. |

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