

A nighttime satellite map of Europe, showing city lights and a network of white lines representing energy infrastructure. The map is set against a dark blue background.

EU MARKET MONITOR

FOR DEMAND SIDE FLEXIBILITY

2019



DELTA-EE

SYNOPSIS

This report provides a holistic and independent view of the progress of Demand Side Flexibility across 21 European markets in 2019. This will enable industry to benchmark disparate markets against each other and track their progress on demand side flexibility. The results from our primary research in each market provides a high level summary of the current market activity.

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November 2019

About Delta-EE and smartEn

Leading providers of intelligence and advocacy for the energy transition

DELTA-EE

Delta-EE is a specialist European Energy Research and Consulting Service provider. We help organisations to develop the best strategies, business models and customer propositions for the energy transition.

This research is part of our **Flexibility Research Service** which provides insight into key markets, competitors, business models and issues shaping the sector, with a specific focus on demand side flexibility.

 www.delta-ee.com



smartEn is the European business association for digital and decentralised energy solutions.

Our members include innovators in services and technology for energy and data management, finance and research.

By taking an integrated perspective on the interaction of demand and supply, we promote system efficiency, encourage innovation and diversity, empower energy consumers and drive the decarbonisation of the energy sector.

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A hand is shown pointing at a digital screen. The screen displays various financial data points, including numbers like 275.88, 247.94, 217.92, and 170.05. There are also line graphs and bar charts visible on the screen. The background is dark with blue and orange highlights.

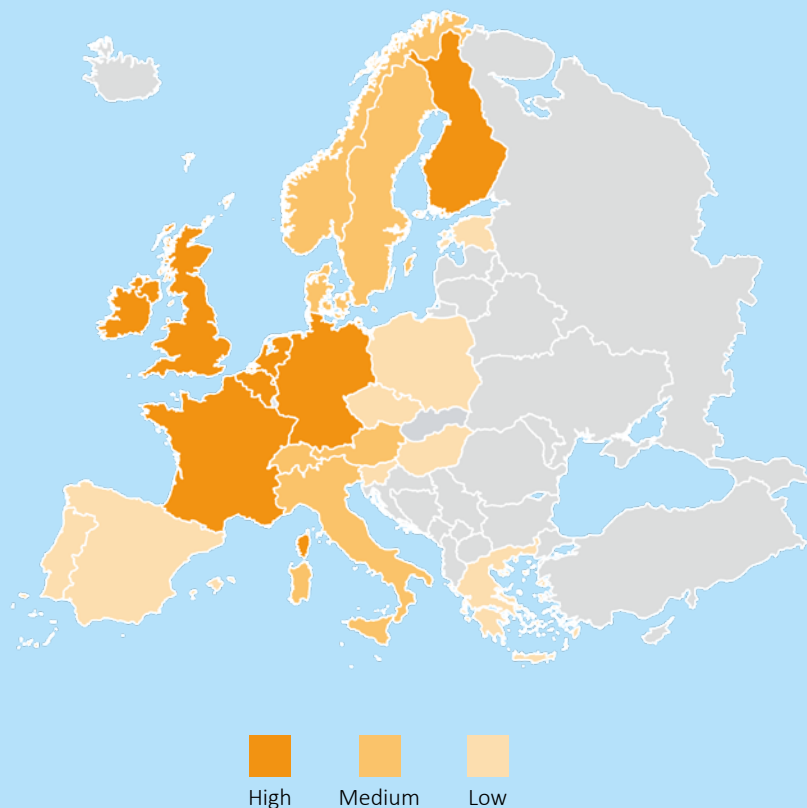
MARKET SNAPSHOTS

- The 2019 EU Market Monitor Map for DSF
- Summary Score Guide

The 2019 EU Market Monitor Map for Demand Side Flexibility

Many dynamic and rapid evolving markets across Europe for DSF

France, Great Britain, and Ireland are the highest ranking countries for market activity, followed by Germany, Finland, Belgium and the Netherlands.



There are many nuances to each individual market. This map provides a system to track the DSF activity in each market.

- In all 21 markets we **find activity in demand side flexibility** (DSF) to varying degrees, across different value streams, customer segments, asset types and market stakeholders.
- The purpose of this report is to provide a high level summary of the **current market activity**, based on our primary research across each market. The score **does not indicate the potential opportunity or success** in a market.
- Across all markets we find:
 - Ancillary services are the most open value streams to DSF and are primarily where DSF is monetised.
 - Industrial loads & distributed generators are the most commonly used assets for DSF.
 - Industrial customers are the most engaged with DSF.
 - Aggregators are typically the market creators and dominate the landscape.

SCOPE OF MARKET MONITOR

- Availability and accessibility of DSF to value streams.
- Monetisation of DSF in value streams.
- Breadth of asset types used for DSF.
- Breadth of customer segments engaged with DSF.
- Number of stakeholders active with DSF.

At a glance our research shows relative activity levels for DSF

Summary Score Guide

In all 21 markets we find activity in demand side flexibility.

What it means for countries with a high, medium and low score in our DSF Market Monitor is summarised below:

HIGH

MATURE MARKETS

Countries scoring 'high' can be considered as more developed markets for DSF. This does not necessarily mean that there are no barriers present.

Typical features of these markets include:

- Unbundled and competitive markets.
- Multiple value streams exist and accept behind-the-meter and aggregated assets.
- High needs for flexibility.
- High innovation from industry.
- Higher value for DSF and therefore higher incentive for DSF across a range of customers, assets and competitors.
- Barriers and market uncertainties exist.

MEDIUM

ACTIVE MARKETS

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

Typical features of these markets include:

- Varying degrees of accessibility and openness to value streams for DSF.
- High barriers for DSF and independent stakeholders, compared with 'traditional' methods of flexibility (i.e. generation assets) and incumbent players.
- Low incentives for businesses and/or customers to engage in DSF.
- Limited engagement, or pockets of engagement where it makes sense, of industry and end users.
- Barriers to entry exist.

LOW

EMERGING MARKETS

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

Typical features of these markets include:

- There is evidence of some activity in demand side flexibility.
- Sometimes trials rather than commercial activity.
- Limited needs for demand-side flexibility, mainly due to excess generation capacity.
- Limited or, in some cases, no value streams established, available and/or accessible to behind-the-meter loads.
- Limited engagement in DSF by industry and end users.

THE 2019 EU MARKET MONITOR FOR DEMAND SIDE FLEXIBILITY

- Purpose, scope and definitions
- Our methodology
- An Overview of Our Scoring System
- Our scoring system

Introduction to the EU Market Monitor for Demand Side Flexibility

DSF Market Monitor Purpose, Scope and Definitions

This report provides a holistic and independent view of the progress of DSF across 21 European markets.

WHAT IS THE MARKET MONITOR AND HOW TO USE IT

- The purpose of this report is to provide a high level summary of 21 EU markets and their **current DSF market activity**.
- The score given to each country **does not indicate the potential opportunity or success** in a market. The score is an accrued 'evidence of DSF activity' rating, based on our qualitative primary research.
- This will enable industry to benchmark disparate markets against each other to track their progress on demand side flexibility.
- The findings are based on our primary research across each market. Assumptions and estimations, based on conversations with industry experts, have been made throughout.

- Our approach and research findings have been challenged by internal and external experts to corroborate our view.
- This market is changing rapidly and this map provides a view on progress to 2019 only.
- This Market Monitor has not been built as a strategic opportunity tool for individual companies to base decisions on.

SCOPE OF MARKET MONITOR

- Availability and accessibility of DSF to value streams.
- Monetisation of DSF in value streams.
- Breadth of asset types used for DSF.
- Breadth of customer segments engaged with DSF.
- Number of stakeholders active with DSF.

OUR DEFINITION OF DEMAND SIDE FLEXIBILITY

Behind-the-meter decentralised sources of flexibility are collectively termed demand side flexibility (DSF). DSF is technology agnostic and refers to the turning on / off, up / down, or shifting of aggregated, decentralised loads, batteries and generation, across any value stream and customer segment.

Introduction to the EU Market Monitor for Demand Side Flexibility

Our Methodology

This report is based on Delta-EE's and smartEn's high-level qualitative primary research across 21 countries and more detailed research into 5 of those countries.

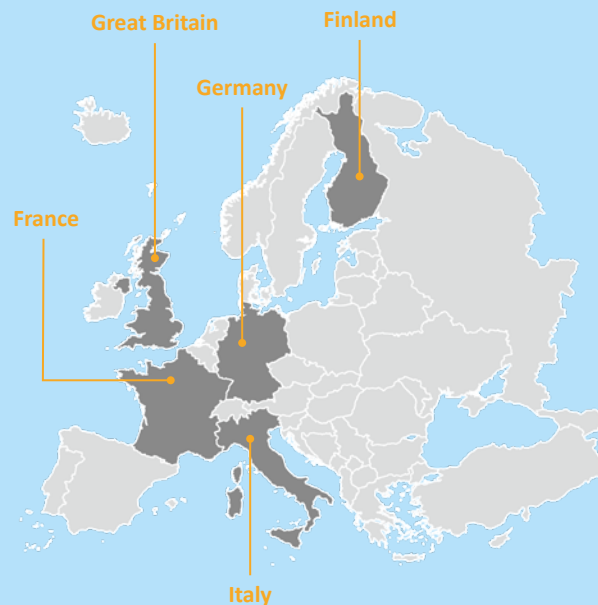
DEMAND SIDE FLEXIBILITY MARKET MONITOR

We designed an InfoBase to structure and analyse the research findings for the demand side flexibility Market Monitor. Our approach was as follows:

- 1 **Design of the Market Monitor Infobase** boundaries, index and scoring system, with challenge from internal and external contacts.
- 2 **Interviewed >60 industry contacts** local to each market, with knowledge on demand side flexibility. This included TSOs, DSOs, Energy Suppliers, Aggregators, independent specialists, technology companies and associations.
- 3 **Undertook secondary research** where required.
- 4 **Collated research findings** into the InfoBase.
- 5 **Scored** each data point, based largely on a high, medium, low rating.
- 6 **Aggregated all scores** to one final score per country.
- 7 **Proofed and ensured consistency** across the InfoBase.
- 8 **Internal and external challenge** on the results.

DETAILED COUNTRY REPORTING

Alongside the Market Monitor Infobase, Delta-EE also carried out more detailed research and produced individual country reports. We focused on 5 countries to give a range of examples of active markets that have taken different approaches to developing demand side flexibility. To complement the Market Monitor, we've included highlights on:



Full country reports are available to Delta-EE subscribers only and include additional, more detailed primary and secondary research that goes beyond the information contained in the market monitor. Each country report is ~30 pages and looks at:

- Value streams
- Policy & regulation
- DSF market size
- DSF competitive landscape
- Future trends and direction

Introduction to the EU Market Monitor for Demand Side Flexibility

An Overview of Our Scoring System

It is important to understand our methodology to enable you to take the correct message from our findings.

- The scoring system for our Market Monitor was designed to easily and quickly track progress and benchmark disparate markets. However, it is important to appreciate that all countries are different to each other and have their own nuances. There is ongoing work to harmonise some parts of some of these markets (e.g. see the FCR coordination, PICASSO, TERRE and MARI projects and the countries involved), however there are still many differences today, that are not highlighted in this report.
- Within each category (e.g. *value stream accessibility*), the score accumulates. This means that, for example, even if there are high barriers to entry for DSF in a specific value stream, a high score is possible if other value streams are open to DSF.
- The total score is the sum of all category scores. Hence a country might score 'medium' in each category, but can obtain a 'high' total score when the scores are accrued.
- The overall score was not weighted, as it naturally lends itself to weight towards products accessibility given the higher number of categories and higher score available.
- The 5 categories do not correlate directly. Given the scoring system, it is possible for e.g. a 'high' score for *breadth of customer segments engaged* even if *value stream accessibility* has a 'low' score.

GERMANY EXAMPLE

In Germany value stream accessibility obtains a 'medium' score because the barriers to access open value streams are high. Despite this, Monetisation of DSF achieves a 'high' score as there is evidence of significant activity across multiple value streams (i.e. ancillary services, wholesale markets and interruptible loads). Likewise, there is evidence of trial and commercial activity in all customer segments and in the majority of asset types. This also leads to a higher score across these categories.

GERMANY EXAMPLE

Germany

Value streams accessible for DSF

DSF monetisation across value streams

Breadth of assets used for DSF

Breadth of customer segments engaged with DSF

Stakeholders engaged with DSF

TOTAL SCORE

Score



Introduction to the EU Market Monitor for Demand Side Flexibility

Our Scoring System

DATA COLLECTION ON

Value streams accessible for DSF

DSF monetisation across value streams

Breadth of assets used for DSF

Breadth of customer segments engaged with DSF

Stakeholders engaged with DSF

BROKEN DOWN BY

- Ancillary services (FCR, aFRR, mFRR, RR)
- Interruptible loads
- Capacity Mechanism
- TSO / DSO network charges
- Day ahead and intraday markets
- DSO specific products
- Other

As above.

- Generators / CHP
- Battery
- Industrial processes
- HVAC
- EV / EV charger
- District heating

- Very large Industrial (Loads are >1MW)
- Medium C&I (loads are 1MW or less)
- Residential

- Number of stakeholders active in DSF (including non-BRPs, BRPs, technology companies etc).

SCORING SYSTEM

0-5 based on availability, openness, and barriers. The scoring system for ancillary services was as follows:

- 0 = Do not exist or not a competitive market.
- 1 = Exist, not open to DSF.
- 2 = Exist, open to DSF, not open to all players, barriers exist.
- 3 = Exist, open to DSF, not open to all players, no significant barriers.
- 4 = Exist, open to DSF, open to all players, barriers exist.
- 5 = Exist, open to DSF, open to all players, no significant barriers.

0-3 based on a high-level estimation of evidence of DSF being monetised:

- 0 = No DSF is being monetised.
- 1 = DSF being monetised in a few examples.
- 2 = DSF is being monetised somewhat.
- 3 = DSF is being monetised significantly.

0-3 based on a high-level estimate of evidence found of asset type being used:

- 0 = Not being used for DSF.
- 1 = Engaged in DSF, but limited activity found or trials.
- 2 = Engaged in DSF somewhat, but not widespread activity.
- 3 = Engaged in DSF and significant activity.

0-3 based on a high-level estimate of evidence found of customer segment engagement:

- 0 = Not engaged in DSF.
- 1 = Engaged in DSF, but limited activity found or trial activity.
- 2 = Engaged in DSF somewhat, but not widespread activity.
- 3 = Engaged in DSF and significant activity.

0 – 4 based on the number of known players:

- 0 = No known players.
- 1 = <10
- 2 = 11- 30
- 3 = 31- 50
- 4 = 51+

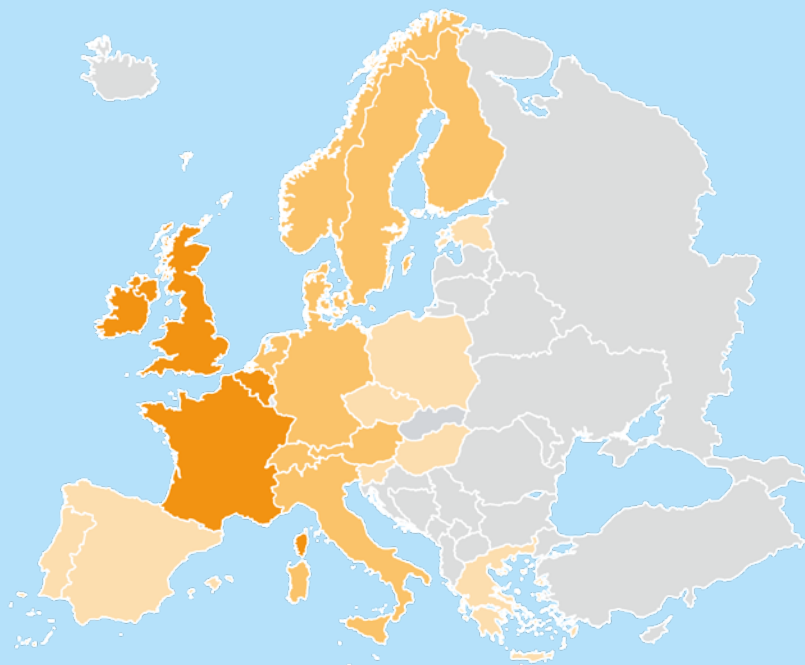
2019 MARKET MONITOR MAP

- Value stream availability and accessibility for DSF
- DSF monetisation across value streams
- The breadth of asset diversity for DSF
- The breadth of customer engagement in DSF
- DSF competitive landscape

Value stream availability and accessibility for DSF

Ancillary services are the most open value streams for DSF

France, GB, Ireland and Belgium have the most open and accessible value streams across the market values.



High Medium Low

INTERPRETING THE RESULTS

Markets scoring highly indicate that multiple value streams are open to DSF, with low barriers to entry. In markets where this value is low, value streams are limited in number and/or accessibility for DSF.

SNAPSHOT – FRANCE

The majority of value streams in France are open to DSF, including ancillary services, capacity mechanism and wholesale markets. The TSO has been active in reducing the barriers to DSF, but a few still exist, including e.g. the degraded business case for independent players due to compensation rules, and difficulties entering the secondary reserves (aFRR) market. Unique to the French market is the NEBEF mechanism, which has been created to allow virtual pools of load to be traded in the wholesale market.

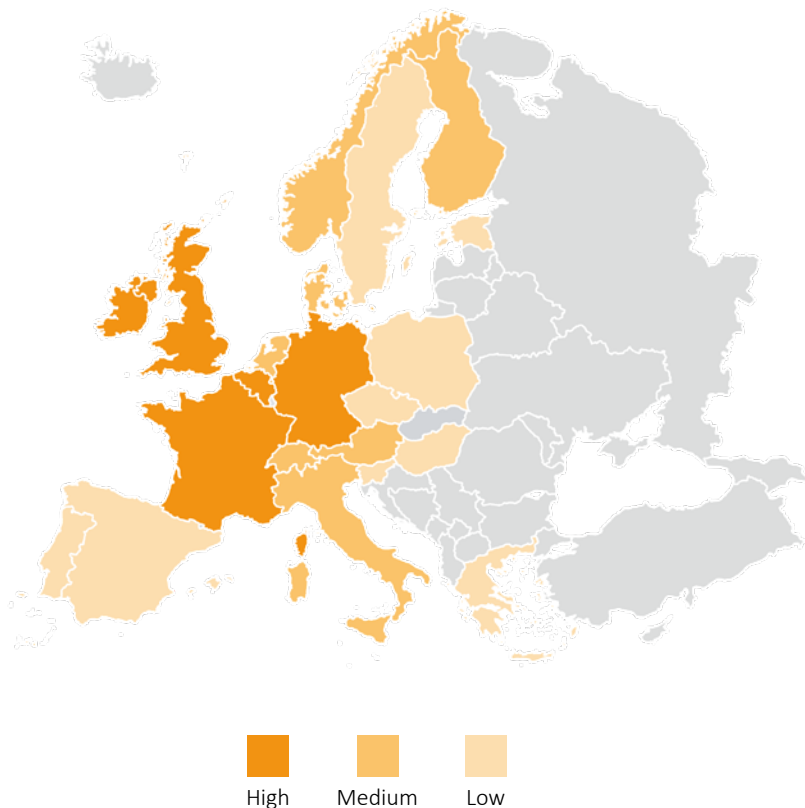
WE LOOKED AT

- Ancillary Services
- Interruptible loads
- Capacity Mechanism
- TSO / DSO network charges
- Day ahead and intraday markets
- New DSO values

Monetisation of DSF in value streams

Ancillary services are primarily used for monetising DSF

GB, Ireland, France & Belgium have evidence of demand side flexibility in most available value streams.



INTERPRETING THE RESULTS

In highly scoring markets, there is evidence of DSF being monetised in the majority of available value streams. Typically there are hot spots in value streams, across all markets. There are a few examples of DSF not being monetised in open value streams given high barriers or lack of economic incentive.

SNAPSHOT – PORTUGAL

Emerging activity in Portugal includes industrial customers active in the Replacement Reserve (RR) market, now open for consumption loads after a pilot project, completed in 2018. The regulator (ERSE) is still working on opening this market further for aggregation and non-BRP stakeholders. There is also an ongoing pilot for dynamic network tariffs for industrial customers.

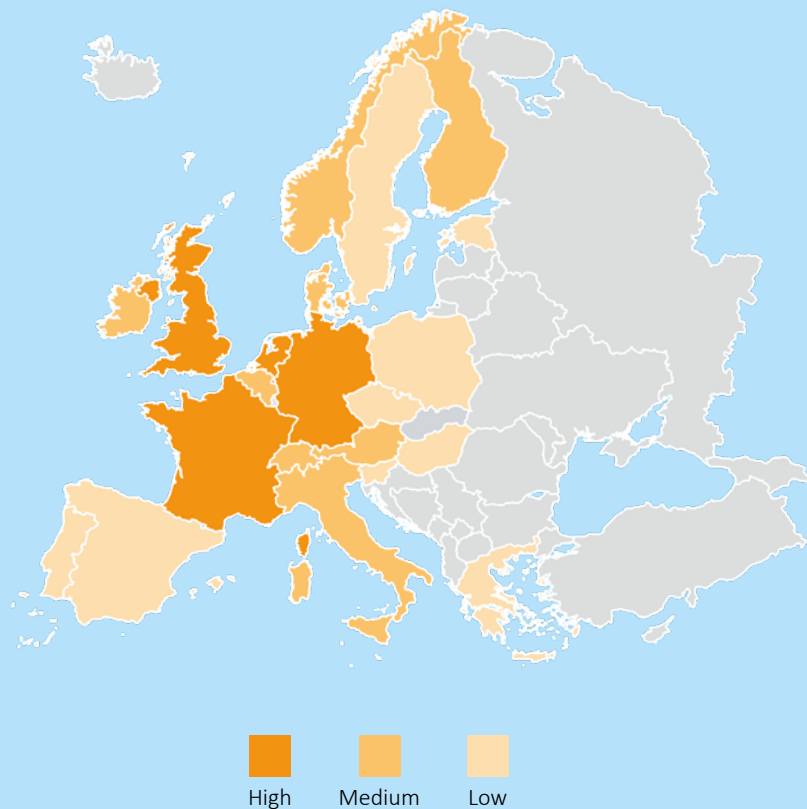
WE LOOKED AT

- Ancillary Services
- Interruptible loads
- Capacity Mechanism
- TSO / DSO network charges
- Day ahead and intraday markets
- New DSO values

The breadth of asset diversity used for DSF

Industrial loads & distributed generators are primarily used

There is evidence of DSF from the majority of asset types in France, Germany, Denmark, Netherlands and Great Britain.



INTERPRETING THE RESULTS

In highly scoring markets there is evidence of activity in the majority of asset types, with some hot spots usually around industrial loads and behind-the-meter generation. In lower scoring markets, there tends to be limited activity across asset types, or significant activity in very few asset types.

SNAPSHOT – DENMARK

There are 100s MW of ~1-40MW electric boilers and CHPs (often installed in combination) in Denmark, mostly in district heating. These are optimised for ancillary services and day ahead markets. It is also one of the top countries for EV flexibility trials with fleets and private vehicles. There is also DSF trial activity with battery, C&I scale consumption loads, cold storage and heat pumps. With domestic dynamic electricity tariffs available by 2021, we expect to see DSF from domestic assets in the future.

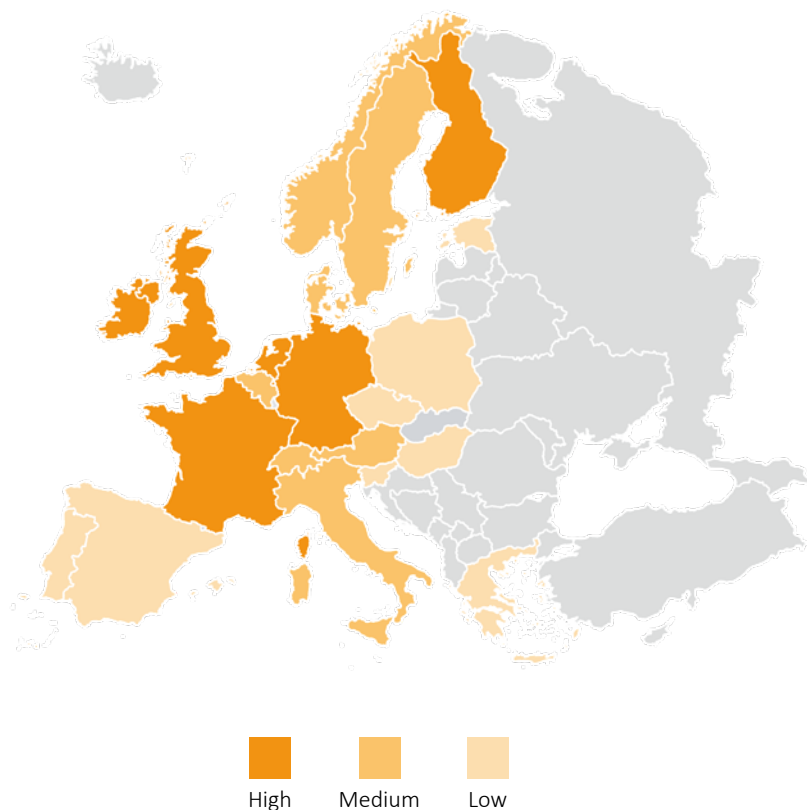
WE LOOKED AT

- Back-up generators
- CHP / generators
- Battery
- Industrial processes
- HVAC
- EV / EV charger
- District heating

The breadth of customer segments engaged with DSF

Industrial customers are the most engaged with DSF

Many countries have evidence of DSF activity across all customer segments, including trials and commercial activity, across any available value stream.



INTERPRETING THE RESULTS

In countries scoring highly we have found significant evidence of activity in all three customer segments. Lower scoring countries may still have strong engagement, but this will be limited to one segment, or limited engagement across multiple customer segments.

WE LOOKED AT

- Industrial
- Commercial
- Residential

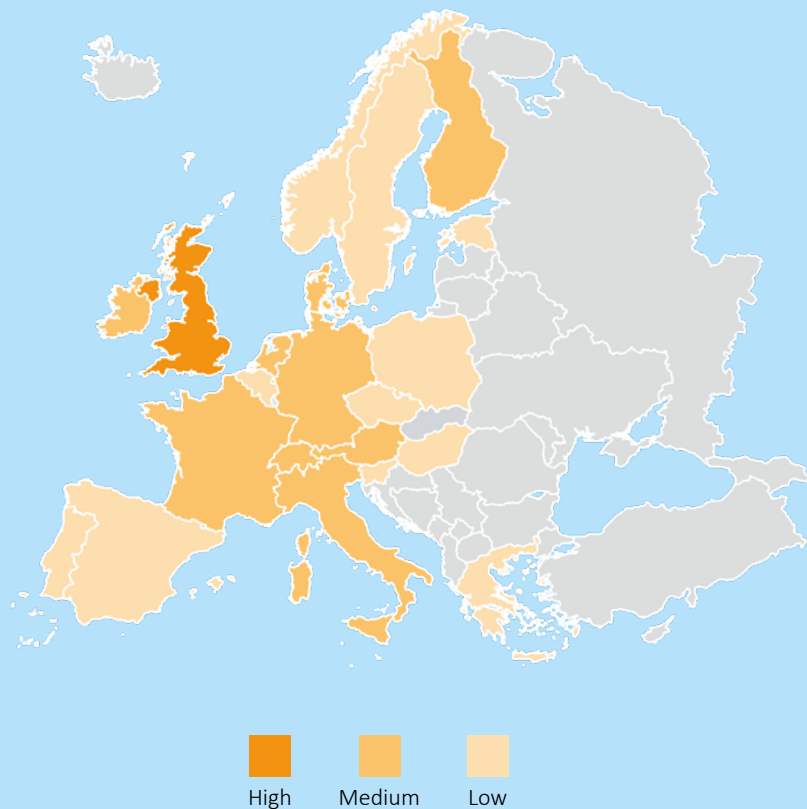
SNAPSHOT – THE NETHERLANDS

We find moderate DSF activity across all customer segments in the Netherlands. For example, C&I customer segments with back-up generators, CHP and industrial loads are active in ancillary services and optimising wholesale and imbalance positions. There is also significant activity in the residential sector, with EV chargers, batteries and electric heating loads. Some of this activity is limited to trials. However, there are a few players with 1000s of aggregated residential scale assets.

The competitive landscape for DSF

Aggregators are market creators and dominate the landscape

There is a significant number of stakeholders active across Europe, with aggregators and energy suppliers dominating the space.



INTERPRETING THE RESULTS

The score here is based on the number of stakeholders active in demand side flexibility. We tend to see more innovative business models in the highly scoring markets (i.e. including those with a high-medium score).

SNAPSHOT – GREAT BRITAIN

The GB market is highly competitive with a high number and broad mix of stakeholders active in DSF. We have identified ~45 stakeholders active in GB. The landscape is dominated largely by aggregators and energy suppliers, but energy services companies, developers, battery companies and technology companies (both hardware and software manufacturers and service providers) are also engaged. There is a large number of new entrants gaining market traction and partnerships are common across the value chain.

WE LOOKED AT

- Number of DSF stakeholders
- Competitive energy retail (domestic)



EUROPEAN POLICY & LEGISLATION

- Guiding principles in the Clean Energy for all Europeans Package
- Timeline implementation Electricity Market Regulation
- Timeline implementation Electricity Market Directive

Guiding principles in the Clean Energy for all Europeans Package

Five principles that will improve the integration of DSF across Europe

1 Open all electricity markets for all decentralised energy resources

- Most undue barriers for market entry for decentralised energy resources have been removed with the objective to create a level playing field with generation.
- The overall philosophy is for the new product design to be sufficiently small in size and trading as close to real time as possible.
- The European resource adequacy assessment is introduced.

4 Relevant data access for all service providers

- Based on customer consent, any third party shall have non-discriminatory access to the final customers' data.
- Customers will receive their consumption data free of charge once every billing period.
- A common European data format and framework will be developed, to facilitate interoperability and data access between different Member States.

2 Effective price signals at wholesale and retail level

- Price caps have been removed to increase efficiency in the markets with derogations only being for specific reasons and time-limited.
- Consumers should be able to choose dynamic prices and should have access to smart metering.
- Network charges shall be cost-reflective and support overall system efficiency.

5 Use all decentralised energy resources by system operators

- The Directive requires standardised and streamlined product definitions for the procurement of flexibility by DSOs and TSOs.
- The objective is to avoid market fragmentation and too specific products tailored to certain types of generation.

3 Provide fair market access for active customers and aggregator

- Independent aggregators don't require prior consent from suppliers to engage with the final customer.
- Customers cannot be subject to discriminatory technical or administrative requirements and charges from their suppliers, to engage with an aggregator.

Timeline implementation Electricity Market Regulation

N.B: An EU Regulation is directly applicable in all Member States.
No need to adopt national transposition laws.

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Balancing Market	Max duration contractual period for (remaining) balancing capacity (art. 6.10-11).	12 MONTHS						6 MONTHS					
	NRAs to report to COM and ACER on share balancing capacity contracts longer than 1 day (art. 6.12).									By 1/1/28			
Day-ahead and intraday market	Balance settlement period in 15min in all day scheduling areas (art. 8.4).	By 31/12											
	Limit to derogations to 15mins (art. 8.4).												
	Expression max 30mins (art. 8.4).												
Network Charges	ACER best practice reports on transmission and distribution tariff methodologies (art. 18.9).	By 5/10											
	Biennial updates of the best practice report (art. 18.9).												
Union-wide 10 year network development plan by ENTSO-E (art. 30.1.b).													
Established EU DS entity	DSOs to submit DSFaft statues to COM and ACER (art. 52.3).	By 5/7											
	Formal establishment (art. 69.1).			By 5/3									
Revision	COM report on revision of existing network codes and guidelines (art. 69.1).							By 1/7					
	(Possible) COM proposal based on report (art. 69.1).								By 31/12				
	Review Regulation (art. 69.2).												By 31/12

Timeline implementation Electricity Market Directive

N.B: An EU Directive is NOT directly applicable in all Member States. To be implemented it needs national transposition laws.

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GLOSSARY

- Glossary of terminology

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Value stream	Definition
Frequency constraint reserve (FCR)	Reserves which are constantly used by the system operator to maintain system frequency as supply and demand constantly changes. It is automatically activated and is the fastest response possible once deviation from the reference frequency has been detected.
Automatic frequency restoration reserve (aFRR)	The reserves primary purposes are to continually: (1) balance the supply and demand, and (2) maintain system frequency. This reserve is activated automatically. The use of FRRs enables activated FCRs to deactivate and be ready to use in case of new disturbances.
Manual frequency restoration reserve (mFRR)	This reserve is activated when a serious grid imbalance or congestion issues arises. The mFRR's primary purposes are to resolve: (1) major or systematic supply and demand imbalance, (2) a significant frequency variation, and (3) major congestion issues. This reserve is activated manually.
Replacement reserve (RR)	Replacement reserves enable activated FRRs to deactivate and be ready to use in case of new disturbances. With regards to the countries covered in this report, this service is only available in Italy and to some extent in Japan.
Wholesale market arbitrage	Electricity on the wholesale market can be traded on the futures, day-ahead and intra-day markets. As with any commodity market, players can optimise their trading positions on both markets by e.g. buying electricity at lower prices (from generators) and selling it at higher prices (to customers). DSF can be used to enhance one's optimisation ability. Country variations exist depending on openness of market.
Balancing market	Imbalance is the difference between the contracted amount of electricity supplied or demanded and the actual physical amount for each market player. The sum of each market player's imbalance is the level of energy imbalance on the system and this must be resolved by the electricity system operator (ESO). Imbalance prices are reflective of the cost incurred by the ESO to resolve the system imbalance. The more out of balance a market player is, the higher their imbalance cost is. Therefore, the imbalance market incentivises the market player's contracted and actual energy supply or demand to 'be in balance'.
Capacity market	The capacity market ensures peak demands can be met in the years ahead. The Capacity Market subsidises owners of generators to provide generation to meet peak demands. Whilst this market is open to DSF, typically, the majority of value available in this market is awarded to traditional generators (e.g. gas power plants).
Network charges	Network charges can typically be broken down into (1) transmission network charges and (2) distribution network charges. Network users (e.g. end customers) are charged a fee to recover transmission and distribution system costs. These fees can be separated or combined and are typically based on the volume of electricity consumed, the connection capacity and/or when the electricity was consumed.
DSO services	The practice of DSOs using flexibility to avoid network reinforcement and manage their systems is only beginning to emerge. This has primarily emerged in the form of DSOs procuring DSF for constraint management. This is an immature market, which is mostly in trial phase at the moment.

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