**EM-Power Europe**

**Munich, May 7–9, 2025**

# TREND PAPER: THE FUTURE OF EUROPE'S ENERGY SYSTEM HINGES ON FLEXIBILITY

**Munich/Pforzheim, April 2025 – As Europe advances toward electrification and a renewable-based energy system, one critical challenge remains: balancing supply and demand efficiently. Without greater demand-side flexibility (DSF), the energy transition risks becoming more expensive, less reliable, and less consumer-centric. DSF enables consumers – whether households, businesses or industries – to adjust their electricity usage in response to real-time grid conditions and price signals. By leveraging decentralized energy resources, storage and smart technologies, DSF can reduce grid congestion, stabilize energy markets and unlock billions in cost savings. Yet despite its potential, regulatory, economic and technical barriers continue to limit its adoption across European markets. What must change for DSF to scale and become a true game-changer in the EU's energy transition?**

Europe's energy system is under increasing pressure as it moves – albeit slowly – towards electrification. While progress is timid, the need for smarter solutions to balance supply and demand is becoming crucial. Demand-side flexibility (DSF) refers to the capability of any active customer to react to external signals and adjust their energy generation and consumption in a dynamic, time-dependent way, either individually or with the support of market players. It can be provided by smart decentralized energy resources (DERs), such as demand management, energy storage, bidirectional electric vehicles and distributed renewable generation. These resources enable a more reliable, sustainable and efficient energy system by shifting consumption patterns and alleviating pressure on the grid. With this potential, DSF can enhance affordability for consumers while increasing competitiveness in industries.

This is a pivotal moment: as electrification is perceived by many as the way to meet Europe's decarbonization targets, the absence of sufficient flexibility threatens to overburden energy grids, driving up costs and undermining the efficiency of the transition. Without fully activating flexible demand and ensuring scalable, profitable business models across Europe, the clean energy transition risks becoming more expensive and less consumer-centric. While some markets have taken steps to integrate DSF, many still face persistent regulatory, economic and technical barriers that limit broader participation. Addressing these barriers and understanding the factors shaping DSF growth – whether policy initiatives, market design or technological innovation – will be essential to unlocking its full potential.

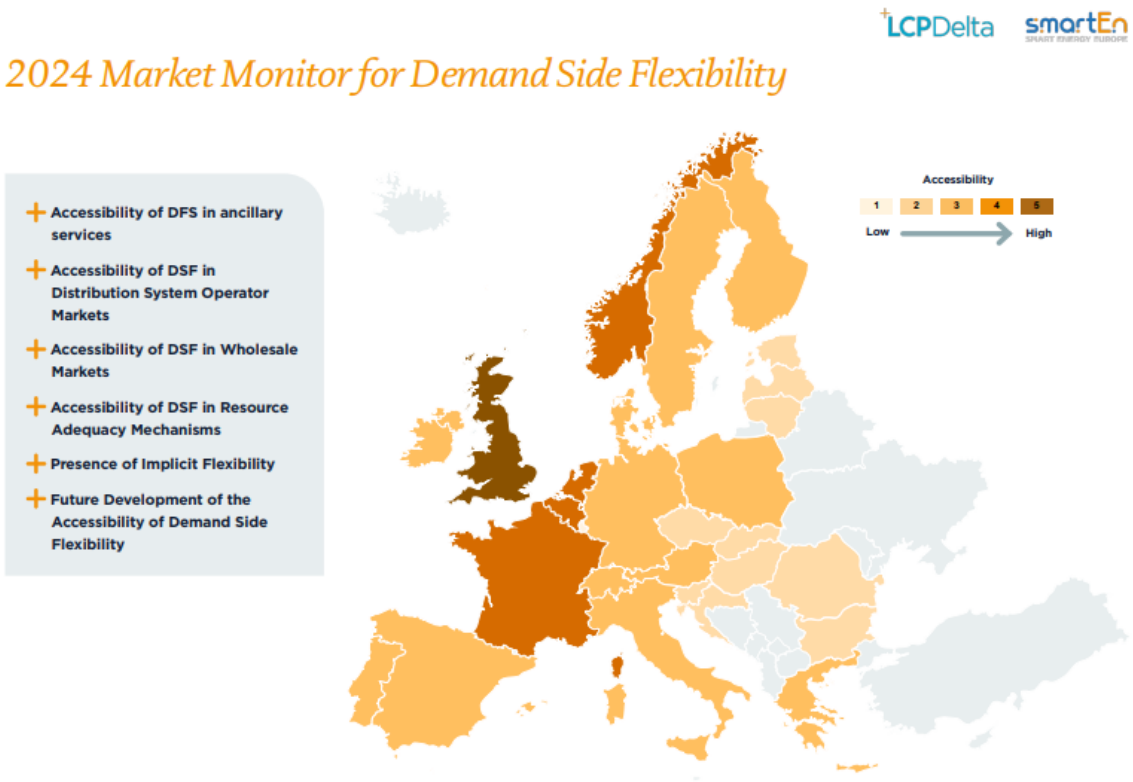
## Demand-side flexibility: the key to an affordable and competitive EU energy system

Consumers can actively adjust their electricity consumption, either by increasing or decreasing it in response to price signals that represent the energy mix and availability of electricity in wholesale markets or grid constraints. This makes DSF a powerful tool for system management. As renewable energy sources gain a larger share of the generation mix, DSF becomes essential not only for integrating variable generation but also for avoiding costly peak demand periods and mitigating grid congestion.

Notably as found in a smartEn study quantifying the benefits of demand-side flexibility (DSF) in the EU in 2030, DSF has the potential to reduce renewable energy curtailment by 15.5 TWh (61%) and save 37.5 million tonnes (8%) in GHG emissions annually. It can also help avoid at least 60 GW of peak generation capacity, saving €2.7 billion per year, and contribute to €11.1–29.1 billion per year in grid CAPEX investment savings. Moreover, consumers with flexible assets can

directly benefit by more than €71 billion per year, while all consumers stand to gain from reduced wholesale prices and system costs, amounting to over €300 billion annually.

### Mixed picture: progress and roadblocks in the European market




*smartEn & LCP Delta 2024 Market Monitor For Demand Side Flexibility.*

Despite its clear advantages, explicit DSF access into European energy markets remains fragmented and limited by diverse regulatory and technical barriers.

Explicit DSF involves market players, such as aggregators, actively offering flexibility services into organized energy markets, such as wholesale and ancillary services. In some regions, such as France, Great Britain and Sweden, there have been positive developments in integrating residential assets into ancillary services. However, broader market access – particularly for other sectors and types of flexibility – remains a challenge. Poland has emerged as an exception, overcoming some barriers by implementing an independent aggregator framework, allowing flexibility service providers to access different markets. This highlights the critical role that regulatory frameworks play in enabling DSF participation

In parallel, implicit DSF is gaining traction. Here, consumers adjust their energy consumption in response to price signals from wholesale markets. This approach is increasingly benefiting residential consumers, who can optimize their energy use based on real-time pricing. However, the effectiveness of implicit flexibility relies heavily on consumer awareness, access to real-time pricing information and the availability of smart meters and smart technologies that facilitate automated demand response. Some of the best performing countries, with the biggest offers of implicit DSF are Great

Britain, Spain, Belgium and the Nordics. The potential for DSF to contribute to grid stability and cost reductions is evident, yet the extent to which this potential is realized varies significantly across different national markets.

Local flexibility markets, which provide congestion relief to local grids, struggle to scale beyond pilot initiatives, with limited incentives for Distribution System Operators (DSOs) to procure flexibility services as alternatives to traditional network reinforcements. This lack of incentive structures continues to hinder the growth of local flexibility solutions, leaving them largely in the experimental phase rather than becoming fully integrated components of the broader energy system.

### Policymakers at a crossroads: will Europe seize the flexibility opportunity?

European institutions are increasingly prioritizing energy security, affordability and competitiveness, creating a momentum for policy reforms that support the expansion of DSF. The EU Electricity Market Reform is a key initiative that aims to facilitate greater access to flexibility markets and improve market structures to encourage DSF participation. Some countries are starting to reference DSF strategies into their National Energy and Climate Plans (NECPs), but progress remains limited, and many fall short in recognising its full potential for achieving climate goals.

With over €300 billion in potential annual system cost savings and significant emissions reductions, failing to act swiftly to integrate DSF into energy policy frameworks risks not only higher economic costs but also missed climate targets.

Despite these developments, the pace of regulatory change is still not keeping up with the urgency of the energy transition, and fragmented market rules continue to pose challenges for scalability.

### Breaking barriers: what's holding demand-side flexibility back?

While the benefits of DSF are well-documented, several persistent challenges must be addressed to fully unlock its potential. A lack of harmonized market rules remains one of the most significant obstacles for market participants to access different markets. With different national rules creating fragmentation that make it difficult for the Flexible Demand Management Industry to scale across multiple markets.

Consumer engagement is another crucial factor, as many consumers remain unaware of the opportunities presented by DSF or lack the necessary technology (e.g., smart meters to engage in implicit flexibility) to participate. For FSPs, the business case can also be challenging, since in most countries there are not enough revenue streams that allow stacking (i.e., accessing several markets simultaneously, like ancillary services and local flexibility markets), to ensure that their flexibility is used in an optimal way.

### The road ahead: how can Europe scale demand-side flexibility?

To accelerate DSF adoption and maximize its benefits, the priority must be the full and ambitious implementation of EU rules across all Member States. Over the past 2 EU legislatures, EU policymakers have established a comprehensive regulatory framework, embedding demand-side flexibility into six EU legislative files with around 70 provisions. These rules empower consumers – whether households, businesses, or industries – to consume, store and generate renewable electricity in a time-dependent way, responding dynamically to price signals and grid needs. However, despite this regulatory foundation, many Member States have yet to fully implement these provisions, delaying the realization of DSF's benefits.

The challenge now lies not in designing new policies but in ensuring swift and effective implementation of existing EU laws. Member States must translate these provisions into national frameworks that facilitate DSF participation in wholesale and ancillary service markets, ensure fair access to flexibility providers and incentivize active consumer participation. Without urgent action, Europe risks falling short of its decarbonization goals while burdening consumers and businesses with higher energy costs due to an inflexible and strained electricity system.

**A smarter, more flexible energy future is within reach**

As Europe transitions towards a more sustainable and electrified energy system, DSF will play a pivotal role in ensuring affordability, competitiveness, and reliability. While progress has been made, significant barriers remain, and addressing them will require decisive regulatory reforms, innovative market mechanisms, and proactive consumer engagement. With the potential to save billions annually and significantly reduce emissions, scaling DSF is not just beneficial but essential for Europe's energy future.

For more insights on how 30 European markets fare in regards to demand-side flexibility, check out the smartEn and LCP Delta 2024 Market Monitor for DSF.

**EM-Power Europe, and the parallel events Intersolar Europe, ees Europe and Power2Drive Europe, will take place from May 7–9, 2025 as part of The smarter E Europe, Europe's largest alliance of exhibitions for the energy industry, at Messe München.**

**Further information on this topic can be found at the following events and exhibitors:**

**EM-Power Europe / Intersolar / Power2Drive Conference**

Truly Smart Solar Prosumers: Managing Energy Bills & Supporting the Grid
Tuesday, May 6, 2025, 11:30am - 01:00pm
ICM München, Room 14B

Smart Electrification of Demand
Tuesday, May 6, 2025, 2:30pm - 04:00pm
ICM München, Room 13A

How to Best Leverage EV Flexibility with Smart and Bi-directional Charging?
Tuesday, May 6, 2025, 2:30pm - 04:00pm
ICM München, Room 13B

**The smarter E Forum**

Optimising Grids Through Demand-Side Flexibility
Thursday, May 8, 2025, 01:00pm – 02:00pm
Messe München, Hall B5, Booth B5.550

Turning energy flexibility into money
Friday, May 9, 2025, 12:00pm – 01:00pm
Messe München, Hall B5, Booth B5.550

HEMS and their pivotal role in modern energy management and grid stability
Friday, May 9, 2025, 1:30pm – 02:30pm
Messe München, Hall B5, Booth B5.550

**EM-Power Europe Exhibitors: www.em-power.eu/exhibitorlist**

**Product categories: Energy Management / Flexibility Management**

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