

Flexibility Markets: development and implementation

TSO-DSO Coordination:

The UK Case

Insight Paper

Energy Systems Catapult
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Preface

There are many developments around flexibility within the energy system, particularly around electricity network reinforcement avoidance and trading platforms. Moreover, flexibility has been instrumental in developing the Distribution System Operators (DSO) markets in the UK from the ground up. The UK Energy Networks Association (ENA)¹, through the Open Network project,² connected all the key stakeholders in the flexibility landscape to identify the fundamental principles of flexibility and has evolved over the years to a market-leading status within the UK. As of 2021 3 GW of contract or other tender flexibility were procured within the UK. A key focus in the years to come is the coordination or alignment of processes and procedures within DSO and Electricity System Operator (ESO)².

However, as identified by the Annex 9 Programme of Work (PoW), there are also significant gaps in this area that could hinder the participation of innovators in the flexibility markets and, at the same time, limit the procurement process for network companies. Through this insight paper, we have attempted to capture the views and insights from experts within the UK by developing a list of questions and conducting interviews based on them. Questions were compiled based on inputs from government and network stakeholders and were then communicated with national experts for their views. This paper aims to draw out the key takeaways from those interviews and surveys under five key topics identified by the participating experts in this area. In addition, it should be noted that the information herein represents insights from a range of experts. Therefore, they should potentially represent more or less essential elements for flexibility markets. Having said that, the insights should be seen as indicative and not a final or comprehensive set of requirements.

¹ Energy Networks Association (ENA), is the industry body representing the companies which operate the electricity wires, gas pipes and energy system in the UK and Ireland

² <https://www.energynetworks.org/newsroom/a-flexibility-first-approach-unlocking-capacity-opening-markets-powering-towards-net-zero>

An independent third party observer or rule setter can facilitate and enhance coordination between TSO, DSO and flexibility service providers

It has been identified that the current flexibility market does not have an entity to set the rules and resolve conflicts if they arise between different parties (ESO/DSO/Aggregators), which might cause conflict while setting the hierarchy in procuring flexibility services—eventually leading to potential risk. For example, service providers want to participate in balancing mechanisms and in the local flexibility market. To this end, in the UK, the BEIS and energy regulator Ofgem has opened a consultation to create an impartial Future System Operator (FSO) with responsibilities across the whole energy system³. It is envisaged that the independent operator will be a neutral market facilitator who will play a vital role in the coordination and cooperation between TSOs and DSOs. With the ongoing energy transition, new challenges, solutions, and recommendations are arising, and new areas of potential coordination also emerge. Among these, at least two are worth mentioning in the context of flexibility and system operation: (1) **The rules need to be laid out accessibly and transparent so that there is the opportunity for the industry to input and propose changes;** and (2) **The creation of a separate entity or whether this could fit into existing rules/frameworks need to be considered and within the context of the broader work on energy code reform.**

Standardized and coordinated control room operations and activities between ESO and DSO could facilitate increased participation in flexibility markets

Another coordination opportunity is linked to the procurement of flexibility services from distributed energy resources (DERs) connected at the edge of the distribution grid. A significant share of the new flexibility resources is expected to be from small-scale assets, such as solar PV, residential batteries, heat pumps or electric vehicles. It will thus be developed in low- and medium-voltage grids. It will be fundamental for a secure system operation to consider these new flexibility resources. Like traditional assets, these added resources could pre-qualify for global ancillary service markets managed by the corresponding ESO and present offers into those markets⁴. A key difference compared to traditional resources is that ESOs have little visibility on the impact of their activation because these assets are not located in transmission grids. For this reason, ESO must coordinate its real-time operation with DSOs to avoid the risk of lack of market participation and to enable a level playing field for all participants. An example use case for coordinated control room operation is presented in the proposal for the locational energy pricing⁵ in the GB power market to drive significant investment in generation, networks, and flexible energy resources.

³ <https://www.gov.uk/government/consultations/proposals-for-a-future-system-operator-role>

⁴ [https://www.nationalgrideso.com/industry-information/balancing-services/reserve-services/demand-turn#:~:text=The%20Demand%20Turn%20Up%20\(DTU,weekend%20afternoons%20in%20the%20summer.](https://www.nationalgrideso.com/industry-information/balancing-services/reserve-services/demand-turn#:~:text=The%20Demand%20Turn%20Up%20(DTU,weekend%20afternoons%20in%20the%20summer.)

⁵ <https://es.catapult.org.uk/report/locational-energy-pricing-in-the-gb-power-market/>

Standardised contracts and procurement timetable will enable aggregators to participate in DSO and ESO markets

Requirements for a unified settlement process in ESO and DSO markets and choice of standard contracts have been identified as a key opportunity to increase participation in both markets. This will avoid the potential risk of inhibiting the participation of aggregators or individual parties in both ESO/DSO markets. Work towards this with a faster, easier, and baseline methodology has been underway, starting with the Market-wide Half Hourly Settlement (MHHS) reforms by Ofgem⁶ - a move expected to bring more products and participation from customers in the flexibility market. Besides, the MHHS will open various new ways in which consumption can be shifted away from the system peak periods and incentivize customers to do so.

Ofgem estimates that MHHS could have significant benefits to customers and that savings up to £4.5bn by 2045 could be achieved under its high load shifting scenario⁶. More direct benefits include deferring network reinforcement to meet peak demand, reduced generation capacity with accurate forecasting and matching of supply and demand, and reductions in carbon emissions with lower demands are also perceived. In addition, incentivizing customers to match their HH demand with periods of high generation from renewables would also support their integration into the energy system. Although MHHS is a step towards standardized procurement and settlement process, there are more challenges yet to be covered like the following: (1) **Contract needs to be adjusted for the generational archetypes, or for the different demand archetypes based on the geography;** (2) **The settlement metering and operational metering need to line-up with a single standard;** (3) **A closer to real-time procurement is needed to avoid fewer assets willing to participate in ESO and DSO markets**

Alignment among process, principles, or other commercial aspects between TSO, DSO, and the market participants will facilitate a competitive flexibility market

The geographical distribution and ownership of assets and operations make procuring and participating in flexibility services more complex. ESO's interest is national, while DSO's regional role and aggregators are local. Besides, the ESO market is quite evolved, while DSO is only emerging, bringing uncertainties over the available committed assets. There are examples of government programmes, like the Smart Systems and Flexibility Plan in the UK⁷, mandating alignment between ESO and DSO process. These programs are envisaged to ensure that the process fits its purpose and serves customers' benefits. However, SME experts view that there is a lack of indication of *value*. If the perceived value is visible enough, the players can work out the process and make a transparent process afterwards. Besides the lack of indication over connection and access in terms of tariffs and banding, both Transmission Network Use of System charge (TNUoS) and Distribution Use of System charge (DUoS) make it difficult for people to understand how much money they could theoretically be

⁶ <https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/electricity-settlement-reform>

⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003778/smart-systems-and-flexibility-plan-2021.pdf

saving or generating by taking part in flexibility markets. For example, particularly for customers like a supermarket or a factory for whom energy is not their day job compared to a battery developer, the uncertainties over the process or commercial arrangements add a layer of complexity. These are the potential group of people who will have the most value for DSO markets and who will get the most out of them.

A minimum mandate is required to ensure the security of supply and accommodate potential non-dispatch or non-responsive flexible service providers from different customer bases

Flexibility first is the principle adopted in the UK to unlock capacity, open markets and for the faster transition towards Net-Zero by the ENA². However, it has been discussed that there needs to be some monitoring of what that is looking like across the different networks. The metrics or KPIs to quantify flexibility vs Capex and Opex to keep the security of supply needs to be streamlined. Advancements towards this direction are happening in the UK with the implementation of a standard evaluation methodology tool⁸ to make the right decision when evaluating flexible options versus traditional network reinforcement solutions. Even though there are processes and tools in place, potential risks are still there. For example, different parties operating in their interest and causing price variations between regions/market segments in their favour. To this end, the following recommendations are made to support the minimum mandate: (1) **Individual DSOs need to take the responsibility of forecasting the constraints and procuring the flexibility without relying on other DNO regions;** (2) **Security of supply should remain the responsibility of ESO;** and (3) **Both ESO and DSO should account to accommodate for potential non-dispatch or non-responsive flexible service providers.**

Defining the role and responsibilities of ESO and DSO ensure increased market participation of flexible service providers

Another area that requires clarity is the definition of the role of ESO and DSO as neutral market facilitators through the processes of procurement. This necessitates mutually exclusive settlement and dispatch events and brings the consensus that the market will be accessed jointly by ESO and DSO. However, there are currently different ESO and DSO standards to procure flexibility. Besides, as raised by many experts, ESO/DSO must consider the impact assessment of protected characteristics of customers while designing markets and procuring services. To this end, the Smart Systems and Flexibility Plan (SSFP) published by BEIS outlines the landscape of DSO and ESO within the UK. DSO and ESO are now independent business entities, and as such, a business entity should focus on its revenues. SSFP aims to bring out the context and mandates that too close commercial alignment between ESO and DSO is not good to have.

Nevertheless, it is something that is inevitable in future to some extent. The Open Networks projects have thus outlined the roles they see each entity would play in the flexibility landscape, which are (1) **ESO market being quite evolved will continue to operate as a functioning market with specific product requirements;** (2) **DSO's role is to ensure that the flexibility**

⁸ <https://www.energynetworks.org/newsroom/ena-standardises-approach-to-flexibility-for-gb-distribution-network-operators>

is valued and signposted accurately; and (3) Suppliers take an active role in the delivery of signals to enable flexibility markets (e.g., Dynamic pricing signals). However, experts view enhanced visibility of information, standards, and procurement timetables as more critical for flexibility service providers than defining roles and responsibilities.

Conclusions

The following conclusions can be drawn from this analysis especially from the UK flexibility market point of view.

- Significant advancements in policies, procedures, platforms, and infrastructure are needed to achieve a coherent TSO-DSO coordination
- More attention has to be given on generating know-how of technological and institutional transformation of energy systems to enable whole system flexible markets
- New business models are at least as important as technological development to support the uptake of local distributed energy resources
- There is an urgent need for more accurate standards and contracts to be placed for both ESO and DSO markets