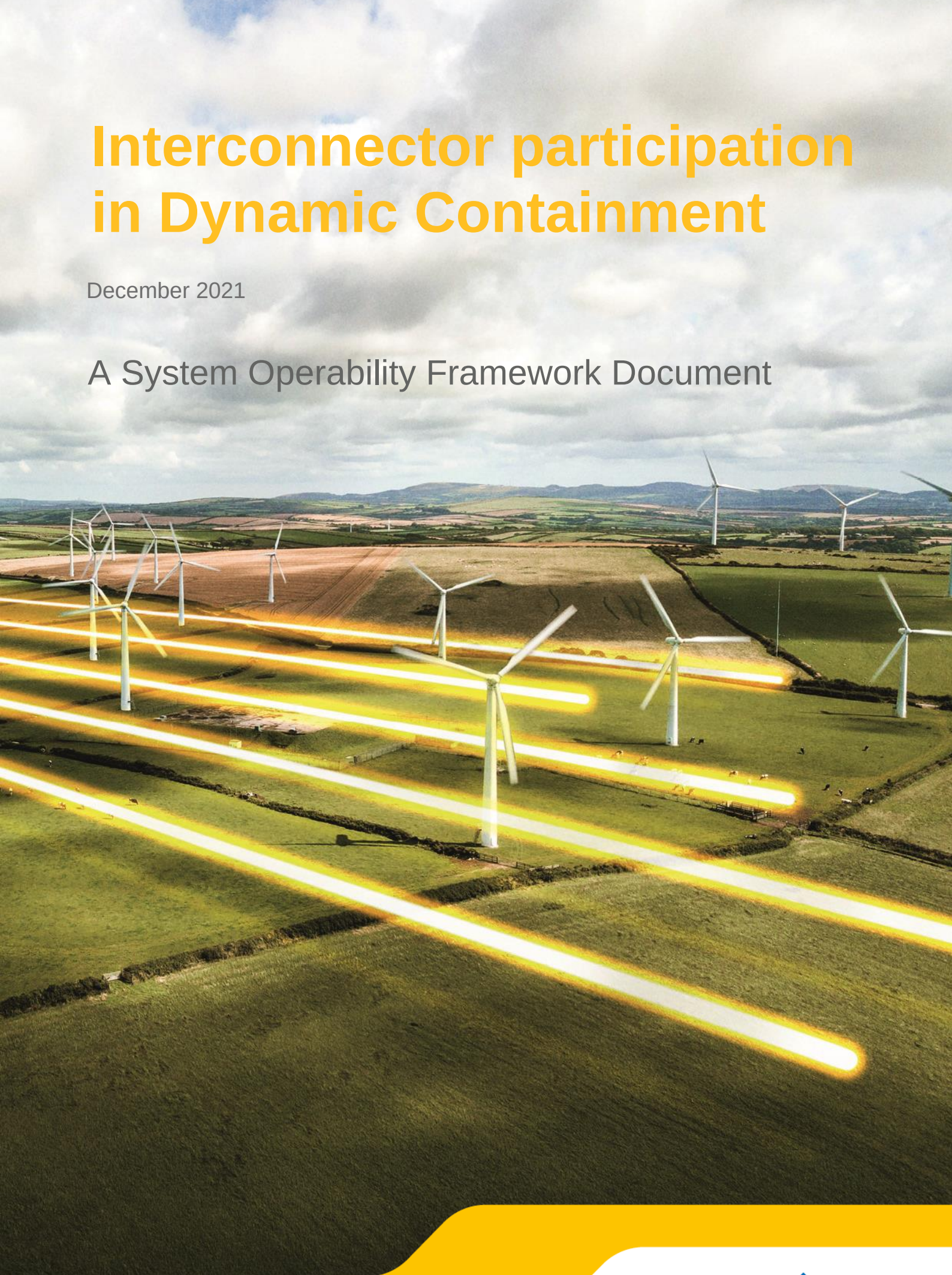
# Interconnector participation in Dynamic Containment

December 2021

## A System Operability Framework Document



nationalgridESO

nationalgridESO

# Table of Contents

nationalgridESO

nationalgridESO

# Background

Since the launch of Dynamic Containment in 2020 we have been engaging with interconnector owners and operators to understand how they perceive the service and how they may participate.

In the BEIS Smart Systems and Flexibility Plan (July 2021) the ESO was instructed to identify the barriers to interconnector participation in the Dynamic Containment market and mitigating actions to reduce those barriers.

By 2025 interconnectors will become a key source of flexibility and will constitute a significant portion of the overall generation mix. Accessing flexibility and ancillary services on interconnectors will become key for operability and also as an important pillar in our ambition for competition everywhere.

This report looks at five of the challenges faced by interconnectors when participating in Dynamic Containment and introduces possible mitigating actions.

From BEIS Smart Systems and Flexibility Plan:

*The government and Ofgem will support the work of the ESO, during Summer 2021, to identify the barriers to interconnector participation in the Dynamic Containment market, and other ancillary and balancing markets. We expect that potential mitigating actions to reducing barriers where such measures are thought to enhance overall value for consumers – will be shared in the ESO's next operability report, at the end of the year.*

**Removing barriers to flexibility on the grid: electricity storage and interconnection**

*Action 2.10*

*The ESO will aim to create balancing services markets that meet our changing system needs, and in which all technology types can compete on a level playing field. The ESO will identify the barriers to entry for the Dynamic Containment market for interconnectors and will work with industry to remove barriers by the end of 2023.*

# Specific challenges

## 1. Firmness

**Challenge**
Interconnectors may not be able to reserve capacity for firm provision of ancillary services. However Dynamic Containment (and other services) require the provider to guarantee firm capacity. Interconnectors do not get to choose their operating profile, unlike a merchant battery that can decide which markets to participate in and what level to operate at.

**Possible mitigation**
The ESO's procurement approach would need to change to accommodate this inability to guarantee capacity & firmness. Some of the things we may need to do, in isolation or in combination;

- Move the timing of the procurement event closer to real-time to improve certainty on capacity & availability
- Allow more granular bidding, i.e. hourly rather than EFA block
- Allow interconnectors to bid in on 'non-firm' basis, with firmness (or not) confirmed once the available capacity is known (possibly ~1hr before delivery)
- Change the payment structure to reflect the difference in value (to the ESO) of firm vs non-firm provision

The alternative to some of these options is for interconnectors to withhold capacity from the day-ahead exchange process. The ESO and stakeholders would need to demonstrate that the cross-border capacity offers better net social welfare when reserved for balancing services (like dynamic containment) compared to energy exchange. Under the Trade and Cooperation Agreement (TCA), EU and GB TSOs must define the detail for post-Brexit Capacity Calculation processes. This task will formally start upon the approval of the Specialised Committed (European Commission and BEIS).

## 2. Frequency exchange rules

**Challenge**
An interconnector delivering dynamic containment at one end will see an approximately equal and opposite change in power at the other end. This impacts the neighbouring TSO (and other TSOs in the same synchronous area), their control area and potentially their system frequency and use of response and reserve services.

Both TSOs, and NGESO in particular as buyer of the DC service, will want to know what can happen if there is simultaneous low/high frequency at each end of the cable. The LFSM-O service requires delivery from 50.4Hz, thus there is already an overlap with DC-HF which requires full delivery by 50.5Hz.

| Synchronous area | LFSM-U threshold | LFSM-O threshold |
|---|---|---|
| Continental Europe | 49.8 Hz | 50.2 Hz |
| Nordic | 49.5 Hz | 50.5 Hz |
| Great Britain | 49.5 Hz | 50.4 Hz |
| Ireland | 49.5 Hz | 50.2 Hz |
| Baltic | 49.8 Hz | 50.2 Hz |

**Possible mitigation**
Providing and receiving TSOs will need comfort and clear rules that can be relied upon to understand how frequency exchange services will behave when one, or both synchronous areas are experiencing frequency disturbance events. Under the TCA, once the Specialised Committed as issued formal direction, EU and GB TSOs will consider additional balancing timescales services, including frequency services.

## 3. Deadband

**Challenge**
The delivery profile of Dynamic Containment includes a ‘knee-point’ at 0.2Hz deviation. This creates two stages of delivery;

- Stage 0 deadband between +/- 0.015Hz
- Stage 1 between 0.015Hz – 0.2Hz
- Stage 2 between 0.2Hz – 0.5Hz

The first stage offers little in terms of frequency control, only 5% of delivery is required by 0.2Hz. It exists for two reasons:

- Compliance with the System Operation Guideline (SOGL) Article 155 on maximum allowable deadband (+/-0.015Hz for GB)
- To give ESO visibility on the real-time availability and performance of DC providers

Requiring delivery in the first stage may be infeasible for interconnectors, due to the increase in controller logic complexity, the very small amounts of required power delivery and system conditions in the providing TSO control area interacting with cable losses. It would also mean that frequency exchange (between TSO areas) occurs much more frequently than is necessary.

**Possible mitigation**
We already know from existing Dynamic Containment providers that it is challenging to meet the performance monitoring limits in the first stage. As the first stage is not part of our frequency control it seems reasonable to consider if this element of delivery could be flexed to allow greater participation. The first stage of DC delivery provides very little benefit for frequency control (with the benefits being mainly about visibility and compliance) and if applied to interconnectors would mean that power is exchanged between TSO control areas far more of the time than if delivery were only to occur in the second stage (>0.2Hz deviation).

Investigation is needed to understand if it is possible to relax (or remove) the requirement for delivery between 0.015Hz and 0.2Hz deviation. This includes assessing the wider operational impact as a result of this change.

## 4. Energy

**Challenge**
Providers of Dynamic Containment are paid only availability and nothing for the energy that they deliver. This approach can work for domestic assets as they can include any energy costs in their availability fee (if they wish) and avoid imbalance via the settlement route available in GB.

A service across an interconnector would likely be considered a frequency exchange service and several stakeholders have raised concerns that the existing settlement approach would mean that the receiving TSO gets the energy component for free and that the providing TSO/consumer is not compensated properly.

**Possible mitigation**
Dynamic Containment is rarely activated and typically delivers a very small volume of energy, however this still requires rules and processes agreed between the two TSOs and the facilitating interconnector. An ENTSO-E working group (Inter-Synchronous Area SG) exists and can consider this problem. It is likely that this group would therefore also look into how the providing TSO would need to compensate/adjust its own frequency containment reserves. Under the TCA, the future interaction and cooperation between ENTSO-E working groups and UK TSOs, will be under a joint Working Arrangements agreement; this also must be approved by the Specialised Committee.

## 5. Service rules vs. harmonisation & standardisation

**Challenge**
The four issues described above may all require modifications or derogations from the existing Dynamic Containment terms and conditions if interconnectors are to participate. The existing rules lack the flexibility in key areas to allow the participation of interconnectors.

- Procurement and firmness of capacity
- Conflict with other services
- Delivery in the deadband
- Settlement of energy

**Possible mitigation**
We could investigate creating a sub-set of rules that are applicable only for interconnectors. However, this approach would be a step away from our ESO strategy of 'standardisation' and it would create a division in our market which may have unintended consequences.

The ‘sub-set’ approach could be used as a template for the inclusion of other technology types that so far have failed to access dynamic containment. For example, demand side response which can struggle with forecasting and following a baseline at 1hr notice

An alternative is a single set of service rules that would allow participation on the same basis from a range of technology types. This may sound preferable considering our strategy (standardisation) but probably does not reflect the real and fundamental differences between provider types. Changes to terms and conditions may dilute the effectiveness of the service or introduce additional risk for the ESO.

# Conclusion

The ESO will continue to work with stakeholders to investigate these and other blockers to participation.

We will look to move forward with planning for a trial delivery of Dynamic Containment over interconnectors in 2022. The trial will aim to prove the technical capability of interconnectors to deliver dynamic frequency response to the quality standards required for Dynamic Containment. It will also aim to further clarify the precise detail of the blockers listed above.

Faraday House, Warwick Technology Park,
Gallows Hill, Warwick, CV346DA

**nationalgrideso.com**

nationalgridESO