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MULTI-PURPOSE INTERCONNECTORS: ENABLING THE TRANSMISSION OF CLEAN ENERGY IN THE UK

— THOUGHT LEADERSHIP

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As the UK strives towards its ambitious target of 50GW of offshore wind capacity by 2030, large-scale investment will be required in the offshore wind industry. It is increasingly clear that point-to-point connections between offshore wind farms and the grid will not be efficient for an expansion of this magnitude. Coupled with a realisation that the plentiful supply of renewable energy within the North Sea will be a crucial part of many European countries' clean energy strategies, there is now an increased focus, both within the UK and elsewhere, on offshore co-ordination of energy transmission and rationalisation of the connection framework.

To help address these issues, the Department for Business, Energy and Industrial Strategy (BEIS) and UK energy regulator, Ofgem, have recently issued consultation responses setting out their proposals on the regulatory framework for multi-purpose interconnectors (MPIs). MPIs are assets that combine the transmission of electricity generated by (and direct connection to) offshore wind farms with cross-border interconnection between the power grids of nearby countries.

At the EU level, there is no specific legal or regulatory framework addressing the development of MPIs. Nevertheless, both the European Commission and the European Network of Transmission System Operators for Electricity (ENTSO-E) in various studies have highlighted that multi-purpose projects (such as transmission of power from offshore wind and cross-border interconnectors) can facilitate the evolution of offshore transmission infrastructure. They are also an essential first step towards the eventual construction of more complex 'meshed' grid structures, which could allow clusters of offshore wind farms to be connected to offshore hubs that connect to each other and then to various onshore terminals.[1]

What are the benefits of MPIs?

Currently, offshore wind farms and interconnectors operate as standalone assets. However, MPIs can play an important role in the co-ordination of transmission infrastructure, by combining the functions of those assets and thereby reducing the number of landfall points required for grid connection. This will minimise disruption for communities by the coastline, whilst also reducing the overall planning and land rights burden for developers.

MPIs enable transmission infrastructure to be used more efficiently. There is often significant unused capacity in offshore wind transmission cables (typically around 50%), as the cable is sized to match the maximum capacity of the offshore wind farm, whilst the offshore wind farm's load factor is reduced when conditions are not windy. MPIs would enable this excess capacity to be used to trade power between markets in nearby countries, thereby allowing efficient use of the infrastructure. High-voltage direct current (HVDC) technology can be utilised to transmit the energy generated over very large distances with little transmission loss and reduce the likelihood of curtailment by transmitting the power to the area where it is needed most.

1 European Commission, Directorate-General for Energy, Antoine, O., Papangelis, L., Michels Alfaro, S., et al., **Technical requirements for connection to HVDC grids in the North Sea**, Publications Office, 2020; ENTSO-E, **Third ENTSO-E position paper on Offshore Development on interoperability** (January 2021).

There are clear cost benefits to such synergies, as there is an overall reduction in the amount of cable required in comparison with point-to-point offshore wind farms connections with side-by-side interconnection. In a market where cable prices are high and manufacturing slots are in short supply, this has significant advantages. Lower operational costs could also be expected.

There are also significant environmental benefits to a reduction in the amount of cable manufactured and laid along the seabed. With the proliferation of offshore wind farms, it is vital to ensure that every effort is made to limit damage to coastal ecosystems and biodiversity, therefore a co-ordinated approach, combining and rationalising transmission assets and connections, will be important to minimise the impact of such large-scale expansion of development.

Regulatory activities

To facilitate the development of MPIs, BEIS and Ofgem have separately sought feedback from interested parties regarding the regulatory framework for MPIs. The consultation forms part of the broader Offshore Transmission Network Review (OTNR), which aims to evaluate the way that the offshore transmission network is designed and delivered. Ofgem and BEIS's responses to such consultations recognise that the existing legal and regulatory framework requires further development in order to encourage early adopters of MPI projects and to create an enduring regime.

Ofgem's consultation primarily focuses on the incremental changes required to the existing regime in order to facilitate MPI development in the near term, whilst the BEIS consultation also explores legislative changes to create an enduring regime post-2030 – including by introducing a new licensable activity into the Electricity Act 1989 for the operation of an MPI, when parliamentary time allows.

Ofgem will run a pilot 'cap and floor' application MPI framework in mid-2022, which will apply to the interconnector asset of the MPI. The pilot is supported by BEIS and will allow MPI developers to benefit from a bespoke process, distinct from the assessment of point-to-point interconnectors. The results of the pilot, and potentially other early adopter projects, will be used to shape the enduring regime.

What are the challenges?

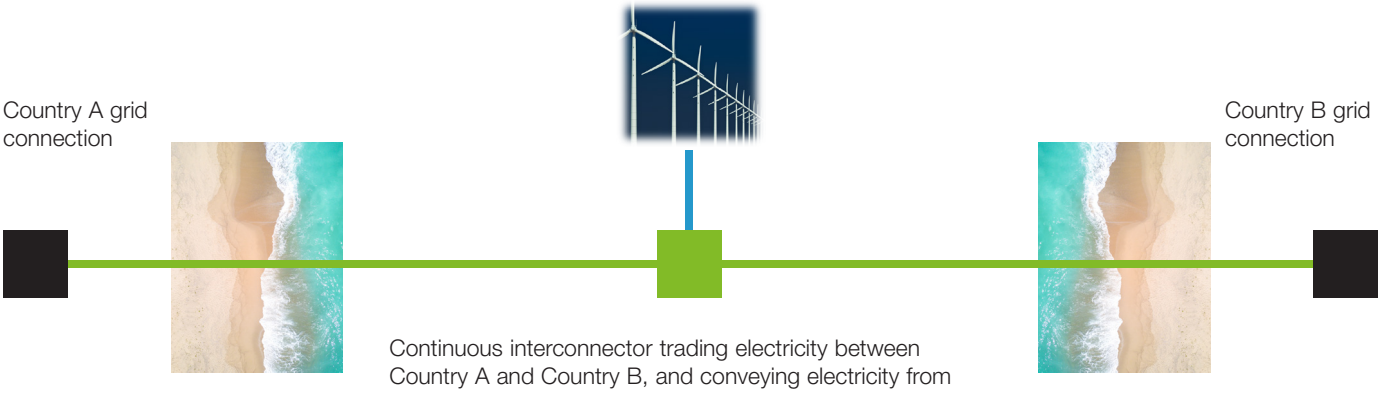
The various consultations have highlighted key challenges with the existing regime which need to be addressed to maximise the potential of MPIs and provide the clarity required to encourage investment in this evolving area. In particular:

Asset classification: There is some uncertainty regarding how an MPI would be classified under the current regime. Ofgem discusses two approaches:

- an Offshore Transmission Owner (OFTO)-led model, which combines a radial connection between the UK grid and an offshore wind farm, with a further connection between that offshore wind farm and the grid or offshore wind farm of a nearby country; and
- an interconnector-led model, in which a point-to-point cross border interconnector also includes a direct connection to an offshore wind farm (which can use that connection to access both markets).

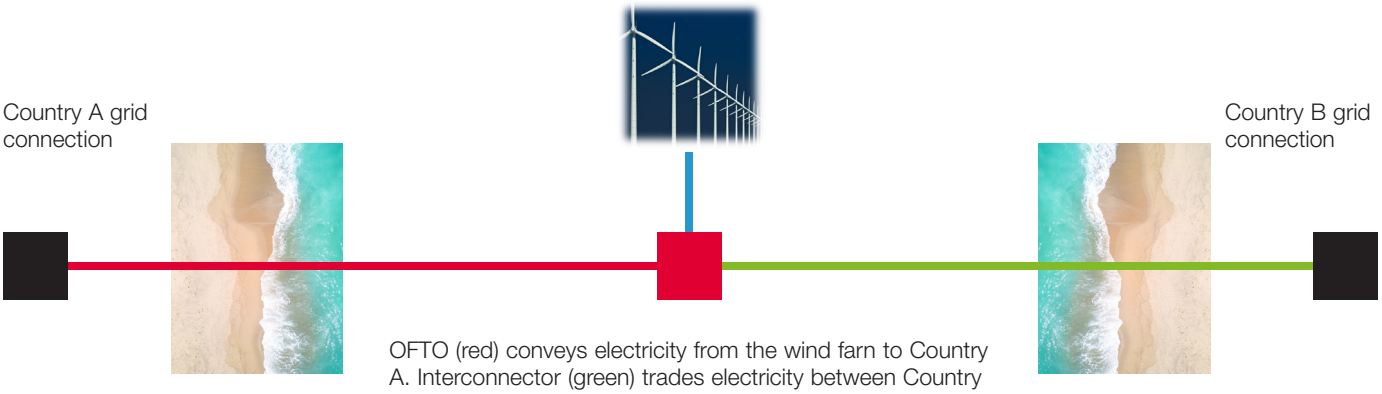
The Ofgem pilot focuses on interconnector-led applicants; however, their minded-to decision (which represents the provisional conclusions of their consultation) retains the flexibility to allow applications from both OFTO-led and interconnector-led projects. Ofgem outlines some guidance regarding asset classification, which suggests using the cable capacity and offshore wind farm load factor to assess whether the MPI should be classified as an interconnector or not. To the extent that the cable is sized to match the capacity of the offshore wind farm and the average load factor is below 50%, Ofgem suggests that there is a strong argument that interconnection is the primary use of the MPI asset, as the average capacity available for cross-border trade would exceed 50%. To the extent that the classification of an asset changes from the activity for which the licence was granted, Ofgem will consider each occurrence on a case-by-case basis – to avoid penalising early adopters whilst upholding duties to enforce the licencing regime.

Interconnector-led Model



Continuous interconnector trading electricity between Country A and Country B, and conveying electricity from the wind farm to both Country A and Country B

OFTO-led Model



OFTO (red) conveys electricity from the wind farn to Country A. Interconnector (green) trades electricity between Country A (from the end of the OFTO) and Country B and conveys electricity from the wind farm to Country B

Licencing regimes: The standard interconnector and OFTO licence conditions are not suitable for MPIs in their current form and require modifications to address a number of matters, including:

- **Priority access:** it is likely that the offshore wind farm would have an expectation of priority access, with residual capacity offered to others;
- **Payment arrangements:** between interconnector and wind farm to determine the charge to the wind farm for types of costs that Transmission Network Use of System (TNUoS) charges would cover;
- **Flexibility:** during commissioning of the wind farm and trial operations when the co-operation of the interconnector will be necessary;
- **Outage planning:** for maintenance and its co-ordination between the interconnector and wind farm; and
- **Revenue:** how the asset would be economically regulated, including with respect to the availability of incentives and penalties.

Interaction with Contracts for Difference (CfD) regime: Similarly, for interconnector-led projects, there is a concern that an offshore wind farm connecting via the MPI would breach the terms of any CfD award it holds. The standard CfD conditions require the holder to connect to a 'transmission licensee' and it is currently not possible for the holder of an interconnector licence to also hold an offshore transmission licence. BEIS has acknowledged the need for future legislation regarding MPIs to align with Ofgem's cap and floor mechanism, CfD and other policy schemes and is considering this issue further, in co-operation with Ofgem.

MPI ownership: Both within the UK and the EU, ownership unbundling requirements operate to prevent ownership or control of connected transmission and generation assets by the same entities. As such, within the current regime, the offshore wind farm component of the MPI could not be owned or controlled by the same entity as the interconnector/OFTO component, and each would be required to hold its own licence. This may not be an insurmountable barrier to development of MPIs in the near term; however, it adds complexity to the management of risks during construction and development, and could potentially limit the number of parties who can invest in MPI projects. Whilst legislative changes may be forthcoming to facilitate such projects in the future, there is no current plan to change the legal framework and so projects developed under the pilot scheme (and any other near-term projects) will be expected to comply with unbundling requirements.

Market arrangements: By their nature, MPIs particularly lend themselves to cross-border projects and therefore it is important to ensure compatibility with the regimes of neighbouring countries – both within the EU and outside. Key considerations include:

- **Capacity calculation:** Article 16(8)27 of the EU's Electricity Regulation requires a minimum of 70% interconnection capacity to be available for cross-zonal trade. Whilst this requirement has been removed in UK domestic legislation, there are minimum availability requirements under the Ofgem's cap and floor mechanism. This could represent significant curtailment to offshore wind farms connected via MPIs, as capacity that could be allocated to the offshore wind farm needs to be reserved for interconnection. Such curtailment could lead to the perverse consequence of requiring more onshore (possibly fossil-based) capacity to be brought online to compensate. Whilst it might be possible to re-size the cable to cater for this issue, this would be inefficient and would likely have cost implications that could deter investment.
- **Market Design:** Further clarity on the market arrangements appliable to MPIs is needed. The consultations consider both:

- **the Home Model (HM)**, where the offshore wind farm is considered part of its home market and generation is priced on the same basis as electricity in its home bidding zone; and
- **the Offshore Bidding Zone Model (OBZM)**, where a separate bidding zone is introduced for the offshore wind farms(s) and the electricity price is set at the level of the connected zone where transmission capacity is available, i.e. the offshore wind farm would receive the same price as the zone exporting electricity to the home market, if the home market is importing, rather than the price in the home market. This is in contrast to the HM above, which would see the offshore wind farm receiving the higher home market price.

The advantages of the OBZM have been noted by the EC and ENTSO-E, particularly in addressing compatibility with EU electricity trading rules and the 70% capacity requirement outlined above, as capacity sent to either connected market would be considered as cross-zonal capacity. Whilst the development of an OZBM may have advantages, there are concerns as to offshore wind revenues, how quickly the regime could be readied for MPIs, and if there are any new procedures that require development. BEIS notes that the HM and OBZM can co-exist and should not be seen as mutually exclusive, however, it recognises that compatibility is essential. BEIS confirms its commitment to the Trade and Co-operation Agreement which governs cross-border electricity trading between the EU and UK and will, alongside Ofgem, undertake to work closely with the European Commission, relevant regulatory bodies and industry participants to explore solutions in this area.

MPIs represent an exciting innovation to help rationalise and expand the offshore grid in the manner required to meet the government target of 50GW of offshore wind capacity by 2030. Whilst the early focus from Ofgem and BEIS has been the combination of offshore wind with interconnection, the application has the potential to be much broader, combining interconnection with pumped hydro, battery storage and offshore consumption (for example, hydrogen production) on green energy islands. With further ESO involvement in the planning and strategic placement of MPIs, it could even be the first step in the development of a meshed offshore grid, to improve efficiency of power supply and grid stability throughout Europe.

There is a clearly a balance to be struck between allowing developers the flexibility to innovate and providing the legal and regulatory certainty required to encourage investment in such pathfinder projects. There is much work still to be done, and it is unclear whether the interim steps taken will be sufficient to provide the certainty required for non-TSO developers in the near term, however, the Ofgem and BEIS responses do provide a welcome step in the right direction and a sign that there is a strong focus on facilitating this novel asset class.

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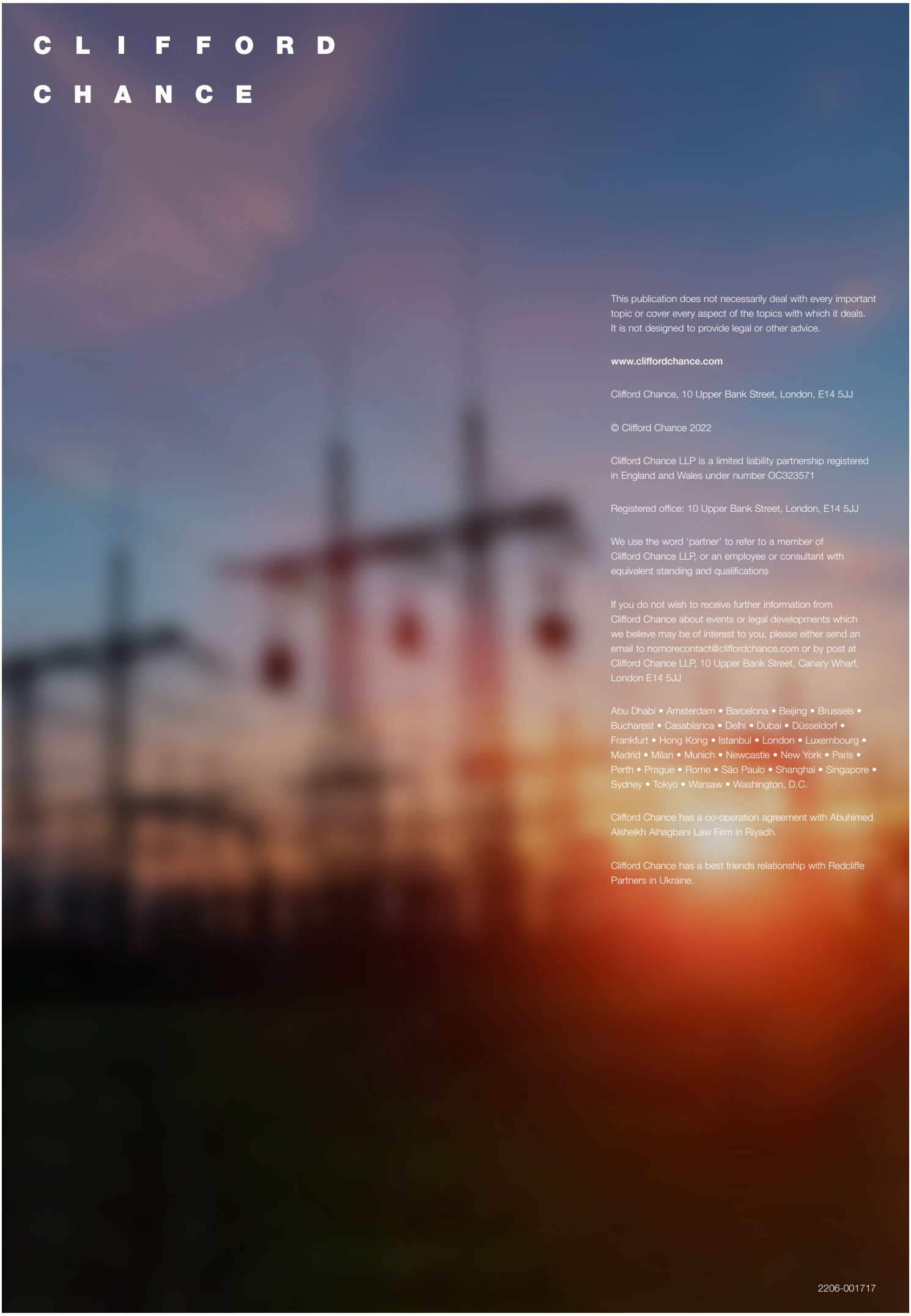

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