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Review of Electricity Market Arrangements in the UK

Silke Goldberg,
Partner, Herbert Smith Freehills
Associate Professor II, University of Oslo
M: +44 7809200255
Email: Silke.Goldberg@hsf.com

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1. Introduction

Introduction

- 18 July > 10 October 2022 UK ran a **wide-ranging consultation** on options for all non-retail electricity markets in Great Britain: wholesale market, balancing mechanism and ancillary services
- Government response expected: **late 2022**
- Any resulting reforms subject to specific consultations
- May bring changes that **go well beyond anything seen** since the 2001 introduction of the New Electricity Trading Arrangements (NETA)

2. New Market Realities – New Market Design?

New Market Realities – New Market Design?

- **Review of the electricity market arrangements (REMA)** comes amidst:
 - Ambition for transition to a cleaner energy system
 - Soaring energy costs
 - Need to ensure security of supply by reducing the UK's exposure to volatile global markets, accelerated by Russia's invasion of Ukraine
- New UK Government policies and turmoil brought new background:
 - Existing Energy Security Bill on hold (provisions moved into other Bills?)
 - New Energy Prices Bill – which might partially achieve some REMA aims
 - Chris Skidmore MP review to ensure 2050 Net Zero target met in most economically efficient way
 - New energy supply taskforce

New Market Realities – New Market Design?

- Current wholesale market arrangements introduced in 2001, when the electricity market was opened to bilateral trading
- Most recent review: Electricity Market Reform (**EMR**) 2013 aimed to:
 - i) bring forward more low carbon generation investment with
 - ii) new 'on-demand' generation capacity to maintain security of supply via new Contracts for Difference (CfD) and Capacity Market regimes respectively
- At the time of the 2001 reforms, about 2.5% of the UK's electricity was from renewables
- By 2021 the figure was just under 40%
- This is set to increase rapidly as the UK seeks to meet its commitment to decarbonise the power system by 2035
- REMA proposals are set to change the current market design to reflect a radically different market

3. Revolutionary or incremental?

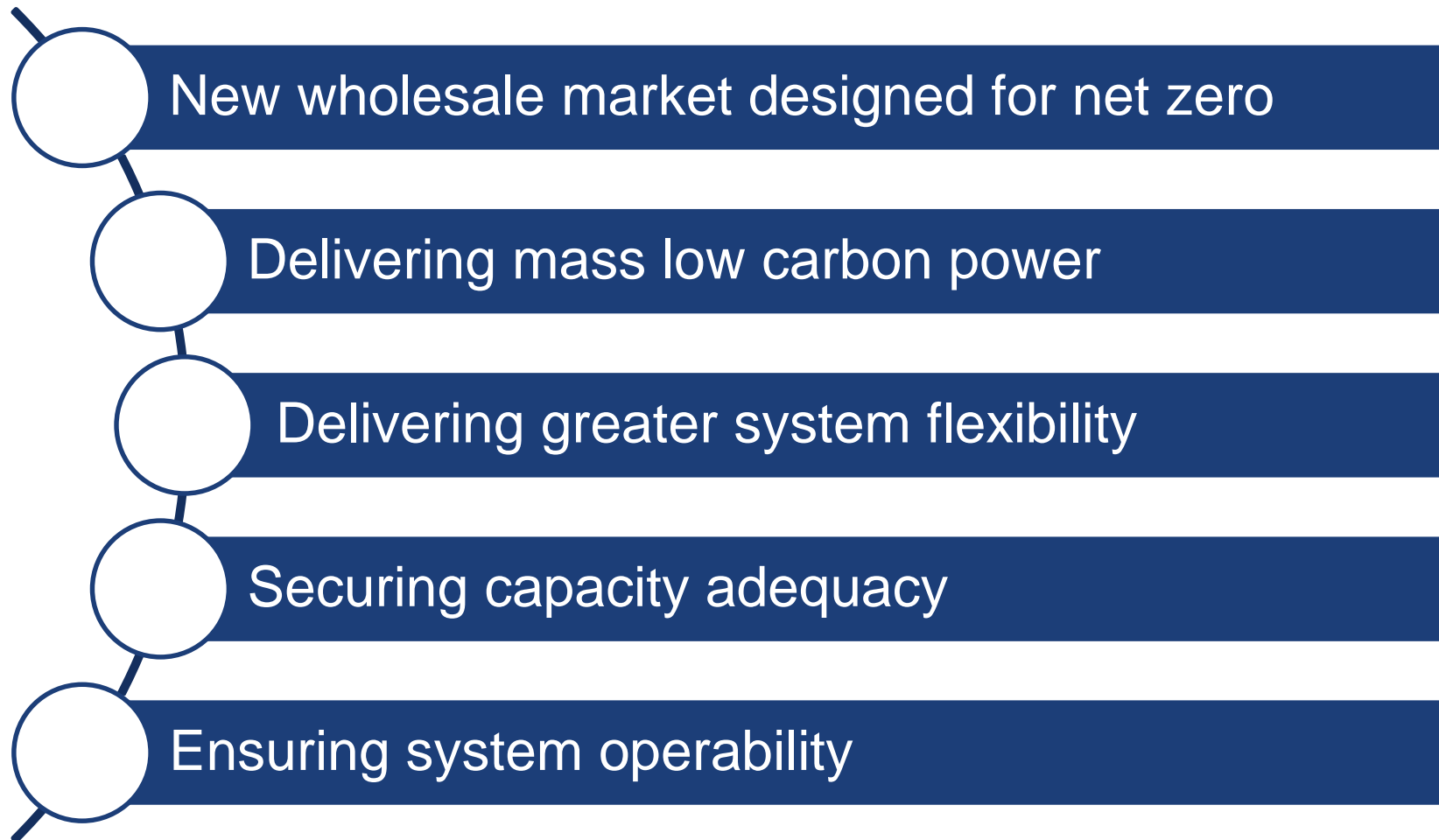
Revolutionary or incremental?

Here is an upfront taster of some of the most revolutionary proposals:

- Splitting the wholesale market into a separate new market for 'as available' power to run alongside an 'on-demand' power market (the latter operating in the same way as the current integrated market)
- Bringing in locational pricing, either zonal or nodal
- A supplier obligation to procure low carbon electricity to replace CfDs (and provide wider incentives) with a decentralised approach
- Equivalent Firm Power Auction consolidating the support of Capacity Market and CfDs

4. Objectives of REMA

Objectives of REMA



5. New wholesale market designed for net zero

New wholesale market designed for net zero

Current challenges

- **Generation with the highest marginal costs currently set prices for the whole market** - As gas generation currently provides the 'on-demand' flexibility this often means prices being set in line with gas prices which reflect the marginal costs of such generation, but have little relation to actual system costs
- **Price cannibalisation** - as capital costs become an increasing proportion of system costs, a pricing system based on marginal costs ceases to be fit for purpose. For example, with rise of renewables, there will be times when marginal costs of renewables set wholesale prices, meaning they could fall to zero or negative

New wholesale market designed for net zero

Current challenges

- **Lack of investment signals for low carbon flexibility** - Rise in renewables means less time for 'on-demand' generation to recoup costs, which does not incentivise development of new technologies, such as storage and demand side response. The Government is keen to avoid significant increase in Capacity Market (or its successor) costs following reforms
- **Lack of sufficiently granular temporal or locational price signals** - Needed to encourage new flexible generation and response in the most appropriate locations on the network to meet demand and reduce system costs

New wholesale market designed for net zero

Current challenges

- **Limited visibility of generation and demand at the distribution level** - The increasing amount of generation going straight into the distribution network, as well as behind-the-meter generation, has not been matched with greater coordination between the distribution networks and the System Operator

New wholesale market designed for net zero

Policy proposals

- **Splitting the market into a separate new market for 'as available' power to run alongside an 'on-demand' power market (the latter market continuing as now)** - The 'as available' market would set prices based on long term average costs (ie taking into account capital as well as marginal costs). Not clear at present how would that be achieved

New wholesale market designed for net zero

Policy proposals

Advantages:

- **Reducing price volatility and price cannibalisation** by encouraging investment in renewables. The change would embed what CfDs do currently, eliminating the need for future CfD rounds
- **Better demand response – Consumers who can flex their demand could buy a higher proportion of their electricity from the 'as available' market.** The consultation notes that much of the benefits of incentivising such consumer responses will be delivered by the half-hourly settlement for consumers through the implementation of the Market-wide Half Hourly Settlement (MHHS) programme. A less fundamental variant would be for the System Operator to manage a pool for renewable power operating voluntarily alongside the existing wholesale market: in effect, a centrally co-ordinated power purchase agreement market

New wholesale market designed for net zero

Policy proposals

- **Bringing in locational pricing, either zonal or nodal** - Locational pricing would enable wholesale prices to reflect local conditions in real time, potentially both for demand and supply
 - *Nodal pricing (or 'locational marginal pricing')* - The wholesale price in each relevant location (the 'node') reflects the costs of physical constraints (capacity and losses) and is usually achieved using central dispatch to manage the complexity of balancing across many nodes
 - *Zonal pricing* - The network is divided into clearly defined zones which each have a single price so that the costs of physical constraints as between zones is reflected, but constraints within the zone are ignored. If a supplier buys electricity that is generated in a different zone than the electricity is supplied, then the supplier will pay the difference (reflecting the costs of physical constraints as between zones)

New wholesale market designed for net zero

Policy proposals

- However, benefits of locational pricing **could be reduced in the real world**, eg due to the fact that the location of a lot of planned renewables is dictated to a high degree by where generation is best (the most windy or sunny)
- **Zonal pricing would be simpler than nodal pricing to transition to** from the current market design, and so less risk of disrupting market participants and delaying investments
- As **nodal pricing** is not a model being targeted by the EU, its adoption by the GB market **would negatively impact GB/EU electricity trading**

New wholesale market designed for net zero

Policy proposals

- **Reorienting the market towards the distribution networks**
 - Seeks feedback on three theoretical approaches:
 1. Separate market (pool, balancing, and ancillary services) at each connection between the transmission and distribution networks, overseen by distribution network operators (DNOs). DNOs would be responsible for balancing the local market and ensuring its operability (they could procure from either other local markets or the national wholesale market). The national wholesale market would continue to exist.
Voluntary participation

New wholesale market designed for net zero

Policy proposals

2. Smart Energy Service Providers run local markets in which the local distribution networks, consumers, storage owners and distributed generators participate. All trades go through the Service Provider, which supervises the operation of the local market and acts as an aggregator, able to participate in (national) wholesale markets. Broader wholesale market mechanisms remain. Voluntary participation
3. The network would be divided into local 'zones' at each grid supply point (or potentially at a more granular level) and suppliers would face charges if there were both an imbalance and a constraint between the location of their consumers' demand and their generators' supply. This should incentivise suppliers to source power locally rather than nationally

New wholesale market designed for net zero

Policy proposals

- **Moving to pay-as-bid rather than pay-as-clear pricing -**
The wholesale market would pay the price bid by each accepted bidder rather than all accepted bidders receiving the highest price paid for any accepted bid. To avoid gaming, limits would need to be put on the prices that generators of particular types could bid, eg average costs
- **Evolving the status quo with incremental reforms – eg** changes to dispatch arrangements from self-despatch to central dispatch (dispatch controlled by the System Operator), changes to settlement periods and gate closures to increase the granularity of market responses (eg via the MHHS programme) and changes to the Balancing Mechanism (eg improved locational signals))

6. Delivering mass low carbon power

Delivering mass low carbon power

Current challenges

- **Continuing support intervention is required**

With price cannibalisation, BEIS does not view wholesale market revenues alone as sufficient to finance necessary low carbon investment. However, the current regime has limitations, including that CfDs:

- limit exposure to market signals for their duration
- do not facilitate competition with low carbon 'on-demand' generation
- do not incentivise optimising location for system needs
- incentivise generation whenever possible rather than with any flexibility in response to price

Delivering mass low carbon power

Policy proposals

- **A supplier obligation to procure low carbon electricity to replace CfDs (and provide wider incentives) with a decentralised approach**

Advantages:

- Flexibility in how the obligation is met, including incentivising demand side flexibility and outright demand reduction
- Encourage innovation for technologies and business models
- Less exposure to the informational deficit faced by government-led decision making

Challenge:

- Suitability of energy supply companies for this increased role – In any event, the large-scale investment required could not rely on the level of counterparty risk associated with energy supply companies - so there would have to be intermediaries to pool risk, with likely role for Government or the System Operator

Delivering mass low carbon power

Policy proposals

- **The current CfD scheme as amended for the latest round** - From allocation round 4 (July 2022) generators will no longer be offered CfDs which pay when wholesale prices are zero/negative

Advantages:

- Helps deal with perverse incentives to generate during over-supply

Challenges:

- As periods of zero or negative prices become more common, this might have increasing impacts on price cannibalisation and risk investment

Delivering mass low carbon power

Policy proposals

- **A revenue cap and floor** - Generators would be guaranteed a minimum revenue in each period (floor) and above a certain amount (a soft cap) much of the excess would be paid back, but with residual incentives. Generators would be able to compete across each of the existing markets (wholesale, capacity, balancing and ancillary services). Floor revenue set competitively
- The consultation proposes such approach could be used for flexible assets (perhaps including 'on-demand' low carbon generation, storage and demand side response). In the long run, it might be possible for 'as available' generators to compete against such flexible assets for the floor price and help with greater system flexibility

Delivering mass low carbon power

Policy proposals

- **CfD variants with increased price exposure** - Possible to achieve via shorter CfD contract periods or, for eg, having a CfD strike range rather than single price
- **CfDs based on deemed generation** - Generators would be paid based on their potential to generate in a particular period rather than on their actual generation

7. Delivering greater system flexibility

Delivering greater system flexibility

Current challenges

- **Balancing supply and demand** due to renewable intermittency and unpredictability - Need for reforms to incentivise more low carbon flexibility (including generation, storage, interconnectors and technologies to shift or reduce demand)
- **Lack of sufficiently granular time- and location-based operational signals** to incentivise flexible asset operation
- **Insufficient investment signals**
- **Reliance on infrastructure that is not yet in place** (ie hydrogen network and CCUS)
- **Limited signals for flexible assets** to hold back energy for periods of system stress

Delivering greater system flexibility

Policy proposals

- **Introducing flexible auctions within the Capacity Market -**
Would hold additional auctions to procure low carbon capacity with specific flexible characteristics (eg faster response times, ability to sustain capacity over prolonged periods, proximity to constraints). This option has been informed by the [Capacity Market 2021: call for evidence on early action to align with net zero](#) consultation

Challenges:

- Adds complexity and risk of reduced liquidity as participants are spread across the auctions, potentially increasing clearing prices
- Relies on getting right difficult centrally made decisions about the parameters of the auctions

Delivering greater system flexibility

Policy proposals

- **Introducing multipliers to the clearing price within the Capacity Market** - Instead of additional auctions for these specific flexible characteristics, existing auctions would apply multiples to the clearing price for low carbon capacity that met the additional flexible characteristics. Similar downsides to the additional auctions

8. Securing capacity adequacy

Securing capacity adequacy

Current challenges

- **Lack of investment signals for low carbon flexibility**
- **The Capacity market was not designed to value low carbon technology and locks in unabated assets**

Securing capacity adequacy

Policy proposals

- **Optimised Capacity Market** - Echoes the two Capacity Market approaches described in terms of greater system flexibility, but targets generators with low carbon or new build characteristics
- **Strategic reserve** - Would involve central procurement for GB capacity (or potentially demand side response) which would not participate in the normal market and be an extreme scenario backstop

Securing capacity adequacy

Policy proposals

- **Centralised reliability options** - the System Operator would determine the capacity to be auctioned (to ensure peak demand is met) and, in return for a reliability premium (determined through an auction), would secure the right to buy electricity from auction winning generators on the wholesale market at a 'strike price' at times of scarcity (ie when the price on the wholesale market exceeds the option strike price). When the option is exercised, the generator pays the System Operator the difference between the spot price and the strike price regardless of whether it is generating. The option could be designed to work for low carbon generation and for demand side response
- Decentralised reliability options are not ruled out, but are not taken forward as a lead option. BEIS considers that a decentralised approach is something that is more likely, if at all, in the longer term

9. Ensuring system operability

Ensuring system operability

Current challenges

- Most ancillary services are currently **provided by fossil fuel generators**
- **Unpredictability of renewables and flexible demand** - Procurement in close to real-time markets is difficult as suppliers and producers need to take account of the most up-to-date information (eg weather forecasts and demand)
- **Current structure of CfDs and the Capacity Market** may disincentivise the provision of low carbon ancillary services

Ensuring system operability

Policy proposals

- **Continuing with the existing policy approach** – the Smart Systems and Flexibility Plan 2021, amongst other things, plans for the Future System Operator to implement a single day-ahead market for response and reserve by 2023
- **Giving the Future System Operator the ability or duty to prioritise low carbon procurement for ancillary services**
- **Developing local ancillary services markets with a new role for DNOs** - This is part of Ofgem's April 2022 Call for Input: Future of local energy institutions and governance

Ensuring system operability

Policy proposals

- **Amending existing CfDs** to remove disincentives to engaging in ancillary services (due to the loss of revenue from diverting power from the wholesale market)
- **Changing the design of the Capacity Market** to support low carbon ancillary services
- If changes were made to the wholesale market which involved central dispatch (ie dispatch controlled by the System Operator), then the **System Operator could co-optimize dispatch with ancillary services**

10. Options in relation to multiple areas of market design

Options in relation to multiple areas of market design

Policy proposals

- **Auction by cost of carbon abatement** - Version of the Dutch 'SDE++' scheme as an option to structuring support for low carbon flexibility. The scheme is similar to UK CfDs with the Dutch Government contracting directly with the auction winners who receive a subsidy for their assets for 15 years. However, the amount of support covers the difference between the base tariff awarded per tonne of avoided CO2 equivalent and an estimated market price

Advantages:

- Allows the cost per CO2 equivalent to be compared across the range of competing technologies

Options in relation to multiple areas of market design

Policy proposals

- **Equivalent Firm Power Auction** – It would consolidate the Capacity Market and CfD regime support schemes and give the market a greater role in determining the capacity mix with a technology neutral approach. A central body would determine the:
 - De-rating factors for individual technologies to reflect the quantity of additional 'on-demand' (ie firm) power required for the 'as available' technology to provide the system with the same level of security of supply as firm power
 - Amount of capacity to procure
 - Hold auctions to find the lowest cost way to ensure security of supply

Options in relation to multiple areas of market design

Policy proposals

As originally proposed by Dieter Helm in his [2017 Cost of Energy Review](#) for the Government, the auction would not value decarbonisation - this would be achieved by an economy-wide carbon price. However, BEIS' alternative of a carbon constraint being added to the auction would be more likely in the current policy climate

Challenges:

- Increased investor risks which might risk increased financing costs offsetting hoped for efficiency gains

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