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Market Investigation Reference: Assessing the Wholesale Market

Submission to the CMA

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Overview:

This is a submission to the Competition and Markets Authority to assist with its investigation into the energy markets. The focus of this paper is the wholesale electricity market. It sets out our views on what a well-functioning market should achieve. It considers the extent to which the current market design can realise this, and the other factors which influence how well the market functions. It also considers the factors which may change the way the market functions in the future.

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Context

In June 2014 we decided to make a Market Investigation reference to the Competition and Markets Authority (CMA) in respect of the supply and acquisition of energy in GB. In July 2014 the CMA published its Statement of Issues where it set out its initial views on the focus of its investigation. It set out four broad 'theories of harm' about areas of the market where circumstances might exist that lead to an adverse effect on competition. Three of these four theories of harm focused on areas of the wholesale electricity market. In this paper we expand on views we have previously set out in our original Market Investigation Reference and in our Initial Submission which we submitted in July 2014. This paper focuses on the wholesale electricity market.

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Executive Summary

The benchmark of a 'well-functioning' market

One of the main focuses of the Competition and Markets Authority's (CMA) energy market investigation is GB's wholesale electricity market. A central part of Ofgem's work, too, involves making sure GB's wholesale energy markets are working effectively. This submission provides analysis that will help the CMA assess the GB wholesale electricity market.

The CMA stated in its Initial Statement of Issues that "the benchmark against which we will assess an [Adverse Effect on Competition] is that of a 'well-functioning market,' that is, one that works well for customers." To support our ongoing monitoring of the wholesale market, we use a framework that shows the things that a well-functioning wholesale energy market should be able to do. The market should:

- Clear supply and demand
- Minimise transaction costs
- Produce prices that reflect economic costs
- Invests, adapts and improves over time in a sustainable manner

We set out this framework and our key findings in relation to the wholesale electricity market in this document to support the CMA's assessment of the market.

How wholesale electricity markets perform these functions

Wholesale electricity markets perform these functions in different ways, depending on the interactions between the markets' underlying fundamentals, the rules established by regulators (the 'market design'), and their characteristics and outcomes. Our comparison of different markets suggests to us that it is these interactions that determine outcomes for consumers: there is no one market design that automatically ensures better outcomes. For example, the GB wholesale electricity and gas markets are designed in a similar way, but have different market characteristics and deliver different outcomes.

The wholesale market will evolve in future

There will be some significant changes to the wholesale electricity market in the coming years. First, the government's EMR programme will change the generation mix, shape firms' investment decisions, and affect incentives. Second, the European Target Model will create more commercial and physical interconnection with other markets and new opportunities for European players to enter the GB market. Third, the mass rollout of smart meters will provide new ways for the demand side to engage in wholesale markets. We are considering all these changes as part of our Future Trading Arrangements project, and will continue to share insights from this work with the CMA. We encourage the CMA to consider these changing aspects of the market design and fundamentals in their assessment of the market and in any remedies they decide are necessary.

1. Purpose and background

Introduction

1.1. We have written this paper in response to issues raised by the Competition Markets Authority (CMA) in its Statement of Issues.[1] This paper focuses in particular on issues around the design of the GB wholesale electricity market. We provide our views on three broad issues:

- The features of a well-functioning market;
- The inter-relationship between market design, market characteristics and market outcomes; and
- The future of the GB wholesale electricity market.

1.2. In this chapter we set out a fuller summary of the issues covered in the paper and provide a summary of the GB wholesale electricity market design.

1.3. In its initial Statement of Issues the CMA states that it will assess Adverse Effects on Competition (AECs) against a benchmark of a 'well-functioning market' in the context of the unique features of electricity as a product. It also notes that there are interactions between the market rules and market outcomes, and that it will consider the strengths and weaknesses of the current system against other feasible systems.

1.4. With that assessment in mind, we set out below a high-level overview of the current electricity market design in GB. In chapter 2 we then set out our view of a 'well-functioning wholesale market.' Within this assessment, we highlight particular instances where regulatory action has been taken (either by ourselves or by national or European authorities) in areas aimed at improving the functioning of the market.

1.5. In Chapter 3 we set out our views on the important inter-linkages between market design, market characteristics and market outcomes. We set out different potential market designs; the fundamental characteristics of an electricity market that these designs must accommodate; and how both affect market outcomes such as prices and volume.

1.6. In Chapter 4 we note certain planned changes to the GB electricity market, including the Government's EMR and smart metering roll out, as well as the European Target Model. We note that this has the potential to change both characteristics and outcomes in the market and that as a consequence the market needs to be assessed in this new context.

[1] CMA Issues Statement: https://assets.digital.cabinet-office.gov.uk/media/53cfc72640f0b60b9f000003/Energy_Issues_Statement.pdf

The GB wholesale electricity market design

1.7. Under the current market design electricity suppliers forecast their consumers' demand and trade with generators and other parties to cover this demand. There are no designated trading venues (indeed trading itself is not an Ofgem-licensed activity). Most forward trading takes place bilaterally, either through directly struck contracts or through an intermediary (a broker) on the Over The Counter (OTC) market. It is also possible to trade through exchanges, although the vast majority of exchange trading is focused on the near-term (ie day-ahead or on the day of delivery). The market trades electricity in half-hour blocks (known as the 'settlement period'). Trading takes place up to one hour ahead of 'real-time' (known as 'gate closure') when the energy must be delivered, at which point the generators notify how much they wish to generate to meet their contractual arrangements.

1.8. The arrangements encourage the market to clear supply and demand to the maximum extent possible before gate closure. After gate closure the System Operator (SO) takes responsibility for balancing the system, with its main tool being the balancing mechanism.[2] In the balancing mechanism, generators are paid-as-bid for their energy (ie generators receive what they bid and there is no single price for balancing services). This model was chosen to encourage most trading to happen before real time (like other commodity markets), thereby limiting the role that the SO needs to play in the period after gate closure, and to reduce the scope for price manipulation.[3]

1.9. The major incentive for a market participant to trade prior to gate closure is the requirement to pay an imbalance price (known as cash-out) where it has either over or under contracted against its physical position. Cash-out prices reflect the System Operator's costs of balancing the system. Reflecting the System Operator's marginal balancing cost provides the most efficient signal to the market to balance.

[2] In practice, the SO can initiate activities prior to gate closure where it considers this necessary to ensure system integrity.
[3] One of the key arguments for moving away from the Pool was that generators could exercise market power and artificially raise the clearing price paid in the Pool. See Review of Electricity Arrangements, Offer, July 1998.

2. Assessing Wholesale Electricity Markets

Chapter Summary

This chapter sets out our view of what the features of a 'well-functioning' wholesale electricity market are. We suggest that the CMA considers the full range of features of a well-functioning energy market when making its own assessment of the market.

Framework for assessing a well-functioning wholesale market

2.1. An important part of Ofgem's role is the monitoring of markets. This has a number of aspects, including monitoring compliance with legal obligations placed on licensees (for example requirements under licence conditions, such as the liquidity Secure and Promote licence condition, or under European law, such as REMIT); monitoring in respect of security of supply; monitoring the impact of policy interventions; as well as monitoring market trends (such as prices).

2.2. As part of our monitoring role we have developed a framework which sets out what a well-functioning wholesale market should look like and the roles that it performs, against which we can assess the market. The CMA set out that it wishes to consider how the market is performing against a benchmark of "a well-functioning market" that "works well for consumers". We believe the framework we have developed will be helpful for the CMA in identifying the characteristics of a well-functioning energy market. In this chapter we outline the framework, before setting out some metrics that we consider provide the best means of assessing the market against that framework.

2.3. Under our framework, we consider that the overall objective of the energy wholesale markets is "**to provide a dynamic and sustainable mechanism in which informed participants can confidently and efficiently buy and sell the energy they need at a price that reflects economic cost**." The ultimate beneficiaries, however, will be consumers.

2.4. Our assessment framework has four features which we discuss in more detail below. Because both our duties and the role of the market go beyond the promotion of competition (in particular, in ensuring the security of supply) some of our features will be more relevant to a competition assessment than others. However, all four do have a competition relevance to some degree. The framework is not specific to the current GB market arrangements, it sets out the features that we would expect any well-functioning wholesale electricity market to have. However, we do make reference throughout to aspects of the current GB arrangements for illustrative purposes. While not part of our assessment framework, we also believe that it is important that the wholesale market fosters trust, so we include this after we outline the other features.

2.5. The four features in our framework are that a market should:

A. Clear supply and demand
B. Minimise transaction costs
C. Produce prices that reflect economic costs
D. Invest, adapt and improve over time in a sustainable manner.

2.6. After describing these features below, we illustrate some metrics against which they can be assessed. We have provided some data related to these metrics to the CMA, and would be happy to continue to do so where it is helpful for the investigation. We then provide a summary of the key findings of our internal analysis of these metrics.

A. Clear supply and demand

2.7. One of the fundamental functions of markets is to ensure that supply satisfies demand at prices agreed between parties. In electricity terms there is a further temporal element in that the level of demand cannot fully respond to fluctuating prices in real time.[4] Electricity is also considered to be an essential product. As supply needs to match demand on a second by second basis (and to ensure that supply and demand are cleared), electricity markets need secure, flexible supplies.

2.8. The market arrangements look to meet this requirement for secure supplies in two different ways. On a day-to-day basis the way in which the GB market is designed leads to consumers' demand being covered in large part by contracts in the forward markets with generators dispatching to meet their contractual obligations. As consumers (ultimately) bear the costs of balancing actions taken by the System Operator, the arrangements seek to incentivise efficient system operation. The arrangements have been designed to incentivise parties to balance their own positions, which in turn assists the System Operator by minimising its balancing role.

2.9. On a longer-term basis the market needs to ensure generation adequacy (that is, that there is sufficient generating capacity available to meet demand). It is therefore an important feature of a good wholesale market that new generation is able to enter the market to replace retiring plant. Given that the cost structures of different types of plant can place a strong bias on either capital or operational cost, the market needs to be able to enable plants to recover both its long and short run marginal costs across its lifetime.

[4] During periods of extremely high demand there may be some voluntary demand side response, especially from large users. However, this is in response to the risk of liability for use of system charges (known as triad charges) which are levied on demand users for the three highest demand half hours in the year. For more information see: http://www2.nationalgrid.com/UK/Industry-information/System-charges/Electricity-transmission/Transmission-Network-Use-of-System-Charges/Statement-of-Use-of-System-Charges

B. Minimise transaction costs

2.10. All markets feature some form of transaction costs. However, it is important that these should be no higher than necessary. Despite its homogeneity as a product, there are particular features of the acquisition and use of electricity, principally relating to the fact that it cannot be easily stored, that lead to transaction costs. The output and demand of electricity vary over different time periods and do not naturally match, so some form of trading is required to ensure the matching of contracted and physical positions. A range of products is also needed to enable market participants to manage various risks, for example, to manage price risk by hedging months and years ahead of delivery.

2.11. The exchange of electricity incurs bargaining costs (usually in the form of fees paid to trading venues, such as brokers and exchanges) and enforcement costs[5] (usually in the form of a credit agreement or collateralisation). The enforcement costs are particularly high in electricity because of the variability of the price of electricity and the need for supply to equal demand on a second-by-second basis.

2.12. The need to manage risks through hedging means there is also a need for the market to be able to reliably access a diverse range of products for managing demand variations. As electricity cannot practically be stored as a means of managing price risk, there is a need to be able to trade in and out of a position rather than simply hold it and this is why liquidity is particularly important. Liquidity in this sense means that there is easy and reliable access to the products needed at the prevailing market price, with no discounts or premiums (which are themselves transaction costs).

2.13. A liquid market should ensure that buyers or sellers that have identified the products they need can then reliably make transactions in a timely way without having to settle for a substantially worse price. While quantitative metrics like churn are useful indicators (as they can be indicative that availability and reliable prices are features of the market) they are not desirable ends in themselves. It is this ease and reliability of access that captures the important aspect of liquidity in the wholesale electricity market.

C. Produce prices that reflect economic costs

2.14. Robust and competitive pricing is a feature of a market with effective competition and with no undue barriers to entry (such as excessive transaction costs for example). A lack of effective competition can lead to distortions such as collusive behaviour or the exercise of market power. In the long-term prices should influence investment decisions. In the short-term, they should lead to efficient dispatch. Overall, robustly derived and communicated prices should foster transparency and trust in the market.

[5] We use the term 'enforcement costs' in this context to mean the cost of enforcing a contract to trade. To note that the term can sometimes be used in a different context in electricity markets (relating to the enforcement of licence obligations) that is not relevant here.

2.15. In a market with a large proportion of forward contracting it is important to have reliable pricing along the forward curve as well as robust spot and cash-out prices. For forward trades, in the absence of a default pricing mechanism (such as a single clearing price), there is a role for reliable price discovery and transmission. This can come from bids and offers (and information about completed trades) visible to the market at trading venues. There is also a role for service providers (such as price reporting agencies or other information services) producing reliable reference prices.

2.16. Spot prices can be observed directly from trading venues and are based on either auction clearing prices or volume-weighted average of trades.

2.17. It is also important that cash-out should be cost-reflective. The cash-out price is not produced by the market itself (although it is based on market prices), but it is a key market signal which drives trading. The Electricity Balancing Significant Code Review (EBSCR) has proposed changes to make cash-out prices more cost-reflective.

D. Invests, adapts and improves over time in a sustainable manner

2.18. The market is not static, but rather constantly evolving and a well-functioning wholesale market should be able to adapt to changing circumstances and improve over time. As part of this, it should provide an environment which fosters investment. We also consider that innovation is a key outcome from a competitive market. In the electricity market this may mean new traded products and platforms in the wholesale market, new supply and demand side technologies and even new business models.

2.19. The current market in GB is one that has seen significant entry, exit and merger and acquisition activity, and is a market which features significant levels of on-going technological development. Further, there is a continuously evolving policy framework which seeks to achieve a range of policy goals, including: decarbonisation and other environmental objectives; greater integration with neighbouring markets; and secure, affordable supplies. This framework has significant impacts, for example on generating plant (in some cases forcing market exit, in others encouraging market entry).

2.20. One of the routes to achieving the objective of a market that can adapt, improve and invest is the industry governance structure that should allow the market to change when it needs to. While there is a substantial degree of industry self-governance, Government and the regulator have significant roles in their oversight of the framework and in ensuring it can meet these requirements.

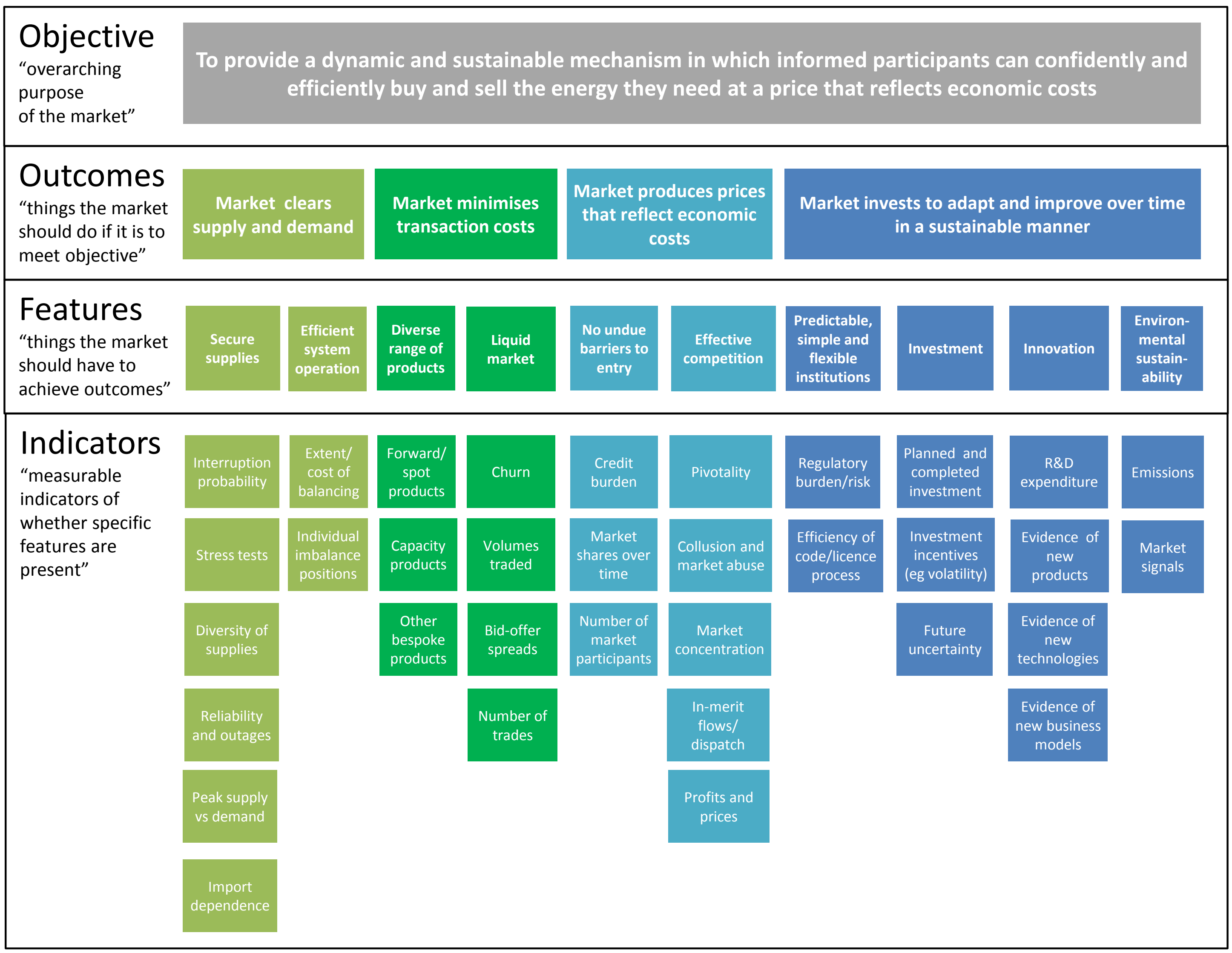
2.21. The electricity market should also be able to accommodate incremental changes to government policies (although some policy changes may be so far-reaching as to require a re-evaluation of the market design – this is discussed in more detail in chapter 4).

2.22. The theme of investment also links strongly with feature A (the market should clear supply and demand). On a long-term basis there is a requirement for investment to facilitate both market entry and market exit. In the GB market arrangements, the concept of scarcity rent is very important in this regard. It fulfils the function of sending investment signals and also provides a means of cost recovery for capital investment.

Assessing the market

2.23. We monitor and assess the performance of the wholesale gas and electricity markets in real time by reviewing price and fundamental market data, and scanning the markets for future issues. We draw on a wide range of data sources including information from the SO and expertise throughout Ofgem. We disseminate this information to the market and consumers in a variety of ways, including through our annual National Report and Capacity Assessment publications.

2.24. Some of these metrics, and how they fit into the framework we have set out, are illustrated below[6]. We have provided some data related to these metrics to the CMA, and would be happy to continue to do so where it is helpful for the investigation.



[6] Not that the number of indicators or features does not imply any kind of weighting or importance between the different outcomes.

2.25. Below we set out a summary of key findings of our internal analysis of these metrics for electricity.

Summary of key findings – electricity

Outcomes	Key findings
Market clears supply and demand	• Total generation capacity has been steady over recent years, as wind generation and CCGTs have replaced coal and oil fired generation. • The proportion of intermittent renewables generation on the system has risen, combined with closing and mothballing of existing plant has lowered de-rated margins, increasing system risks and leading to the introduction of new balancing services. • Further closures are expected to tighten capacity margins for 2015-2016, with weak investment signals from the energy only market holding back replacement of lost plant. • Market participants maintained their ability to balance their positions despite increases in intermittent generation. EBSCR reforms should further incentivise this.
Market minimises transaction costs	• When assessed across a suite of metrics, the GB market is relatively illiquid, particularly when compared to markets such as NordPool and Germany. The outlook appears to be improving following implementation of Secure and Promote, but it is too soon to draw robust conclusions. • Liquidity tends to be clustered in near term markets, baseload contracts dominate, and the majority of trading is conducted OTC.
Market produces prices that reflect economic costs	• The wholesale market appears to be relatively competitive, and compares well with many other European and international markets. • There are high market shares for particular plants that are dispatched downwards by the System Operator (SO) for the resolution of location transmission constraints; however, we continue to monitor compliance with TCLC carefully. • Market entry (and exit) in recent years has been broadly consistent with what might be observed in a competitive market, but the costs of credit and collateral may present a barrier to entry for smaller players.
Market invests, adapts and improves invests over time in a sustainable manner	• Market signals from the energy-only market have not encouraged investment to the same scale seen in the gas market, contributing to tighter generation margins expected for the next two years. • Expectations of scheduled new capacity in the GB market have also declined in the last 2 years • Modifications to key industry codes have been on a downwards trend, but some industry participants have noted they feel the overall complexity of compliance with various policies has increased.

Further consideration: Markets should foster trust

2.26. Well-functioning markets should also foster trust. Market participants and the wider public may for a variety of reasons believe that a market is not delivering for them. One way to tackle a lack of trust is through greater transparency. Even though creating transparency can have costs (for example through information requests from regulators) it also has value if it creates confidence for market participants, since trust and confidence generally reduce transaction costs. We have, for example, examined how robust prices produced by Price Reporting Agencies and used by market participants are.[7] To increase market confidence we recommended that Price Reporting Agencies align their gas and electricity pricing activities to the IOSCO principles for Oil Price Reporting Agencies.[8]

2.27. For the wider public, our work on the Consolidated Segmental Statements and Supply Market Indicators are both examples of where we have taken action to increase transparency with a view to increasing confidence in the market.

2.28. One other area that is key to fostering trust is good conduct. This can relate to issues such as collusion, market abuse and the exercise of market power which may lead to significant consumer detriment. It can also cover individual instances of improper conduct (such as 'rogue traders') which may have a smaller impact on consumers generally, but nonetheless erode trust and confidence in the market. The need to ensure good conduct has been a persistent theme in both GB and other electricity markets.[9] In recent years the European Commission has introduced the Regulation on Market Integrity and Transparency (REMIT) and the UK Government introduced the Transmission Constraint Licence Condition (TCLC). In differing ways both measures are targeted at fostering trust through ensuring good conduct.

2.29. We use the powers afforded by these regulations in order to actively monitor the market and identify abuse. Key activities include monitoring for potential infringements of REMIT, TCLC and competition law. We also undertake proactive compliance activity to monitor the legal obligations placed on licensees.

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[7] https://www.ofgem.gov.uk/publications-and-updates/pricing-benchmarks-gas-and-electricity-markets-call-evidence

[8] https://www.ofgem.gov.uk/ofgem-publications/88681/decisionforpricebenchmarksingasandelectricitymarketsjuly2014.pdf

[9] In GB for example, National Power and Powergen were required to divest 4GW of plant in order to acquire supply businesses in 1999; and Ofgem introduced a Market Abuse Licence Condition in 2001. The CC decided against the introduction of the market abuse licence condition after Ofgem made a special regulatory reference because two generation licence holders refused to consent to the condition.

3. Interactions between Electricity Market Design, Market Characteristics and other Market Outcomes

Chapter summary

In this chapter we set out the interactions between market fundamentals, market design, market characteristics and market outcomes in energy wholesale markets. We argue that: these complex relationships need to be considered when any changes to market design are assessed; and that, in light of these interactions, no one market design automatically delivers better outcomes for consumers.

Introduction

3.1. The nature of electricity as a product means that complex rules are required to facilitate competition. In this chapter we explore the importance of both market design and market fundamentals (and their inter-relationship) and how both influence market characteristics and outcomes[10].

3.2. In this Chapter we consider the complex interactions between:

- **Market fundamentals** – we use this term here to mean the physical realities of how energy is produced and supplied to consumers, which are geographically-specific and are generally fixed in the short term;
- **Market design** – the rules chosen by regulators and other decision makers to facilitate trade between generators, suppliers and other market participants;
- **Market characteristics -** how market participants choose to trade and the structures of the market; and
- **Market outcomes** – outputs of the market, including prices and volume.

3.3. We consider that any changes to either the market design or the market fundamentals may lead to a change in market characteristics and outcomes. However, there is a complex two-way relationship between market fundamentals and market design. A change to one element is likely, over time, to significantly impact the other.

[10] We note that market fundamentals and market design are included as market characteristics in the Competition Commission's guidelines for Market Investigation References (that the CMA have now adopted). However, we have separated them from other market characteristics for this paper in order to reflect their particular importance in energy wholesale markets.

3.4. We note the CMA's intention to consider "the strengths and weaknesses of the current system against other feasible systems, including incremental changes to the current framework or potentially wider ranging reforms" as part of Theory of Harm One.[11] We believe that an awareness of the interrelationships described in this chapter is important for the CMA's assessment of the wholesale market design.

Market fundamentals

3.5. By fundamentals, we mean the physical realities of how energy is produced and supplied to consumers. Each wholesale electricity market has a unique set of fundamentals, depending on the physical nature of the system and the generation mix. Market fundamentals are generally fixed in the short term.

3.6. The physical nature of the system, including its size, the level of physical constraints on the network, the flexibility of demand, and the level of physical interconnection have an impact on the how big the role of the SO needs to be versus the role of the market. These factors create specific balancing challenges, which may limit the actions that the market can take to manage imbalances, or necessitate certain rules to align the market's incentives more closely with the complexities of the physical system.

3.7. The generation mix may also impact on how big the role of the SO needs to be (and subsequently how this is reflected in the market rules). The type of generation on the system matters because of the different physical characteristics of different generators, in particular in how responsive they are to dispatch signals, and how quickly they can ramp up and down (in other words, how 'controllable' or flexible their output is). The size of available generation and the size of the largest generator on the system in relation to the overall system is also important. Put very simply, a system with a large number of small generators is statistically more resilient than a system with a small number of large generators. Similarly, the ability (and willingness) of the demand side to respond to price signals will also impact on the SO's role.[12]

3.8. In GB, the nature of the system is such that it is more efficient for the market to determine most plant dispatch, with the role of the SO limited to technical activities and residual balancing. This is reflected in the market design.

[11] CMA Issues statement: https://assets.digital.cabinet-office.gov.uk/media/53cfc72640f0b60b9f000003/Energy_Issues_Statement.pdf

[12] Demand is commonly less flexible than generation by its nature (electricity being an essential good that cannot easily be stored). However, there is potential for greater flexibility, subject to facilitation through technology and pricing signals.

Market design

3.9. In this section we discuss the different types of market design most commonly used in wholesale electricity markets globally. Broadly speaking, there is a spectrum of market designs which encompasses more centralised compulsory electricity 'pools' where the SO has a monopoly over generation plant dispatch[13], and more de-centralised 'bilateral' market designs where generators control their own dispatch and the System Operator's role is more residual. The key element which differentiates market designs is the extent to which pricing and dispatch are determined centrally by the SO or through the aggregation of the decisions of individual market participants.

3.10. While market designs can broadly be categorised as 'pool' or 'bilateral', these two terms cover a range of distinctly different designs. For example, the term 'pool' has been used to describe a range of different models, including:

- Gross mandatory pools with fully centralised dispatch and pricing – eg the England and Wales Pool;
- 'Net' pools which allow bilateral trading but in which the SO has control of dispatch for a long period before delivery;
- Markets with a mandatory exchanges (eg a mandatory auction at the day-ahead stage);[14]
- Markets with voluntary but highly liquid exchange (eg the Nordic market); or
- Markets with a balancing market for electricity[15].

3.11. The table below illustrates a number of different possible market designs that are either currently used, have been previously used, or have been proposed.

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[13] Dispatch refers to the way in which decisions about which plants will run when are made.
[14] Note that this model is theoretical – we are not aware that it has been implemented anywhere. However, we include it as it has been raised as a potential model to implement in GB.
[15] By balancing market we mean a central, real-time auction with a clearing price for balancing energy. In GB, we have a balancing mechanism, a monopsony in which the System Operator procures a range of balancing products and providers are paid-as-bid for this energy.

	Mandatory Pool *(eg The England and Wales Pool)*	**Net pool** *(eg the Iberian Market)*	**Mandatory exchange**	**Bilateral market with balancing mechanism** *(NETA, the Nordic market)*	**Bilateral market with balancing market** (*Netherlands)*
Prices	**Centralised** Determined by mandatory auction or central algorithm	**Hybrid** Prices determined in forward contracts, and residual pool market	**Centralised** Determined by mandatory exchange, but with bilateral trades after and balancing mechanisms	**Decentralised** Determined by bilateral trades in the forward markets	**Hybrid** Prices determined in forward contracts, and residual pool market
Generator Dispatch	**Centralised** Central dispatch - System Operator is largely or solely responsible for deciding which specific generating units should run and when	**Hybrid** Generators self-dispatch until the day-ahead stage; at which point the System Operator has control	**Decentralised** Self-dispatch – organisations dispatch to meet their contractual obligations; the System Operator has a residual balancing role	**Decentralised** Self-dispatch – organisations dispatch to meet their contractual obligations; the System Operator has a residual balancing role	**Decentralised** Self-dispatch – generators continue to dispatch throughout real-time

3.12. Outside of these key dimensions there are a large number of other design choices – or building blocks – which can apply to both pool and bilateral markets:

- Is there one wholesale market price or is there a set of locational prices?
- How are imbalance prices set?
- Are there any limitations on how parties trade?
- Do specific mechanisms exist to ensure the adequacy of capacity?
- Are there particular mechanisms to promote low carbon generation?

Market characteristics

3.13. We refer to market characteristics to mean how the industry is structured and (strongly related) the trading environment and behaviour. Two other important characteristics result from this, firstly the level of **liquidity** in the market and then (again strongly related) whether **market power** is present in the market. The CMA's Statement of Issues indicates their interest in both of these issues.

- **Market structure –** In this context, by market structure we mean both ownership structures and also other forms of vertical and horizontal relationships. Different markets may face incentives to establish vertical relationships (either through common ownership or long-term contracts). However, there may also be incentives for horizontal relationships, such as maintaining (again possibly under common ownership or through long-term contractual arrangements) a portfolio of different plant, or different activities. There may also be incentives around achieving a certain size in order to operate profitably ('economies of scale').
- **Trading –** Strongly correlated to market structure is the characteristic of how participants choose to trade with each other within the rules of the market. Outside of specific restrictions on how they must act, market participants have a

choice of how they wish to trade to manage risk and cover consumers' demand. Different markets have developed different industry practices in relation to how products are sold. In the GB wholesale electricity market, most forward trading is physical and bilateral. Other markets (eg the GB gas market; Nordpool) have a greater proportion of trading in financial products and make greater use of cleared exchanges. Similarly, some markets may be more inclined to enter into long term bilateral agreements (such as 'tolling' agreements or Power Purchase Agreement). Where vertical relationships exist there is an option (if not necessarily an imperative) to utilise these to trade internally.

- **Liquidity** – In Chapter 2 we noted liquidity in the context of electricity markets was the ease of access to products at a robust price without incurring undue costs. The ability to do this will in some ways be influenced directly by the market design, but also by other market characteristics such as the structure of market players and the way the market trades.
- **Market power** – We consider that the potential to exercise market power is the most significant market characteristic since it is the feature that has the most significant impact on competition and is most likely to lead to consumer detriment through its influence on market outcomes, such as price.

Market outcomes

3.14. The key outcomes of the competitive process are:

- **Prices** – As set out in chapter 2 wholesale prices are particularly important in an electricity market such as NETA[16]. In the short term, prices are the main driver for generator dispatch, and therefore it is important that they create signals for the market to dispatch efficiently and ensure demand is met continuously.
- **Investment signals** – Wholesale prices are also the main signals for investment in the current GB market. Particularly important here are 'scarcity rents' – prices which rise above the short-run marginal cost of the marginal generator when there is scarcity on the system. Scarcity rents are necessary to allow capacity providers to collect sufficient revenues to recover their fixed costs[17].
- **Volume** – There is a potential interaction between volume and price, but this is limited in most electricity markets where volume is largely dictated by demand (as most demand is relatively price-inelastic and, in the short-term, unlikely to respond to price).

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[16] In this document we refer to the electricity trading arrangements as NETA, the New Electricity Trading Arrangements. In 2005, the NETA design was extended to incorporate Scotland in 2005 and became known as the British Electricity Trading and Transmission Arrangements (BETTA).

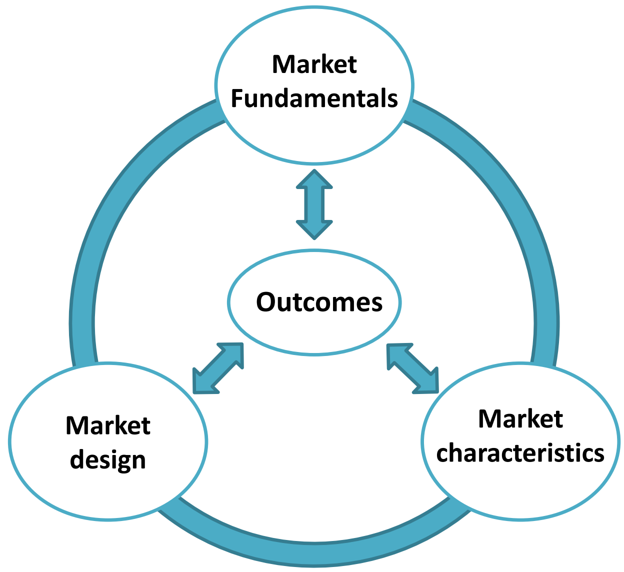
[17] In energy-only markets, capacity providers collect their revenues through the energy price. Plant with short run marginal costs (SRMC) below the market price earn inframarginal rents, which they can use to cover their long term costs. Marginal capacity providers will not earn these rents. However, at times of scarcity, consumers are willing to pay up to VoLL for electricity. At these times even the marginal generators are able to price at a level above their SRMC to collect scarcity rent and ensure they can recover their fixed costs.

Wholesale energy market interactions

3.15. Market fundamentals, market design, market characteristics and market outcomes are closely interrelated. Below we describe some of the most important interactions.

Market fundamentals influence market design

3.16. Market fundamentals are an important influence on the regulator or government's choice of market design. When the England and Wales Pool was replaced by a self-dispatch market model, the SO's ability to manage the system efficiently and economically was a core consideration. The level of physical constraints, as well as the dynamics of the plant on the system (for example how quickly they can ramp up or down), were important factors in the decision as to how much control the SO needed to have over plant dispatch (and how soon it would have this control).[18]



3.17. More recently, Ireland considered the merits of moving to a self-dispatch model. An important part of this decision was a feasibility study by the Transmission System Operators (TSOs), which recommended a central dispatch model, largely based on Ireland's market fundamentals and the degree of intervention required from the SO as a result[19].

3.18. Although international comparisons are difficult, there are examples of relatively well-functioning wholesale markets in both general categories of market design.[20] There is no clear evidence that any one model is intrinsically better for the facilitation of competition.

3.19. However, as we touched on above, the choices when designing a market are not limited to self- or central-dispatch. There are a number of choices which could strengthen the market's ability to manage imbalances related to the physical nature

[18] More recently, the SO outlined some of these considerations in as part of a policy working group into gate closure: http://www.elexon.co.uk/smg-issue/issue-35-timing-of-gate-closure-and-related-matters
[19] For example, the system is small and has high levels of operational wind (31% of peak demand) and large relative size of it thermal units (6.92% of peak demand). See TSO report at: http://www.allislandproject.org/en/TS_Current_Consultations.aspx?article=41f5681a-ef37-41ca-ab7d-7a1bdd7db385
[20] For a comparison of European markets see: http://ec.europa.eu/energy/gas_electricity/doc/2014_iem_communication_annex2.pdf

of the system. For example, moving to locational or zonal pricing (from a single price zone), would redraw the boundaries within which the market can trade and ensure the underlying physical constraints of the system are reflected in market signals. This would better align the market's view with the physical realities of the electricity system[21]. Similarly, a shorter gate closure[22] or shorter settlement periods[23] would reflect more of the complexities of physical balancing onto the market. However these changes could impact on the SO's ability to manage the system economically and efficiently.

The influence of market fundamentals on market characteristics and outcomes

3.20. Market fundamentals have important impacts on the risks and incentives faced by market participants. Regardless of the market design, the market fundamentals, in particular the nature and cost structures of the generation mix, impact on the level and nature of prices. For example, a market with high levels of intermittent generation and higher cost flexible generation will experience price volatility which could increase the risks which must be managed by the market.

3.21. In **case study 2** we provide the example of the Nordic market to highlight the importance of market fundamentals. We note that although the key elements of its market design is similar to the GB wholesale electricity market, the different market fundamentals – specifically the high levels of cheap, flexible generation and low levels of intermittent generation – have an impact on how parties trade and the incentives they face.

3.22. Another enlightening comparison is with the GB gas market, which is sometimes perceived to be working more effectively than the GB wholesale electricity market. In its Statement of Issues, the CMA said that they wish to understand why this is the case, and why vertical integration is less of a feature in the gas market. **Case study 3** on the GB gas market brings to light the importance of the physical differences between gas and electricity, which can impact on some elements of the market design and the incentives faced by the market.

[21] However, this choice has to be balanced with other considerations, such as the impact on competition and liquidity. The European Capacity Allocation and Congestion Management (CACM) Network Code requires regular assessments of whether GB should have locational pricing.

[22] Gate Closure is currently one hour before each half-hour settlement period. It is the point at which trading in the wholesale market ends and parties' finalise their expected physical positions (their FPNs), their contracted position (their contract notifications).

[23] In GB, we have a 30 minute settlement period. Other countries have different settlement period lengths, for example: 60 minutes in the Nordic market; and 15 minutes in Germany and the Netherlands.

The influence of market design on market characteristics and outcomes

3.23. However, market designs can shape market characteristics and outcomes. The market design can place direct requirements on how the market trades. For example gross mandatory pools, such as the Single Electricity Market (SEM) in Ireland, require all physical trades to go through a central pool, whereas the GB electricity market design allows and encourages bilateral physical forward trading between market participants.

3.24. We note the CMA's suggestion that the electricity market design in GB has played a part in creating incentives to vertically integrate as part of theory of harm 1b. In case study 1 we consider some of these arguments, but note that there have been other drivers which may have increased the level of vertical integration in GB.

Box 1 vertical integration in the GB electricity market

One potential relationship between market design and market characteristics is that market design can affect the level of vertical integration in the market. As we detailed in the State of the Market Assessment, the GB electricity market has become increasingly vertically integrated in the last decade. We set out the drivers that may have led companies to establish vertical relationships:

- Managing risk and providing a natural hedge
- Certainty for investment
- Credit and collateral costs
- Liquidity risk
- Economies of scope

It has been suggested that the electricity market design in GB has been one of the factors driving these incentives and has contributed to the increase in vertical integration in the market. Below we consider these arguments:

<u>Increased incentives for suppliers to physically balance.</u> Before NETA, suppliers had a relatively passive role in the market compared to generators - they were not responsible for forecasting and purchasing to cover their consumers demand, instead paying the Pool price for the volume of electricity their consumers used. Participants could hedge using financial contracts around the Pool price. NETA places strong incentives on generators and suppliers to physically balance by forecasting how much they will produce/consume, and buying/selling this energy in the forward markets, or else they will be exposed to unattractive cash-out prices. An alternative to hedging in the forward market is to hedge physically through vertical acquisitions. Furthermore, because there is no single price for energy, it is more difficult to hedge financially and this may strengthen incentives to hedge physically by vertically integrating.

<u>Increased incentives to be available.</u> As set out in case **study 1**, under the GB pool generators were found to have insufficient incentives to be available in real-time. NETA aims to create incentives to be available by providing cost-reflective cash-out prices which are equivalent to the balancing costs that a party has contributed to by being out of balance. These greater incentives may have strengthened the case for vertical relationships to manage these.

The removal of capacity payments. NETA removed explicit capacity payments so that generators had to rely solely on the energy market to recover fixed costs. Vertical integration may therefore have been driven by a desire to improve investment certainty in the market. Vertical relationships remove the risk associated with having to recover fixed costs in the wholesale market through trading. It is worth noting that EMR will reintroduce capacity payments outside of the energy price.

The increased cost of doing business. Although NETA overall led to greater efficiency[24], it has been suggested that this was partially offset by a higher cost of doing business compared to the Pool, in particular increased costs related to trading teams and forecasting. Larger, vertically integrated companies would be able to spread some of these costs across a larger revenue base, and may have been able to take advantage of economics of scope.

It is important to note that there were other drivers for vertical integration: for example, increased concerns about counterparty risk resulting from high-profile defaults by firms such as Enron and TXU in the early 2000s. Other commentators suggest that the physical nature of electricity and the variation in marginal costs of generation means that there is inherently more risk associated with energy markets, and this would be true regardless of the market design and indeed there are 'Pool' markets which have seen increasing levels of vertical integration.

This example demonstrates the close inter-linkages between the market design and market characteristics described in this chapter.

The influence of market characteristics and outcomes on market design

3.25. Market characteristics and outcomes have also been important when policy-makers have considered changes to the market design. This is particularly the case where market power is a factor. This was the case when reform to the England and Wales Pool was being considered (**case study 1**). Industry structure at the time – specifically that most of the price-setting generation was held by two firms – meant that vulnerability to market power was an important consideration when the New Electricity Trading Arrangements were developed. This influenced the decision to change the market design and was also a significant factor in some of the design choices. For example, the removal of single cleared price for wholesale electricity was in part to reduce incentives for this price to be manipulated.

3.26. Another important characteristic which influences the choice of market design is the policy landscape: the regulator and the ethos of the regulator / regulation; government policy objectives and the use of the electricity industry to meet these; and European policy, including the European Target Model, which acts as a framework within which market designs must fit. This includes how Governments have opted to privatise or deregulate the industry.

[24] Overall costs were reduced through falling wholesale prices. Wholesale prices fell by over 20% between the introduction of NETA in March 2001 and October 2002.

Market design influences market fundamentals

3.27. Finally, we note that over the long-term market design can change market fundamentals. Some types of market design can suit some types of generation and be less suited to others. This is particularly true of balancing arrangements and particular design features such as the distance between gate closure and delivery, and the length of settlement period. The effect of this may be to encourage market entry for certain types of generation (or demand response) but act as a barrier to others, thereby evolving the generation mix.

Implications of these relationships

3.28. We believe that the relationships we have outlined in this chapter are important interactions for the CMA to consider when assessing the wholesale electricity market and considering any remedies. In particular, we do not believe there is clear evidence that any one market design automatically delivers better outcomes. Instead, the market design has to be assessed in terms of its interaction with the market fundamentals and characteristics. Furthermore, the assessment of any proposed changes to the market design will have to take into account these interactions.

3.29. The market fundamentals, design and characteristics are all set to change significantly in the coming years. The next chapter will consider some of the implications of these changes for the interrelationships set out above.

4. The Future of the Wholesale Market

Chapter summary

In this chapter we turn to the future of the GB wholesale electricity market. In the coming years, the market will undergo significant changes, arising in particular from the Government's Electricity Market Reform programme; the process of integration with other European energy markets; and the roll-out of smart meters. These factors will have a material impact on the market fundamentals and design. It will be important for the CMA to consider these developments and the impact they will have in assessing the functioning of the market today and considering potential remedies. We will continue to keep CMA updated on our activities in this area.

Introduction

4.1. As the CMA noted in its Initial Statement of Issues, the wholesale electricity market will face a number of significant changes in the coming years. The potential impact of these changes should be considered when:

- **Assessing the functioning of the market today** - because competitive positions of market players and the impact of AECs may shift with the changing market fundamentals and incentives; and
- **Considering any potential remedies that the CMA may want to introduce** so that any intervention is future-proofed against developments in the wholesale market.

4.2. With that in mind, in this chapter we identify some of the major changes that have been announced at European and GB-level and consider ways in which these could affect market outcomes. We highlight similar interactions to those set out in Chapter 3, noting the close interactions between the underlying market fundamentals, the changing market design and the market characteristics and outcomes.

4.3. However, given the scale and nature of these changes, it is not yet possible to conclude how the competitive landscape will look in future. Our analysis here is therefore merely illustrative, not comprehensive. We discuss at the conclusion of the chapter how we are seeking to explore these issues with industry as part of the Future Trading Arrangements (FTA) Forum and in our wider work on the wholesale market.

Future developments

4.4. The GB wholesale electricity market has been subject to energy policy change at both national and European level for a number of years. Recent legislative changes are likely to have further impacts on the market in future. In this chapter we consider three changes in particular:

- The UK Government's Electricity Market Reforms;
- The European Commission's Electricity Target Model; and
- The introduction of smart meters, a policy goal at both national and European level.

4.5. We outline these very briefly below, before illustrating the ways in which these could affect the complex inter-relationships between outcomes, characteristics, design and fundamentals[25].

Electricity Market Reform

4.6. The Government's Electricity Market Reform (EMR) programme is likely to have a number of important impacts on the wholesale market in the coming years. In particular the introduction of Feed-in Tariffs with Contracts for Difference (CFDs) and the Capacity Mechanism (CM) can be seen as driving a significant change to the market design and fundamentals. In one sense, it could see a number of the functions of the wholesale market identified in chapter 2 be delivered by mechanisms outside the 'traditional' wholesale market. Reflecting the arguments made in Chapter 3, these changes to the market design will alter the fundamentals of the market, and will have implications for the market characteristics and outcomes.

European Target Model

4.7. The GB electricity market is set to become more integrated with other European markets through the harmonisation of market rules (Network Codes), and physically through additional interconnector infrastructure. These are part of the European Target Model (EU TM).[26] These rules will change particular aspects of existing market arrangements. They will supplement work which has been undertaken at a regional level to 'couple' markets (essentially harmonise rules) in the Day Ahead and Intraday timeframes. However, the EU TM also imposes restrictions on national markets. While the current GB market design broadly fits in with the EU TM framework, other market types (such as gross mandatory pools with complex bids at the day-ahead stage) are incompatible with key aspects of the EU TM. The EU TM will therefore prohibit some market design choices.

[25] We set these developments in further in our Initial Submission to the CMA, at: https://www.ofgem.gov.uk/publications-and-updates/energy-market-investigation-initial-submission-competition-and-markets-authority
[26] Key elements of the EU TM are set out in the Capacity Allocation and Congestion Management Framework Guidelines at: http://www.mekh.hu/gcpdocs/52/FG_Electricity%20CACM.pdf and the Balancing Framework Guidelines at: http://www.mekh.hu/gcpdocs/52/FG%20Electricity%20Balancing.pdf

Smart metering

4.8. Under the Government's smart metering programme, the roll-out of smart meters to all customers is due to be completed towards the end of this decade.[27] The roll-out of smart meters is broadly in-line with EU policy.[28] From the perspective of the wholesale market, one of the main impacts of smart metering will be the increased potential for flexibility in demand giving consumers increased opportunities to participate actively in the market.

Impacts

4.9. Taken together, the full range of impacts of these developments may be complex and are difficult to accurately predict. However, we draw on some examples below where changes could impact on market outcomes and thereby send important signals to the market. These in turn may affect market fundamentals and characteristics. We consider in a case study the potential impacts on the market characteristic of vertical integration. However, this is just one of many characteristics (such as liquidity, trading and market power) which may evolve in response to these developments.

Prices

4.10. EMR CfDs will see payments made to generators on the basis of their metered output (the megawatt-hours generated by the plant) and will therefore form part of the economic incentives faced by a generator when deciding whether or not to generate. This could result in periods of negative pricing up to the value of their expected CfD payment where the generator would be willing to pay the System Operator not to be turned down in the Balancing Mechanism.[29] Negative prices of this sort have been a feature in markets that already have a high degree of subsidy for certain types of plant, such as Germany.[30]

4.11. In addition, an increasing volume of intermittent generation could to lead to greater price volatility. This is due to greater swings in available generation output, and associated with this greater value being placed on flexible and demand side response (DSR).

[27] Key smart metering documents can be found at: https://www.gov.uk/government/policies/helping-households-to-cut-their-energy-bills/supporting-pages/smart-meters
[28] See Status Review of Regulatory Aspects of Smart Metering at: http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Customers/2013/7-1_C13-RMF-54-05-Status_Review_of_Regulatory_Aspects_of_Smart_Metering_FOR_PUBLICATION.pdf
[29] Generators that are not receiving subsidies and can be turned down are usually willing to pay the System Operator to be turned down in the Balancing Mechanism to avoid fuel costs.
[30] DECC has produced analysis on the likelihood of negative prices, see: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48443/5693-lcp-assessment-of-the-dispatch-distortions-under-t.pdf

4.12. On the other hand the impacts of the EU TM will have a degree of smoothing effect on prices by making it easier to arbitrage between GB and other markets, enabling the export power at times of system surplus and for market participants in other European countries to sell power into the GB wholesale market when GB prices rise. This interconnection with other markets would have potential benefits for liquidity, competition and consumers' bills.[31]

Investment signals

4.13. The CM could have the effect of lower wholesale forward prices. This effect may be supplemented by smart metering, which will facilitate DSR and reduces pressure on the capacity margins in the wholesale market. This would undermine the investment case for plant not in receipt of capacity payments, as it would reduce the revenue available to them from the wholesale market.

4.14. We consider that it is important to give thought to how the signals for investment may move back to the market in the absence of the CM. Our reforms to ensure that cash-out prices are cost-reflective will be an important part of this move.

Changing demand side behaviour

4.15. Both the CM and the possible negative price effects of CFDs create incentives for alternative capacity such as DSR and storage solutions to enter the system. Meanwhile, smart metering could facilitate intermittent generation in the wholesale market by shifting demand to times of high output. It could also reduce daily peaks in demand by enabling consumers to shift output to times of the day when wholesale prices are lower. Provided DSR and storage can find effective routes to market, there is the potential for a greater interaction between volume and prices.

Impacts on industry structure

4.16. The electricity market is currently characterised as having a large degree of vertical integration, and in Box 2 we set out how some of the changes in the market could affect this in future. However, we suggest that it is also important for the CMA to consider how developments in the wholesale market could affect the incentives for other kind of business structures. For example, there may be greater or lessened incentives to have horizontal relationships, such as maintaining a portfolio of different generating plant. There may also be incentives around achieving scale in order to operate profitably.

[31] An early example of this can be seen in the day-ahead market coupling arrangements, which has led to a single pool of liquidity at the day-ahead stage in GB and provided access to this pool for European players.

Box 2 - Effects on the characteristics of the wholesale electricity market: vertical relationships

The CMA's second Theory of Harm refers to vertical integration (VI) as potential AEC in the wholesale electricity market. Some commentators[32] have suggested that the changes introduced by EMR will remove the incentives for firms to vertically integrate – or indeed unwind existing VI structures. However, we argue that the impacts of EMR are multifaceted and likely to impact different party types in different ways, and therefore suggest that the net impact of EMR on incentives to vertically integrate is uncertain.

A further reason for being cautious about the potential of EMR to undermine the case for vertical integration is the timing of the impact of the mechanisms. While EMR will eventually have a significant effect on the energy market, this effect will only unfold over time as more CfD- or CM-supported generation comes online. Initially (to 2020) the impacts of CFDs will not be significant enough relative to the size of overall generation portfolios to, in themselves, weaken vertical integration.[33]

In the State of the Market Assessment, we set out a number of drivers that may lead companies to establish vertical relationships. Below we illustrate some examples of how EMR could impact these incentives, with the caveat that other developments will have an impact as well.

Managing risk and providing a natural hedge – Firms with vertical relationships are better protected against shifts in the value chain resulting from movements in wholesale prices than those without vertical relationships. As noted above, EMR provides price certainty for generation subject to CfDs, thereby reducing these generators' risk exposure, which may reduce incentives to vertically integrate. However, the increase in intermittency could drive wholesale price volatility and vertically integrating is one way that parties could use to manage this.

Liquidity risk and certainty for investment - Because of their ability to transfer energy internally, vertically integrated firms are less dependent on trading in the wholesale market to sell or source their energy – in the short term to balance, and in the longer term to invest. As noted above, liquidity may be concentrated in the wholesale market products which form the CfD reference price. This could make it more difficult for non-CfD generators and suppliers to trade to hedge their price risk outside of these timescales. For these players, vertical relationships are likely to remain an attractive strategy. However, EMR contracts could provide some of the long-term revenue certainty needed to invest, reducing the need to vertically integrate to do so if there is insufficient liquidity for longer term contracts and tolling agreements.

Economies of scope - Vertically-integrated firms may benefit from the fact that expertise gained in one segment of their business benefits their operations in another. To the extent that EMR increases complexity of the arrangements, this may increase the value of being able to share industry knowledge.

[32] Eg see Dieter Helm's paper for Energy Futures Network at: http://www.dieterhelm.co.uk/sites/default/files/What%20future%20for%20vertically%20integrated%20energy%20companies.pdf

[33] The amount of CfD generation that comes online depends in part on the Levy Control Framework, see: http://www.nao.org.uk/report/levy-control-framework-2/

Our work in this area

4.17. To conclude, the market fundamentals, market design and market characteristics will be significantly altered by the developments outlined in this chapter, reshaping the competitive context of the market. We would suggest that the CMA should be conscious of these developments when assessing AECs and when considering any potential remedies.

4.18. More generally it is important to recognise that the net impact of all of these changes is inherently uncertain. Ofgem is continuing to consider issues and engage with industry in this area. For example, the Future Trading Arrangements forum is an industry group, co-ordinated by Ofgem, which provides an opportunity for industry, DECC and Ofgem to consider the wide range of issues impacting on the wholesale electricity market, and how the arrangements may need to evolve in light of these. Though the FTA project is not explicitly focused on competition, it may nevertheless provide some useful evidence for the CMA’s investigation.

4.19. Finally, we have internal work-streams which are aimed at identifying key areas where we expect market performance and behaviour may change. We will continue to update our monitoring and industry engagement to reflect these, and provide the CMA with relevant information when it becomes available.

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Case Study 1: Moving from a Pool to a Bilateral Market in 2001

The New Electricity Trading Arrangements (NETA) were introduced in England and Wales in 2001, replacing the England and Wales Pool which had operated since privatisation in 1990. In 2005 the arrangements were extended to include Scotland as part of the British Electricity Trading and Transmission Arrangements (BETTA). NETA was introduced following a review of the electricity trading arrangements in 1997[34] which expressed concerns in relation to:

- The Manipulation of System Marginal Price (SMP). The existence of a single, central price for electricity meant that generators with market power had the ability and the incentive to manipulate prices. Generators at the margin, typically National Power and PowerGen, were found to have undue influence on Pool prices.
- Manipulation of Capacity Payments. Capacity payments were based on a Value of Lost Load (VoLL) and a loss of load probability (LOLP). Withdrawing capacity at the day-ahead stage could increase the LOLP, thereby driving up capacity payments.
- Complexity. The complexity and lack of transparency of bidding and price setting allowed generators to exercise more market power than would have been possible had the market been structured more like a classic commodity market, especially as this complexity may have created a barrier to monitoring market power.
- Lack of transparency about trading outside the Pool. Market participants could strike up CfDs around the Pool price. The bulk of electricity purchases and sales were covered by CfDs, and the terms of these arrangements were not published.
- Passive demand side. There was different treatment for generation and demand. Generators bid in, while suppliers paid a uniform price. Suppliers were not responsible for forecasting and purchasing to cover their consumers demand and subsequently had a relatively passive role in the market compared to generators.
- Insufficient incentives to be available. If a generator failed to deliver it forewent the market price but was not exposed to the costs and consequences of not meeting its commitments. This transferred costs and risks of plant failure from generators to consumers through energy uplift payments.

The key objective for the new electricity trading arrangements was that they would be "**market-based trading arrangements more like those in commodity markets elsewhere**". As a result, parties were incentivised to trade in the forward markets, rather than in a real-time spot market, and the role of the SO in setting prices and dispatching plant was reduced.

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[34] See the Review of Electricity Trading Arrangements: Proposals, July 1998 and the Review of Electricity Trading arrangements: Framework Document, November 1998 at: https://www.ofgem.gov.uk/ofgem-publications/79067/review-electricity-trading-arrangements.pdf

Case Study 2: The Nordic Power Market

The Nordic market is a good example of the importance of market fundamentals. It is often cited as an example of a well-functioning market because of its high liquidity and a diverse range of participants, including aggregators and DSR providers. While the key market design elements are similar to GB, the market fundamentals are very different. In turn that can be seen to have an impact on the market characteristics, specifically how the market trades.

The Nordic energy market is a conglomeration of four markets: Norway, Sweden, Denmark and Finland. The key elements of the electricity market design in the Nordic markets are very similar to the GB market. Generators and suppliers trade bilaterally (and on exchanges) until one hour ahead of 'real-time,' and self-dispatch to fulfil their contractual obligations. The SO then takes over and uses a balancing mechanism to balance the system. Imbalance prices are designed to encourage forward trading (dual imbalance prices for generators, and single imbalance prices for suppliers). Market participants have freedom to trade however they wish – there is no requirement to trade on the Nord Pool Spot exchange. One key difference is zonal pricing. The Nordic market is split into 12 price zones according to physical constraints across the 4 countries.

While the market design in the Nordic region may be similar to that in GB, there are important differences in terms of how market participants choose to trade. Most physical trading takes place at the day-ahead stage[35], and hedging and risk management is done mostly through financial contracts linked to this price[36]. Churn in the Nordic market is around 5.3, including physical and financial trades. By contrast, GB churn of physical trading averages around 2.8. Liquidity in the near-term (physical) Nord Pool markets is closely linked to liquidity in the forward (financial) markets.

Liquidity in the Nordic Market and GB		
	% of consumption (2013)	
	Nordic Market[37]	**GB**[38]
Day-ahead	87%	76%
Intra-day	1%	4%
Physical forward OTC	11%	242%
Balancing	1%	2%[39]
Financial trading	430%	-[40]

[35] Nord Pool Spot runs the power exchange in the Nordic market – the day ahead exchange is Elspot, and the intraday continuous trading market is Elbas. Elspot has a price cap of €2,000/MWh and a price floor of -€200/MWh.
[36] Most forward trading is via financial contracts. Financial trading in the Nordic electricity market takes place on Nasdaq OMX Commodities. Contracts can be struck for base-load up to six years ahead.
[37] Consumption in the four Nordic countries for 2013 totalled 380.5 TWh.
[38] Consumption in GB for 2013 was 317 TWh.
[39] Source: http://www.iea.org/media/workshops/2014/esapworskhopi/Mike_Edgar.pdf
[40] Most GB forward trading takes place OTC. As a consequence, a physical hedge trade and a financial trade are almost impossible to distinguish.

These different market outcomes – in particular the high liquidity on the day-ahead platform of the Nordpool Spot exchange - can be explained partly by the market fundamentals. The Nordic region has a significantly different generation mix with high levels of hydropower, including pumped storage (53% across the region); and relatively low levels of intermittency (6% across the region). This means there is less likely to be a significant shift in price after the day-ahead stage, making the day-ahead market a good tool for the market to manage imbalance risk. In GB wind can drive swings in output after the day-ahead stage, meaning there is often significant variation between the day-ahead price and the price at delivery.

There are also impacts further along the curve. The robust and highly liquid day-ahead market provides a reference price to financially manage risk in longer timescales. The liquidity in the two markets then becomes mutually-reinforcing, as market participants trade to exchange their financial hedge for a physical contract in the day-ahead market. The financial rather than physical nature of trading in forward timescales may also facilitate a more diverse range of players, including traders, banks and aggregators, further adding to liquidity in the markets.

There is a further important difference in fundamentals that should also be noted, and that is related to the nature of the demand side. When the Nordic market opened, there were over 600 different suppliers, mostly small regional and municipal utilities. While there has been significant consolidation since then there are still between 25 and 100 suppliers in each of the countries within the region. This is likely to have contributed to levels of liquidity.

Case study 3: The GB Gas Market

The introduction of NETA followed the implementation of the New Gas Trading Arrangements (NGTA) in 1999. Following the lifting of the moratorium on constructing gas-fired generation in 2000 around 5 GW of gas plant gained consent, meaning that important inter-linkages between the two markets developed. Both markets operate on the basis of bilateral trading arrangements, whereby market participants trade with each other to meet the demand of consumers (with the System Operator carrying out a residual balancing role).

One important difference between the gas and electricity markets is the physical differences between gas and electricity as products. These influence the market design, which influences the incentives faced by the market, and subsequently how market participants respond to these incentives (eg by establishing vertical relationships). A key physical difference is that gas can be stored and even transported globally as liquefied natural gas (LNG). This means there is much more 'flex' associated with being able to import, export or store large volumes of gas at relatively low short run marginal cost. There is even 'flex' associated with the gas in the pipes (known as linepack). This means from an operational perspective there is a greater margin for error in balancing the system and physical constraints are less acute.

The relative flexibility of gas means there is a smaller balancing role for the SO in gas, which is reflected in the market design in a number of ways. For example, the gas trading arrangements have a daily balancing period where market participants can continue to trade right up until the close. Under normal market operation the SO is only ever the *residual* balancer of the system. In electricity the trading arrangements have a 30 minute balancing period with fixed commercial positions one hour ahead of delivery. After gate closure the SO takes over as *physical* balancer of the system.

These physical and market design features mean that there is inherently more risk associated with balancing electricity than gas - a risk that electricity market participants respond to by establishing vertical relationships. For example, in gas, suppliers can respond to demand fluctuations in real-time, and the existence of storage reduces the need to match buyers and sellers on a real-time basis, and allows arbitrage between high and low prices. Further, because gas can be stored and physically exported there is a global market which helps support market depth and liquidity. It therefore increases suppliers' confidence that they will find a market. The role of GB as a gas trading hub facilitates participation by market participants such as financial players.

Another important difference between gas and electricity is that different sources of electricity generation have very different marginal costs. This, combined with the need to balance on a second-by-second basis and shorter balancing periods, drives more daily price volatility in electricity.

Taken together, the market fundamentals (in particular the physical characteristics of gas as a product) have resulted in more competition, greater liquidity, and less vertical integration in the gas wholesale market than is seen in the electricity market. This highlights how irrespective of the market design in electricity, the differences in market fundamentals between gas and electricity mean it is misleading to talk of achieving parity in gas and electricity market outcomes.