# Energy market investigation

## Gas wholesale market

**10 March 2015**

This is one of a series of consultative working papers which will be published during the course of the investigation. This paper should be read alongside the updated issues statement and the other working papers which accompany it. These papers do not form the inquiry group's provisional findings. The group is carrying forward its information-gathering and analysis work and will proceed to prepare its provisional findings, which are currently scheduled for publication in May 2015, taking into consideration responses to the consultation on the updated issues statement and the working papers. Parties wishing to comment on this paper should send their comments to energymarket@cma.gsi.gov.uk by 18 March 2015.

The Competition and Markets Authority has excluded from this published version of the working paper information which the Inquiry Group considers should be excluded having regard to the three considerations set out in section 244 of the Enterprise Act 2002 (specified information: considerations relevant to disclosure). The omissions are indicated by [✂].

**Contents**

*Page*

## Summary

1. The energy market investigation issues statement identified the gas wholesale market as an area that the Competition and Markets Authority (CMA) was not minded to investigate further, since the evidence collected during the phase 1 assessment leading up to the market reference suggested that the gas wholesale market does not possess the potentially harmful features that have been identified in the electricity wholesale market. In particular, the gas wholesale market is less vertically integrated, shows higher levels of liquidity and is linked to international markets via high levels of pipeline interconnection and liquefied natural gas (LNG) terminals.

2. The majority of respondents to the issues statement either supported, or did not comment on, our proposal regarding the gas wholesale market but some were opposed and thought that the CMA should investigate further. In most cases the reasons given for this view were generic in nature, for example the need to take an even-handed approach between gas and electricity, or the importance of investigating all aspects of the energy market in order to restore consumer confidence. However some respondents also highlighted specific issues that they felt could be causing harm in the gas wholesale market, including market manipulation, pricing transparency and concentrated ownership of gas storage capacity.

3. For this paper we have reviewed a number of broad indicators of the performance of the gas wholesale market, drawing mainly on data provided by Ofgem, together with information collected from gas transporters, the gas spot market operator (Xoserve)[1] and the Six Large Energy Firms via data requests. The assessment covers the scope for unilateral market power (UMP); barriers to entry; liquidity; vertical integration; and the balancing market. We have also examined the specific issues mentioned by respondents as possible sources of harm in the market.

4. Overall, our review is consistent with the position adopted in the issues statement. We emphasise that this is our view of the gas wholesale market and not of gas retail markets. On all the indicators we have reviewed to date, the gas wholesale market is currently performing well. We note that over the course of the next 20 years, as the UK's dependence on gas from the EU is forecast to grow, there may be more concern about exposure to less

[1] Xoserve delivers gas transportation transactional services on behalf of the five major GB gas transportation network companies – Northern Gas Networks, Scotland Gas Networks, Southern Gas Networks and Wales & West Utilities (gas distribution) together with National Grid (gas distribution and transmission). Xoserve is jointly owned by these companies.

competitive conditions in Europe. However, this is not an issue in the timeframe of this investigation.

5. The potential sources of harm raised by respondents appear to be adequately addressed by existing regulation, in particular the undertakings on Centrica Storage in relation to its ownership of the Rough storage facility, and the EU Regulation on Energy Market Integrity and Transparency (REMIT) in relation to market manipulation and abuse.

6. It should be noted that our assessment of the scope for UMP in gas relies on measures of concentration (market shares and Herfindahl–Hirschman Indices (HHIs)) and pivotality,[2] both of which have limitations. In the case of our analysis of upstream electricity markets, we seek to overcome these limitations with more sophisticated analysis. However, there are a number of features in the gas wholesale market which make UMP less likely to be exercised than in the case of electricity and we therefore consider that it is reasonable to take a different approach to assessing UMP in the two markets.

7. This paper is intended to provide a detailed rationale for our decision not to investigate the gas wholesale market in depth. We welcome views on this conclusion.

## Overview of the gas wholesale market

8. This section of the paper provides a brief overview of the key features of the GB gas wholesale market, including key milestones in the liberalisation process, the physical functioning of the gas system in terms of the main supply sources, and the operation of the traded market. The majority of this information has been sourced either from Ofgem or from the Oxford Institute for Energy Studies paper on the evolution of gas trading in Great Britain,[3] and readers may wish to consult these sources for additional information.

### *History of market liberalisation*

9. The GB gas wholesale market was the first in Europe to liberalise and one of the first globally. Key legislative/regulatory milestones in the liberalisation process included:

    - the Gas Act 1986 following which British Gas was initially privatised;

[2] 'Pivotality' refers to a situation in which market demand cannot be satisfied without the production capacity of a given operator.
[3] See Patrick Heather (2010) *The evolution and functioning of the traded gas market in Britain*.

- the Gas Act 1995, which set out a timetable for full opening of the market to competition, including the residential sector which was not originally envisaged at the time of privatisation. The Gas Act 1995 also established the basic regulatory framework via the licensing system for gas transporters, gas shippers and gas suppliers;

- the Uniform Network Code (1996), which set out the rules and procedures for third party access (TPA) to the GB pipeline network and introduced a regime of daily balancing. The Uniform Network Code created the national balancing point (NBP), which is a virtual point on the gas network where gas shippers (wholesalers) nominate their buys and sells and where National Grid Gas (NGG), the System Operator, balances the system on a daily basis; and

- the Review of Gas Trading Arrangements (1999), which introduced the on-the-day commodity market (OCM) for spot trading and gas balancing, allowing parties to balance their own positions up to 3.45pm on each day, after which NGG takes over and becomes the counterparty to all remaining trades for the day.

10. While there have of course been many subsequent changes to gas regulations via gas licences and the Uniform Network Code, a striking feature of the gas wholesale market by comparison with the electricity market is the high degree of regulatory stability since the market was liberalised. The basic NBP regulatory framework remains largely intact and has formed the basis for a liquid traded market as will be discussed further below.

### *Physical supply sources*

11. Physically, the GB gas system has some of the most diverse supply sources in Europe, with gas being supplied onto the NBP from:

    - fields on the UK continental shelf (UKCS) and the Norwegian continental shelf (NCS), via pipelines;

    - global gas fields, for example in the Middle East, via import terminals for LNG;[4] and

[4] LNG is transported in specialised container ships and then regasified prior to being input into the network.

- the mainland European gas pipeline network via interconnector pipelines that connect Bacton in the UK with Zeebrugge in Belgium (the IUK [5]pipeline) and Balgzand in the Netherlands (the BBL[6] pipeline).[7]

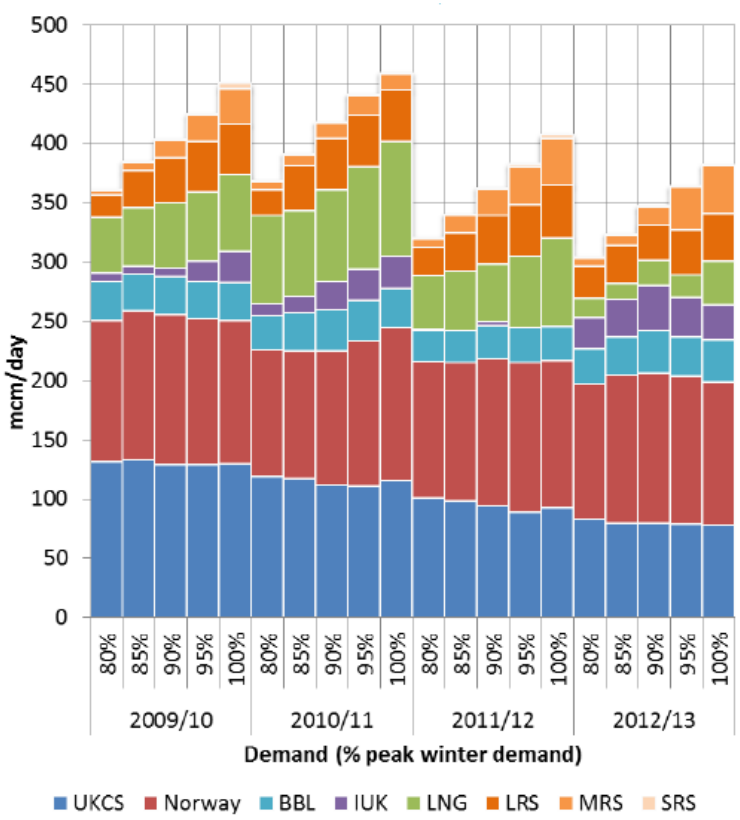
12. Gas storage also plays a critical role in managing variation in gas demand, in particular the seasonal swing between winter and summer, which is much more pronounced for gas than it is for electricity. Gas storage facilities are typically described as being 'long range' (LRS), 'medium range' (MRS), or 'short range' (SRS) depending on their capacity and the speed with which they empty and refill. By far the largest facility in GB is the Rough storage facility which is owned and operated by Centrica Storage, under regulatory undertakings imposed by the Competition Commission (CC).

13. Figure 1 below, provided by Ofgem, shows the supply sources used to meet demand on days that saw 80 to 100% of peak winter demand, in the years 2009/10 to 2012/13. It can be seen that the UKCS and NCS are the two largest supply sources and effectively operate as 'baseload' (ie their flows do not vary much over the course of the year), although UKCS supply is trending downwards over time as the UKCS is depleted. Swing is provided by storage and to a lesser extent by LNG and pipeline flows from mainland Europe (IUK and BBL).

[5] Interconnector (UK).
[6] The Balgzand Bacton Line.
[7] The IUK pipeline is bidirectional (ie it can flow either way depending on contractual positions and/or price differentials between the UK and Europe) while the BBL pipeline flows one way from the Netherlands to the UK.

FIGURE 1

**Supply sources used to meet high demand**

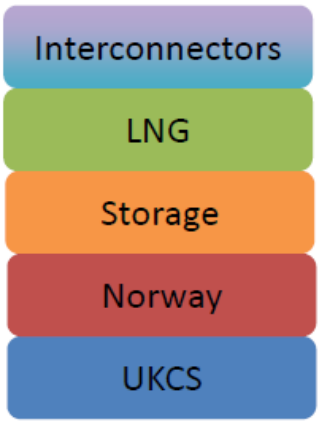



Source: Ofgem.

14. According to Ofgem, there is a rough 'merit order' in gas which might look something like Figure 2 below. In recent years the highest cost gas has typically come via the interconnectors with mainland Europe and from LNG. Baseload gas typically comes from the UKCS and Norway. The value of storage varies over the year, with withdrawals becoming more viable in the winter, but the value of storage determined by the difference between the summer price of gas and the winter price. It is more difficult to draw up a precise merit order in the gas wholesale market that it is in the electricity wholesale market.

FIGURE 2

**Relative cost of wholesale gas sources**




Source: Ofgem.

15. It should be noted that in carrying out our assessment of the gas wholesale market, we have not attempted to examine issues related to the structure and performance of the gas market in mainland Europe, although the UK market is exposed to these through the interconnectors. We recognise that there are concerns that have been raised regarding mainland European gas markets, such as the linking of gas contracts to oil prices and the current high level of dependence on Russian gas supplies. The issues around the structure and competitiveness of EU gas markets will become more important to the UK in a 15 to 20 year horizon assuming that dependence on imports grows.

***Overview of the traded market***

16. The NBP evolved rapidly as a trading hub for UK and European gas following the introduction of the Network Code in 1996 and the subsequent development by an industry working party in 1997 of a standardised trading contract known as the Short Term Flat NBP Trading Terms and Conditions (or NBP ’97 for short) which is still in widespread use today.

17. As in the electricity wholesale market, the most common form of gas trading consists of bilateral over-the-counter (OTC) trades (which in gas are based on the NBP ’97 contract described above), which are conducted in ‘clips’ or multiples of 25,000 therms per day in one of several clearly defined time periods (eg day, month, season). OTC deals are normally traded via brokers, in the past over the phone, but now predominantly online.

18. OTC contracts are bilateral contracts for physical delivery. In addition to physical contracts, bilateral financial swap contracts are also traded in the gas wholesale market although they are much less widely used. Financial swaps

are a mirror of the physical trade but use an index at maturity to work out the payment due based on the difference between the contract price and the reference outturn price.

Futures exchange and cleared trades are another route to market for traded gas, in which a clearing house acts as the central counterparty and financially guarantees all of the executed trades. The gas futures exchange in Great Britain is operated by Intercontinental Exchange (ICE), which now also operates the gas OCM via ICE Endex.[8] Trading volumes on the ICE gas futures exchange have grown steadily, and during winter 2009/10 reached a record share of around 30% of the overall volumes of gas traded at the NBP.

19. The OCM is the spot and balancing market for natural gas in the UK. It is an anonymous cleared exchange and therefore eliminates counterparty risk, as for the ICE futures exchange. NGG's balancing trades for the day are used to set cash-out prices for any shipper imbalance volumes which remain following the close of trading.

20. Finally, 'old-fashioned' bilateral contracts (ie non-standardised contracts where all terms and details are individually negotiated between the two parties on a bespoke basis) are also still used in the gas wholesale market, predominantly for longer-term deals such as a long-term supply agreement to a combined-cycle gas turbine (CCGT) power station or large industrial user.

## Theories of (no) harm set out in the issues statement

21. As set out in the issues statement, the CMA's initial position on the gas wholesale market was that it appeared to be functioning well and that there were no obvious competition problems that suggested we should pursue further work in this area.

22. The majority of respondents to the issues statement either explicitly supported our position on the gas wholesale market or made no comment on the position. Of those who did not agree with the position, five respondents gave general reasons for disagreeing, such as the need to review all aspects of the market in order to restore trust, the relevance of the gas market as a comparator to electricity, or the importance of gas as a fuel source for electricity generation. Only four respondents set out specific theories and/or evidence of harm in the gas wholesale market as follows:

    - Utility Warehouse stated that Centrica might enjoy a significant competitive advantage through its dominant position in gas storage, and

[8] See the ICE and ICE Endex websites.

that independent suppliers might have difficulty renting storage capacity on reasonable terms – although the company acknowledged that it had not attempted to rent capacity itself since 2005.

- Ecotricity mentioned incidents of market manipulation in the gas market such as the St Fergus and Bacton scandal in 1999.
- Which? stated that the processes used to gather and publish gas wholesale market data by price reporters were vulnerable to manipulation, often relying on human reporting rather than transactional data, leading to uncertainty regarding price integrity.
- An independent energy consultant stated that gas transmission was not inherently a natural monopoly and that investment in gas transmission pipeline capacity could be delivered via a market-based model as in the US rather than on a regulated monopoly basis.

23. The remainder of this paper will discuss firstly the evidence in support of the position set out in the issues statement, ie that the gas wholesale market is working well and does not represent a source of harm to energy consumers, and secondly any evidence against the position, focusing in particular on the potential sources of harm mentioned by respondents to the issues statement

## Evidence supporting approach on theories of harm set out in the issues statement

24. In this part of the paper we review evidence on the following with respect to the GB gas wholesale market:

*(a)* the potential for UMP;

*(b)* barriers to entry;

*(c)* liquidity;

*(d)* vertical integration; and

*(e)* balancing market performance.

Comparisons are made with the GB electricity wholesale market and/or with gas wholesale markets in other countries, wherever possible and relevant.

### *Potential for unilateral market power*

25. Ofgem has provided us with analysis of market shares and HHIs for the gas wholesale market, looking both at overall gas supply and at flexible gas only. This analysis is shown in Figures 3 and 4 below. It can be seen that regardless of which market definition is used, the gas wholesale market appears to be relatively unconcentrated based on market shares and HHIs, suggesting limited scope for exercising UMP.

FIGURE 3

**Market shares of upstream GB gas supply, 2012/13**

[✂]

Source: [✂].
Note: [✂].

FIGURE 4

**Market shares of flexible GB gas capacity under different market definitions of flexibility,[9] 2012/13**

[✂]

Source: [✂]
Note: [✂].

26. Another metric used by Ofgem to assess the scope for UMP is pivotality analysis. This looks at the supply capacity held by a given player in the wholesale market, and assesses whether demand could be met in all relevant periods (eg each day, week, month, quarter and season) if that supply capacity were not available. Different sensitivities are modelled on both the supply side (looking at the impact of infrastructure outages, specifically the loss of the IUK interconnector and the Milford Haven landing terminal) and the demand side (varying the weather profile used in the analysis using four different weather profiles ranging from mild, based on the 2011/12 winter profile, to 'extreme cold', which is a 1-in-50 winter).[10]

27. [✂].

28. [✂].

---

[9] [✂].
[10] Specifically, the four profiles used by Ofgem are: mild – 2011/12 weather profile; cold – 2012/13 weather profile; very cold – 2010/11 weather profile; extreme cold – 2011/12 weather profile uprated to a 1-in-50 winter. More detail on the methodology used in Ofgem's pivotality modelling can be found in Appendix 4 of Ofgem's recent assessment of Storengy UK Ltd's application for a minor facilities exemption for Stublach phase 2.

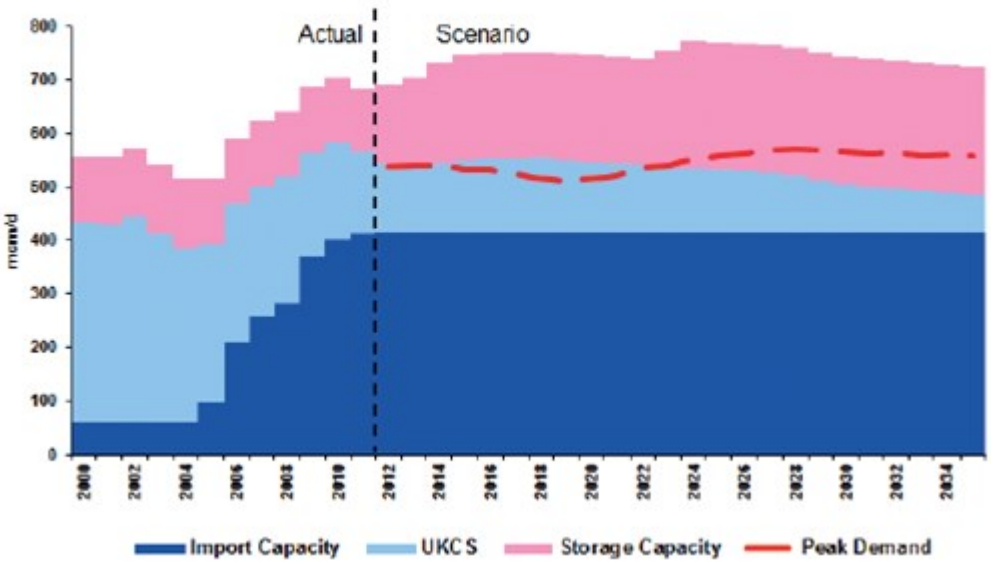
29. Caution must be exercised in interpreting the sort of pivotality evidence that Ofgem adduces to conclude that there are low risks of upstream UMP. Gas, like electricity, is a market that is characterised by peak demand pricing patterns. These are markets in which prices will sometimes rise to very high levels, and that must sometimes rise above the short-run marginal cost of the marginal producer in order to create the necessary incentives for marginal producers to invest in capacity. In periods when demand must be curtailed to meet available supply (when the capacity constraint is binding), by definition every producer is pivotal. There is therefore no surprise in the finding that in some very severe winters, the largest producer is pivotal – there will always be some severity of winter that leads to concerns that prices will exceed short-run marginal costs under a pivotality criterion.

30. The expected evolution of peak demand and supply is shown in Figure 5, taken from National Grid's Ten Year Statement in its Slow Progression scenario (in which gas demand is highest). While the graph shows that there is no risk of being short of capacity, it is also clear that an upstream importer or UKCS producer could quite easily tip the system into needing storage near peak times.

FIGURE 5

**Peak GB gas supply and demand, 2000–2035**

*Figure 2.5D*
*2013 Peak Supply - Slow Progression*
*Source: National Grid*




Source: National Grid.

31. We have put more weight on Ofgem's analysis in assessing the potential for the exercise of UMP in gas than in electricity. The reason for our different treatment of the two markets is set out in Table 1 below. There are a number of features in the gas market that make UMP less likely to be exercised than in the electricity market.

**Table 1: Reasons for differing treatment of UMP in gas versus electricity**

| *Gas market feature* | *Implication* |
|---|---|
| Demand and price peaks are less frequent | Less frequent opportunity to exercise UMP. |
| Upstream concentration is lower. | Less incentive to exercise UMP. |
| Imports have fewer constraints. | Upper bound for gas prices set by LNG import prices. |
| There is more storage capacity. | Storage provides an upper bound for gas prices. |
| Demand is more elastic. | Less incentive to exercise UMP. |
| No worries about input foreclosure (except Rough storage, where undertakings remedy the problem). | No vertical aspects of exercise of UMP. |

Source: CMA analysis.

32. Despite these features, strategically withholding gas supplies during cold winters might still have the effect of raising wholesale prices. [✂].

33. We believe that taken together, the Ofgem analysis, the features of the gas market and the absence of industry complaints suggest that the likelihood of identifying problematic behaviour is low.

### *Barriers to entry*

34. There is considerable uncertainty regarding the future trajectory of gas demand and supply in light of issues such as the transition to renewable sources of energy, energy efficiency, the depletion of UKCS and NCS supplies and the development of shale gas. In its work on Future Energy Scenarios, National Grid has modelled four scenarios for the supply/demand mix to 2035,[11] while its 2014 Ten Year Statement for the gas transmission network contains four scenarios.[12]

35. In all the 2014 Future Energy Scenarios, UKCS gas is assumed to continue declining as a supply source; in the two 2013 Future Energy Scenarios, the NCS supplies to the UK are also assumed to decline by 2035.[13] This raises the question of whether the gas market can be expected to respond

[11] National Grid (2014) *UK Future Energy Scenarios: UK gas and electricity transmission*. The four scenarios are termed Gone Green, Slow Progression, No Progression, and Low Carbon Life.
[12] National Grid (2014) *Gas Ten Year Statement 2014*.
[13] National Grid (2013) *National Grid's UK Future Energy Scenarios 2013*

competitively by bringing other sources of supply on stream, or whether there could be barriers to entry or expansion that would prevent such a response and hence increase the likelihood of competition problems in the market in future. (There is also the question of whether, even if new supply sources do come on stream, the changes in the supply mix may affect levels of concentration in the market and hence the scope for exercising market power.)

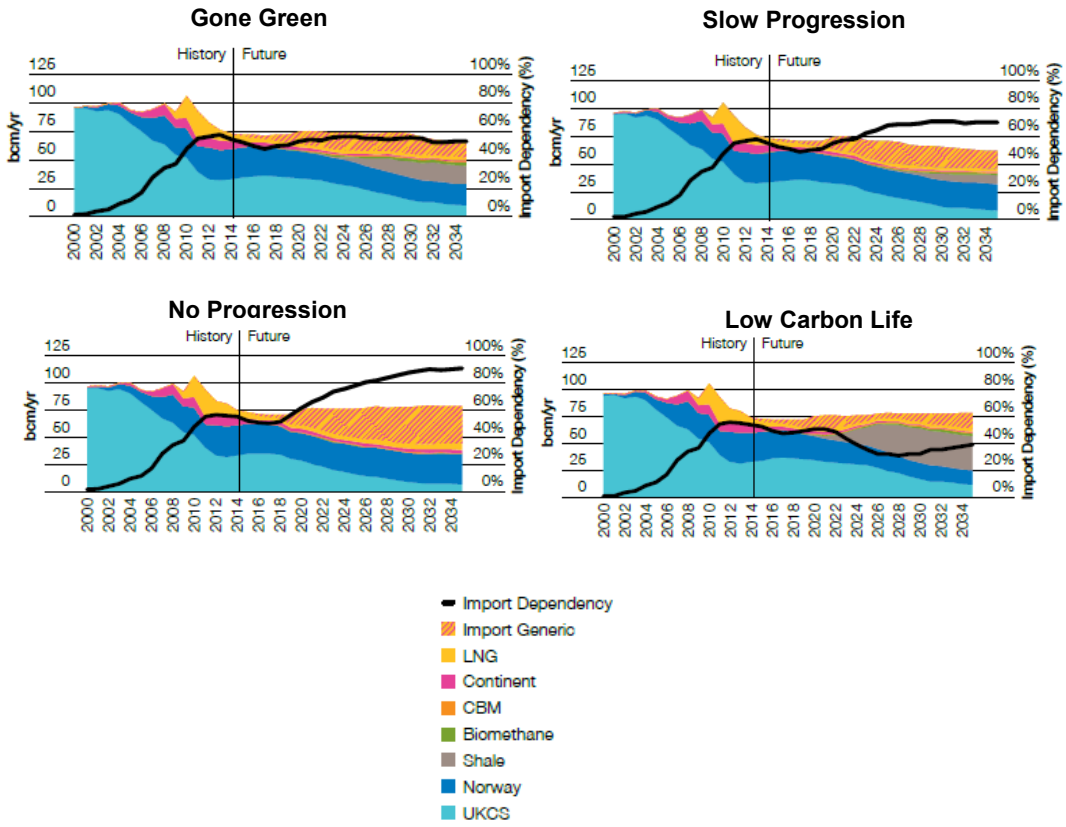
36. Potential new sources of supply modelled by National Grid include additional LNG capacity, coal bed methane (CBM) and biomethane, and shale gas. Of these, the greatest uncertainty relates to shale gas, given that no wells have yet been drilled beyond the exploration and testing stage. National Grid based its 2013 Future Energy Scenarios projections on a 2013 report by the Institute of Directors,[14] and used a very wide spread of shale projections ranging from no successful development in the No Progression scenario through to a peak of 32 bcm/year in the Low Carbon Life scenario.

37. Figure 6 shows the evolution of the supply mix and import dependency under the four 2014 Future Energy Scenarios. Both overall gas demand and import dependency are highest in the No Progression scenario, in which there is assumed to be no money to spend on developing lower carbon options, limited further development of the UKCS, no shale gas and very little biomethane. The shortfall in domestic supply is met through imports from mainland Europe and LNG. Even under this scenario however, National Grid states that the additional imports 'could all be handled with the UK's existing LNG and pipeline infrastructure, though the amount of gas required may attract development of new import capacity'.[15]

[14] Institute of Directors (2013) *Infrastructure for business: getting shale gas working*.
[15] National Grid (2014) *UK Future Energy Scenarios: UK gas and electricity transmission*, p188.

FIGURE 6

**Supply mix and import dependency to 2035, National Grid Future Energy Scenarios**




Source: National Grid.

38. Given that current supply capacity appears to be sufficient to meet forecast needs to 2035 even under National Grid's highest scenario for future gas use and import dependency, it is perhaps not surprising that there are currently no gas import projects under construction in the UK. However, National Grid's Ten Year Statement does list four proposed import projects at present, all of them LNG terminals, with a combined capacity of 30+ bcm.[16] Planning approval has been granted for one of these (Norsea LNG) but development is currently on hold, while a second (Amlwch) has received planning approval onshore. National Grid notes that this list is not exhaustive and that other import projects have at times been detailed in the press.

39. In relation to gas storage, the Ten Year Statement lists two projects currently under construction – Hill Top Farm and Stublach – with a combined capacity of 0.3 bcm (total existing UK storage capacity is 4.6 bcm). A further seven storage projects are currently at the proposal stage, with a combined capacity

[16] See National Grid (2014) *Gas Ten Year Statement 2014*, Appendix 2, Table A2.4B.

of 7.5 bcm, almost double the UK's existing capacity. All of these projects bar one have already been granted planning permission, although final investment decisions have not yet been taken. Furthermore, it should be noted that none of the storage projects currently under construction or proposed are operated by Centrica Storage, which owns the majority (75%) of storage capacity in the UK at present and is regulated via undertakings agreed with the CC.[17] Hence, if these storage projects go ahead it should reduce concentration levels in the relation to ownership of gas storage.

40. In summary, there do not appear to be any material barriers to entry for either new gas import capacity or gas storage capacity that would indicate a likely emergence of competition problems in the wholesale market in the future. In fact, given that the share of supply accounted for by the largest upstream supplier (Norway's Statoil) is forecast to decline under most scenarios and that any new LNG or pipeline import capacity would be subject to regulations on TPA,[18] it seems more likely that concentration levels in upstream gas supply would fall rather than rise. Similarly, the current proposals for new gas storage facilities would, if completed, reduce concentration of ownership by Centrica Storage, and these facilities would also be subject to TPA regulations.

### *Liquidity*

41. Evidence obtained from Ofgem – shown in Figures 7 and 8 below – indicates that gas market liquidity has grown fairly steadily since deregulation in 1998, albeit with some temporary dips following market shocks (such as the failures of Enron and TXU Europe in the early 2000s, and the global financial crisis in 2008-09).[19] Figure 7 shows that the churn ratio of traded gas volumes to physical volumes has fluctuated between 15 and 45 in recent years, following a seasonal pattern with lower churn in the winter months. (One rule of thumb that has been suggested is that markets are 'mature' if they have a churn rate of ten or greater.[20])

---

[17] The CC undertakings on Centrica Storage are discussed further in paragraphs 57–58 below. Note that on a measure of deliverability rather than capacity, Centrica owns approximately 30% of the GB total.
[18] Providers of interconnector pipelines, storage facilities and LNG import terminals are subject to TPA regulations under European legislation, although they may apply for exemptions from the TPA requirements. Exemption applications are considered by Ofgem on a case-by-case basis. For more detail on the exemption process and past Ofgem decisions, see Third party access exemptions.
[19] The two figures do not measure churn in identical ways. Figure 8 is the better absolute measure.
[20] Patrick Heather (2010) *The evolution and functioning of the traded gas market in Britain*, Oxford Institute for Energy Studies.

FIGURE 7

**GB gas wholesale market churn, 1998–2009**

[✂]

Source: [✂].

42. Indicators of liquidity in the gas wholesale market also compare well with gas markets in other countries, and with electricity markets (both GB and abroad). FIGURE 8 shows that the churn ratio at the NBP has generally been above that at mainland Europe's main gas trading hub in the Netherlands, although in the first quarter of 2014 the churn ratio at TTF exceeded that at the NBP. The number of trading parties participating in the NBP market is also higher than at TTF, although the gap has been narrowing over time.

FIGURE 8

**Churn and number of trading parties – Britain (NBP) and Netherlands (TTF)**

[✂]

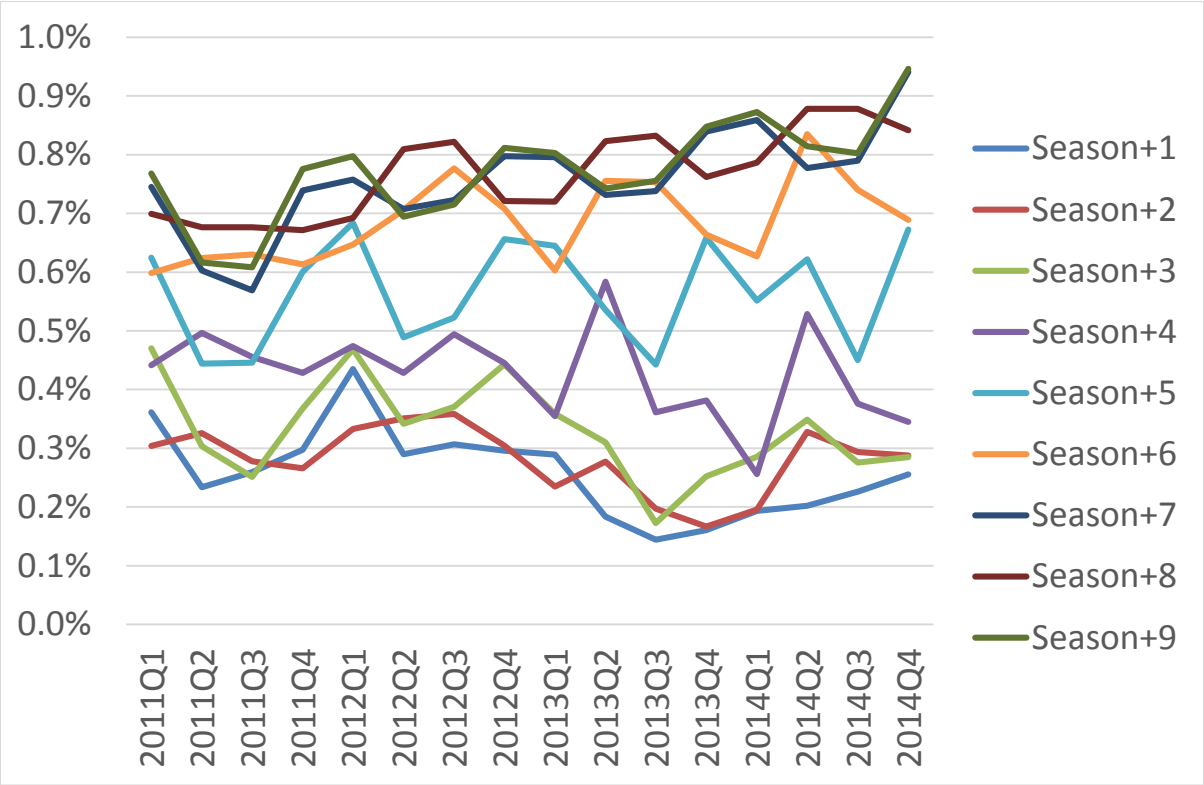
Source: [✂].

43. Bid–offer spreads are another common measure of market liquidity. Figure 9 shows spreads for seasonal gas products at the NBP since 2011. As a possible benchmark, the market-making obligations under Ofgem's Secure and Promote licence conditions require certain firms to post bids and offers with a maximum spread of between 0.5% and 1%, depending on the product, and 0.6% for the only product Ofgem mandates as far ahead of delivery as season +4.[21] The spreads observed in gas for at least four seasons ahead (ie over two years from the time of purchase to start of delivery) have been, on average, below 0.5% during this period, and even nine seasons ahead they have been below 1%.

[21] See the liquidity working paper.

FIGURE 9

**Bid–offer spreads for gas (seasonal products)**




Source: ICIS Heren price assessment data, CMA analysis.
Note: Average spreads by quarter based on data for every weekday (not weighted).

44. We asked parties whether they saw limited liquidity in any gas market products. The general view was that liquidity is good in the gas market. This opinion was held by both the Six Large Energy Firms and independents. E.ON said that gas liquidity in GB was strong compared to other European markets. Several parties said that liquidity was lower towards the end of the curve (ie further ahead of delivery).

45. In the initial CMA financial and trading questionnaires issued to parties, the Six Large Energy Firms were asked to provide their views on the reasons for the higher levels of liquidity observed in the gas wholesale market relative to the electricity market. Responses to this question are summarised in Table 1 in the Appendix. The main reasons offered were as follows:

- **A lower level of regulatory and policy uncertainty in the gas sector relative to electricity** was the most frequently cited explanation, mentioned by all respondents except Scottish Power. Particular areas of

policy and regulation mentioned were balancing charges,[22] renewable subsidies and the government's Electricity Market Reform package, including the forthcoming capacity market, Contracts for Difference and the carbon price floor.[23]

- **Differences in the scope of the geographical market** were cited by four respondents. It was noted that the gas wholesale market was European or even global in nature, due to high levels of interconnection with mainland Europe and the ability to ship gas as LNG. This in turn enables participation by a much wider range of trading parties. By contrast, the electricity wholesale market has traditionally operated on a national basis with some limited interconnection to France and Ireland.

- Related to the geographical market point, four respondents also noted that **Great Britain was the first mover in Europe with respect to liberalising its gas market, and the NBP had therefore developed as a trading hub for European gas**.[24] In electricity, on the other hand, bilateral markets were created in Mainland Europe at a much earlier stage.

- Three respondents noted that **gas could be stored economically, which allowed the gas network to be balanced on a daily basis, whereas the electricity network was balanced in real time**. The structure of the spot markets reflects this, with gas being traded and priced on a daily basis while electricity uses half-hourly blocks.

- **The typically high correlation between GB gas and electricity prices has meant that gas trading/hedging has been used as a substitute or proxy for electricity**. This issue was mentioned by two respondents.

- Two respondents also noted that the existence of a **liquid exchange-traded futures contract in gas (operated by ICE)** had facilitated new entry without the need to establish master trading agreements with a critical mass of counterparties as in the OTC segments of the gas and electricity market. The fact that ICE futures contracts can be financially

---

[22] E.ON noted that there had been three major reviews of electricity cash-out in the 13 years since the New Electricity Trading Arrangements were introduced and ten changes to the charging methodology, with further proposals being progressed at present following the Ofgem Significant Code Review.
[23] E.ON explained that since the level of the carbon floor was set in each budget for a period of two years, this created a significant risk in trading power further along the curve (ie beyond the current tax period) and some risk of change remained even once the tax rate was set. E.ON also mentioned that the carbon floor created a distortion in generation costs between the UK and Europe which had affected interconnector flows and slowed the process of market integration.
[24] As noted earlier, gas liquidity at the TTF (Netherlands) hub is now approaching NBP levels, but this is a relatively recent phenomenon.

settled also makes the gas market more accessible to non-physical players.

Further points raised by individual respondents can be found in the Appendix.

### *Vertical integration*

46. One of the four theories of harm set out in the issues statement is that vertically integrated electricity companies harm the competitive position of non-integrated firms to the detriment of customers, either by increasing the costs of non-integrated energy suppliers or reducing the sales of non-integrated generating companies. This section of the paper looks at the evidence as to whether vertical integration could also be an issue in the gas sector.

47. Figure 10 shows [✂]. Figure 11 shows the physical position of the main players in the electricity market over the same period for comparison. It can be seen that the gas market is significantly less vertically integrated than the electricity market. All of the Six Large Energy Firms are net short in gas overall – only Centrica has a significant upstream gas position, and even in this case its position accounts for only around half of demand. On the upstream gas side, large international players such as Statoil, Total, and ExxonMobil have significant net long positions and are relatively small players in the retail market (mainly supplying non-domestic customers). By contrast, in electricity, three of the Six Large Energy Firms (RWE (npower), Scottish Power and Scottish and Southern Energy (SSE)) are close to being balanced, while EDF Energy (EDF) is net long and Centrica and E.ON are net short.

48. It is also worth noting that in the electricity sector, vertical integration has been achieved wholly through physical ownership of upstream generation assets. This is not the case to the same extent in the gas sector.

FIGURE 10

**Estimated physical position of main players in GB gas wholesale market, 2012/13**

[✂]

Source: [✂].

FIGURE 11

**Physical position of main players in GB electricity market, 2012/13**

[✂]

Source: [✂].

49. In the initial CMA financial and trading questionnaires issued to parties, the Six Large Energy Firms were asked whether they had 'seriously considered making any upstream investments in gas, including any long-term contract purchases, in the Relevant Period', and if so to describe these and provide the relevant papers and analysis that were prepared for senior management or board members. A brief summary of the responses to this question is shown in Table 2 below.

50. It can be seen that aside from Centrica, the two other companies with significant upstream supply interests are SSE and E.ON, although E.ON's production interests are operated within a separate group business – E.ON Exploration and Production (E&P). Scottish Power and EDF noted interests in storage assets only. Also of interest is that both E.ON and EDF stated that their wholesale gas needs were generally sourced by a single buying entity at European level, rather than necessarily specifically for the GB business.

**Table 2: Upstream gas investments considered by the Six Large Energy Firms, 2008–14**

| *Company* | *Summary of investments* |
|---|---|
| SSE | A number of acquisitions were made and/or considered, including gas field acquisitions, exploration company acquisitions, long-term contract purchases, and storage capacity and LNG. |
| Scottish Power | [✂]. |
| RWE | None – although note that RWE interpreted the question as not covering gas storage whereas other respondents did include storage. RWE also noted that RWE DEA[25] was currently in the process of being sold. |
| E.ON | E.ON E&P is a separate business within the E.ON group that focuses on oil and gas in the North Sea and is also active in Russia and North Africa. The company was established in 2004 following acquisition of Caledonia Oil & Gas Limited. E&P is operated as an entirely separate business to energy supply. E.ON also enters into long-term Europe-wide gas import contracts via its trading entity, but these are not dedicated to the GB business in particular and hence no details were provided in the response. |
| EDF | EDF owns gas storage assets in the UK. The majority of EDF Group's gas structuring needs are managed by a single gas structurer managed in France and Italy rather than directly by EDF Energy. The EDF Group continually monitors opportunities to source upstream gas assets or long-term contracts [✂]. |
| Centrica | Has a significant upstream gas position, as previously noted. Centrica also considered [✂] additional upstream investments during the relevant period, including acquisition of fields [✂] from various oil and gas majors, and a joint agreement for sale of [✂]. |

Source: CMA analysis.

51. In the same way as for liquidity, the Six Large Energy Firms were asked to comment in the financial questionnaire on the differing levels of vertical integration in electricity and gas, and in particular to 'explain what benefits to VI in electricity do not apply to gas, and list any other reasons why there is

[25] *RWE Dea AG*.

relatively little VI in gas'. While there was some overlap between the explanations given for higher liquidity in gas and those offered for lower vertical integration (suggesting a linkage between the two issues), there were also some points of difference. The most common responses to the VI question are set out below, with more detail available in Table 2 in the Appendix:

- **Differences in the history and evolution of the two industries subsequent to privatisation and deregulation** were mentioned by all respondents except RWE. Specifically, the vertically integrated electricity companies emerged because generation companies had an incentive to acquire regional electricity companies (RECs), partly for the natural hedge but also for the stable returns offered by the distribution networks,[26] while conversely RECs had an incentive either to invest in CCGT plant or to acquire plant that PowerGen and National Power were forced to divest by the regulator, in order to profit from and/or obtain a natural hedge against high generation prices due to generator market power in the early days of deregulation. By contrast, upstream oil and gas is a specialised global industry and only Centrica had any upstream interests in gas at the time of privatisation. Furthermore, EDF noted that while the upstream oil and gas majors could in theory have entered gas retailing (and some had done so for non-domestic customers), this might not have been an attractive proposition for reasons that could have included the relatively low return on capital relative to exploration and production, and perceived high regulatory risk particularly in the case of domestic supply.

- **The fact that gas can be stored economically, which reduces balancing risk in gas and therefore the value of VI**, was noted by three respondents. A fourth respondent (Centrica) also mentioned the lower balancing risk due to the gas balancing regime being daily in nature and allowing for *ex post* trading, but did not specifically link this to the storability of gas.

- **Differences in tax regimes**, in particular the high taxes on production of UKCS gas (62 to 81%), was said by three respondents to reduce the value of the 'natural hedge' in owning upstream gas assets. Centrica also mentioned that the requirement for arm's length transfer pricing and sector-specific taxation reduced the effective volume of gas available for

[26] The RECs were privatised as bundled supply and distribution entities (albeit with regulatory provisions to ensure non-discriminatory access to the networks), whereas in gas the distribution networks were transferred to the network operator Transco (subsequently acquired by National Grid to become NGG).

self-supply through vertical integration in gas, thus reducing the value of vertical integration.

- **The strong link between oil and gas production** was mentioned by two respondents. It was noted that there were limited opportunities to acquire upstream gas production assets without also acquiring a field that produced a substantial quantity of oil, which was a very different market that was not generally of interest to energy retailers.

- **The greater ease of trading gas across borders** (similar to the geographical market scope point raised in relation to liquidity) was also mentioned by two respondents. However it was not specifically explained how this reduced incentives to VI.

- **Proxy hedging via ownership of non-CCGT generation plant** was another issue raised by two respondents. In other words, because of the strong correlation between gas and electricity prices in recent years, energy companies with investments in nuclear, hydro, wind or even coal benefit from higher gas prices (via the impact on the electricity price) in a similar way to companies that have investments in upstream gas supply.

Other points raised by individual respondents can be found in the Appendix.

***Balancing market performance***

52. Differences in the design and performance of the balancing regime for wholesale gas versus that for electricity – which in turn are related in part to the physical characteristics of the two commodities, specifically the possibility for gas to be economically stored – were put forward as an explanation for the observed differences in both liquidity and VI by several respondents. In particular, key differences between the gas and electricity balancing arrangements include the following:

- The gas market is balanced on a daily basis and imbalance prices, volumes and charges are also calculated daily. In electricity, imbalances are calculated and charged for each of the 48 half-hourly trading periods in every day.

- In gas, cash-out buy and sell prices are both set by actual balancing trades (the highest and lowest price transactions undertaken by National Grid on the OCM on each day). By contrast, in electricity the reverse price (used for settling imbalances in the opposite direction to the overall system imbalance) is set on the basis of a market index price. In practice

this means that the spread between system buy and sell prices is generally lower and more stable in gas than in electricity.

- The gas balancing regime allows for *ex post* trading (ie trading out imbalances after the settlement period has closed). This is not permitted in electricity.

53. To assess this issue in more detail, we requested electricity balancing data from Elexon[27] as well as gas balancing data from the gas transporters which was provided on their behalf by Xoserve and ICE Endex[28] to enable comparison of imbalance volumes, cash-out prices and charges between the two markets. We are still in the process of analysing this data but some initial results are presented below. (For simplicity, figures have been calculated for the entire period for which we obtained data – 1 January 2011 to 31 July 2014.)

54. Key points to note from Table 3 are the much lower spread between buy and sell prices in the gas market (an average spread of 3.6% in gas versus 24.0% in electricity), as well as the lower total imbalance charges paid/received over the period. Total imbalance volumes are higher in gas, but this needs to be set against the fact that total energy demand on the gas network is more than twice as high as energy demand on the electricity network. Hence as a percentage of metered volumes, imbalance volumes are approximately the same in gas and electricity.

[27] Elexon is an independent organisation responsible for administering the electricity wholesale market rules as set out in the Balancing and Settlement Code. It compares how much electricity generators and suppliers said they would produce or consume with actual metered volumes, calculates imbalance (cash-out) prices for the difference on the basis of balancing actions taken by National Grid Electricity Transmission as system operator, and transfers funds accordingly. For more detail see the Elexon website.
[28] ICE Endex operates the UK's natural gas spot market, the OCM.

**Table 3: Balancing market summary statistics for period 1 January 2011 to 31 July 2014**

| | *Gas* | *Electricity* |
|---|---|---|
| Average system buy price (SBP) (£/MWh) | 20.61 | 53.50 |
| Average system sell price (SSP) (£/MWh) | 19.88 | 40.67 |
| Average spread SBP – SSP (£/MWh) | 0.73 | 12.83 |
| Average spread SBP–SSP (% of SBP) | 3.56 | 23.99 |
| Total imbalance volumes* (TWh) | 97.72 | 59.32 |
| Total imbalance volumes (% of metered volumes) | 2.73 | 2.70 |
| Total imbalance charges* (£bn) | 1.97 | 2.52 |

Source: Elexon, Xoserve

*Total imbalance volumes and charges were calculated by summing absolute values of both long and short positions.

## Evidence against approach on theories of harm set out in the issues statement

55. This section reviews evidence against the position set out in the issues statement – ie evidence that there may be some sources of harm to competition and/or consumers in the functioning of the gas wholesale market, which were not captured in our assessment above. We focus in particular on the potential sources of harm mentioned by respondents to the issues statement.

### *Gas storage*

56. As noted above, Utility Warehouse stated in its response to the issues statement that Centrica might enjoy a significant competitive advantage in the gas wholesale market through its dominant position in gas storage, and that independent suppliers might have difficulty renting storage capacity on reasonable terms. Utility Warehouse did acknowledge however that it had not looked into renting storage capacity since 2005. None of the other respondents to the issues statement (which included several smaller independent suppliers) mentioned any concerns regarding gas storage.

57. As discussed in paragraphs 34 to 40, the Centrica group currently owns the majority (around 75%) of gas storage capacity in Great Britain in the form of the Rough storage facility. This facility is operated by Centrica Storage, a wholly owned subsidiary of Centrica plc. After Centrica completed its acquisition of Rough from Dynegy,[29] the CC issued a report on the merger and undertakings were given in 2003 to the Secretary of State which imposed restrictions and obligations on Centrica's operation of Rough in light of its wider position in the gas market. The undertakings were last reviewed by the CC in 2011 following a request from Centrica to the Office of Fair Trading

[29] Centrica acquired both Dynegy Storage and Dynegy Onshore Processing UK, which together owned and operated the Rough storage facility.

(OFT), based on Centrica's view that changes in market conditions meant that the undertakings were no longer required. The CC concluded that with the exception of investment in Rough, the aspects of harm that the CC identified in 2003 might still be expected to occur, and therefore decided to retain the undertakings on Centrica but with some variations.[30]

58. In light of the extensive review of the Rough storage undertakings carried out by the CC in 2011 – and given that none of the respondents to the issues statement have raised storage as an issue or barrier to competition, with the exception of Utility Warehouse which last looked into renting storage capacity in 2005 – we consider that the undertakings appear to be operating effectively to address any potential adverse impacts on competition in the gas wholesale market and/or on gas supply that could arise due to Centrica's large ownership position in gas storage. We therefore do not propose to investigate this issue further unless specific evidence of harm is presented to us.

***Market manipulation***

59. In its response to the issues statement, Ecotricity mentioned incidents of market manipulation such as the St Fergus and Bacton scandal in 1999 as reasons for potentially being concerned about the possibility of manipulation in the gas wholesale market. Ofgem has also provided us with information on an investigation it carried out into allegations of gas market manipulation in November 2012, which was closed with no finding of any breach.

60. We have obtained information from Ofgem regarding all investigations that it has carried out into allegations of gas market manipulation since January 2011. The information provided [✂]. In summary, Ofgem has advised us as follows:

- REMIT was introduced in December 2011. Ofgem was granted powers to investigate and enforce certain breaches of REMIT in June 2013.[31] An investigation can be opened when there are circumstances suggesting that one of these breaches has occurred. Ofgem has advised us that this is a relatively low hurdle and as such may result in a relatively large number of investigations being opened and closed without there being a case to answer. Ofgem works closely with the Financial Conduct Authority

[30] Some of the key elements of the undertakings following the 2011 review are as follows: (i) Rough capacity must be sold to third parties on non-discriminatory terms; Centrica can compete for up to 25% of Rough capacity in the primary market; (ii) at least 20% of Rough capacity must be offered on annual contracts; (iii) legal, financial and physical separation must be maintained between Centrica Storage and all other parts of the Centrica group; (iv) information relating to the storage operations must be disclosed to all market participants simultaneously. More information can be found on the Centrica Storage website at Storage regulation.
[31] Details can be found on Ofgem's website at REMIT.

(FCA) as well as the Agency for the Co-operation of Energy Regulators and other European national regulatory authorities to detect and investigate cross-border market abuse.

- One market abuse matter Ofgem has been involved with has now been closed. It pertained to the November 2012 allegations mentioned previously, which related to whether trading in the period around 4.30pm might have been manipulative. Following their review, Ofgem and the FCA concluded that no evidence of the alleged market manipulation could be found and therefore that the interests of consumers have not been harmed.[32] [✂].

- Ofgem has further investigations open currently. Details of these investigations are not at present in the public domain.

61. To judge from the information available, Ofgem's past and ongoing investigations into market abuse allegations suggest that it has the powers to deal with any such problems already. There does not appear to be a systematic problem with the gas wholesale market that would merit attention from the CMA. Given the size of the market, and the regulatory framework that is now in place under REMIT, periodic investigations may be expected. As Ofgem has noted, the hurdle for launching an investigation is relatively low. The regime appears to be functioning effectively, particularly since no breaches of the regulations have been identified to date.

***Price transparency/integrity***

62. Which? stated that the processes used by price reporters[33] to gather and publish gas wholesale OTC market data were not robust, often relying on human reporting rather than transactional data, leading to uncertainty regarding price integrity.

63. The OTC market is transparent to the trading parties themselves, as they are able to view details of the transactions that take place via their trading software, and all OTC trades are settled at the price agreed bilaterally between the relevant parties. However it is possible that harm could arise if the prices emerging from the price reporting process were used to settle other contracts (eg exchange-based futures contracts), leading to the potential for manipulation in order to affect the settlement price. ICE, a European gas futures exchange, states on its website that its daily settlement price is based

[32] See Ofgem statement into allegations of gas market manipulation.
[33] Price reporters such as ICIS Heren collect information on OTC energy trades, for example in order to compile and publish estimated wholesale price indices.

on 'the weighted average price of trades during a 15 minute period from 16:15 London Time', and that 'the daily settlement will be determined by ICE using price data from a number of sources including spot, forward and derivative markets for both physical and financial products.'[34] These are liquid markets with large volumes of trade, implying a low unilateral ability to manipulate the price.

### *Transmission investment*

64. Paul Hunt, an independent energy consultant, stated in his submission that gas transmission was not inherently a natural monopoly and that investment in gas transmission pipeline capacity could be delivered via a market-based model as in the US rather than on a regulated monopoly basis.

65. We have not examined this issue in detail given the position adopted in the issues statement that the regulation of the transmission and distribution assets are beyond the scope of this inquiry. Furthermore, as noted in paragraphs 34 to 40 above, National Grid's scenario modelling indicates that peak GB gas demand will remain flat or fall in future years. It is therefore reasonable to expect that the requirement for investment in new gas transmission pipelines will be limited, particularly by comparison with investment in electricity transmission.

66. It is worth noting however that Ofgem has recently released draft conclusions for the planning and delivery arrangements for the electricity transmission system, which include proposals to open up new, high-value and separable onshore transmission projects to competitive tender.[35] A similar approach is already used for offshore transmission, where links are tendered rather than taken forward by monopoly transmission operators. This suggests that a more competitive approach to new network investment is at least theoretically possible and could deliver savings to consumers.

[34] See UK natural gas daily future.
[35] See Integrated Transmission Planning and Regulation (ITPR) project: draft conclusions.

# Appendix: Summary tables for Six Large Energy Firms – responses to generation and trading financial questionnaires

**Table 1: Responses to Question 17: reasons for higher liquidity in gas versus electricity**

| *Explanation* | *Mentioned by* | | | | | |
|---|---|---|---|---|---|---|
| | *SSE* | *Scottish Power* | *RWE* | *E.ON* | *EDF* | *Centrica* |
| Less regulatory/policy uncertainty in gas by comparison with electricity, eg imbalance charges, carbon price floor. | X | | X | X | X | X |
| Gas market is global or European while electricity market is national. | X | X | X | | X | X |
| UK was first mover/front-runner in liberalising its gas market in Europe. NBP has been used as a trading hub for European gas. In contrast in the power market bilateral markets were created in mainland Europe much earlier. | | X | X | X | | X |
| Gas can be stored economically and hence can be traded/balanced on a daily basis, whereas electricity cannot be stored for other than very short periods/market is half-hourly. | X | | | X | | X |
| High correlation between gas/electricity has meant that gas trading is used as a substitute/proxy for electricity trading. | X | X | X | | | |
| Presence of a liquidly traded exchange futures gas contract (ICE) facilitates new entry without the need to first establish master trading agreements with a critical mass of counterparties. | | | X | | X | |
| Tax regime – a number of producers have their tax liabilities measured with reference to day-ahead gas price, resulting in gas producers hedging majority of volumes at day-ahead stage. | X | | | | | |
| Higher number of participants in the gas market, including financial players (banks and investment funds). | | | X | | | X |
| Temperature-related demand swings result in more trading activity in gas. | | | | | X | |
| The NBP can be traded as either a physically delivered OTC or financially settled futures exchange product. Financially settled products make the NBP more accessible to non-physical players. By contrast UK electricity is predominantly a physically delivered market, hence non-physical players looking for exposure to European power prices favour financial markets such as German power ahead of UK power. | | | | | | X |
| UK power products are more complex, partly due to the need for within-day shape but also because power is a secondary commodity derived from a range of primary commodities (gas, coal, electricity), resulting in more complex price determination. This is exacerbated by regulatory drivers such as the carbon price floor. | | | | | | X |
| UK power has historically been structured around an electricity forward agreement (EFA) calendar whereas other European power hubs are based on the Gregorian calendar. | | | | | | X |

**Table 2: Responses to Question 26: reasons for lower vertical integration in gas versus electricity**

| *Explanation* | *Mentioned by* | | | | | |
|---|---|---|---|---|---|---|
| | *SSE* | *Scottish Power* | *RWE* | *E.ON* | *EDF* | *Centrica* |
| Differences in history of privatisation/deregulation in gas versus electricity. For example, vertically integrated electricity companies have origins in either the RECs established after privatisation (which then bought generation assets) or the generation companies that acquired RECs. Retail companies were acquired by generators partly for the natural hedge but also for the stable returns offered by the distribution networks, as distribution and supply were bundled in the RECs at the time. Conversely, the high level of concentration/market power in generation immediately following deregulation provided an incentive for the RECs to invest in CCGT plant and/or acquire plant that PowerGen and National Power were forced to divest by the regulator, in order to profit from and/or obtain a natural hedge against high generation prices.-By contrast upstream oil and gas is a specialised global industry and only Centrica had any upstream interests in gas at the time of privatisation. | **X** | **X** | | **X** | | **X** |
| Oil majors may not have been interested in entering the residential supply market for reasons such as relatively low return on capital employed relative to exploration and production, and perceived high regulatory risk. | | | | | **X** | |
| UKCS tax regime reduces value of 'natural hedge' because of high taxes on production (62 to 81%). | **X** | **X** | | | | |
| Gas can be stored economically. Hence risks around balancing are lower and/or the value of VI is lower. | **X** | | | **X** | | |
| Balancing regime in gas is daily with post-event trading allowed. | | | | | | **X** |
| Gas is often produced as a by-product of oil production. There are limited opportunities to acquire upstream gas production without also acquiring a field that produces a substantial quantity of oil, which is a very different market that is not generally of interest to energy retailers. | **X** | | | **X** | | |
| Because electricity price has been strongly correlated with the gas price, owning non-fuel generation plant (wind, hydro, nuclear) provides a similar hedge to owning upstream fuel (SSE). Companies with large investments in coal or nuclear technologies could be viewed as a having a proxy structural hedge for a short gas position (ie value of coal and nuclear benefits from an increase in gas prices) (Centrica). | **X** | | | | | **X** |
| History of privatisation and liberalisation: the high level of concentration in the generation industry immediately post-privatisation led to the RECs building their own CCGTs and acquiring plant that National Power and PowerGen were forced to dispose of. | | **X** | | | | |
| Upstream gas fields provide limited flexibility as they are technically designed for maximum flow and economically optimal to run at maximum flow. | | | **X** | | | |