Grain LNG phase 4 competition assessment

A REPORT PREPARED FOR NATIONAL GRID GRAIN LNG LIMITED

October 2012

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Summary of competitive effects

Introduction

National Grid Grain LNG Ltd. (Grain LNG) commissioned phase 1 of its LNG import facility at the Isle of Grain in Kent in 2005. The phase 2 expansion of the terminal was commissioned in 2008 and commercial operations for the phase 3 expansion began in December 2010.

Grain LNG is now planning a fourth phase which it expects to construct provided that it is able to obtain exemption from requirements to offer regulated third party access (rTPA). The exact size and configuration of the phase 4 expansion will be a function of market appetite following a public offering of capacity, and is expected to comprise:

- a second cryogenic pipeline, to take LNG from ships to the LNG storage tanks;
- an additional storage tank of 190,000 cubic metres; and
- two additional vaporisers and associated equipment.

If developed, National Grid expects the Grain phase 4 expansion project to be commissioned in October 2016 at the earliest.

As part of preparing its exemption application, Grain LNG has commissioned Frontier Economics to carry out a competition assessment of the project. This document presents the assessment.

UK gas sector

Liberalisation and the lifting of the prohibition on the use of gas in power generation led to a rapid rise in gas demand and by 2010 gas consumption had reached 41% of UK primary energy demand. Until 2004, the UK was self-sufficient in gas production. However, since 2002 UK Continental Shelf (UKCS) production of gas has been in decline and UK gas consumption has continued to increase. The UK is now a net importer of gas and an increasing volume of imports via pipelines (from Norway and Continental Europe) or LNG terminals will be needed to meet demand.

Gas is imported from Norway through four pipelines Vesterled (capacity of 13 bcm pa), Langeled (25 bcm pa), Tampen (9 bcm pa) and Gjøa (6 bcm pa).[1] The Bacton – Zeebrugge interconnector has the capacity to import 26.9 bcm pa into the UK and can also export up to 20 bcm pa to Belgium. The BBL interconnector from the Netherlands can import up to 19.5 bcm pa into the UK,

1 The Tampen and Gjøa pipelines deliver gas from Norway to the UK's FLAGS pipeline.

including the additional capacity made available following the commissioning of a fourth compressor in April 2011.

Currently, LNG import facilities exist at four UK sites with a combined import capacity of over 50 bcm per year: Grain, Teesside and two sites at Milford Haven (Dragon LNG and South Hook). The South Hook terminal has already been expanded with a second phase. The LNG developments at Grain (phases 1, 2 and 3) and Milford Haven and the BBL pipeline have received an exemption from the rTPA requirements of section 19D of the Gas Act 1986.

Conceptual framework for the assessment

Section 19C (7) of the Gas Act contains the criterion relevant for this report, which is the competition assessment:

> *(e) the exemption will not be detrimental to competition, the operation of an economically efficient gas market or the efficient functioning of the pipeline system connected or to be connected to the facility*

The equivalent conditions in Article 36 of the third Gas Directive 2009/73/EC contain an additional criterion that the investment should enhance competition in gas supply. Since the investment will add to rather than reduce capacity for gas supply into the UK and Europe, the investment will tend to enhance competition. This means that the competition criterion in the UK's Gas Act is equivalent to the competition criteria of the Directive.

Another condition for the granting of an exemption is that the project will not proceed if an exemption is not granted. This combined with the competition criterion for exemption has the consequence that the relevant counterfactual for the purposes of analysing the competitive effect of the exemption is that the project will not proceed (i.e. *not* that the project will proceed without an exemption).

In light of this and in order to analyse the competitive effect of the proposed exemption, we:

- identify where in the gas value chain the project could have a direct or indirect impact;
- identify which are the relevant markets in competition terms where those impacts may be felt; and
- analyse the current or where practicable the foreseeable state of competition in each of the relevant markets, with and without the proposed investment, assuming as a "worst case" in respect of each market that the player with the largest market share in the counterfactual obtains all of the Grain 4 capacity.

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If a player other than the player with the largest market share in the counterfactual obtained some of the rights to Grain phase 4, the competitive impact of the expansion would be better than that set out in the analysis.

The condition is that the overall impact should not be detrimental to competition. This means that it would be possible to meet the competition condition even if there were a detriment in a subset of the relevant markets.

Grain phase 4 and its impact

The Grain 4 project could have a direct impact on the provision of LNG import capacity, which includes unloading from LNG carriers, temporary storage and regasification.

In addition to this direct impact, Grain 4 could through the actions of contracting parties give rise to a number of indirect impacts on the gas value chain, namely:

- LNG supply – the proposed expansion might cause or facilitate a player to enter into or expand its supply of LNG;
- LNG shipping – the investment may indirectly lead to an increase in the shipping of LNG;
- wholesale supply of gas (UK and Europe) – the investment may cause more gas (from LNG) to come to the wholesale market in the UK and in Europe;
- network services – the investment will increase the demand for the use of network services (i.e. gas transportation) in the UK;
- shipping of gas – if there is an increased demand for network services, there would be an increase in the demand for shipping services on the UK's national transmission system (NTS);
- flexibility/storage – the investment may have an effect on the demand for flexibility or storage but in our opinion is also an additional source of supply for flexibility or storage; and
- retail supply of gas – the proposed expansion could have an impact on the supply of gas to end consumers, for example, if access to upstream supplies afforded a particular competitive advantage to a retail supplier.

We have considered these impacts and endeavoured to identify what, in competition terms, are the relevant markets within which the impacts occur.

Relevant potentially affected markets

A market in competition terms comprises all products that are substitutes for one another and are sufficiently geographically close to constrain each other's pricing.

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Conceptually to define the extent of the relevant markets we apply the hypothetical monopolist or small but significant non-transitory increase in price (SSNIP) test. In practice it is difficult to apply the SSNIP test explicitly and we therefore use whatever quantitative and qualitative evidence is available to gauge which products are likely to be substitutes.

Where there is uncertainty as to the market definition and for where the market definition is likely to vary over time, we assess the competitive effect of Grain 4 for a range of possible market definitions.

We ignore the impact of Grain 4 on monopoly regulated services as there can be no competitive impact in these markets.

We have identified the following to be possible relevant markets in competition terms:

- Direct impact:
  - wholesale supply of gas to the UK / North West Europe / Europe; and
  - flexibility / storage in the UK (and possibly Europe).
- Probable indirect impact:
  - global LNG liquefaction;
  - global LNG shipping; and
  - shipping (as in providing commercial access to UK gas transport and balancing services).
- Other markets:
  - supply of gas to daily metered industrial and commercial (I&C) customers in the UK;
  - supply of gas to non-daily metered I&C customers in the UK; and
  - supply of gas to residential customers in the UK.

Analysing competitive conditions

While, in principle, a competitive assessment should ideally be made over the life of the exemption, it is not practicable to predict market developments with any accuracy over that timeframe. It is also the case that the majority of market developments that could make the competitive impact of Grain 4 worse are controlled by regulators who will have the power to prevent them if they cause a detriment to competition. In addition, regulators have a right to cancel an exemption where circumstances have changed such that the exemption becomes detrimental to competition. It is therefore necessary to balance the desirability of

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a forward looking analysis with the practical availability of data to give effect to this.

In the light of the above, we consider competitive conditions in the relevant UK and European markets in the period immediately after the earliest time that Grain 4 would be commissioned (Autumn 2016) and then again some five years later i.e. gas year 2021/22 for the UK and calendar year 2022 for Europe. This horizon allows us to reflect data from the last year of ENTSOG's most recent TYNDP available. However, we note that even for this timeframe, it is difficult to make accurate predictions.

A key metric that we have used in our competitive assessment is the Herfindahl-Hirschmann Index (HHI), which measures the sum of the squares of market shares (expressed as percentages). This measure is used frequently in the analysis of mergers where there is no capacity addition and a simple comparison of HHIs, with and without the exempt project, will tend to exaggerate any potential competitive detriment of the largest player gaining rights to the project since the addition of capacity will add to the competitive pressure on the market.

To the extent that the ability to restrict supply exists, it is likely that both the ability and benefit will be spread over both the suppliers and buyers with long term contracts. Therefore, to the extent information about long term contracts is available it should be used to adjust the positions on the wholesale market of suppliers and buyers of the long term contracts.

Contract information was not available to us previously and therefore was not used as part of our previous competition assessments in support of rTPA exemption requests for developments at the Isle of Grain. Contract information is now available to us and we therefore take it into account in this analysis.

It is impossible to be precise about the distribution of the ability to restrict supply or the benefit of doing so resulting from long term contracts. As a base case, we analyse various possible wholesale markets attributing market shares 50% to suppliers and 50% to buyers of long term contracts, where known.

Views differ within Europe as to whether there are, in any given area, upstream and downstream wholesale markets or just one wholesale market. In the UK, for example, no one would refer to an upstream wholesale market or a downstream wholesale market. In contrast, in Germany, for example, it would be quite normal to think of an upstream wholesale market in which producers participate as sellers and importers participate as buyers. In the so called downstream wholesale market, the importers are now the sellers and retailers, power companies, etc, are the buyers.

The UK experience suggests that it is easy for producers or indeed any party with access to bulk gas to participate in the wholesale market, selling to the type of buyers that in countries such as Germany would be categorised as buyers in the downstream wholesale market. This suggests that there is nothing in the nature

of the downstream wholesale market which fundamentally distinguishes sale of bulk gas in the downstream market as a different type of economic activity to the sale of gas in the upstream wholesale market.

To the extent that the separation of the two markets continues, the reason for this separation must be either:

- an inability to access transportation capacity; or
- a continuance of behavioural patterns, originally induced by contracts with restrictive destination clauses and some promise of exclusivity, but which continue after the illegality of such contract terms has been well established.

In many cases there appears to be physical transportation capacity available, but there is contractual congestion in the sense that all available capacity has been booked. The EC's and ACER's work to improve the functioning of the internal energy market may make an appreciable contribution to the relief of constraints to access transportation. Other factors such as the expiry of existing capacity contracts and new investment will also make a contribution.

For those countries in relation to which two wholesale markets presently operate, we cannot say with any certainty how long the structure will prevail before the markets coalesce.

We conduct our analysis as though there were only a single wholesale market. This is because the UK is considered to have a single wholesale market and if the geographic extent of the market directly affected by the Grain 4 expansion extends beyond the UK to include North West Europe or Europe, the entire region must also have a single wholesale market.

In the analysis of wholesale energy markets, it is common practice to assume that capacity shares are a good proxy for market shares and may in fact be a better indication of competitive conditions. The key justification for this is that energy infrastructure tends to be very capital intensive and operate with a relatively low marginal cost. So long as price remains higher than the low marginal cost all capacity is capable of providing a competitive constraint.

We therefore use a mixture of capacity and market share data in assessing the effect of the Grain phase 4 expansion.

Competitive assessment

The results of our competitive analysis are summarised below.

Directly affected markets

We have assumed two demand scenarios for UK gas: one in which there is no export to continental Europe and one in which there is export to continental Europe. Based on these two scenarios, we estimate that in 2016/17 the HHI for

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the UK wholesale market will be 896 or 757 respectively, applying our base case approach to long term contracts. If we assume that the largest player, Petoro, takes 100% of the rights to use Grain 4, the HHIs under these two scenarios would be 1184 and 879, respectively.

However, a change of 288 or 122 in the HHI is relatively modest and leaves the market's HHI relatively close to 1000, very much towards the lower end of the range over which market concentration is considered to start to become a concern.

Other qualitative considerations reinforce the conclusion that the UK wholesale market would remain competitive even if Petoro were to have the exclusive use of the Grain 4 expansion. The excess of import capacity over the import requirement for gas to the UK means that it is unlikely a plausible unilateral withdrawal strategy by Petoro or any other player to raise price substantially is possible. In addition, were the actual disposition of rights to the Grain 4 expansion not to fall to Petoro, our assumption that Petoro obtained exclusive use of the expansion would exaggerate any potential competitive detriment of the expansion.

We then considered the effect of the Grain phase 4 expansion on the UK wholesale gas market in 2016/17, in the case whereby Petoro retained its absolute level of UKCS production and the production of others declined such that overall UKCS production followed the profile set out in National Grid Ten Year Statement 2011. The HHI without the Grain 4 expansion in the case with no exports is estimated as 950 and with exports 785. If we assume that Petoro takes 100% of the rights to use Grain 4, the HHIs under the two scenarios would be 1279 and 930, respectively. Again, the change in the HHI is relatively modest and leaves the market's HHI towards the lower end of the range over which market concentration is considered to start to become a concern. In combination with the qualitative reasons described above, we do not consider that the expansion would be problematic even if Petoro were to obtain exclusive use of the expanded capacity.

We also considered developments to the UK gas market to 2021/22. The ongoing decline in UKCS production does not lead to a marked change to concentration. For this reason we find that the effect of Grain 4 on competition in 2021/22, as measured by HHI, is similar to the effect found for 2016/17.

Even though UKCS production declines over time, the capacity to bring gas to the UK far exceeds import requirements in both 2016/17 and 2021/22. The excess capacity far exceeds the capacity of Grain 4 or indeed the supply of the largest player even if it were to obtain exclusive rights to Grain 4. This suggests that it would be impossible even for the largest player to create a supply shortfall by withholding capacity from the UK market.

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In relation to a possible North West European or European market, we considered the competitive effect of the Grain 4 expansion in both 2016/17 and 2021/22. We undertook this analysis for four demand and supply scenarios:

- a best guess (base case) demand and supply scenario;
- a more rapid decline in indigenous EU gas production;
- a higher rate of demand growth, which results in a greater demand for gas from outside the EU; and
- a scenario with increased reliance on one non-EU upstream supplier.

In all cases the HHI of the relevant market following the Grain 4 expansion was found to be less than 1000, indicating a competitive market.

In relation to a possible market in flexibility for the daily delivery of gas to the UK in 2016/17, we find the market to be quite fragmented, with an HHI of 478 without Grain 4. We do not adjust the market shares for the effect of long term contracts in the flexibility market for two reasons. Firstly, we do not know how contracts for the annual supply of gas would translate into the daily or seasonal deliverability of gas. Secondly, our analysis of UK and European wholesale markets suggests that the impact of known long term contracts on concentration is minimal and, given the low concentration in the markets for flexibility, it is almost inconceivable that long term contracts would result in Grain phase 4 giving rise to competition concerns in the daily or seasonal markets for gas flexibility. Centrica has the largest share of the market for daily deliverability and, if Centrica were to obtain the full rights to Grain 4, the HHI would increase to 509. We therefore conclude that this market would remain competitive even if the largest player in this market obtained all Grain 4 capacity.

In reality the market is likely to be even more competitive than this implies as we have ignored the regulated access arrangements that apply to the Rough storage facility and National Grid's LNG storage site at Avonmouth (i.e. not including the storage at the Grain import terminal). There should also be significantly more capacity than demand.

In relation to a possible market in flexibility for the seasonal delivery of gas to the UK in 2016/17, we find the market has an HHI of 528 without Grain 4. Centrica has the largest share of the market and if Centrica were to obtain the full rights to Grain 4, the HHI would increase to 586. We therefore conclude that this market would remain competitive even if the largest player in this market obtained all Grain 4 capacity.

We considered the effect of the Grain 4 expansion on the markets for daily and seasonal deliverability in the case whereby Centrica (as largest player in the flexibility market) maintained its absolute level of UKCS production as production of other parties declined. We also considered the effect of the

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expansion on competition for the base case and the Centrica UKCS scenario in 2021/22. In all of the cases we considered in 2016/17 and 2021/22 the Grain 4 expansion resulted in HHIs in the order of 500-600, indicating a competitive market. We conclude that the Grain 4 expansion would not be detrimental to competition in the markets for daily or monthly flexibility.

Potentially indirectly affected markets

The largest single player in the global LNG supply (or liquefaction) market is Qatar Petroleum with a 17% market share. The market has a competitive structure with an estimated HHI of 735. If Qatar Petroleum were to acquire all rights to Grain 4 capacity and then match this by incremental investment in liquefaction capacity, the HHI of the global LNG market would rise to 782. The market would therefore remain competitive.

The LNG shipping market is global and is diverse. We estimate the HHI of this market to be approximately 612. The largest player is currently a subsidiary of Shell, STASCO. If STASCO were to acquire all the rights to Grain 4 capacity and then match this by further investment in shipping, the HHI of the market based on capacity shares would be increased to 659. We therefore conclude that exemption for Grain 4 raises no issues for the LNG shipping market.

Use of Grain 4 will inevitably give rise to the imported gas being shipped on the UK transportation system. No data are available on market shares for gas shipping in the UK. However, given that 211 entities currently hold shipping licences and there are few barriers either to entry or to expansion, we do not believe that any shipping activity associated with Grain 4 would have any adverse competitive impact on the market for the provision of shipping services.

Potentially vertically related markets

Our analysis suggests that both the directly affected relevant markets (wholesale and flexibility) are competitive and therefore there should be no competition concerns. If these markets are competitive, then an increased market share in these markets confers no material advantage which can be leveraged into other adjacent markets. However, for the sake of completeness we consider hypothetical competitive impacts in three vertically related markets. If there were an effect to be felt anywhere, it would be in one of the three UK retail markets:

- the supply of gas to daily metered I&C customers in the UK;
- the supply of gas to non-daily metered I&C customers in the UK; and
- the supply of gas to residential customers in the UK.

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In the case of the potential market to supply gas to non-daily metered I&C customers in the UK we estimate the HHI without Grain 4 as 1384 based on 2009 data.[2] If Centrica, the firm with the largest market share, were to acquire the rights to Grain 4 and somehow use this to prevent other suppliers from procuring gas in the wholesale market and supplied the other parties' customers in their place, the HHI would increase by 88 to 1472.

We do not anticipate that Grain 4 will have any effect on this market. Furthermore, the effect of Grain 4 is likely to be more pro-competitive than a merger because Grain 4 is adding capacity in the market. For these reasons, we conclude that it is unlikely Grain 4 will cause a competition concern in this market.

In the case of the potential market to supply gas to daily metered I&C customers in the UK we estimate the HHI without Grain 4 as 1481 based on 2009 data.[3] If Statoil, the firm with the largest market share, were to acquire the rights to Grain 4 and somehow use this to prevent other suppliers from procuring gas in the wholesale market and supplied the other parties' customers in their place, the HHI would increase by 103 to 1584.

Aside from the modest HHI change and the likely inability for a holder of the rights to Grain 4 to foreclose access to this market, we note two other reasons to suppose that Grain 4 will not be detrimental to competition in this market. Firstly, this market is generally presumed to be competitive due to low barriers to entry and expansion, as evidenced by large changes to market shares of suppliers to this market over time. Secondly, it is worth noting that a supplier cannot both supply the daily and the non-daily metered segments from Grain 4. Therefore, the resultant changes in HHI due to Grain 4 will be smaller than we have estimated. For these reasons, we conclude that it unlikely Grain 4 will cause a competition concern in this market.

In terms of the supply of gas to UK residential customers, the HHI has fallen significantly from over 5000 in 2001 to around 2480 in December 2010, as Centrica's legacy market share (which was 100% at the beginning of retail opening) has fallen from 69% to 42% over this time period.[4] The continued fall in Centrica's market share indicates active competition through switching.

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2 According to Ofgem's report *2010 Great Britain and Northern Ireland National Reports to the European Commission* the HHI for the non-daily metered segment was 2314 as at November 2009. However, it is unclear whether this segment relates to I&C customers only or to all non-daily metered customers.

3 According to Ofgem's report *2010 Great Britain and Northern Ireland National Reports to the European Commission* the HHI for the daily metered segment was 1173 as at November 2009.

4 Ofgem, *2011 Great Britain and Northern Ireland National Reports to the European Commission* and Datamonitor.

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Ofgem has noted a steady but significant rate of switching, with the rate being between 17 and 19% in the five years from 2005 to 2009.

Despite the falling concentration levels, relatively high switching rates and the ease of expanding in retailing, Ofgem has intimated some possible concerns with the working of the retail market for domestic consumers. In its Energy Supply Probe, Ofgem found "… that the fundamental structures of a competitive market are in place, and the transition to effective competitive markets is well advanced and continuing." However, Ofgem also "… identif[ied] a number of important areas where consumers are not yet benefiting fully from the competitive market and vulnerable consumer groups are disproportionately affected."[5]

We have not taken a view as to the competitive functioning of the domestic retail market. However, given the competitive structure of the wholesale market, it is not credible that any change to the wholesale market resulting from the Grain 4 expansion will affect the domestic retail market. A party would need to be dominant in the wholesale market in order to leverage the change in its position in the wholesale market due to Grain 4 to gain an unfair competitive advantage in the retail market. As shown in the analysis of the UK wholesale market, even if the largest player in the market were to acquire all of the rights to use the capacity of the Grain 4 expansion, the expansion would not cause competition concerns.

We also note that in the counterfactual the largest player in the UK residential retail market (Centrica) is not the same as the largest player in the UK wholesale market (Petoro). If Petoro were to acquire residential retail market share in accordance with the size of the Grain 4 expansion, this would likely be beneficial to competition in the retail market since Petoro is not currently active in the market. Conversely, were Centrica to acquire rights to all of the Grain 4 expansion, the detriment to competition in the UK wholesale market would be less than that assessed by us.

Overall conclusions

The Grain phase 4 expansion project adds capacity through which gas can be delivered to the UK system. From a static perspective, the addition of capacity must be good for consumers since it could not create a strategic opportunity for any player immediately to withdraw more capacity than it has just added.

From a dynamic perspective, our analysis shows that for all conceivably affected markets, the addition of Grain 4 with exemption from rTPA requirements would not be detrimental to competition.

5 Ofgem, *Energy Supply Probe – proposed retail market remedies*, April 2009.

The key factor leading to this conclusion is that all of the directly and indirectly affected markets have low levels of concentration without Grain 4 and with the rights to Grain 4 allocated to the worst case party in the case of each market.

In the case of the vertically related retail supply markets, we anticipate no effect of Grain 4.

The conclusion that Grain 4 would not be detrimental to competition is supported by the fact that Grain 4 would not foreclose the UK or wider markets to further investments in LNG terminals or piped imports of gas.

The robustness of our conclusion is reinforced by the fact that our analysis is likely to err on the side of overstating the impact of Grain 4 on market concentration, for several reasons:

- In the longer term, competition relates to contracts often involving lead times that allow investment. In these circumstances, the competitiveness of a market is determined more by the number of parties that are able to compete for a contract than by existing market shares (or existing HHIs).

- We consider the change in HHI as a result of a capacity addition. The improvement in the competitiveness of the market from the counterfactual, i.e. without the project, is better than indicated by the change in HHI because of the increase in the capacity overhang in the market adding to the competitive pressure.

- We hypothesise in relation to each market that the player currently with the highest market share will acquire all of the rights to Grain phase 4. These players are not the same for each market. As a result, if the player which may be most likely to have an adverse effect on competition on one market were to acquire all the rights to the Grain phase 4, the competitive impact on the other markets will not be worse (and may well be significantly better) than those set out in the analysis.

- We hypothesise in relation to each market that the player currently with the highest market share will acquire all of the rights to Grain phase 4. If a player other than the player with the largest market share in the counterfactual obtained some of the rights to Grain phase 4, the competitive impact of the expansion would be better than that set out in the analysis.

Summary of competitive effects

1 Introduction

Over time as gas demand remains static or grows only slightly and indigenous gas supplies from the UK continental shelf (UKCS) decline, dependence on imported gas will grow. National Grid expects imports to reach 69% of demand in 2020 and 81% of demand in 2030.[6]

In response to the market demand for import infrastructure, National Grid Grain LNG Limited (Grain LNG) in 2004/05 converted an existing LNG storage facility at the Isle of Grain into a fully-fledged import facility to receive LNG, a new source of gas for the UK. The first three phases of this project are now operational, with the third phase beginning commercial operations in December 2010.

The development of the Grain LNG import terminal has been followed by the construction of two LNG import terminals at Milford Haven, by Dragon LNG and by South Hook LNG. Dragon and phase 1 of South Hook were commissioned in mid-2009, phase 2 of South Hook was commissioned in 2010 and Excelerate's GasPort at Teesside was commissioned in early 2007. In addition, the Gjøa gas pipeline from Norway was commissioned in 2010.

The facilities at Grain and at Milford Haven have requested and been granted exemption from the requirement to provide rTPA under the Gas Act 1986 (as amended), which transposes into UK law the 2009 European Gas Directive.[7]

Grain LNG is now planning to invest in a further expansion of its existing LNG import facility (Grain phase 4) and intends to request exemption from the requirement to provide rTPA for the additional capacity created by this expansion. Establishing whether the project meets the relevant criteria for eligibility for an exemption requires inter alia an assessment of the likely impact of the project (with rTPA exemption) on competition. Grain LNG has asked Frontier Economics to carry out this assessment, which is presented in this report.

The remainder of this report is set out as follows:

- **Section 2** provides an overview of the UK gas sector, including recent developments and projections for supply and demand;
- **Section 3** sets out the conceptual framework for the competition assessment required in relation to an exemption request;

6 National Grid. *Gas Ten Year Statement*. December 2011. Page 21.

7 Directive 2009/73/EC, which repealed Directive 2003/55/EC.

- **Section 4** describes the planned investment in Grain phase 4 and identifies the activities in the gas value chain on which it could have an impact;
- **Section 5** endeavours to define what in competition terms are or may be the relevant markets that may be affected by Grain 4;
- **Section 6** addresses generic issues regarding the assessment of the competitive impact of Grain 4; and
- **Section 7** assesses the competitive affects that Grain phase 4, with rTPA exemption, could have on the relevant markets.

Annexe 1 provides data and assumptions used to project market shares in the UK wholesale market.

Annexe 2 provides the data and assumptions used to calculate shares of daily and seasonal gas delivery capacity.

Annexe 3 provides data used to calculate the market shares in the North West European and Europe-wide wholesale markets.

2 The UK gas sector

This section provides an overview of the UK gas sector and market developments expected over the next approximately 10 years. It includes an outlook for the supply sources of gas to the UK and the composition of national demand. This section also discusses the structure of the sector.

2.1 Sector outlook

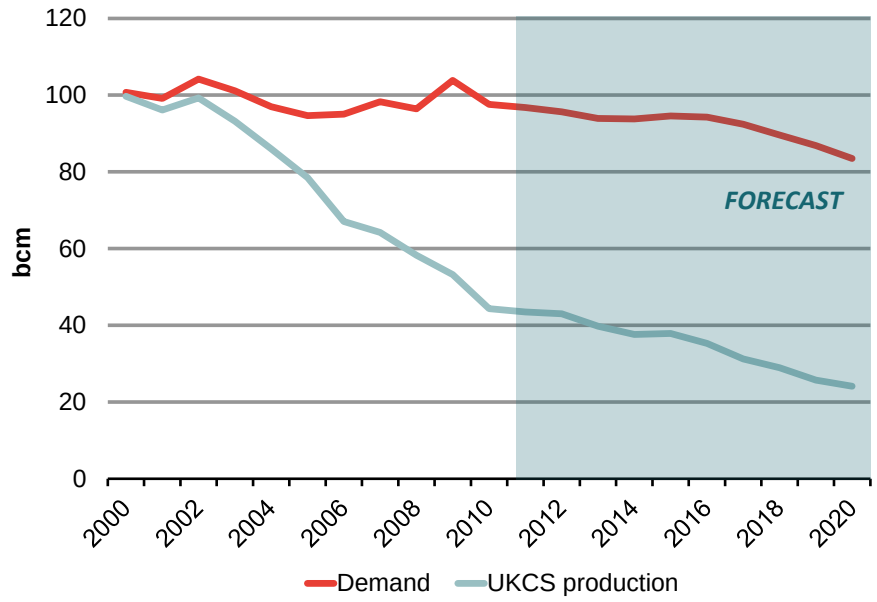
The UK gas sector is the most advanced in terms of liberalisation in Europe. The introduction of the Gas Act initiated a staged liberalisation of the entire UK gas market. These reforms, which extended competition to domestic retail supply in the late 1990s, were generally regarded as successful and have led to the creation of reasonably liquid spot and forwards markets. Liberalisation and the lifting of the prohibition on the use of gas in power generation led to a rapid rise in gas demand. Over the past two decades gas consumption has risen to account for 41% of UK primary energy demand.[8]

The UK was self-sufficient in the production of gas to meet its national demand. Indeed, from 1998, when the Bacton-Zeebrugge interconnector was commissioned, until 2003/04, the UK was a net gas exporter to Europe. Since then UK consumption of gas has continued to increase, UKCS production has declined, and the UK has become a net importer of gas.

Figure 1 presents the historical and projected UKCS production and national demand, including exports, from 2000 to 2020. Following an 8% increase from 2008/09 to 2009/10, demand decreased by 6% in 2010/11. Up to 2019/2020 demand is projected to fall at an average rate of 1%. UKCS production is forecast to decline at 6% per annum on average and remaining UK gas reserves are forecast to decline by around 10% per annum.

8 DECC, *Energy flow chart 2010*.

Figure 1. UKCS production and UK gas demand



Source: National Grid, *Gas Transportation Ten Year Statement 2011*

National Grid's estimates suggest that UK import dependency will reach around 55% in 2012, 59% in 2015 and 69% by the end of 2020. These figures suggest that import infrastructure projects will be increasingly important for the UK gas market in future.

Next, we present a brief description of the structure of the market.

2.2 Sector structure

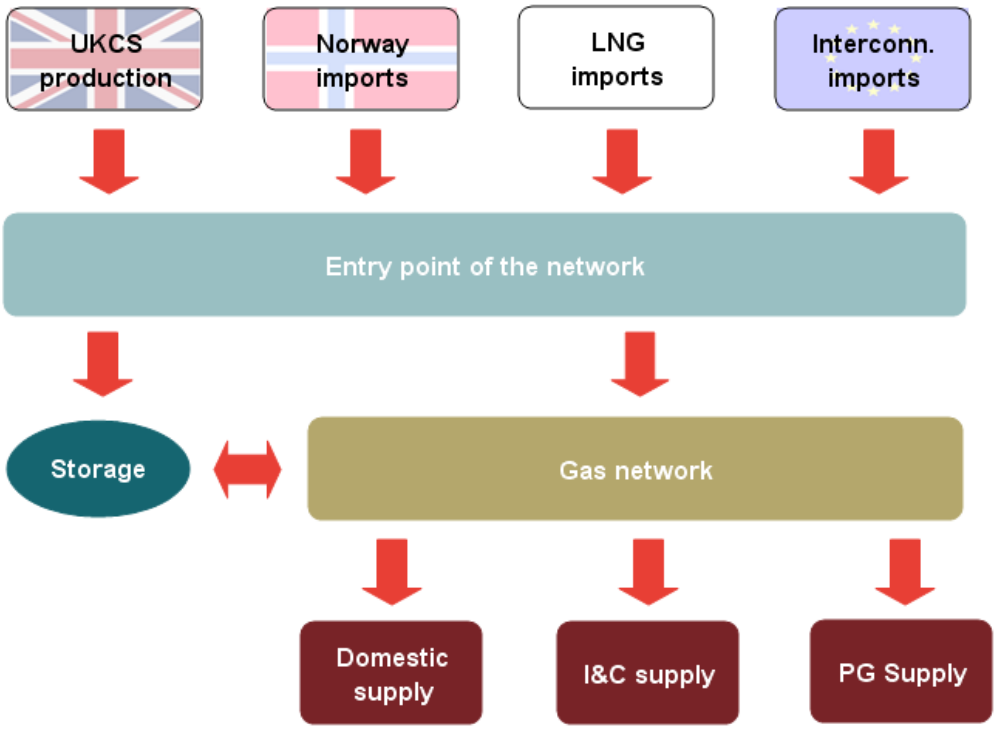
As shown in Figure 2, the gas market in the UK is composed of the following activities:

- gas supply;
- NTS entry, transmission and distribution;
- gas shipping on the national transportation system (NTS);
- storage and flexibility; and
- retail supply.

Below we present the main elements of each activity, with the exception of gas shipping on the NTS.

The UK gas sector

Figure 2. Series of activities in the UK gas sector



Source: Frontier Economics

2.2.1 Gas supply to the UK

Gas in the UK is supplied from essentially four sources:

- UK Continental Shelf (UKCS) production, which consists of a large number of individual fields under the North Sea and Irish Sea;
- Norwegian imports via the Vesterled, Langeled, Tampen Link and Gjøa pipelines;
- LNG imports at the Isle of Grain in Kent (since July 2005), at Teesside Gas Port (since 2007) and at Milford Haven (since 2009); and
- Continental imports through the Interconnector[9] and the BBL[10] pipeline.

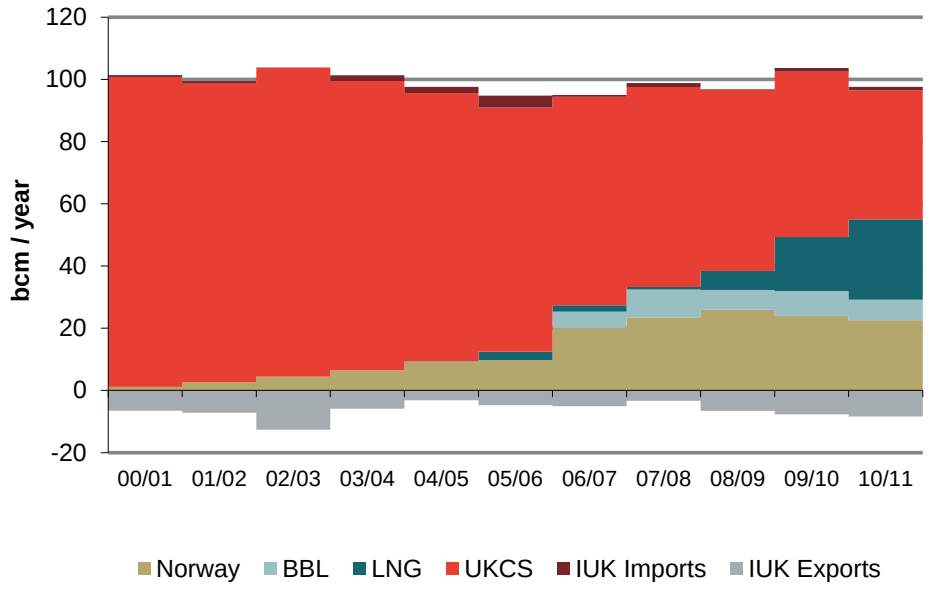
9 The UK–Belgian interconnector (IUK) transports gas between Zeebrugge on the Belgian coast and Bacton on the Norfolk coast in the UK. IUK is bi-directional.

10 The BBL pipeline transports gas from Balgzand in the Netherlands to Bacton. BBL can only flow gas in the direction of imports into the UK.

Some of the gas delivered to the UK's national transmission system is then exported to Continental Europe through the Interconnector.

Figure 3 shows the composition of UK supply sources since 2000. Although UKCS production accounts for the largest proportion of gas supplied to the UK, its importance has declined steadily. Today it represents around 43% of gas supplies, whereas in 2004/05 it accounted for almost 90% of gas supplies. Since then, the increase in gas supply from Norway (currently 23% of total gas supplies) and from the continent via BBL & IUK (currently 8% of total supplies) is notable. LNG imports represent around 26% of total UK gas supply, a substantial increase over last year's 17% and 6% in 2008/09.

Figure 3. Historical annual UK gas supply sources and IUK exports



Source: National Grid, *Gas Transportation Ten Year Statement 2011*

We discuss the different sources of gas in more detail below.

Gas from UKCS

Gas production on the UKCS is sourced from over 100 individual fields under the North Sea and Irish Sea. The gas is transported through dedicated pipelines to one of 7 "beach" terminals. When gas arrives at the beach terminal, it is passed through facilities to process the gas to the quality level required, after which it enters the NTS.

The UK gas transmission and distribution system is discussed further below.

The UK gas sector

Gas from Continental Europe

The UK gas market is connected with Belgium and the Netherlands.

The Belgian interconnection is owned and operated by IUK, a consortium of nine energy companies. This bi-directional link was opened in October 1998 with an import capacity of 8.5bcm/year and export capacity of 20bcm/year. Import capacity was progressively expanded over the period 2005 to 2007 and is now 25.5bcm per year.[11]

Since IUK became operational it has been exporting gas to Continental Europe most of the time. However, from time to time flow has been reversed (especially during winter). It was expected that due to the decline of UKCS production, the interconnector would play an increasing role in importing gas to the UK. However, IUK has continued to be a net exporter of gas from the UK to the Continent and since the BBL pipeline was commissioned (see below), net export flows on IUK have become stronger.

The Dutch interconnector is owned and operated by BBL Company, a joint venture between Gasunie, E.On Ruhrgas and Fluxys. It became operational on 1 December 2006 with an import capacity into the UK of 15bcm/year. BBL cannot currently export gas physically from the UK to the Netherlands. Construction of a fourth compressor station in the Netherlands increased import capacity into the UK by 3bcm/year from 1 April 2011[12]. Currently, total import capacity is 20 bcm/year.[13]

Gas from Norway

Total Norwegian export capacity is about 130bcm per year, with export capacity to the UK representing around 41% (53.7bcm per year).[14]

Gas from Norway is imported into the UK via four pipelines: Vesterled, Langeled, Tampen and Gjøa, all of which are operated by Gassco. The Vesterled and Tampen pipelines have a maximum aggregate capacity of approximately 22bcm/year.

The Langeled pipeline was commissioned in 2007 and supplies gas to the UK beach supply point at Easington. It has a maximum capacity of 25bcm/year.

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11 http://www.interconnector.com/Enhancement/project.htm. 25.5. bcm per year is equivalent to 26.9 bcm when adjusted for UK standard conditions.

12 http://www.bblcompany.com/news/news/4th-compressor-ready-for-operation

13 The import capacity of BBL is 19.5 bcm per year when adjusted for UK calorific value and standard conditions.

14 National Grid, *Gas Transportation Ten Year Statement 2011.*

A fourth pipeline, Gjøa, was commissioned at the end of 2010 with a capacity of 6 bcm/year. The Gjøa and Tampen pipelines deliver gas to the UK FLAGS pipeline which is connected to the St. Fergus beach terminal.

The importance of Norwegian gas in UK gas supply increased steadily from 2000/01 to 2007/08. In 20010/11 it accounted for 23% of total UK gas supplies (23bcm)[15]. Long term forecasts for Norwegian production were revised down by the Norwegian Petroleum Directorate from 120-140 bcm pa in 2009 to 105-130 bcm pa in 2010. However, gas from Norway is expected to remain an important source of supply. According to National Grid Norwegian gas flows to the UK will peak at 24 bcm pa in 2015/16 and decline thereafter, falling to 10 bcm in 2030.[16]

Gas from global LNG supply

In July 2005, the UK began importing liquefied natural gas (LNG) at the Isle of Grain with the completion of the conversion of an existing LNG storage facility into an LNG importation facility operated by Grain LNG.

LNG is transported in deep-sea tankers and arrives at the import terminal where it is moved to storage tanks and then re-gasified and processed before entering the NTS.

LNG imports to Europe more than doubled from 33 bcm in 2000[17] to 84 bcm in 2011[18]. Spain is the biggest LNG importer in Europe, although in some months the UK has imported more LNG than Spain. The UK share of LNG imports to Europe has increased due to new import facilities being commissioned in the last few years, which are intended to ensure continued gas supply with the decline in UKCS production. Existing European regasification capacity, about 179 bcm/year[19], was over double 2011 LNG imports (84 bcm).

The initial capacity of the Isle of Grain LNG terminal (phase 1) was 4.4bcm per year. It was expanded at the end of 2008 to 13bcm per year (phase 2). Phase 3, which commercially went live in December 2010, increased the terminal capacity to 19.7bcm per year.

In 2009, phase 1 of the South Hook LNG terminal, owned by ExxonMobil and Qatar Petroleum, was completed with a capacity of 10.5bcm per year. Phase 2 of South Hook, which was commissioned in early 2010, added about 10.5bcm of capacity. Dragon LNG, owned by BG Group and Petronas, was also

15 Ibid.

16 Ibid.

17 National Grid. *Gas Transportation Ten Year Statement 2010*. Table 4.6A.

18 BP Statistical Review, 2012.

19 GLE. *LNG Map*. May 2012.

commissioned in 2009 with a capacity of 6bcm per year. National Grid reports that Dragon LNG now has a capacity of 10.5 bcm.[20] Both South Hook and Dragon are located in Milford Haven (Wales).

In addition, Excelerate's GasPort at Teesside was commissioned in early 2007 with a capacity of about 4bcm per year. The terminal requires purpose built LNG tankers that incorporate on board equipment for the vaporization of LNG.

Several further LNG import terminal developments have been proposed for the UK. However, none is currently under construction[21].

2.2.2 NTS entry, onshore transmission and distribution

The NTS is the gas transmission network that takes the gas from where it is brought onshore and transports it at high pressures across Great Britain.[22] It is owned and operated by National Grid. There are eight gas distribution networks (GDNs) in Great Britain linked to the NTS.

GDN operators transport gas from the NTS using a low pressure system to serve domestic customers, business consumers and independent gas transporters (IGTs). All GDNs were under the ownership of National Grid until it divested four in June 2005.

Figure 4 shows the eight gas distribution networks in Great Britain:

- East of England, London, North West, West Midlands which are owned by National Grid;
- Northern, owned by Northern Gas Networks;
- Scotland and Southern, owned by Scotia Gas Networks; and
- Wales & West, owned by Wales & West Utilities.

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20 National Grid, *Gas Transportation Ten Year Statement 2011*. Dragon LNG's website states that its maximum send out rate is 1.2 mcm per hour, which is equivalent to about 10.5 bcm per year. Gas LNG Europe (GLE) reports that the Dragon has a capacity of 6 bcm per year.

21 National Grid, *Gas Transportation Ten Year Statement 2011*.

22 We use the term "UK" in this report. However, most of this report relates to Great Britain, i.e. England, Scotland and Wales.

Figure 4. Gas distribution networks and their owners

Source: Energy Networks Association

2.2.3 Gas transportation, trading and shipper services

In addition to producers that deliver their gas to the UK, the main types of player in the UK gas industry are gas transporters, shippers, retail suppliers and traders.

Gas transporters

Gas transportation services on shore are provided by holders of a gas transporter's licence issued by Ofgem. National Grid, along with several smaller gas transporters, is licensed by Ofgem to convey gas through its pipeline network for shippers. National Grid currently operates the NTS and its four retained distribution networks.

Currently, 211[23] companies are licensed by Ofgem as shippers. Holders of a shipper's licence can purchase gas from producers, traders or other shippers, sell gas to suppliers (see below) or other shippers, and employ National Grid (and other gas transporters) to transport the gas to final customers.

Typically, shippers purchase gas at the beach and deliver it to the final consumer, or sell the gas at the National Balancing Point (NBP) to another shipper who will then deliver the gas to a final consumer. The NBP is a notional point within the NTS defined for shipper balancing but is also used to provide a 'place' for the transfer of the title to traded gas. Shippers are responsible for balancing their own gas entry and off-take, with National Grid balancing the total system to ensure system integrity.

Companies, wishing to sell gas to small consumers, i.e. customers using 2,200 GWh a year or less, need to obtain a supplier's licence from Ofgem. No such licence is needed to supply customers using more than 2,200 GWh a year, i.e. shippers can sell gas to these larger consumers directly. A company with a supplier's licence contracts with shippers to ship gas through the network to its customers. A supplier that is not also a shipper has no direct relationship with gas transporters. However, in practice, many suppliers are also licensed as shippers.

Gas traders

Aside from physical delivery, there is a liquid over-the-counter traded market for wholesale gas involving shippers, retail suppliers and traders. The market includes several forms of forward contract and trades up to the day-ahead of delivery and even within the day of delivery.

2.2.4 Downstream retail supply

UK retail gas supply is characterised by the existence of six large supply groups: E.ON UK, RWE npower, EDF Energy, Scottish and Southern Energy (SSE), Scottish Power and British Gas.

In 2010, domestic (i.e. household) supply accounted for around 35% of total gas consumed in the UK, industry and commerce (including the energy industry) 35% and power 30%.[24]

In December 2010 the domestic sector comprised 22.5 million customers and British Gas had the largest share (42%).[25]

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23 http://www.ofgem.gov.uk/Licensing/Work/Documents1/external_gas_list_excel1.pdf, accessed on 17/07/2012

24 Source: DECC Digest of UK Energy Statistics, table 4.2.

25 Ofgem, *2011 Great Britain and Northern Ireland National Reports to the European Commission*, pp. 60-61.

2.2.5 Flexibility and storage

Final demand for gas is not constant but varies by season, day of the week etc. Because shippers and suppliers need to have gas available for final delivery at exactly the time that the final customer wants it, they need to procure flexibility and access to storage facilities.

There are six gas and 1 LNG storage facilities in the UK, with a combined working gas volume of 4.4bcm, as shown in Table 1. Four projects are under construction that will provide an additional 0.8bcm of capacity by 2014 and a number of storage projects, totalling 11bcm have planning permission.[26]

Shippers and suppliers can also procure flexibility by securing the right to interrupt gas supplies to a proportion of their customers (typically large industrial and commercial customers, or power stations). In addition, the rate of gas imports and production can be varied over time to provide flexibility.

Table 1. Existing UK storage

Storage Project	Operator	Location	Space (bcm)
Rough	Centrica Storage	Southern North Sea	3.3
Hornsea	SSE Hornsea	Yorkshire	0.3
Hatfield Moor	Scottish Power	Yorkshire	0.1
Holehouse Farm	Energy Merchants Gas storage	Cheshire	0.06
Humbly Grove	Star Energy	Hampshire	0.3
Aldbrough	SSE/Statoil	Yorkshire	0.2
LNG Storage[27]	National Grid LNG Storage	Various	0.08

Source: National Grid, *Gas Transportation Ten Year Statement 2011*

26 National Grid, *Gas Transportation Ten Year Statement 2011*.

27 LNG storage is located at Avonmouth. The Partington and Glenmavis storage facilities were closed in 2011 and 2012, respectively. See http://www.nationalgrid.com/NR/rdonlyres/655FE1E5-873B-40EA-9490-C4C65F53E996/54422/LNGSSiteClosuresPublicAnnouncement27June2012.pdf

3 Conceptual framework for the assessment

The criteria that need to be met for a UK LNG import facility to gain an exemption from regulated third party access (rTPA) are contained in section 19C (7) of the Gas Act:[28] The criterion relevant for this report is the competition assessment:

> *(e) the exemption will not be detrimental to competition, the operation of an economically efficient gas market or the efficient functioning of the pipeline system connected or to be connected to the facility; and*

The Gas Act transposes the requirements of Article 36.1 of the third Gas Directive 2009/73/EC into UK law. Article 36.1 expresses the requirements slightly differently from the Gas Act and envisages two competition tests:

> *(a) the investment must enhance competition in gas supply …*
>
> *(e) the exemption must not be detrimental to competition or the effective functioning of the internal market in natural gas, or the efficient functioning of the regulated system to which the infrastructure is connected.*

Ofgem assesses the exemption application according to the criteria in the Gas Act 1986 (as amended) and it does not consider that there are any material differences between the criteria in the Gas Act and those in the Gas Directive.[29] We concur with this view.

So long as the investment in question represents a net addition to the sources of supply that are available to the market, the physical investment per se must always be pro-competitive. It is almost inconceivable that the commissioning of the investment represented by the Grain 4 facility would immediately cause an equivalent or greater supply capacity to close. It is therefore only when the exemption is considered, and hence the long term disposition of usage rights, that competition concerns could arise.

Hence, the substantive competition test remaining is whether the exemption (and the disposition of rights under it) is detrimental to competition. To test whether the exemption may be detrimental we need to establish the counterfactual. We understand that Grain LNG will make representations to the effect that, without exemption, the investment in Grain phase 4 will not proceed. Indeed, this must be the case, to meet another of the criteria for exemption.

It therefore follows that, with respect to condition (e) of both the Gas Act and the Gas Directive, the counterfactual is that no investment will take place; not

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28 The Gas (Third Party Access) Regulations 2004 (No. 2043), amending the Gas Act 1986.

29 Application by Dragon LNG Limited under section 19C of the Gas Act 1986 for an exemption from section 19D of the Gas Act 1986, Ofgem final views, February 2005. Ofgem's statement referred to the criteria set out in the second Gas Directive (2003/55/EC). However, there is no material difference between the wording of the criteria in the second Gas Directive and the third Gas Directive.

that the same investment will take place but the facilities constructed will operate under the rTPA regime.

In short, the key question for consideration is whether, after taking account of the possible disposition of usage rights for the Grain 4 facility that could arise under an exemption from rTPA, the project could have a materially adverse effect on the market structure and hence competitiveness of any relevant gas market.

The test of this requires a competitive assessment which normally consists of three steps:

- Identifying where in the gas value chain the project could have a direct or indirect impact.
- Identifying which are the relevant markets in competition terms where those impacts may be felt.
- Analysing the current or foreseeable state of competition in each of the relevant markets, with and without the proposed investment.

While, in principle, a competitive assessment should ideally be made over the life of the exemption, it is not practicable to predict market developments with any accuracy over that timeframe. It is also the case that the majority of market developments that could make the competitive impact of Grain 4 worse are controlled by regulators who will have the power to prevent them if they cause a detriment to competition. In addition, regulators have a right to cancel an exemption where circumstances have changed such that the exemption becomes detrimental to competition. It is therefore necessary to balance the desirability of a forward looking analysis with the practical availability of data to give effect to this.

In the light of the above, we consider competitive conditions in the relevant UK and European markets in the period immediately after the earliest time that Grain 4 would be commissioned (Autumn 2016) and then again some five years later i.e. gas year 2021/22 for the UK and calendar year 2022 for Europe. This horizon allows us to reflect data from the last year of ENTSOG's most recent TYNDP available. However, we note that even for this timeframe, it is difficult to make accurate predictions.

In order to test whether the case for exemption is robust to the result of the open season process that would allocate rights to use Grain 4, we assume for each relevant market the disposition of usage rights most likely to have an adverse effect on competition in that market. These scenarios are not the same for each market as a result. The effect of this is that the separate analysis of each market will tend to overestimate any possible competitive detriment. (Grain 4 rights cannot all be given simultaneously to the most problematic party in each of two markets if those two parties are not one and the same.)

Conceptual framework for the assessment

If no possible outcome of the open season process leads to a material adverse effect on competition, criterion (e) is met.[30]

If a player other than the player with the largest market share in the counterfactual obtained some of the rights to Grain phase 4, the competitive impact of the expansion would be better than that set out in the analysis.

30 We note that formally it is not necessary for the investment with exemption to have no detrimental effect in any relevant market. It is sufficient if the detriment to one or more relevant markets is offset with greater benefits to competition in other relevant markets.

4 Grain phase 4 and its impact

4.1 The grain phase 4 investment

The first three phases of the Isle of Grain LNG import facility are now operational. Capacity for these three phases has been sold to a number of companies wishing to utilise the facility.

The exact size and configuration of the proposed Grain phase 4 expansion will be a function of market appetite following a public offering of capacity through an open season process. The phase 4 expansion examined here assumes:

- a second cryogenic pipeline, to take LNG from ships to the LNG storage tanks;
- an additional storage tank of 190,000 cubic metres; and
- two additional vaporisers and associated equipment.

The maximum phase 4 incremental deliverability, berthing slots and storage likely to be taken up by shippers are set out in **Table 2**. At this stage, Grain phase 4 is scheduled for completion by winter 2016/17 at the earliest.

Table 2. Grain phase 4 capacity additions

	Phase 1 – 3	Phase 4	Phase 1 – 4
Gas deliverability (bcm per annum)	~19.7	~8.0	~27.7
Gas deliverability (GWh per day)	645	~250	~895
LNG storage (m^3)	~1,000,000	~190,000	~1,190,000
Berthing slots (per annum)	236	~100	~336

Source: Grain LNG

Currently, Grain has 14 vaporisers, each with a capacity of around 65GWh/day or 910 GWh/day in aggregate. Phase 4 will add two vaporisers, bringing the maximum physical send out capacity to 1040 GWh/day. The aggregate send out capacity (895 GWh/day) that Grain LNG intends to sell through contracts is lower than the theoretical maximum vaporisation capacity. The difference allows for maintenance and other outages of the vaporisers. However, following the phase 4 expansion, with all vaporisers functioning Grain would theoretically be able to deliver gas at a rate 16% higher than expected contracted capacity for

short periods of time (subject to the availability of sufficient amounts of NTS entry capacity).

National Grid is seeking an exemption for the full capacity of the phase 4 expansion, for a period of 25 years or more.

4.2 Likely impacts on gas value chain

The physical service that either will or may be provided as a result of the proposed investment in Grain is the provision of LNG import capacity, which includes unloading from LNG carriers, temporary storage and regasification.

In addition to this physical service, the proposed investment might be expected to have an impact on the following activities in the gas value chain:

- LNG supply – the proposed expansion might cause or facilitate a player to enter into or expand its supply of LNG;
- LNG shipping – the investment may indirectly lead to an increase in the shipping of LNG;
- wholesale supply of gas (UK and Europe) – the investment may cause more gas (from LNG) to come to the wholesale market in the UK and in Europe;
- network services – the investment may increase the demand for the use of network services (i.e. gas transportation) in the UK;
- shipping of gas – if there is an increased demand for network services, there would be an increase in the demand for shipping services;[31]
- flexibility/storage – the investment may have an effect on the demand for flexibility or storage but is also an additional source of supply for flexibility or storage; and
- retail supply of gas – the proposed expansion could have an impact on the supply of gas to end consumers, for example, if access to upstream supplies afforded a particular competitive advantage to a retail supplier.

[31] Here we refer to shipping gas through National Grid's transportation network, as opposed to the distinct service of LNG shipping.

5 The relevant affected markets

Having identified where the proposed project will, or could have, a direct or indirect impact on competition, this section identifies as far as is practicable the relevant markets that could be affected.

5.1 Market definition and the SSNIP test

Definition of the relevant market for a particular competition case typically begins with the set of products most directly relevant to the case under review. Any market definition will normally be defined in two dimensions, a product dimension and a geographic dimension. The European Commission (EC) has defined the relevant product market as follows:[32]

> *A relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use.*

It also defines the relevant geographic market as follows:

> *The relevant geographic market comprises the area in which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those areas.*

Put simply, a market essentially comprises all products that are substitutes for one another and sufficiently geographically close to constrain each other's pricing. This implies that competitive constraints must be assessed in order to define the relevant market, in accordance with the EC's guidelines on market definition. Demand substitutability and supply substitutability should be considered when assessing competitive constraints.

A potentially useful conceptual tool in the context of market definition is the hypothetical monopolist test, often referred to as the SSNIP test.[33] The SSNIP test considers whether a hypothetical monopolist with control over a defined set of products is able to sustain a profitable increase in the price of those products above the competitive price level, assuming that the price of all other products remains constant.

In practice, this generally means assessing whether a hypothetical monopoly of a set of products over a given region could profitably increase prices by 5-10% and sustain this over a period of at least a year.

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32 See European Commission Notice on the definition of the relevant market for the purposes of Community competition law, published in the Official Journal: OJ C 372 on 9/12/1997.

33 SSNIP means small but significant non-transitory increase in price.

A market is defined as the smallest set of products defined in both product and geographic terms that it is profitable to monopolise. The test is applied first to a narrow definition of the market and then, if the test is not met, the market definition is broadened progressively until such a price increase by a hypothetical monopolist appears both feasible and profitable.

There are essentially two reasons why a SSNIP might not be profitable. First, there may be products or services outside of the control of the hypothetical monopoly to which customers would switch in the event of a price rise. These products are known as demand-side substitutes. Second, there may be products or services outside of the control of the hypothetical monopoly which are supplied using similar assets that could be rapidly used to supply directly competing products/services. These products are known as supply-side substitutes. An analogous approach applies to the definition of the geographic scope of the relevant markets.

The SSNIP test is phrased as a precise and quantitative test. However, it is never really possible to take a market definition exercise to a point at which the SSNIP test can be explicitly and quantitatively applied with market data and to observe the effect of a 5% increase in prices on the demand for the product. In these circumstances, it is common practice to use whatever quantitative and qualitative evidence is available to infer what the likely result would be, i.e. to gauge which products are likely to be substitutes for one another and which of those products are sufficiently geographically close to be substitutes for one another in that they constrain each other's pricing. This is also the approach that we have taken in this report, i.e. where necessary we employ qualitative assessments and use market definitions already adopted by competition authorities.

In addition to uncertainty over the precise market definition, the definition of the relevant market is also likely to vary over time (e.g. by season) as demand and supply conditions change. Therefore, in considering the competitive effect of Grain 4, we assess a range of possible market definitions.

We also note that the SSNIP test needs to be applied with caution in the energy sector. A variety of features make the energy sector different from many other markets. For example, as the energy sector involves capital intensive inflexible projects, many intermediate markets are characterised by competition for contracts not the day-to-day competition characteristic of most consumer markets. In such circumstances, the timeframes over which to judge the operation of competitive constraints and the firms that provide them may differ from the one year most frequently employed in the SSNIP test. In particular, the relevant timeframes to judge the operation of competition in energy markets may be longer than one year.

The relevant affected markets

As noted in Section 3, in theory, it would be ideal to consider the competitive impact and hence definition of the relevant market over the life of the requested exemption, since the definition may change over time. In practice, we consider a range of possible market definitions as the relevant markets are not clear now, yet alone well into the future.[34]

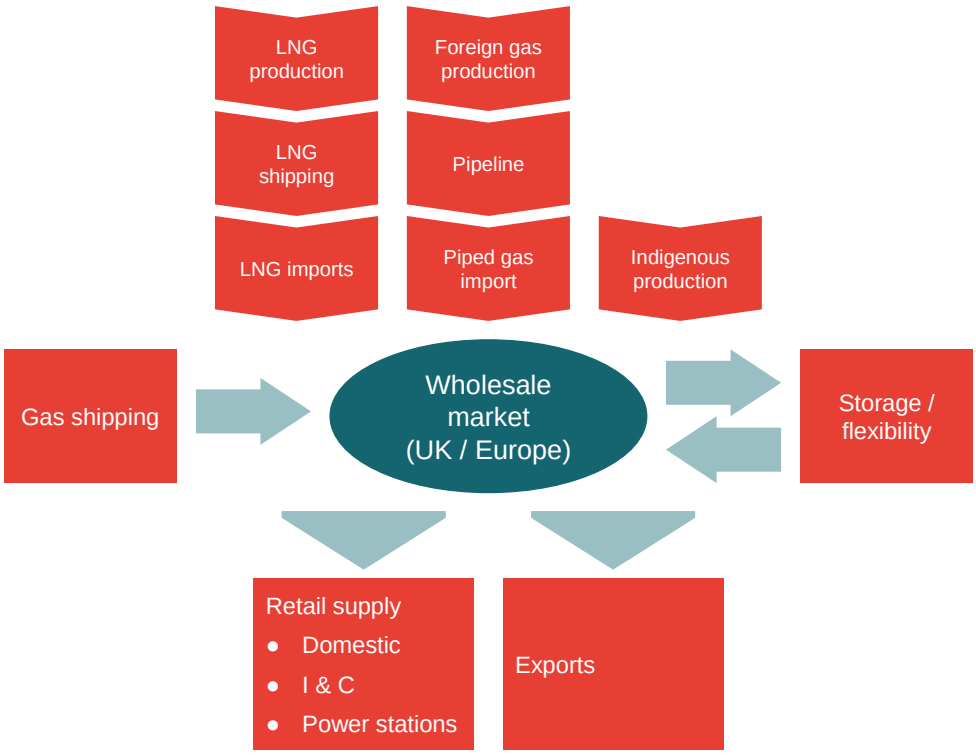
5.2 The relevant markets in the present case

For the purposes of gauging the effect of the planned expansion of the Isle of Grain LNG terminal on competition, we need to identify each possible market that the activities due to the expansion of the terminal, i.e. activities leading to the supply of LNG to the UK, could have an impact on. In what follows, we therefore discuss each of the relevant activities in the UK LNG supply chain (as set out in Section 4.2) and, where appropriate, identify the likely scope of the relevant product and geographic markets. We conclude with a list of markets that might be affected by the proposed expansion of the Grain LNG import facility and that we examine in more detail in our assessment of the impact of the expansion on competition.

As a precursor to our discussion of individual markets it is helpful to look at an overview of the way in which competition operates. This is shown schematically in **Figure 5**.

34 See Section 6 for a further discussion of the timeframe for the competition assessment.

Figure 5. Gas sector schematic



Source: Frontier

The focal point of competition is the relevant wholesale market. Various gas producers compete to supply that market by importing piped gas, importing LNG or producing indigenously. Those who use the LNG route need to acquire the relevant subsidiary services necessary to get LNG into the wholesale market, including liquefaction, LNG shipping, importation and regasification. Retailers buy from the wholesale market and compete to sell to final customers. Exporters also buy from the wholesale market, to supply gas to other markets. Upstream suppliers and/or retailers need to source or self supply flexibility and shipping services. In turn, gas shippers must procure network services.

5.3 LNG liquefaction

Gas imports through the Isle of Grain LNG facility start with the supply of LNG from an exporting country. The expansion of the LNG import capacity at Grain is likely to (indirectly, as is discussed in more detail in our competitive assessment in Section 6) have an impact on the supply of LNG in that it may potentially be associated with the opening of a new supply source or expansion of an existing supply source for LNG exports, to the extent that existing export capacity is perceived to be either booked or constrained.

The relevant affected markets

The main issue for the purposes of market definition for LNG supplies is the likely appropriate geographic scope of the relevant market.

Over the period 2009 to 2013 liquefaction capacity is expected to expand by 131 bcm per year. Half of this capacity will be added by Qatar (63 bcm per year), which according to the IEA is "easily" able to target Asian, European and North American markets. Qatar's initial strategy of having an equal spread of distribution between the three regions has evolved to focus more on Asia and less on North America[35] (as a result of increased natural gas extraction in North America). Both the initial strategy and the change in strategy serve to illustrate the globalisation of LNG markets.

It is clear that the market for LNG supplies to Grain is not limited to Europe / Africa. Indeed, the sources of supply of existing European LNG import facilities include Africa, the Middle East, and South and Central America, as indicated by **Table 3**. All three regions also supply the Asia Pacific region, as does Europe. In addition, Africa, the Middle East and South and Central America also supply North America.

Table 3. LNG trade flows in 2011 (bcm)

From \ To	North America	Sth & Central America	Europe	Asia Pacific	Middle East	Total
Nth America	-	0	0	1	-	2
Sth & Central America	6	6	6	6	0	24
Europe (including Russia)	0	0	3	16	0	20
Middle East	8	2	45	73	2	130
Africa	2	2	37	15	1	57
South-East Asia & Australia	0	0	-	97	1	98
Total	17	11	91	207	5	331

Source: BP Statistical Review, 2012

35 Ibid.

The fact that a single export region supplies multiple import regions and a single import region is supplied from multiple export regions indicates that supply sources and destinations are likely to be able to substitute for one another. This combined with the increasing flexibility of the LNG trade suggests that LNG supply should be considered a global market.

This does not imply that prices are equal everywhere, they will differ owing to transportation cost differences. However, if Qatar is acting rationally and the marginal netback values of gas in Qatar are equal, a hypothetical monopolist exporting LNG to the Mediterranean/Atlantic area that raised price would cause Qatar to move LNG that would have gone to the Asia Pacific region to the Mediterranean/ Atlantic region.

This would tend to suggest that although there are geographical factors influencing the pattern of supply, supply side substitution may well make LNG export a global market. This view appears to be shared by Ofgem, which states:[36]

> "*The relevant market for LNG is increasingly a global one, with supply and demand conditions in regions such as Asia impacting upon the volume of LNG deliveries available to GB. This has been demonstrated over the past few years – for example in 2008, LNG deliveries to GB were low, despite a high NBP price, due to high Asian demand which meant that the majority of available cargoes were diverted to this region. In contrast, deliveries in 2009 were substantially higher as economic conditions suppressed LNG demand in competing markets, and US domestic production was boosted by high volumes of unconventional gas.*"

The trend over time is for an increase in the average size of LNG tankers in the global fleet, as shown by **Figure 6**. This will further improve the economics of LNG transportation, making LNG from distant suppliers even more competitive.

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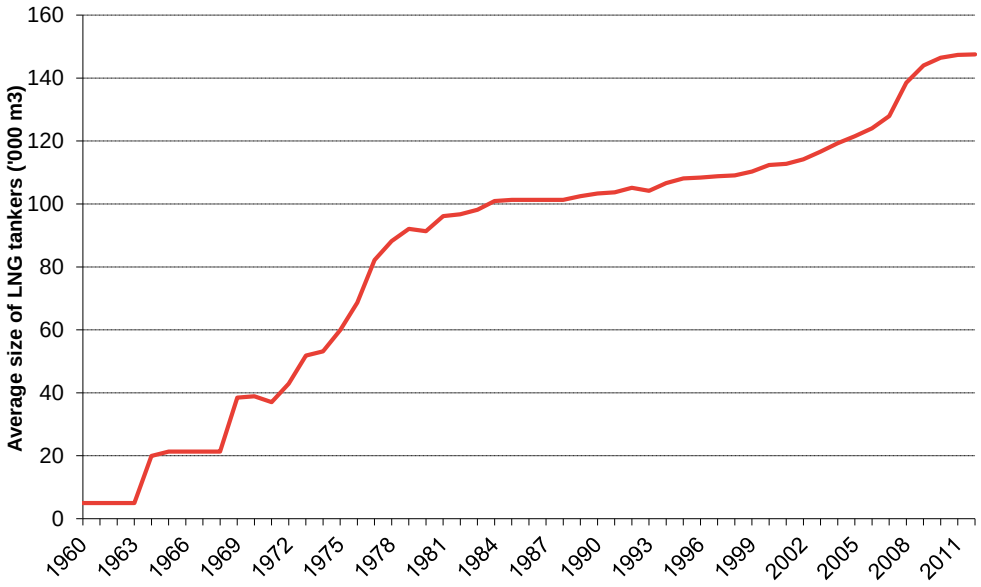
36 Ofgem, *2010 Great Britain and Northern Ireland National Reports to the European Commission - In Relation to Directives 2003/54/EC (Electricity) and 2003/55/EC (Gas)*, p. 48.

Figure 6. Average size of LNG tankers



Source: www.shipbuildinghistory.com

As regards the definition of the relevant product market, the question to examine is to what extent LNG can be considered a separate relevant market, or whether piped natural gas forms part of the same relevant market. This question is more difficult to answer. In many instances (including in relation to the UK and the vast majority of Europe) piped natural gas is a perfectly good substitute for LNG imports. For a few regions, piped natural gas is infeasible and any demand side substitution would have to be in terms of fuels other than natural gas. We cannot readily conclude whether or not a hypothetical monopolist of global gas LNG supplies could profitably raise prices, but for the purposes of further analysis in this case we assume that it might, i.e. for the purposes of this study, we assume that global LNG supply is a potentially relevant market.

5.4 LNG shipping

The main service required to bring LNG to the market is a shipping service to transport the gas to a location where it can be marketed. The construction of the LNG import capacity at the Isle of Grain might (indirectly) have an impact on the supply of LNG shipping services, in that it might lead to an addition of new tankers to the market.

The relevant questions that one would wish to examine for the purposes of product and geographic market definition in this context is whether different types of LNG tankers in terms of capacity are likely to form part of the same relevant product market of LNG shipping services and whether LNG shipping is

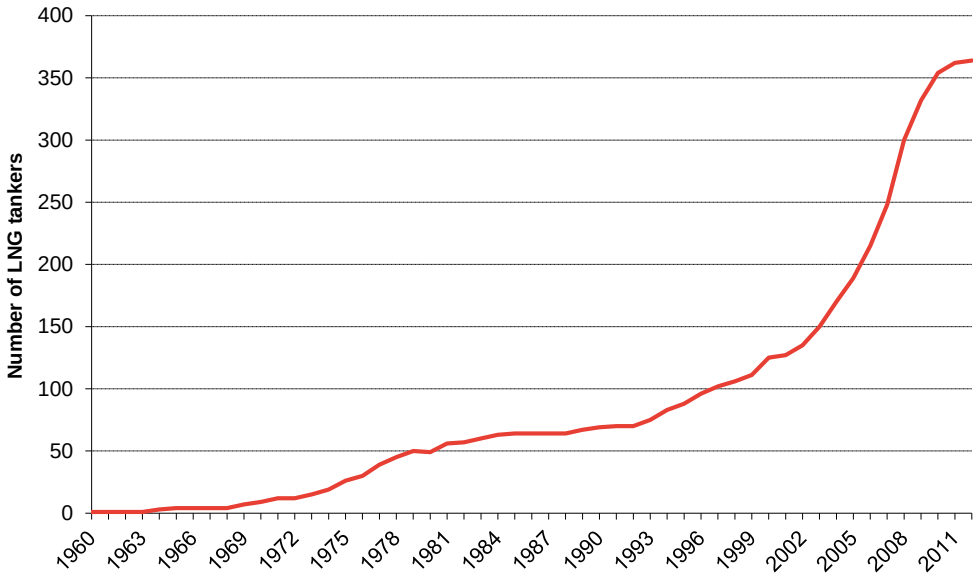
a global activity or whether the geographic scope of the market is likely to be narrower than that.

As regards the definition of the relevant product market for LNG shipping, LNG tanker design is such that no other tankers are a substitute for them. The product market is therefore no wider than all LNG tankers. The relevant question is therefore whether it would be appropriate to segment the product market into sizes of LNG tanker.

Our understanding of the development of LNG is that new tankers have frequently been ordered for use on a particular new route and that sometimes tankers are sized for the specific route for which they are bought. That said, the ordering of new tankers is usually necessary because a new route increases the demand for tankers. Even if some harbours cannot accommodate the largest vessels it seems reasonable to suppose that a chain of substitution would mean that the whole market would be affected by the action of a hypothetical monopolist in a segment.

The increasing number of LNG ships in the global fleet, as shown by **Figure 7**, is likely to facilitate this substitution. We therefore assume that the relevant product market is that of LNG shipping services without any further sub-segmentation by tanker size.

Figure 7. Number of LNG tankers in service



Source: www.shipbuildinghistory.com

In addition, the share of fleet capacity that is not dedicated to specific trade routes is reported to have increased over time to 14% in 2009.[37] This implies that the ability to substitute between LNG shipping services has increased over time.

As far as the geographic scope of the market for LNG shipping services is concerned, tankers clearly have no material difficulty in moving from one part of the world to another. In our view it is therefore clear that the geographic scope of the LNG shipping services market is global.

5.5 LNG importation

The next activity in the LNG supply chain that is likely to be affected by the potential capacity development at Grain 4 is the provision of LNG import services, i.e. the provision of access to LNG import facilities.

At the time the Grain 4 expansion is commissioned there will be three other terminals (South Hook, Dragon and Teesside GasPort) in operation in Great Britain, in addition to Grain phases 1 to 3, as shown in **Table 4**. South Hook has recently undergone expansion to double its initial capacity. Furthermore,

37 Sophia Ruester, *Recent Dynamics in the Global Liquefied Natural Gas Industry*, January 2010.

planning permission has been granted to expand Dragon (to increase its capacity) and to three other projects totalling 50 bcm of import capacity.[38]

Table 4. LNG import terminals in Great Britain

Import project	Operator / developer	Capacity (bcm/year)	Commissioning date
Isle of Grain Phase 1, 2 & 3	National Grid	20	2005, 2008 & 2010
GasPort	Excelerate	4	2007
South Hook 1 & 2	Qatar Petroleum / ExxonMobil	21	2009 & 2010
Dragon 1	BG / Petronas	10.5	2009

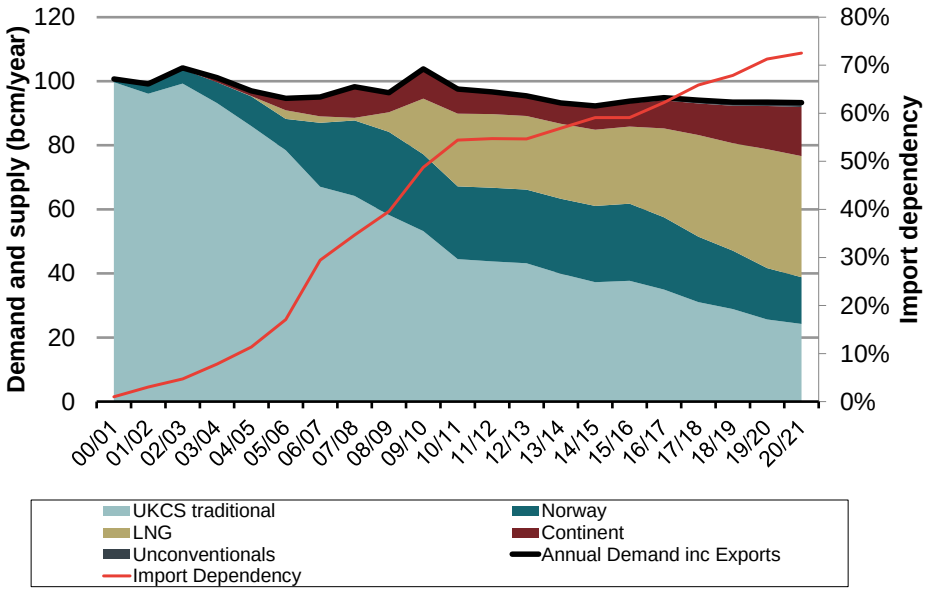
Source: National Grid correspondence (for Grain) and National Grid, *Gas Transportation Ten Year Statement 2011* (for other terminals)

This means that a relevant question to be examined for the purposes of this study is whether the provision of access to LNG import facilities in Great Britain is likely to constitute a relevant market in competition terms.

There is no demand for LNG *per se* that cannot be substituted by piped gas since the product from the two sources of gas is homogenous. The fact that LNG is becoming an increasingly integrated part of the overall gas supply to Great Britain, as illustrated by **Figure 8**, suggests that in practice LNG and piped gas are substitutes.

38 A final investment decision has not yet been taken regarding these investments. (National Grid, *Gas Transportation Ten Year Statement 2011)*

Figure 8. Annual gas supply to Great Britain – National Grid Slow Progression Scenario

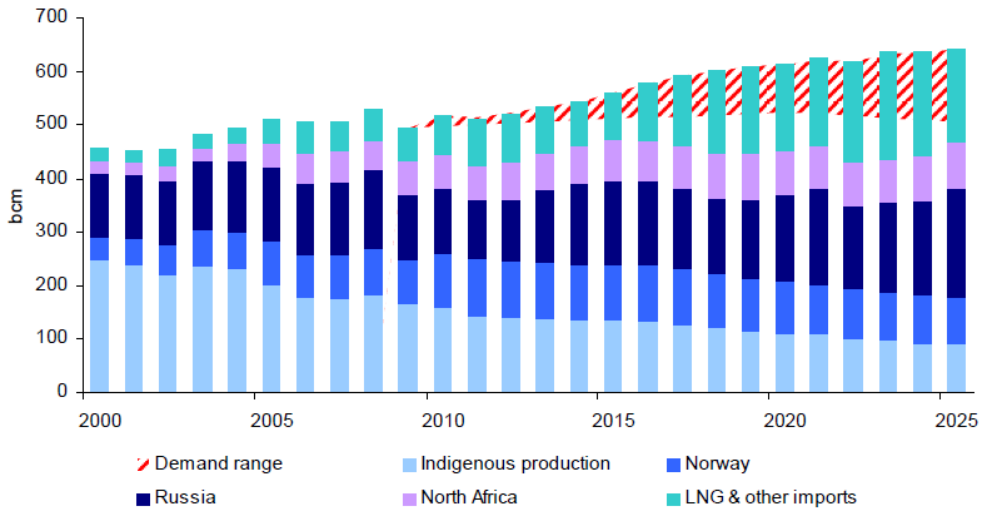


Source: National Grid, *Gas Transportation Ten Year Statement 2011*

The fact that LNG is also becoming an increasingly integrated part of the overall gas supply to Europe, as illustrated by **Figure 9**[39], also suggests that in practice LNG and piped gas are substitutes.

[39] Algeria supplies Europe through both LNG and piped gas. The category "LNG" represents LNG supplied by countries other than Algeria.

Figure 9. Annual gas supply to Europe



Source: National Grid, *Gas Transportation Ten Year Statement 2010*

Aside from the indications that LNG is becoming an increasingly integral part of the gas market a logical argument implies that LNG and piped gas are substitutes. If, on the one hand, the UK/European wholesale market is competitive and, on the other, the supply and shipping of LNG are competitive, a monopolist of GB LNG import facilities faces competitive constraints on what it can charge.

As our competition analysis concludes that these surrounding markets are indeed competitive, it would appear that GB LNG importation is not a separate market.

Therefore, we conclude that LNG imports to Great Britain are in the same market as piped gas supplies to Great Britain. This is not inconsistent with Ofgem's view of the wholesale gas market, which it defines as "…*covering any transaction of gas between market participants other than final end use customers.*" [40] Importantly, Ofgem does not consider that LNG is in a separate wholesale market from piped gas.

5.6 Network services

The service of providing entry and transportation on National Grid's gas transportation network may be a market in economic terms. However, this service is recognised as a natural monopoly and is regulated as such. As a result no competition concerns can arise.

[40] Ofgem, *2009 Great Britain and Northern Ireland National Reports to the European Commission - In Relation to Directives 2003/54/EC (Electricity) and 2003/55/EC (Gas)*, p. 43.

5.7 Relevant wholesale markets (Great Britain / Europe)

The Isle of Grain LNG import terminal is located in Great Britain and imports through the phase 4 expansion will supply the UK wholesale market.

As described above, in our view LNG is a substitute for piped gas and is therefore part of the wholesale market. For the purposes of determining the relevant geographic market of LNG supply in competition terms the pertinent question that needs to be considered is therefore whether the relevant wholesale market should be limited to the UK or should be widened to include some or all other countries of Europe.

The answer depends on physical and other barriers to substitution for the supply of gas between regions. In assessing physical barriers, we consider the extent to which there is slack capacity to import gas into the UK from other regions in Europe and to transfer gas between regions in Europe. We also consider whether LNG import facilities allow tankers to choose between the UK and other European destinations.

We begin the geographic definition by focussing on the UK since this is the region directly affected by the Grain phase 4 expansion.

The UK Competition Commission concluded that in 2003 there was a UK wholesale market.[41] In the sector enquiry of 2005-2007, the European Commission (EC) notes that it considers gas supply markets generally to be no wider than national in scope.[42] However, the EC also considered, as part of its decision regarding the merger between GDF and Suez, that the gas hubs at Zeebrugge (Belgium) and NBP (UK) can be regarded as belonging to the same market and that the TTF hub (Netherlands) is not part of the same market.[43] [44]

Since the Competition Commission reached its conclusion there has been a number of developments which have increased the possibility to integrate the UK gas system with those of continental Europe:

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41 The Competition Commission "Centrica plc and Dynegy Storage Ltd and Dynegy Onshore Processing UK Ltd – A report on the merger situation", August 2003.

42 DG Competition Report on Energy Sector Inquiry, 10 January 2007, p38.

43 DG Comp, Case No COMP/M.4180 – Gaz de France/Suez, 14/11/2006, p21.

44 The EC considers that trading at a hub is a product market that is distinct from gas wholesale supplies. The EC notes that it has previously defined a wholesale gas market as importers' direct sales to their final customers and their sales to retailers operating on the distribution networks who are not themselves responsible for shipping (ibid. p22). We consider that gas hub trading is part of the gas wholesale market since a prospective buyer of gas from an importer could alternatively procure gas from a trading hub, i.e. hub trading and purchases from importers are substitutes.

- **IUK.** Reverse flow (i.e. in the direction of importing into the UK) capacity on the IUK pipeline between Bacton and Zeebrugge has increased from 8.5 bcm/year to 16.5 bcm/year from 2005, to 23.5 bcm/year from October 2006 and 26.9 bcm/year today.

- **BBL.** The BBL pipeline was commissioned with an import capacity to the UK of 15 bcm/year. Capacity was expanded by about 3 bcm/year in April 2011, bringing total capacity to 19.5 bcm per year. In addition, reverse flow (i.e. UK to Netherlands) nominations are now possible although the capability for physical reverse flows is not yet possible.

- **Orman Lange.** The Orman Lange field in Norway has been connected to the UK through the Langeled pipeline with a capacity of 25 bcm/year – the configuration of pipelines from Orman Lange allows gas from the field to be transported either to the UK or to continental Europe in varying proportions.

- **Other pipelines from Norway.** The Tampen Link with a capacity of 25 mcm per day or about 9 bcm pa connecting Norway's Statfjord field to the UK's FLAGS pipeline was commissioned in 2007. The Gjøa gas pipeline with a capacity of about 6 bcm pa connecting Norway's Gjøa platform to the UK's FLAGS pipeline was commissioned in 2010.

- **LNG imports.** LNG import capacity into the UK has expanded to approximately 55 bcm/year.[45] In addition, LNG import capacity into Europe has expanded, e.g. Spain has expanded LNG import capacity significantly, the Zeebrugge terminal import capacity has increased from 4.5 to 9 bcm, facilities to load ships with LNG has been added at Zeebrugge and the GATE terminal in the Netherlands was commissioned in 2011. These developments may well make it feasible for LNG tankers to choose their final destination on the basis of prevailing spot prices.

Further developments that could lead to increased integration are planned before Grain phase 4 is commissioned, for example:

- **LNG imports.** GLE lists projects under construction in Europe with a combined LNG import capacity of 47 bcm per year. This capacity is scheduled to be commissioned between 2012 and 2016.[46]

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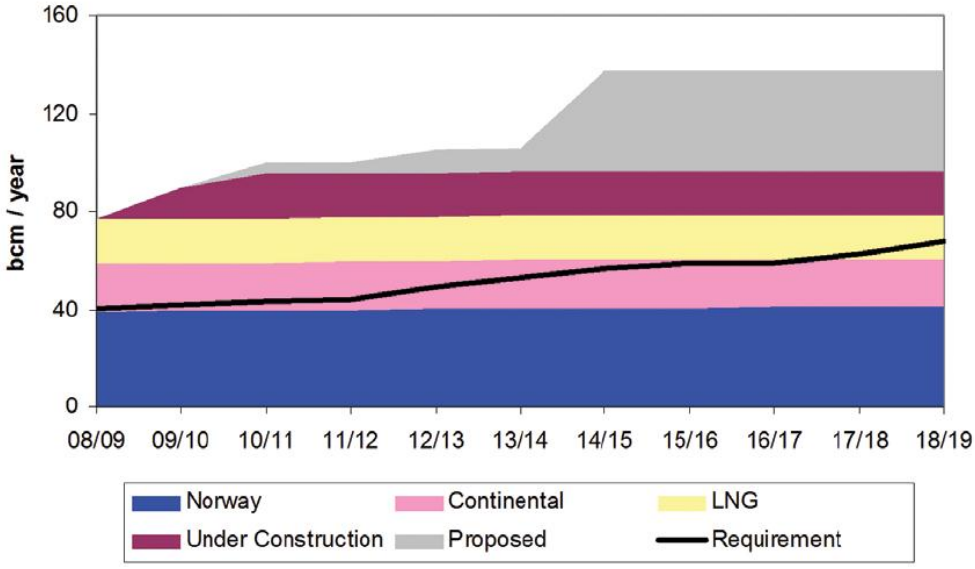
45 Gas LNG Europe (GLE) reports LNG import capacity into the UK of 51 bcm per year.

46 GLE investment database 2011.

These developments and the option of allowing physical reverse flows on the BBL pipeline for a relatively small capital outlay all point towards a greater coupling of the UK and European wholesale gas markets.

The existing and projected spare import capacity depicted by **Figure 10** suggests that there will be no physical constraints on the ability of the UK to import additional gas if prices in the UK wholesale market were to rise.[47]

Figure 10. UK import requirement and de-rated import capacity



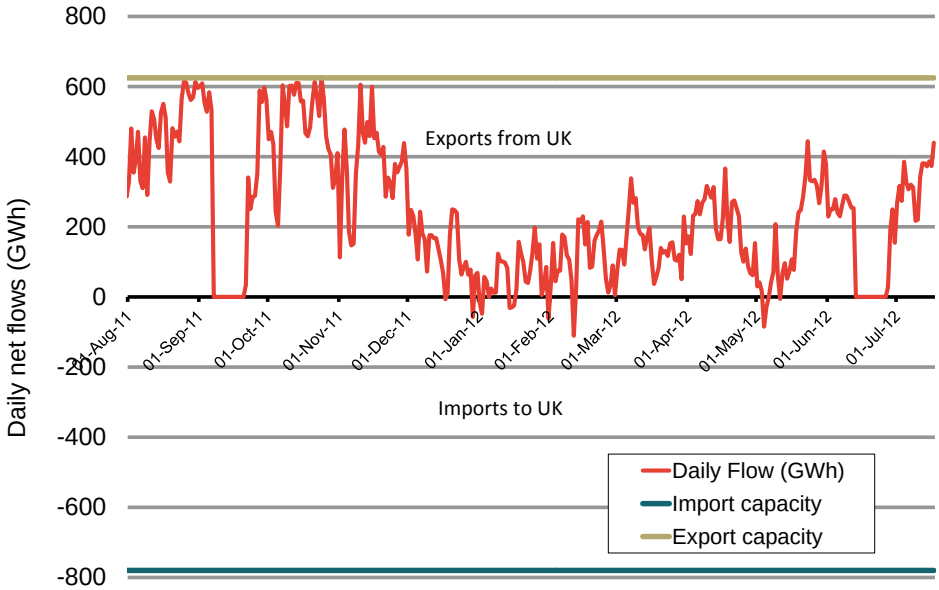
Source: ENTSOG, *European Ten Year Network Development Plan 2010 – 2019 Attachment A Capacity Development, Demand and Supply Scenarios by Country*, page 234

A detailed look at flows on the Bacton-Zeebrugge and BBL interconnectors shows spare capacity (see **Figure 11** and **Figure 12**) in both the import and export directions.[48] It is also apparent that flows on the interconnectors do in practice vary with demand and supply conditions, providing a further indication that wholesale gas in the UK and continental Europe may well form part of the same market.

47 Since the time of preparing the data underlying this graph South Hook 1 and 2 and Dragon LNG terminals have been commissioned. Existing import capacity and plans for new import capacity sum to about 200 bcm per year, which far exceeds projected import requirements. Therefore, for the purposes of this graph, ENTSOG has de-rated import capacity to reflect operational experience and expectations of future use, as follows: IUK 25%, other import pipelines 85%, LNG terminals (operating or under construction) 75% and LNG terminals (proposed) 50%.

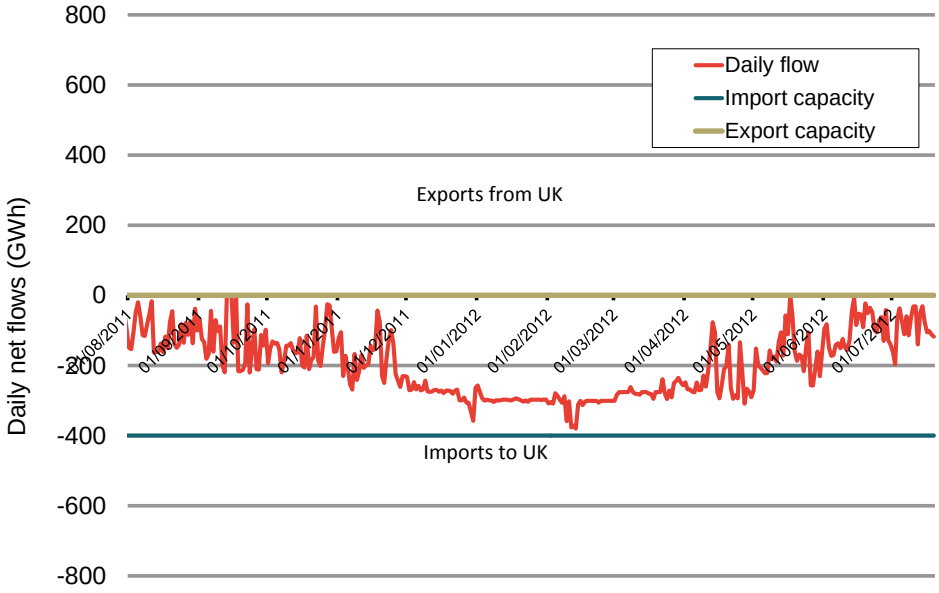
48 Note that it is currently not possible to flow gas physically through the BBL pipeline in the direction of exporting from the UK to the Netherlands.

Figure 11. IUK flows for the past 12 months



Source: www.interconnector.com

Figure 12. BBL flows for gas year 2009/10



Source: www.bblcompany.com

The relevant affected markets

Given the pattern of supply and demand, the capacity of transmission network and the institutional arrangements in Europe currently, it is quite possible that for much of the time the relevant market might be limited to North Western Europe (essentially UK, Netherlands, Belgium, Germany and France). However, plans for further gas transmission capacity and improvements to institutional arrangements[49] could mean that, by the time that Grain 4 is commissioned, the market may be essentially Europe wide (essentially North Western Europe plus Spain, Italy and Austria).

The NordStream pipeline (also referred to as the Baltic Sea Pipeline), the first line of which was commissioned in November 2011 and the second line of which is under construction, from Russia to Germany, the ongoing amalgamation of balancing zones in Germany, the expansion of entry capacity into France at the German border, the planned expansion of the Belgium–France border capacity and the delivery of increasing volumes of LNG to the South, West and North West of Europe may relieve the current East-West transportation constraint in Europe. The transmission constraint to the South West of France is also likely to be partially or fully relieved through developments to the GRTgaz network and the ability of LNG suppliers to choose between delivery to the South of France, Iberia and North West Europe. To accommodate flexibility in LNG deliveries, GRTgaz is developing its network to allow physical flows in the direction from South to North.

In reality the relevant market may well vary over time. At times, the UK may be an independent market, i.e. when there is no slack interconnection capacity. At other times it will be part of a wider European market. This view appears to be shared by both Ofgem and the European Commission who state:[50]

> *Ofgem (the UK energy regulator) believes it is necessary to 'consider both markets jointly in the assessment of the implications of the proposed merger'. This suggests that these two entry/exit points constitute separate, albeit closely linked, markets. Ofgem mentions the fact that the two points are linked if there are transmission capacities on the Interconnector, but that the points decouple when the Interconnector is full in either direction.*

Given the uncertainty in the future degree of integration of the European gas systems we think that for the purposes of this report it would be prudent to consider the possibility of a UK wholesale market, a North West Europe wholesale market and a Europe-wide wholesale market.

Views differ within Europe as to whether there are, in any given area, upstream and downstream wholesale markets or just one wholesale market. In the UK, for example, no one would refer to an upstream wholesale market or a downstream

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49 For example, ACER's and ENTSOG's work on the network code for cross border pipeline capacity allocation.

50 DG Comp, Case No COMP/M.4180 – Gaz de France/Suez, 14/11/2006, p237.

wholesale market. In contrast, in Germany, for example, it would be quite normal to think of an upstream wholesale market in which producers participate as sellers and importers participate as buyers. In the so called downstream wholesale market, the importers are now the sellers and retailers, power companies, etc, are the buyers.

The UK experience suggests that it is easy for producers or indeed any party with access to bulk gas to participate in the wholesale market, selling to the type of buyers that in countries such as Germany would be categorised as buyers in the downstream wholesale market. This suggests that there is nothing in the nature of the downstream wholesale market which fundamentally distinguishes sale of bulk gas in the downstream market as a different type of economic activity to the sale of gas in the upstream wholesale market.

To the extent that the separation of the two markets continues, the reason for this separation must be either:

- an inability to access transportation capacity; or
- a continuance of behavioural patterns, originally induced by contracts with restrictive destination clauses and some promise of exclusivity, but which continue after the illegality of such contract terms has been well established.

In many cases there appears to be physical transportation capacity available, but there is contractual congestion in the sense that all available capacity has been booked. The EC's and ACER's work to improve the functioning of the internal energy market may make an appreciable contribution to the relief of constraints to access transportation. Other factors such as the expiry of existing capacity contracts and new investment will also make a contribution.

For those countries in relation to which two wholesale markets presently operate, we cannot say with any certainty how long the structure will prevail before the markets coalesce.

We conduct our analysis as though there were only a single wholesale market. This is because the UK is considered to have a single wholesale market and if the geographic extent of the market directly affected by the Grain 4 expansion extends beyond the UK to include North West Europe or Europe, the entire region must also have a single wholesale market.

5.8 Shipping on the gas transportation network

Moving down the supply chain, the next activity that might be affected by the proposed expansion is the provision of shipping services.

The Gas Act has the effect that only shippers may purchase transportation services from National Grid Gas and the distribution network companies.

Upstream suppliers and retailers can either purchase shipping services or, more often than not, choose to obtain shipper licences themselves and self supply. In one, rather trivial sense shipping is a market in that there is no access to the transportation system other than through a shipper. We therefore regard shipping as a potentially relevant market.

5.9 Flexibility and storage

There are several different sources of flexibility available to system users in the UK. These include:

- different types of storage facilities (e.g. offshore, salt cavity and LNG);
- LNG import terminals;
- beach swing;
- line pack;
- the Bacton-Zeebrugge interconnector;
- the BBL interconnector; and
- demand interruption.

The exact extent of substitutability between these sources of flexibility is a complex issue due to:

- differences in the rates at which the various sources of flexibility are able to accept and deliver gas; and
- differences in the duration over which the flexibility can be provided.

The UK Competition Commission (CC) considered the relevant market in this area at length in its 'Rough' enquiry in 2003.[51] It analysed the flexibility market in two dimensions: daily flexibility and seasonal flexibility. In its view, the product market for flexibility included all forms of flexibility, but excluded LNG importation facilities which were already planned at that time as, in its view, LNG importation would be used as baseload capacity.

In geographic terms the CC took the market to be Great Britain.

51 Competition Commission, *Centrica plc and Dynegy Storage Ltd and Dynegy Onshore Processing UK Ltd – A report on the merger situation*, August 2003.

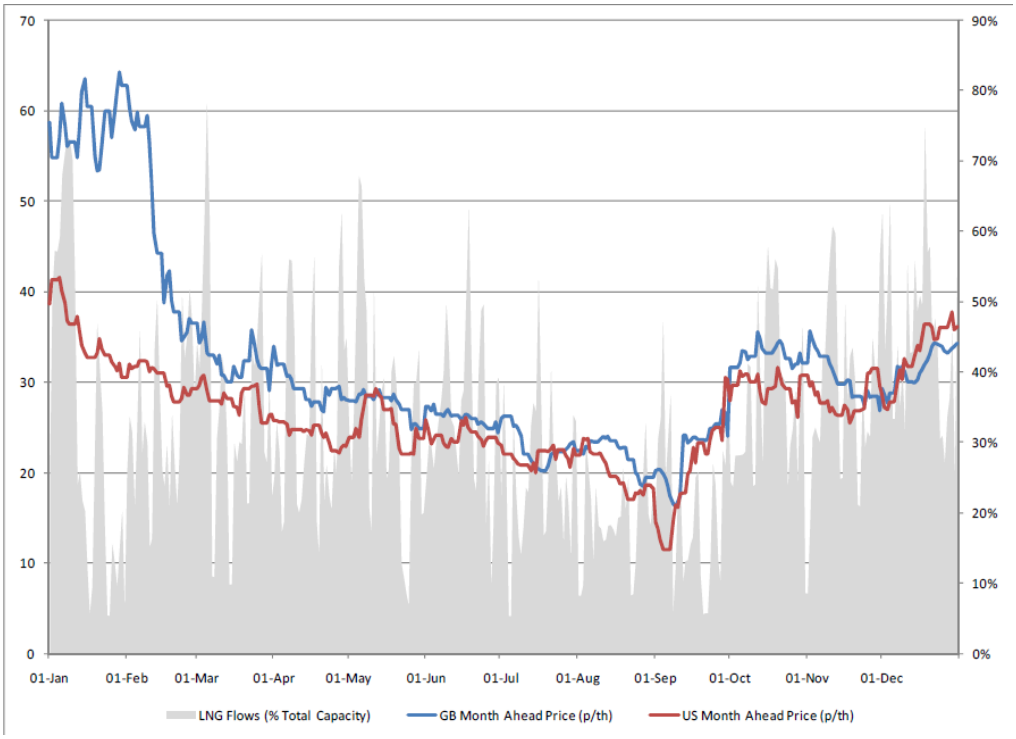
We consider that LNG import facilities are part of the flexibility market, for several reasons:

- LNG terminals in practice have not been used for baseload imports into the UK. Rather, LNG imports have varied with demand and supply conditions in the UK and elsewhere, as illustrated by **Figure 13**, which shows imports through the Isle of Grain terminal in 2009. Given that it takes some time for a shipping schedule to be changed, LNG terminals could in general help meet unexpected changes to gas supply needs only in the longer term, e.g. in the time scale of weeks, months and seasons. A shorter term response could be possible but only to the extent that LNG stocks are available at the terminal (see next bullet).

- In the short term, LNG terminals also provide additional flexibility since the regasification capacity of LNG import facilities may exceed that needed to meet baseload use. This is because LNG import facility operators need to have some additional regasification (vaporisation) capacity in reserve so that they can meet their contractual obligations even when some of their regasification capacity is out of action for planned or unplanned maintenance. In addition, users may want to shape their flows from the terminal. On days when the available regasification capacity exceeds the firm contracted regasification requirements of the facility users (and where sufficient NTS Entry capacity is available), the facility will be available as a direct source of daily flexibility. However, we note that such flexibility is only ever available on a short-term basis because the use of such flexibility will cause the facility to be emptied more quickly than planned. Any increase in flow will necessarily be accompanied by a reduction in flow prior to the next planned injection of LNG from a tanker.

  Even if LNG import facilities do operate in baseload mode, they will from time to time deliver gas that is a direct substitute for gas delivered from more narrowly defined flexibility products, i.e. baseload gas will in part be delivered in peak periods.

Figure 13. Grain import flows, 2009



Source: Ofgem, *2010 Great Britain and Northern Ireland National Reports to the European Commission*

More generally, we note that all sources of gas can contribute to delivery of gas in different timeframes although the extent to which they may do so depends on their characteristics. A source of flexibility has two key constraints on delivery:

- a maximum delivery rate; and
- a maximum volume of delivery before the source must be re-stocked.

As we move from a short duration to a longer duration, the volume constraint on the ability for sources to deliver flexibility will become more binding, for example, line pack cannot deliver flexibility for more than a few hours and therefore even for a segment with duration of one day it cannot be used to help meet flexibility requirements. Therefore, the flexibility market will look more and more like the wholesale gas commodity market as the duration is extended. To provide meaningful analysis, we propose to focus the analysis of flexibility on a short duration segment (a day) when the analysis of the market for flexibility is most likely to produce results distinct from the analysis of the wholesale market as well as a longer duration period (a season).

In terms of the geographic scope of the product market, flexibility is typically not supplied from distant sources due to its relatively high transportation costs and as such, only flexibility sources/storage within the country or in neighbouring countries are considered as possible supply substitutes. Therefore, we consider the flexibility market to be no more than national in scope although we note that

to the extent allowed by cross-border capacity, flexibility from neighbouring countries can be supplied to the UK.

Therefore, we analyse the effect that Grain 4 may have on the two flexibility markets that the Competition Commission identified, i.e.:

- the market for peak day delivery of gas (the daily flexibility market); and
- the market for peak season delivery of gas (the seasonal flexibility market).

5.10 Retailing

The final activity in the supply chain is retailing. In assessing the retail market we aggregate the activity across individual customers into different segments where the competitive conditions are similar among the customers in a segment and where allowed by the available data. For example, large industrial customers, small industrial / commercial customers and households have different characteristics such as the drivers of switching behaviour.

The European Commission uses the following segments in reporting information about the retail activity:[52]

- electricity producers;
- industrial customers; and
- residential customers.

This is also essentially the approach adopted by the Competition Commission in its 2003 Rough enquiry.[53]

In our view, however, rather than further disaggregating the relevant product markets, it is at least possible that there are only two real markets for the supply of gas to final users: one supplying large customers where buyers are sophisticated and price is paramount; and one supplying smaller customers where brand and customer facing functions such as call centres are important. However, there is no very clear cut-off point dividing these two.

Since our analysis is constrained by available data, we adopt three market definitions in line with available data:

- daily metered industrial and commercial;

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52 DG Comp, Case No COMP/M.4180 – Gaz de France/Suez, 14/11/2006, p242.

53 Competition Commission, *Centrica plc and Dynegy Storage Ltd and Dynegy Onshore Processing UK Ltd – A report on the merger situation*, August 2003. In this case, the CC considered retail supply to power stations, industrial and commercial (I&C) customers, and households.

- non-daily metered industrial and commercial; and
- residential.

The geographic scope of these three markets is typically defined as national at least as far as GB is concerned.[54] We see no reason to depart from this approach for the purpose of this report.

5.11 Summary of potentially affected markets

In the above analysis we tried to identify relevant markets by systematically working down the value chain. We summarise below the potentially relevant markets that we have identified but now characterised by the nature of the potential impact.

The potential relevant markets are:

- Direct impact:
  - wholesale supply of gas to the UK / North West Europe / Europe; and
  - flexibility/storage in the UK (and possibly Europe).
- Possible indirect impact:
  - global LNG liquefaction;
  - global LNG shipping; and
  - shipping (as in providing commercial access to UK gas transport and balancing services).
- Other markets:
  - supply of gas to daily metered I&C customers in the UK;
  - supply of gas to non-daily metered I&C customers in the UK; and
  - supply of gas to residential customers in the UK.

54 See COMP/M.3007 – E.ON/TXU Europe Group, December 2002 and COMP/M.3096 – TotalFinaElf/Mobil Gas, February 2003.

6 Analysing competition conditions

This section addresses issues pertaining generically to the assessment of the competitive impact of the Grain 4 expansion. The issues addressed are:

- potential indicators of competitive conditions; and
- issues in applying indicators in the present case.

6.1 Analysing competition conditions – generic indicators

We first describe the generic indicators used to analyse competition conditions in markets and then review the specific use of indicators for the present purpose.

A variety of indicators can be used to analyse competition conditions in a given market. These include:

- the market share of the largest player;
- concentration ratios, i.e. the combined market share for the *n* largest players;
- the percentage of the time that the largest player faces positive residual demand; and
- the Herfindahl-Hirschman Index (HHI).

6.1.1 The market share of the largest player

The market share of the largest player is the simplest test to apply but arguably also the crudest. Experience with the application of European competition law is such that there is now a consensus that when a single firm's market share is less than 40% there is a strong presumption that it is not dominant.[55]

6.1.2 Concentration ratios

Concentration ratios may be more relevant when there is a concern about joint dominance rather than single firm dominance. Experience with the application of European competition law suggests that the combined market share for two firm dominance would probably need to exceed 65% and for three firm dominance 75%. However, the degree of symmetry among the key market shares is also a relevant consideration. Very asymmetric market shares are less

[55] See *Guidance on the Commission's Enforcement Priorities in Applying Article 82 EC Treaty to Abusive Exclusionary Conduct by Dominant Undertakings*, Dec 2008, p7.

likely to cause concern than relatively symmetric shares since asymmetry reduces the likelihood of tacit collusion as firms' incentives are likely to be less aligned.[56]

6.1.3 Pivot or residual demand analysis

Recently, residual demand analysis has often been used in the analysis of competition cases in energy markets. This technique involves analysing the extent to which a player faces residual demand during peak demand periods even if all other players supplied the market with maximum capacity. An alternative measure is to analyse the proportion of time for which a given player faces residual demand even if all other players supplied the market with maximum capacity. This type of analysis can in principle be extended to analyse the incentives on a party to withdraw supply in order to increase price.

6.1.4 The Herfindahl-Hirschman Index

The HHI is arguably the most widely used single indicator of competitive conditions in a market where there are adequate data to allow its estimation. Typically, markets with an HHI of less than 1000-1200 are considered competitive and markets with an HHI in excess of 1800-2000 are considered concentrated.[57]

6.2 Application in the present case

There are various factors that affect the way that these generic indicators can be applied in the present case. These include:

- the need for a projection forward to at least 2016/17; and
- the meaning of market shares when wholesale supply is dominated by contracts, many of which are likely to be long term but subject to some kind of periodic price review.

6.2.1 Focus on 2016/17 and beyond

Pivot analysis is particularly suited to examining competition conditions in a way that takes account of the balance of supply and demand in the market. When there is excess capacity pivot analysis will, other things being equal, show a reduced number of hours in which a particular player is pivotal. However, in the

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56 See *OFT & CC, Merger Assessment Guidelines – Consultation Document*, April 2009, p39-40.

57 The OFT and CC may have regard to the following guidelines in assessing the competitive effects of a merger: any market with a post-merger HHI exceeding 1,000 may be regarded by the Authorities as concentrated and any market with a post-merger HHI exceeding 2,000 as highly concentrated. In a concentrated market, a horizontal merger generating a delta exceeding 250 may give cause for concern over anti-competitive effects, as may a horizontal merger in a highly concentrated market generating a delta exceeding 150. See OFT & CC, *Merger Assessment Guidelines*, 2010. These thresholds are in line with European Commission guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings—Commission notice (2004/C31/03).

present case the addition of the project can never show deterioration in the number of hours in which a player is pivotal.

In short, the static effect on competition will always be beneficial. There can only be a detriment to competition if the project leads to the closure of some existing capacity serving the market or the foreclosure of other capacity that would have been built. Hence any detriment must be a dynamic, not static effect. Furthermore, as it is necessary to predict conditions well into the future, it is generally less appropriate to try to predict whether there will be any excess or lack of capacity. In effect, the possible advantage of pivot analysis is lost in this application.

6.2.2 The meaning of market shares

The other three indicators all depend on market shares. The underlying reason for interest in market shares is that they can be indicative of the extent to which parties have:

- the ability to exercise market power; and
- the incentive to exercise market power.

However, market shares (and HHIs derived from market shares) do not address these two key issues directly. They only provide an *a priori* indication. The ability to exercise market power depends on the ability of a party to reduce supply. A party with a 49% share and zero control over all firms in a market might benefit greatly from the exercise of market power but have no control by which it can reduce supply.

The characteristics of the gas sector, in particular those of the wholesale market make it difficult to identify who has the beneficial interest, who might benefit from the exercise of market power and who has the control to exercise it. The supply at a wholesale level in the UK and elsewhere in Europe comprises a variety of contracts on terms which are not in the public domain. The consequent issues are most easily illustrated by looking at hypothetical extremes.

If, hypothetically, all contracts with upstream suppliers were of very short duration, one would conclude that upstream suppliers both controlled the volume supplied to the market and benefited from any rise in price that a restriction of supply led to. At the other hypothetical extreme, if all gas was sold on very long term contracts with the price set independently of observed gas prices in the relevant market and the volume of supply controlled by the buyers, one would conclude that the buyers in such long term contracts would both control the volume of gas released to the market and be the beneficiaries of any price rise caused by a restriction of supply.

The reality does not match either of these extremes. Contracts are typically not very short in duration, neither are they infinitely long. Contracts typically have

prices linked to a basket of indicators including various oil/oil product prices and a periodic review which may lead to a more fundamental renegotiation of price. It is likely that prevailing gas prices in a country might be expected to be at least a partial influence on the periodic price review. In reality it is likely that upstream and downstream parties would share the benefit of any price rise through supply restriction.

The incidence of any ability to restrict supply to the market is also uncertain. With the existing set of contracts, it is typically the buyer who can exercise the right to vary the volume delivered within defined parameters. However, in the market for contract renewal, it is the upstream suppliers (not the down stream buyers) that would have the ability to restrict supply if competition from other upstream suppliers were inadequate.

In short, to the extent that the ability to restrict supply exists, it is likely that both the ability and benefit will be spread over both the suppliers and buyers with long term contracts. It is impossible to be precise about the distribution but as a base case, we analyse various possible wholesale markets attributing market shares 50% to suppliers and 50% to buyers of long term contracts, where known.

Another implication of the characteristics of the wholesale gas market is that, in the longer term, competition relates to contracts often involving lead times that allow investment. In these circumstances, the competitiveness of a market is determined more by the number of parties that are able to compete for a contract than by existing market shares (or the HHI that existing market shares may imply).

6.2.3 The availability of market share data

Traditionally, competition analysis has focussed on actual shares that individual firms supply to a market. The benefit of this measure is that it reflects capacity that is economic and will avoid inclusion of capacity that cannot realistically compete. However, market share data would not give the best indication of competitive conditions if unused capacity does provide a competitive constraint. Moreover, it is frequently the case that good data on actual market shares are not available and therefore the best proxy must be used instead.

In the analysis of wholesale energy markets, it is common practice to assume that capacity shares are a good proxy for market shares and may in fact be a better indication of competitive conditions. The key justification for this is that energy infrastructure tends to be very capital intensive and operate with a relatively low marginal cost. So long as price remains higher than the low marginal cost, all capacity is capable of providing a competitive constraint.

We therefore use a mixture of capacity and market share data in assessing the effect of the Grain phase 4 expansion.

7 Competitive assessment

In section 5, we identified as far as is practicable the relevant markets in which the Grain phase 4 expansion may have a direct or indirect impact. In this section we analyse for each potentially relevant market, the worst competitive impact that the allocation of rights to Grain 4 could cause.

We do this by hypothesising in relation to each market that the player currently with the highest market share will acquire all of the rights to Grain phase 4. As previously noted, these players are not the same for each market and hence these separate analyses will tend to exaggerate any possible level of aggregate detriment, taking into account all relevant markets.

7.1 Directly affected markets

The markets directly affected by the Grain phase 4 expansion are those for wholesale gas and flexibility.

In the case of wholesale gas, we do not exclude the possibility that the relevant market will extend beyond the borders of the UK to encompass North West Europe or even Europe, particularly by the time Grain phase 4 is commissioned. For this reason, we assess the impact of Grain phase 4 on competition in the three geographic markets recognising that no more than one of them can be the correct geographic definition of the market at any one time. In all three cases we find that Grain phase 4 is not detrimental to competition.

In the case of flexibility, we undertake the competition assessment for the UK market (taking account of cross-border capacity) for the daily and seasonal segments.

The following developments potentially have implications for the development of competition in the UK and EU wholesale markets in the longer term:

- Emerging import gap:
  - The development of UK and EU gas demand is associated with a high degree of uncertainty. On the one hand, efforts to improve energy efficiency by the EU and national governments might lead to a decline in household gas consumption for space heating. The continued promotion of renewable electricity generation is going to reduce the share of thermal power generation and potentially also gas demand by electricity generators. On the other hand, coal-fired and nuclear power generation, especially on the continent, are also on the decline, which can potentially result in a higher market share for gas in power generation. In the household sector, there is still the potential to connect new households to gas-fired space heating technologies,

especially in Central and Eastern Europe. National Grid's Ten Year Statement and the Ten Year Network Development Plan (TYNDP) of the European gas network operators' association (ENTSOG) expect a small decline in Western European gas consumption and an increase in Central and Eastern Europe gas consumption.

- On the supply side, uncertainty appears to be lower. Indigenous production from conventional sources in both the UK and EU is expected to decline significantly. This might lead to changes in market shares in EU production as some producers might have access to less exploited fields than others. Overall, we do not expect that production from unconventional sources can compensate the decline trend.
- Consequently, even if gas demand does not increase, the import gap will. This potentially increases the market shares of non EU gas suppliers.

- Infrastructure projects – the pipeline projects on the continent aiming to diversify primary gas suppliers are not progressing swiftly. The dominance of existing non-European suppliers might therefore rise as more imports are required. In particular, Gazprom has developed significant capacity to delivery gas to Europe (Nord Stream) and might add further capacity (South Stream).

- Changes in price formation and the distribution of upstream and downstream market power – the traditional linkage of prices to, for instance, the price of oil on the continent reduced incentives for upstream suppliers to adjust output to manipulate price – if one presumes that upstream suppliers had the ability to do so. The trend towards hub price indexation even in continental European long-term contracts implies that suppliers could profit from higher prices. At present, we do not consider this a concern for competition. Theoretically, it might imply market power tending to move from the midstream to the upstream level.

These potential developments might lead to changes in the market shares of individual suppliers or the level of concentration in the market in general, and are therefore taken into account in our competition assessment.

For the directly affected markets, we therefore investigate the effect of the Grain 4 expansion on a business as usual scenario of developments to the UK and European gas markets at the time of the commissioning of Grain 4. We also assess the effect for:

- potentially adverse scenarios from a competition perspective in which the player with the highest market share increases its market share for reasons that are independent of whether or not Grain 4 is in place; and

- the longer-term perspective, i.e. the impact of Grain 4 in the year 2021/22.[58]

7.1.1 UK wholesale gas market

The proposed Grain phase 4 expansion project adds capacity through which gas can be delivered to the UK system. From a static perspective, the addition of such capacity must be good for consumers. The addition of capacity, even if controlled by a large player in the wholesale market such as Centrica, for example, would not be expected to create a strategic opportunity for Centrica immediately to withdraw more capacity than it has just added. If such a withdrawal were profitable, then, if it were to seek to maximise profit, Centrica should already be withdrawing capacity in the absence of any rights to the new facility.

Any possible competition concern must relate to dynamic effects. Specifically, the relevant question is: "would the addition of capacity foreclose other developments and allow the holders of rights to Grain 4 to exercise dominance in supply (from domestic production plus imports) to the wholesale market?"

A potential starting point to address this question is the analysis of market concentration with and without the proposed investment.

As described previously, the wholesale market comprises sellers of gas and buyers of gas and the incentive and ability to raise price in the wholesale market by either a seller or a buyer depends upon the contractual relationships between them. For this reason we consider market concentration for the physical supply of gas partially adjusted for sales of gas through long term contracts. We do not know the precise terms of long term contracts such as the remaining duration of the contracts or price reset terms. Therefore, rather than assume the incentive and ability to raise price is transferred from sellers to buyers to the full extent of contracted quantities for which we have knowledge, we assume the incentive and ability to raise price is transferred to half of the extent of contracted quantities known by us.

Table 5 and **Table 6** list the market shares, partially adjusted for long term contracts, of the three largest suppliers to the UK wholesale market and other large suppliers that might potentially be critical in one or other of the markets we assess were they to obtain all of the Grain 4 capacity. We show the market

[58] We chose the year 2021/22 for the longer term analysis since the most recent National Grid Ten Year Statement (December 2011) can be expected to provide a credible projection of market developments until the end of 2021 (ten years), on which we base our projections. For projections further into the future, the uncertainty of market developments would increase and any analysis would become increasingly speculative.

shares for 2016/17, the earliest year in which Grain phase 4 would be available.[59] The difference between the two tables relates to the assumption as to whether or not there are exports through interconnectors with continental Europe that should be added to UK demand.[60] We set out the detailed assumptions made to predict market shares in 2016/17 in Annexe 1.

These tables suggest that with or without substantial exports from the UK, it is likely that Petoro (the Norwegian State gas and oil company) would be the largest supplier. We therefore choose, as the worst scenario (i.e. the scenario which allocates all of the new capacity at Grain to the existing largest player) to analyse in relation to this market, Petoro acquiring all rights to Grain phase 4.

Table 5. UK without exports wholesale market shares and HHIs in 2016/17 for the largest players – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	16.0	17%	25%
Statoil	14.3	15%	15%
ExxonMobil	9.4	10%	9%
Others	55.1	58%	51%
including Centrica	7.8	8%	8%
GdF Suez	1.5	2%	1%
Sum or HHI	**Sum: 94.9**	**HHI: 896**	**HHI: 1184**
Delta HHI			**288**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

59 We provide details for the 20 largest players in each market and of the markets shares of physical supply not adjusted for contracts in Annexe 1.

60 UK demand includes exports to Ireland.

Table 6. UK + exports wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	15.6	11%	19%
Statoil	14.3	11%	11%
Qatar Petroleum	13.3	11%	10%
Others	81.8	65%	60%
including Centrica	9.6	8%	7%
GdF Suez	3.3	3%	2%
Sum or HHI	**Sum: 126.0**	**HHI: 757**	**HHI: 879**
Delta HHI			**122**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Market shares and measures of concentration such as HHIs are considered a possible guide to the extent to which firms may be able to exercise market power. An HHI of under 1000 generally indicates a market with low concentration and an HHI of over 2000 generally indicates a market with high concentration.[61]

In this analysis, we are considering the change in HHI as a result of a capacity addition rather than a merger. With the Grain phase 4 project, HHIs will tend to indicate that the market is more problematic than it really is. The improvement in the competitiveness of the market from the counterfactual, i.e. without the project, is better than will be indicated by the change in HHI because of the increase in the capacity overhang in the market adding to the competitive pressure.

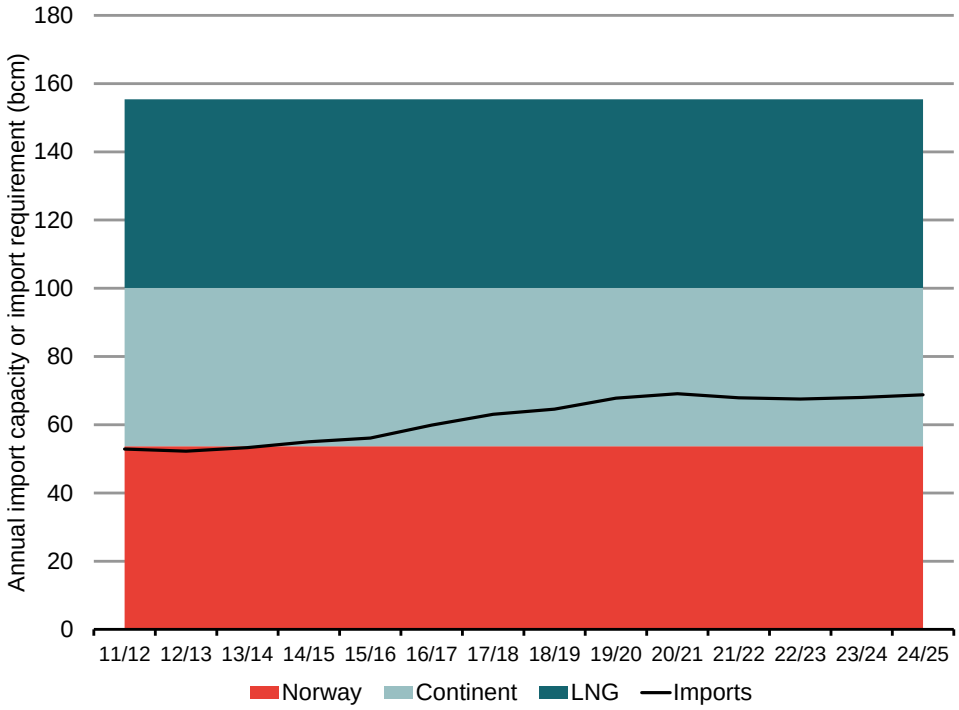
The HHI of the market prior to Grain phase 4 is in the region of 757 - 896, depending on the extent of exports assumed. Assuming that all the rights to Grain 4 are taken by the largest supplier inevitably causes deterioration in the HHI. However, a change of 122 or 288 in the HHI is relatively modest and leaves the market's HHI relatively close to 1000, very much towards the lower end of the range over which market concentration is considered to start to become a concern. A horizontal merger that resulted in an HHI of between 1000 and 2000 and an increase of HHI of less than 250, as is the case for the UK markets plus exports, would be unlikely to cause competition concerns. Although the test for competition detriment in relation to exemptions may not be identical, the large capacity overhang suggests that there should be no competition concern.

61 European Commission, *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings* (2004/C 31/03).

Although the change in HHI for UK demand is above that which could cause competition concerns in the case of a merger, for the qualitative reasons described below we do not consider that the expansion would be problematic even if Petoro were to obtain exclusive use of the expanded capacity at Grain. Furthermore, even in that case, the HHI is well below the threshold of 2000 above which a market is considered to be highly concentrated.

Figure 14 compares existing import capacity to annual import requirements (which is derived from annual demand requirements less UKCS production).

Figure 14. UK import capacity and annual import requirement



Source: National Grid, *Gas Transportation Ten Year Statement 2010*

The surplus import capacity falls slowly over time, from 103 bcm in 2011/12 to 83 bcm in 2030/31.[62] If we were to include the 55 bcm per year of proposed LNG import capacity (including Grain 4), the import margin would be between 130 bcm and 150 bcm per year or 130% to 150% of today's annual GB gas

62 We note that some surplus annual capacity is required in order to accommodate flexibility requirements. We do not attempt to estimate the annual margin required to accommodate flexibility. Nevertheless the comparison of annual import requirements with annual import capacity over time is informative in that it shows the import capacity as rising significantly faster than the import requirement.

demand. The reason why import requirements remain relatively constant even as UKCS production declines is because UK gas demand is expected to decline, from 97 bcm per year today to 80 bcm per year in 2030/31.[63]

This means that there would need to be a very large withdrawal of capacity before import capacity became constrained – far larger than the estimated market share of Petoro (approximately 24 bcm with Grain phase 4 or 16 bcm without) and even larger still than the capacity of Grain phase 4 (8 bcm). In other words, the supply demand balance is likely to be such that there is no plausible unilateral withdrawal strategy that Petoro (or any other player) could follow to raise prices substantially.

Comments by Ofgem also indicate that it is likely to consider the UK wholesale market to be competitive.[64] Ofgem recognises that the GB market receives gas from a variety of sources. While it does not attempt to estimate supplier market shares, it suggests that there are a large number of suppliers active in the market, for example:

- UKCS production shares of five companies exceed 5%;
- 16 shippers hold primary capacity on IUK;
- seven main shippers hold capacity on Langeled;
- two to three shippers typically use BBL;
- six shippers use Grain;
- South Hook is part of an integrated LNG supply chain and is owned by a joint venture of Qatar Petroleum and ExxonMobil; and
- Dragon LNG is owned by BG Group and Petronas.[65]

Analysis of worst case scenario on UKCS production

The previous calculations assumed that the decline in UKCS production affects each producer equally and the market shares in production stay constant. The competition situation would be different if market shares changed. As a worst case from a competition perspective, we assume that the largest overall supplier, Petoro, were able to maintain the absolute level of its UKCS output while the expected output declines only affect all other producers. The HHI in such a

63 We use National Grid's "slow progress" demand scenario here. The gas demand reduction is greater in National Grid's "gone green" scenario.

64 Ofgem, *2010 Great Britain and Northern Ireland National Reports to the European Commission - In Relation to Directives 2003/54/EC (Electricity) and 2003/55/EC (Gas)*, p. 49-50.

65 Since Ofgem's report was published the shareholding of Dragon LNG has changed to be 50% each for BG Goup and Petronas. 4Gas is no longer a shareholder. See www.dragonlng.com.

scenario without Grain 4 for the UK market (without exports) would be 950. If Grain 4 capacity were held exclusively by Petoro, the HHI would increase to 1279. Although the change in HHI in this case is above that which could potentially raise competition concerns in the case of a merger, for the qualitative reasons described above we do not consider that the expansion would be problematic even if Petoro were to obtain exclusive use of the expanded capacity. The competitive effect as indicated by HHIs when the UK market with exports is considered is smaller: the HHI is 785 without Grain and 930 if Petoro obtained exclusive use of the expanded capacity.

Table 7. UK without exports wholesale market shares and HHIs in 2016/17 if Petoro increases its share of UKCS production – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	19%	28%
Statoil	14.0	15%	15%
ExxonMobil	9.2	10%	9%
Others	53.4	56%	49%
including Centrica	7.7	8%	7%
GdF Suez	1.5	2%	1%
Sum or HHI	**Sum: 94.9**	**HHI: 950**	**HHI: 1279**
Delta HHI			**329**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 8. UK + exports wholesale market shares and HHIs in 2016/17 if Petoro increases its share of UKCS production – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	15%	21%
Statoil	14.0	11%	11%
Qatar Petroleum	13.2	11%	9%
Others	80.3	64%	59%
including Centrica	9.5	8%	7%
GdF Suez	3.3	3%	2%
Sum or HHI	**Sum: 126.0**	**HHI: 785**	**HHI: 930**
Delta HHI			**145**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Outlook to 2021/22

Developments beyond the commissioning date of Grain 4 do not negatively affect market concentration in UK gas supply:

- the decline in UKCS production implies that the market share of currently large suppliers, such as ExxonMobil, decreases; and
- new import requirements are likely to be met by a number of players as stakes in existing and proposed import projects are diverse.

Therefore, while some players will increase their market share, this largely compensates for declining shares of others and does not imply a significant increase in market concentration.

Table 9. UK without exports wholesale market shares and HHIs in 2021/22 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	14.8	16%	25%
Statoil	13.1	14%	14%
ExxonMobil	9.0	10%	9%
Others	53.9	59%	52%
including Centrica	7.5	8%	8%
GdF Suez	1.9	2%	2%
Sum or HHI	**Sum: 90.8**	**HHI: 863**	**HHI: 1141**
Delta HHI			**278**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 10. UK + exports wholesale market shares and HHIs in 2021/22 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	14.8	12%	18%
Qatar Petroleum	14.5	12%	11%
Statoil	13.6	11%	11%
Others	80.8	65%	60%
including Centrica	9.1	7%	7%
GdF Suez	3.5	3%	3%
Sum or HHI	**Sum: 123.7**	**HHI: 740**	**HHI: 879**
Delta HHI			**139**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

This is reflected in our analysis for the year 2021/22. We find the HHI to be 863 for UK supplies and 740 for the UK market plus exports. Assuming that Petoro exclusively controls Grain 4 results in HHIs of 1141 for the UK market only and 879 for the UK market including exports. The HHI for the UK market (without export demand to the continent) is slightly lower than for the 2016/17 gas year with and without Grain 4 and the change in HHI as a result of the Grain 4 expansion is also lower.

We also investigated the impact of the aforementioned worst case scenario in 2021/22, i.e. whereby Petoro maintains its absolute level of UKCS output while all other producers lose output and market share (with the aggregate of all producers being in line with National Grid's projected UKCS production decline from the 2011 Ten Year Statement). Again, the results are not materially different from those of 2016/17. The highest HHIs are obtained for UK supplies without exports, where the HHI increases from 955 without Grain 4 to 1303 with Petoro gaining exclusive rights to Grain 4. Although this scenario is unlikely as it would imply that no producer other than Petoro invests in UKCS production to maintain its output, it also would not cause concerns for competition for the qualitative reasons that we mentioned above, i.e. there continues to be an overcapacity for gas supplies to the UK (**Figure 14**) which is more than three times as large as Petoro's total supplies in 2021/22 of 26 bcm (if the company increases its UKCS production share and exclusively controls Grain 4). Hence, the supply demand balance is likely to be such that there is no plausible unilateral withdrawal strategy that Petoro (or any other player) could follow to raise prices substantially in the UK market.

7.1.2 North West European or European wholesale market

As noted in Section 5, we think it is quite possible that the relevant wholesale market will be, at the time when the Grain phase 4 expansion will be commissioned, wider than the UK, i.e. either a North West European or Europe wide wholesale market.

If the relevant market is North West Europe (UK, Belgium, the Netherlands, France and Germany), we estimate the wholesale market shares in 2016/17 to be as shown in **Table 11**, with adjustment for half of known long-term contract volumes.

Table 11. NW European wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		GdF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	36	11%	14%
Petoro	31	10%	10%
ExxonMobil	31	10%	9%
Others	221	69%	67%
including Gazprom	28	9%	9%
Statoil	18	6%	5%
Centrica	10	3%	3%
Sum or HHI	**Total: 320**	**HHI: 654**	**HHI: 689**
Delta HHI			**35**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

In calculating the market shares shown in **Table 11**, we start with the most recently available historic data (i.e. 2010) on physical supplies of each firm to the market, as provided by Wood MacKenzie. We reflect changes in physical supplies by assuming:

- a decline in EU production in line with the ENTSOG TYNDP;
- constant market shares of Norwegian suppliers; and
- increasing import demand to be met by the other non-EU suppliers (including LNG), with the increases proportional to 2010 market shares.

We then adjust the physical supplies according to information about long term contracts for the year 2016/17. This is estimated from information provided by Wood Mackenzie about contract sales and contract purchases of each firm in 2010, adjusted according to the change in overall contract quantities in the market to 2016/17.

Where a firm buys gas through a long term contract, we add that volume to its physical supply and where a player sells gas through a long term contract, we subtract that volume from its physical supply. This gives us physical supplies fully adjusted for long term contracts.

As with the UK wholesale gas market, we do not know the precise terms of long term contracts such as the remaining duration of the contracts or price reset terms. Therefore, we assume that the incentive and ability to raise price is transferred from seller to buyer to half of the extent of our knowledge of contracted quantities. That is, we calculate the physical supply partially adjusted for long term contracts for a firm by taking the simple average of the physical supply for the firm and the physical supply fully adjusted for long term contracts.

If there is a North West European gas market, its structure appears to be relatively atomistic with an HHI of 654 in 2016/17. GdF Suez, with 11% of the market, is the largest player. If GdF Suez were to acquire the full rights to use the Grain phase 4 expansion (and were it to fully utilize the terminal), its market share would increase to 14% and the HHI would increase to 689 – an increase of 35. The resultant HHI is well below 1000 and therefore the market would be presumed to be competitive with the Grain 4 expansion.

Alternatively, if the relevant wholesale market were essentially Europe wide (essentially North Western Europe plus Spain, Italy and Austria), we estimate the wholesale market shares to be as shown in **Table 12**, based on the same methodology, with adjustment for half of known long-term contract volumes.

Table 12. European wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	46	10%	12%
GDF Suez	38	8%	8%
ExxonMobil	33	7%	7%
Others	340	75%	73%
including Petoro	32	7%	7%
Statoil	19	4%	4%
Centrica	10	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 517**	**HHI: 540**
Delta HHI			**23**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

The largest supplier of gas to the European market is Gazprom with a 10% market share prior to the development of Grain 4. The HHI of this market is estimated at 517.

As Gazprom is the largest supplier, the worst case outcome from the perspective of the competition scenario would be that Gazprom acquires all rights to Grain 4. If this were the case, Gazprom's market share would increase to 12% and the HHI for the market would increase by 23 to 540.

The resultant HHI is well below 1000 and therefore the market would be presumed to be competitive with the Grain 4 expansion. In addition, the change in HHI is small which means that even if the market were presumed not to be competitive, the Grain phase 4 expansion would not be detrimental to competition if it were acquired by the largest player in the market.

Various features of the North West European and European wholesale gas markets lead us to believe that the market and changes to that market as a result

of Grain 4 are more competitive than indicated by HHIs alone. Even if the market pre-Grain 4 were more competitive than implied by HHIs, this would not alter the fact that the addition of Grain 4 with rTPA exemption would improve competition. The factors that lead us to believe that the market and changes to the market are more competitive than indicated by HHIs alone are as follows:

- **Investment in Grain 4 will not foreclose any existing supply sources.** We should not lose sight of the fact that Grain 4 represents a net addition to capacity to supply the wholesale market. This is not a merger situation in which any deterioration in HHI has no offsetting benefit through the introduction of extra capacity to the market. Natural gas production and wholesale market supply are generally very capital intensive and with low short run marginal costs (except the opportunity cost of not having the gas for a future date). Production rates from existing fields may be eased or concentrated on periods of higher gas prices but little is likely to physically reduce their capacity to supply[66]. We therefore do not see that Grain 4 is at all likely to cause premature closure of existing supply assets. If all the other assets remain in essentially their existing ownership and are capable of delivering the same profile of gas to the market, the addition of Grain 4 capacity, even in the hands of GdF Suez or Gazprom, will have a beneficial effect on competition that is understated by HHI analysis alone.

- **The nature of competition in the industry.** Most downstream players in the gas industry tend to contract for supplies over periods measured in years rather than just buying in very short term markets. This means that a substantial part of the competition from producers to supply gas occurs on timescales which allow for the development of new sources of supply. The relevant competitive conditions in the market are not defined by current market shares but the capability of all firms regardless of their existing market share to invest in new sources of supply. The diversity of firms available to develop new sources is quite adequate. Although the geographic diversity of new gas sources could be an issue (see next point) it is not readily addressed through competition policy.

Finally, Grain 4 would appear to meet the European Commission's requirement for being pro-competitive. The European Commission recognises that meeting the needs of end consumers will most likely require substantial investment in new infrastructure such as transit pipelines, interconnectors and LNG terminals.[67] The EC also considers that new infrastructure can have pro-competitive effects

66 We note that declining field pressure might be a factor.

67 European Commission, Energy sector inquiry – draft preliminary report, 2006, p72.

when allowing for new competitors in national markets or new sources of gas to reach the EU.[68]

Analysis of supply and demand worst case scenarios

While the European and NW European markets exhibit HHIs well below 1000 in all scenarios, we test if this could change if the gas market does not develop as we expect, and if a less competitive situation could raise more concerns if the capacity of Grain 4 is exclusively controlled by the largest player. We explore three scenarios that could potentially lead to less competition than assumed in the base case scenario:

- a more rapid decline in EU production implying higher market shares of non-EU suppliers;
- a higher demand growth leading to higher import demand and higher market shares of non EU-suppliers; and
- a reliance on one supplier to meet the emerging import gap.

Faster than expected decline in EU production

In the base case investigated above, EU production was based on the latest TYNDP by ENTSOG (2011) which presumes a decline of 31 % in indigenous gas production between 2010 and 2019. As a worst case EU production scenario, we assume this decline rate doubles and that the supply-demand gap would be made up by non-EU suppliers including LNG supplies but excluding Norway (where we do not expect production to increase significantly).

68 Ibid p73.

Table 13. NW European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – partial contract adjustment

Company	Counterfactual		GdF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	40	12%	15%
Gazprom	33	10%	10%
Petoro	31	10%	10%
Others	216	68%	65%
including Statoil	18	6%	10%
Centrica	9	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 682**	**HHI: 722**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 14. European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	53	12%	13%
GDF Suez	40	9%	9%
Petoro	32	7%	7%
Others	331	73%	71%
including Statoil	19	4%	4%
Centrica	9	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 543**	**HHI: 571**
Delta HHI			**28**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

In such a scenario, we expect GdF Suez to become the dominant player in the NW European market and Gazprom in the European market, each with a market share of 12 % in the respective market (**Table 13** and **Table 14**). The respective HHIs are 682 and 543, pre-Grain 4. Assigning exclusive rights to Grain 4 to Gazprom implies:

- an increase in the HHI of 40 to 722 for the NW European market; and
- an increase in the HHI of 28 to 571 for the European market.

Hence, the resultant HHIs are well below 1000 and therefore the market would be presumed to be competitive with the Grain 4 expansion.

Increase in demand

As a worst case demand scenario, we assume that demand is 10 per cent higher in each country. This results in a 32 bcm / year higher demand in NW Europe and a 46 bcm / year higher demand in Europe in 2016/2017 compared to the base case scenario. Such a scenario could, for instance, be the consequence of an increase in gas-fired power generation (because of delays in the construction of nuclear power plants where they are being developed or a withdrawal of nuclear power generation from the market in some countries, e.g. Germany) or delays in the EU's efforts to improve energy efficiency, which would lead to a decline in, especially, households gas demand.

The impact on concentration in the NW Europe and Europe market is comparable to but smaller than the scenario with a decline in EU indigenous production:

- In the NW European market, the HHI increases from 668 by 32 to 700 (assuming GdF Suez, the largest player in the market without Grain 4, takes exclusive control and fully utilizes Grain 4).
- In the European market, the HHI increases from 538 by 25 to 563 (assuming Gazprom, the largest player in the market without Grain 4, takes exclusive control and fully utilizes Grain 4).

The resultant HHIs are well below 1000 and therefore the market would be presumed to be competitive with the Grain 4 expansion.

Gazprom scenario'

As a further scenario with worse competitive conditions than the base case, we assume that the emerging import gap can only be met by Gazprom and no other player can increase its market share. In this case we also find that the Grain 4 expansion would not be detrimental to competition.

In NW Europe in the baseline scenario (**Table 11**), Gazprom was only one among a number of large players, such as GdF Suez, ExxonMobil, and Petoro. If we assume that only Gazprom meets the emerging import gap, the company has a higher market share in 2016/17 but is still not the largest supplier: GdF Suez, Petoro and ExxonMobil have larger market shares. Others, such as GdF Suez, the largest supplier which also supplies some LNG volumes, would lose market share in the 'Gazprom scenario' with an overall beneficial impact on concentration. Hence, the HHI in NW Europe is actually lower in this scenario than in the base case. Therefore, we focus on the possible European wide market (see **Table 15**). We further explore the potentially strong position of Gazprom in NW Europe in our outlook to 2021/22, which we describe in the next subsection.

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Table 15. European wholesale market shares and HHIs in 2016/17 with Gazprom meeting all new import demand – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	48	10%	12%
GDF Suez	33	7%	7%
ExxonMobil	33	7%	7%
Others	343	75%	64%
including Petoro	32	7%	7%
Statoil	19	4%	4%
Centrica	10	2%	2%
Sum or HHI	**Total: 457**	**HHI: 516**	**HHI: 540**
Delta HHI			**24**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

In the European market, where the position of Gazprom is stronger than under the base case, the Grain 4 expansion has a minimal effect on competition. The resultant HHI of 540 is well below 1000 and therefore the market would be presumed to be competitive with the Grain 4 expansion.

Long-term outlook

For the long-term outlook, we assume ENTSOG's TYNDP demand growth rate and indigenous production decline rate from 2010 to 2020 remain constant to 2021/22. Hence, import demand is larger than in 2016/17.

As a consequence, HHIs increase to 729 in the NW European market and to 611 in the European market (without Grain 4). Gazprom becomes the largest supplier in both the NW European and European market, with market shares of 13 % and 15 % respectively (**Table 16** and **Table 17**).

Assigning exclusive rights to Grain 4 to Gazprom implies:

- an increase in the HHI of 42 to 771 for the NW European market; and
- an increase in the HHI of 38 to 649 for the European market.

Hence, taking a long-term perspective does not alter our previous findings that the Grain 4 expansion is not detrimental to competition in the NW European or European markets. A change of 38 or 42 in the HHI is relatively modest and HHIs of below 1000 imply a low market concentration.

Table 16. NW European wholesale market shares and in 2021/22 – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	42	13%	15%
GDF Suez	38	12%	12%
Petoro	32	10%	10%
Others	211	65%	63%
including Statoil	18	6%	5%
Centrica	4	2%	2%
Sum or HHI	**Sum: 323**	**HHI: 729**	**HHI: 771**
Delta HHI			**42**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 17. European wholesale market shares and in 2021/22 – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	68	15%	16%
GdF Suez	39	8%	8%
Petoro	33	7%	7%
Others	327	70%	68%
including Statoil	20	4%	4%
Centrica	8	2%	2%
Sum or HHI	**Sum: 466**	**HHI: 611**	**HHI: 649**
Delta HHI			**38**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

The question as to which suppliers bring in additional volumes to meet increasing import demand might become more relevant. One of the concerns of the European Commission is that European gas supplies become too dependent on one or two external suppliers. We assess the impact of assigning exclusive rights to Grain 4 to such a dominant player, as follows.

As Gazprom is the largest supplier to both the NW European and European markets in 2021/22, we construct a worst case regarding a potential dominance of Gazprom. Firstly, we assume, as in the 'Gazprom scenario' analysis for 2016/17 (**Table 15**), that LNG and non-EU gas suppliers do not increase their market share from 2010 levels and that any new import demand from declining

EU production or demand increases (in some countries) is met by Gazprom. Secondly, because of an increasing trend to hub price indexation on the continent and the expiration of existing long-term contracts, we presume that the incentive to manipulate prices or withhold supply quantities rests fully with the upstream supplier. In other words, we presume the control over all volumes imported by companies like E.On or GdF Suez from Gazprom, rests with the Russian company. As this approach ignores the fact that some volumes are sold under long-term contracts that run beyond 2030, it may overstate the market power of Gazprom. Nevertheless, this scenario illustrates the theoretically highest market share that Gazprom might have. We present the results in **Table 18** and **Table 19**.

Table 18. NW European wholesale market shares and in 2021/22 with Gazprom meeting all new import demand – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	59.1	18%	21%
Statoil	35.2	11%	11%
ExxonMobil	34.7	11%	10%
Others	194	60%	58%
including Petoro	32	10%	10%
GdF Suez	13	4%	4%
Centrica	4	2%	1%
Sum or HHI	**Sum: 323**	**HHI: 899**	**HHI: 965**
Delta HHI			**66**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 19. European wholesale market shares and in 2021/22 with Gazprom meeting all new import demand – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	102	22%	24%
Sonatrach	47	10%	10%
ExxonMobil	39	8%	8%
Others	278	60%	58%
including Statoil	39	8%	8%
Petoro	33	7%	7%
GdF Suez	13	4%	3%
Centrica	4	2%	1%
Sum or HHI	**Sum: 466**	**HHI: 935**	**HHI: 995**
Delta HHI			**60**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Despite the marginally higher HHI in both markets, the values remain below 1000 so market concentration can be considered low both before and after the Grain 4 expansion. Assigning exclusive rights to Grain 4 to Gazprom does not lead to a significant increase in the HHI.

7.1.3 The UK flexibility markets

As noted in section 5, Grain 4 will lead to an increase in delivery capacity to the wholesale market across all time frames. However, it has the potential proportionally to make a more significant contribution to daily delivery capacity because the maximum regasification capacity exceeds the base load requirement.

In this sub-section, we examine the potential impact of Grain 4 on the UK daily and seasonal market segments by calculating the capacity shares to deliver over those relevant time frames.

We assume that a source of capacity is able to deliver at its maximum rate, as adjusted by swing, for the entire duration of the relevant period unless a volume constraint applies. For example, the working gas volume of storage may limit the potential of storage to deliver at the maximum withdrawal rate for extended periods. The specific assumptions we make regarding the deliverability of sources of capacity are presented in Annexe 2.

The analysis of flexibility considers the capacity to deliver gas. Therefore, so that we do not understate the impact of Grain phase 4 on the market structure, we do not ascribe any capacity to LNG terminals other than those terminals that exist or are under construction.

For the analysis of flexibility markets, we do not consider the impact of long term contracts. While we have some knowledge of long term contracts for the annual supply of gas, we do not know how these would translate into the daily or seasonal deliverability of gas. In addition, the analysis of UK and European wholesale market shares suggests that the impact of known long term contracts for annual supply on concentration in the markets for flexibility is minimal. Given the low concentration in the markets for flexibility, it is almost inconceivable that long term contracts would result in Grain phase 4 giving arise to competition concerns in the markets for daily or seasonal gas flexibility.

Daily flexibility

In analysing the market for daily flexibility, we have taken account of all the sources of gas that can deliver gas to the market on the days in which market demand is greatest. To estimate the future structure of the market, we have had to make a number of assumptions:

- annual production from UKCS has been projected as per the UK wholesale market (see Annexe 1) with firms' shares held constant at their 2010 levels;
- the production swing from the UKCS is in aggregate 117% in 2016/17, as estimated by Wood Mackenzie;
- the deliverability of gas from existing storage is taken from National Grid's TYS 2011;
- we include storage projects that are under construction according to the 2011 TYS and Gas Storage Europe, the association of European storage operators;
- we have assumed that the two interconnectors BBL and IUK and the pipelines from Norway would be available to meet peak day demand in accordance with 1/365 of their annual capacity, with shares of capacity corresponding to ownership shares;
- we have assumed that those LNG import terminals other than Grain will be able to deliver gas on any one day at a rate which is 120% of their expected pro-rata annual capacity;[69] and
- we understand from Grain LNG Ltd that the physical capacity for Grain, following the phase 4 expansion, to deliver gas would be 116% of the expected contracted send out capacity.

69 In practice this ratio varies from terminal to terminal.

Based on these assumptions, the shares of daily deliverability in the UK wholesale market are those set out in **Table 20**.

Table 20. UK market shares of daily deliverability in 2016/17

Company	Counterfactual		Statoil takes Grain 4
	Volume (mcm/day)	Market share	
Statoil	72	9%	12%
Centrica	70	9%	8%
Petoro	57	7%	7%
Others	607	75%	73%
including GdF Suez	43	5%	5%
Sum or HHI	**Sum: 806**	**HHI: 479**	**HHI: 514**
Delta HHI			**35**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

The HHI in the market without Grain 4 is 479 and it increases by 35 to 514 if the largest player in this market, Statoil, takes all of the capacity available at Grain 4, i.e. 26 mcm per day.[70] These HHIs are well below 1000, beneath which there is a presumption of a competitive market.

Even the small change in HHI that we show tends to overstate the effect of Grain 4 on daily deliverability. This is because we assume in calculating market shares that Grain 4 has available all 16 of its vaporisers and is therefore able to deliver at a maximum rate of 16% higher than its proposed contracted maximum send out rate (we also assume that there are no NTS entry capacity constraints). In reality, not all vaporisers will be available all of the time.

According to National Grid's Ten Year Statement, forecast peak total demand will be a little over 6500 GWh per day in 2016/17, or a little over 590 mcm per day. This implies that prior to Grain 4 being constructed there would be excess capacity of about 37% of demand. This demand supply balance implies reasonable prospects for competition.

The largest capacity share is held by Statoil, with about 9% of the market. This share is well below the excess capacity in the market for daily flexibility. Indeed, Grain 4 would increase the excess supply to 41% of demand, making it even more difficult for any party to withdraw profitably capacity from the market.

We conclude that the market would remain competitive even if Statoil, the party anticipated to have the largest market share, were to acquire all of the rights to Grain 4.

70 Note that the 24 mcm/day includes the physical capacity that has not been sold through contracts.

Seasonal flexibility

We have defined the market for seasonal flexibility by reference to delivery of gas over a continuous period of 67 days of high demand. This corresponds to the duration over which the main seasonal storage facility connected to the UK gas transportation system, Rough, is able to deliver that gas stored in it. Given that Centrica as the owner of Rough is also the largest player in the seasonal flexibility market, this definition of a season is likely to provide the most stringent test of the potential competitive effects of Grain 4 – assuming that Centrica obtains the rights to all of the capacity of Grain 4.

In analysing the market for seasonal flexibility, we have maintained those assumptions made previously that are relevant and made further assumptions about the sources that can deliver gas to the market in the 2016/17 winter season:

- annual production from UKCS has been projected as per the UK wholesale market (see Annexe 1) with firms' shares held constant at their 2010 levels;
- the production swing from the UKCS is in aggregate 117% in 2016/17, as estimated by Wood Mackenzie;
- the deliverability of gas from existing storage and working gas volumes are provided by Wood Mackenzie;
- we include storage projects that are under construction, according to National Grid's TYS 2011 and Gas Storage Europe;
- we have assumed that the working volumes of storage assets are exhausted over 67 days even if the normal cycle time of some storage facilities is shorter;[71]
- we have assumed that the two interconnectors BBL and IUK and the pipelines from Norway would be available to meet peak day demand in accordance with 67/365 of their annual capacity, with shares of capacity corresponding to ownership shares; and
- we have assumed that LNG import terminals are able to deliver gas seasonally at a rate that is 67/365 of their annual capacity.

Based on these assumptions, the shares of seasonal deliverability in the UK wholesale market are those set out in **Table 21**.

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71 The working volume of Rough, which is the largest UK storage facility, is approximately 67 days of withdrawal capacity (3100 mcm of storage volume and 45 mcm per day of withdrawal capacity).

Table 21. UK market shares of seasonal deliverability in 2016/17

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4613	11%	14%
Statoil	4147	10%	9%
Petoro	3819	9%	9%
Others	29679	70%	68%
Including GdF Suez	1021	2%	3%
Sum or HHI	**Sum: 42258**	**HHI: 533**	**HHI: 580**
Delta HHI			**47**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

The HHI in the market without Grain 4 is 533 and it increases by 47 to 580 if the largest player in this market, Centrica, takes all of the capacity available at Grain 4. These HHIs are well below 1000, beneath which there is a presumption of a competitive market.

Even ignoring the fact that the bulk of the capacity held by Centrica must be made available to other participants (i.e. the bulk of Centrica's capacity at the Rough storage facility), it would be impossible for Centrica to withdraw sufficient capacity to make the market short of daily deliverability as the capacity significantly exceeds demand for seasonal flexibility.

We conclude that the market would remain competitive even if Centrica, the party anticipated to have the largest market share, were to acquire all of the rights to Grain 4.

Scenario analysis and long-term outlook

Worst case scenario regarding flexibility from UKCS

Our scenario analysis for the UK wholesale market looked at potentially adverse impacts on competition from changes in UKCS production shares by the different players. The corresponding scenario for the daily and seasonal flexibility markets would have Statoil or Centrica, the largest player in the daily and seasonal markets respectively, maintaining their 2010 UKCS output while the decline in UKCS production is (proportionally) allocated to all other producers. The effect on the market concentration in both the daily and seasonal flexibility markets is small (**Table 22** and **Table 23**).

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Table 22. UK market shares of daily deliverability in 2016/17 if Statoil UKCS production does not decline

Company	Counterfactual		Statoil takes Grain 4
	Volume (mcm/day)	Market share	
Statoil	80	10%	13%
Centrica	70	9%	8%
Petoro	56	7%	7%
Others	601	75%	72%
including GdF Suez	43	5%	5%
Sum or HHI	**Sum: 806**	**HHI: 490**	**HHI: 530**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 23. UK market shares of seasonal deliverability in 2016/17 if Centrica UKCS production does not decline

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4810	11%	14%
Statoil	4125	10%	9%
Petoro	3797	9%	9%
Others	29525	70%	68%
including GdF Suez	1021	2%	2%
Sum or HHI	**Sum: 42258**	**HHI: 539**	**HHI: 588**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

The HHI in each market is always below 600 and the change in HHI when Grain 4 capacity is assigned to Statoil or Centrica respectively is well below 100. We conclude that the market would remain competitive even if the party anticipated to have the largest market share, were to be able to increase its market share of UKCS production and at the same time were to acquire all of the rights to Grain 4.

Outlook to 2021/22

Our conclusion that the Grain 4 expansion is not detrimental to competition in the market for daily or seasonal deliverability does not change in the long-term as we do not include any uncommitted new storage projects in our analysis. Any such projects could only increase market concentration if they were found not to

adversely impact competition, as they would not be granted exemptions from third-party access otherwise. Because of declining UKCS production, the market shares of some of the largest flexibility providers actually decline compared to 2016/17. If production market shares in the UKCS remain constant, Centrica would be the largest flexibility provider in both the daily and seasonal flexibility markets. To depict a worse case from a competition perspective, we use the previous assumption that Centrica maintains its 2010 UKCS production levels.

According to National Grid's Ten Year Statement, UKCS production in 2021/22 is 23 bcm. The swing factor of production is 122 % (according to Wood Mackenzie).

Table 24. UK market shares of daily deliverability in 2021/22 if Centrica UKCS production does not decline

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm/day)	Market share	
Centrica	73	10%	13%
Statoil	68	9%	8%
E.On	55	7%	7%
Others	576	75%	72%
including Petoro	53	7%	7%
GdF Suez	43	6%	5%
Sum or HHI	**Sum: 771**	**HHI: 494**	**HHI: 534**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 25. UK market shares of seasonal deliverability in 2021/22 if Centrica UKCS production does not decline

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4835	12%	15%
Statoil	3856	10%	9%
Petoro	3539	9%	9%
Others	27670	69%	67%
including GdF Suez	1021	3%	2%
Sum or HHI	**Sum: 39900**	**HHI: 552**	**HHI: 609**
Delta HHI			**57**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

In the market for daily flexibility in 2021/22, the HHI without Grain 4 is 494 and it increases by 40 to 534 if the largest player in this market, Centrica, takes all of the capacity available at Grain 4, and increases its market share in UKCS production substantially from 2010 level. The HHI in the market for seasonal flexibility is higher with than without Grain 4, but this does not raise competition concerns (The HHI increases by 57 to 609 if Centrica were to control the capacity of Grain 4). The HHIs in both markets are well below 1000, beneath which there is a presumption of a competitive market.

7.2 Markets with a possible indirect impact

It is reasonable to suppose that the additional LNG flows into the UK as a consequence of Grain 4 might directly or indirectly result in the development of an LNG liquefaction facility (or at least the expansion of an existing facility). Furthermore, additional LNG tankers that will be used to deliver gas to Grain 4 could be required. It is also reasonable to assume that whoever acquires the rights to Grain 4 might assume an increased share of the UK shipping market as a result of the flow of gas through Grain 4.

Before addressing the possible competitive impact in the LNG export and LNG shipping markets, it is important to understand that the direct effect of Grain 4 is to create a buyer in each of these markets. It does not create an LNG exporter or LNG shipper *per se*. Just as the addition of capacity to supply a market cannot create an incentive for the withdrawal of more capacity than was added, so the addition of a player's demand in a market cannot create an incentive for the player to act as more of a monopsonist and withdraw more demand than has been added. We do not see the possibility that the creation of incremental buyer demand for these services could lead to problems associated with buyer market power.

However, there is the possibility that the holders of rights at Grain 4 may satisfy their demand for an LNG supply source or LNG tankers by building, or entering into long term contracts for, new capacity. Under these circumstances such parties become a supplier of the service, not just a buyer. To the extent the new supply matches the quantity to be delivered to Grain 4, it is possible to argue that this simply adds an element of self supply which has no effect at all on the rest of the market, and can therefore have no detrimental effect.

For completeness, we analyse the upstream markets as if the worst possible party from a competition perspective were to undertake investment to meet the requirements of Grain 4. This case would be the equivalent of the holder of rights to Grain 4 immediately contracting the largest player to undertake upstream investment.

There may also be an impact on the UK gas shipping market. This is discussed as the last of the markets in this subsection.

7.2.1 Global LNG supply

The aggregate global liquefaction capacity in 2010 was estimated as 340 bcm per year.[72] Qatar Petroleum has the largest share of the market with 17% and the estimated HHI for the global LNG supply market in 2010 is 735.[73] If Qatar Petroleum were to build extra LNG liquefaction capacity to match the maximum annual flow through Grain 4 (about 8 bcm), the HHI would increase by 47 to 782.

Currently, global regasification capacity is approximately double global liquefaction capacity.[74] This suggests that any development of liquefaction capacity in response to Grain 4 is likely to be significantly smaller than 8 bcm per year, i.e. the implied change to HHI resulting from Grain 4 is less than 47.

HHIs with and without Grain 4 are well beneath the threshold below which there is a presumption of a competitive market.

Qualitative considerations reinforce the view that there is no reason to believe that Grain 4 exemption would be detrimental to competition in the LNG supply market:

- as noted above, the connection of any impact in the LNG supply market to Grain 4 is somewhat tenuous, i.e. it is not a clear consequence;
- competition to acquire LNG exports generally occurs through contracts developed over quite long lead times and purchasers will have the option to negotiate with a party willing to build new capacity. Indeed, because contracts dominate, it may be impossible for a purchaser of LNG exports to buy it all from existing facilities. Negotiating new build could well be the only option. In this case market shares in the existing market are of no direct relevance; and
- LNG export is a fast growing business where the rate of new investment would make the exercise of market power difficult.

On this basis we conclude that exemption of Grain 4 from rTPA will not be detrimental to competition in the global LNG supply market.

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72 Wood Mackenzie estimates the 2010 liquefaction capacity as 340 bcm per year. The IEA estimates the 2009 liquefaction capacity as 310 bcm per year.

73 In calculating the HHI for the market, we assume that "others" comprises 8 firms whose market shares are each approximately the same size as the smallest identified firm, NNPC.

74 Sophia Ruester, *Recent Dynamics in the Global Liquefied Natural Gas Industry*, January 2010, page 27.

7.2.2 LNG Shipping

As noted above, the possible impact to consider in the LNG shipping market arises if the largest existing LNG shipper were to expand its fleet capacity in order to serve Grain 4.

We estimate that there are 46 operators of LNG tankers worldwide, including tankers due for delivery before the end of 2012. The combined fleet has a capacity of 52.5 million m^3 and the largest operator, STASCO[75], has a market share by volume of 16.9%. Only 3 operators have a market share that exceeds 5% and the combined market share of the 3 largest operators is 34.4%.

In table **Table 26** we present the range of market shares and HHI for global LNG shipping.[76] It is clear that the LNG shipping market is quite atomistic.

75 STASCO is a subsidiary of Shell.

76 "Known other" operators comprise 25 firms.

Table 26. LNG shipping operator market shares and HHIs, 2012

Company	Counterfactual		STASCO increases capacity
	Shipping cap. ('000 m^3)	Market share	
STASCO	18%	18%	18%
Mitsui OSK Line	8%	8%	8%
NYK Line	7%	7%	7%
Teekay LNG	6%	6%	6%
M.I.S.C.	6%	6%	6%
Ceres LNG Services	6%	6%	6%
K Line	5%	5%	5%
Golar LNG	4%	4%	4%
BW Gas	3%	3%	3%
Exmar	3%	3%	3%
Knutsen OAS	2%	2%	2%
ProNav Ship Mgmt.	2%	2%	2%
BP Shipping	2%	2%	2%
National Gas Shipping	2%	2%	2%
Hoegh LNG	2%	2%	2%
K Line/NYK Line	2%	2%	2%
Hyundai MM	2%	2%	2%
Overseas Shipholding	1%	1%	1%
StenaBulk	1%	1%	1%
SK Shipping	1%	1%	1%
Others	9,559	16%	16%
Sum or HHI	**Sum: 58,134**	**HHI: 612**	**HHI: 659**
Delta HHI		**47**	

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Prior to Grain 4, the LNG shipping structure has an HHI of 612. A subsidiary of Shell has the largest market share and therefore the worst scenario from the perspective of competition in this market would be for Shell to expand its fleet to match the flow through Grain 4 (on the basis of 7.2 bcm p.a. throughput). If we assume that tankers serving Grain 4 travel the same distance as the average of all other tankers, we can simply translate throughput at Grain 4 into tanker demand by comparing Grain 4 throughput with world LNG production. On this basis Grain 4 would increase the size of the shipping fleet by 1.8%, increasing STASCO's share by 1.7 percentage points and increasing the HHI by 47 to 659.

Given that, with or without any effect consequent to Grain 4, the structure of this market is very competitive, we conclude that exemption from rTPA for Grain 4 would not cause a detriment to competition in the LNG shipping market.

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7.2.3 Gas shipping

As with LNG supply and LNG shipping, Grain 4 will create demand for UK gas shipping services on the NTS. However, it is quite likely that whoever acquires rights to Grain 4 will choose to self ship and the question we address is whether this could possibly cause any competitive concerns.

There are currently 211 shippers licensed to use the UK system.[77] However, there are no publicly available data on market shares of the UK shipping market. Therefore, it is difficult to comment meaningfully on the structure of the shipping market.

In any event, regardless of any uncertainties concerning market structure, there are, in our view, relatively low barriers to entry in the shipping market. There are some systems costs involved but we do not think that these would inhibit a producer or supplier from becoming their own shipper if they felt that that they were unable to access competitive shipping services. Perhaps just as importantly, there are extremely low barriers to expansion as a shipper. If the shipping market were uncompetitive an existing shipper would be able at very little cost to expand their share of the market virtually overnight. The lack of data on market shares also helps to ensure that it would be difficult for coordination to develop because one shipper's behaviour cannot easily be observed by others. We therefore conclude that low barriers to both entry and expansion prevent shipping from being an uncompetitive market irrespective of the Grain 4 development.

7.3 Possible vertically related markets

In addition to the markets that may be affected by investment associated with, but not part of, the investment at Grain 4, there are potentially vertically related markets. Vertical markets are markets that are at different levels in the supply chain for a good or service.

If the primary affected markets are competitive there should be no competitive impact of Grain 4 on vertically related markets. Our analysis suggests that the directly affected relevant markets (i.e. wholesale and flexibility) are competitive and therefore there should be no concern. If these markets are competitive, an increased market share in these markets confers no material advantage which can be leveraged into adjacent markets. Nevertheless, we consider hypothetical competitive impacts in three vertically related markets.

The potential concern that could arise out of the proposed development at Grain 4 in this context is that it could lead to an increase in the degree of vertical

[77] Some of the licensed shippers may be affiliated firms. Even if that were the case, there are a large numbers of independent licensed shippers.

integration of a company. Clearly, the proposed project would not directly increase the degree of vertical integration. Rather, it could increase a (potentially already vertically integrated) player's control over the wholesale supply of gas.

The primary vertical concern that could arise out of the proposed expansion therefore would relate to the access to gas of players active in the downstream retail supply of gas. The question is whether acquisition of the additional capacity at Grain 4 could potentially enable the acquiring player to foreclose competing downstream players from access to gas. Clearly, such vertical concerns could only arise if the additional capacity were acquired by a player with control over a large part of the upstream gas supply in the UK.

Given the small upstream market shares of the relevant parties and the small increment in those market shares added by the proposed capacity expansion at Grain 4, we do not think that the proposed investment can be expected to give rise to any vertical concerns. Moreover, as we will show below, the competitive conditions downstream are not such that they could cause a vertical relationship with competition concerns.

Clearly, the more competitive the downstream market for the supply of gas to end consumers, the less one would be concerned about competition being inhibited by the Grain 4 expansion. As we will show in the following three sections, discussing the supply of gas to daily metered I&C, non-daily metered I&C and households, we consider these to be sufficiently competitive for no vertical concerns to arise in relation to Grain 4.

7.3.1 Supply of gas to I&C customers

Retail supply of gas to I&C customers can be categorised into supply to daily metered and to non-daily metered customers.

Table 27 shows the market shares of supply to non-daily metered I&C customers in November 2009. The HHI of the non-daily metered I&C market segment is about 1384, which is over the commonly adopted threshold of 1000, below which there is a general presumption of competition but well below the HHI at which there is a presumption of a lack of competition.

Table 27. Supply to non-daily metered I&C customers market shares and HHIs, 2009

Company	Counterfactual		Centrica takes Grain 4
	Supply (GWh/mth)	Market share	
Centrica	**29100**	**22%**	**25%**
Corona Energy	16400	12%	12%
E.ON Energy	23400	17%	17%
EDF Energy	990	1%	1%
Gazprom	9200	7%	7%
GDF Suez	7900	6%	6%
RWE npower	6000	4%	4%
ScottishPower	920	1%	1%
Shell Gas Direct	6900	5%	5%
SSE	7400	5%	5%
Total Gas and Power	23400	17%	17%
Others	3000	2%	2%
Sum or HHI	Sum: 134610	HHI: 1384	HHI: 1472
Delta HHI			88

Source: Frontier analysis based on data from Datamonitor

Centrica is the largest supplier in this market segment. If it were to acquire the rights to Grain 4 and by doing so somehow prevent others from procuring gas in the wholesale market and supplied the other party's customers in their place, the HHI could in theory rise by 88 to 1472. Note that we include the change in HHI for completeness but do not anticipate any effect of Grain 4 on the vertically related supply markets.

A horizontal merger that resulted in an HHI of between 1000 and 2000 and an increase in HHI of less than 250 would be unlikely to cause competition concerns.[78] However, we are not dealing with a merger in this case. We note that the advent of Grain 4 is likely to be more pro-competitive than a merger with a similar HHI outcome because Grain 4 is adding to the capacity in the market.

78 European Commission, *Guidelines on the assessment of horizontal mergers under the Council Regulation in the control of concentrations between undertakings* (2004/C 31/03).

Table 28 shows the market shares of supply to daily metered I&C customers in November 2009. The HHI of the daily metered I&C market segment is about 1481, which is over the commonly adopted threshold of 1000, below which there is a general presumption of competition.

Table 28. Supply to daily metered I&C customers market shares and HHIs, 2009

Company	Counterfactual		Statoil takes Grain 4
	Supply (GWh/mth)	Market share	
Centrica	3600	3%	3%
Corona Energy	2300	2%	2%
E.ON Energy	6200	5%	5%
ENI	14300	11%	11%
Gazprom	3600	3%	3%
GDF Suez	12800	10%	10%
RWE npower	3500	3%	3%
Shell Gas Direct	19500	15%	15%
Statoil UK	**30100**	**24%**	**27%**
Total Gas and Power	25000	20%	19%
Wingas	6500	5%	5%
Sum or HHI	Sum: 127400	HHI: 1481	HHI: 1584
Delta HHI			103

Source: Frontier analysis based on data from Datamonitor

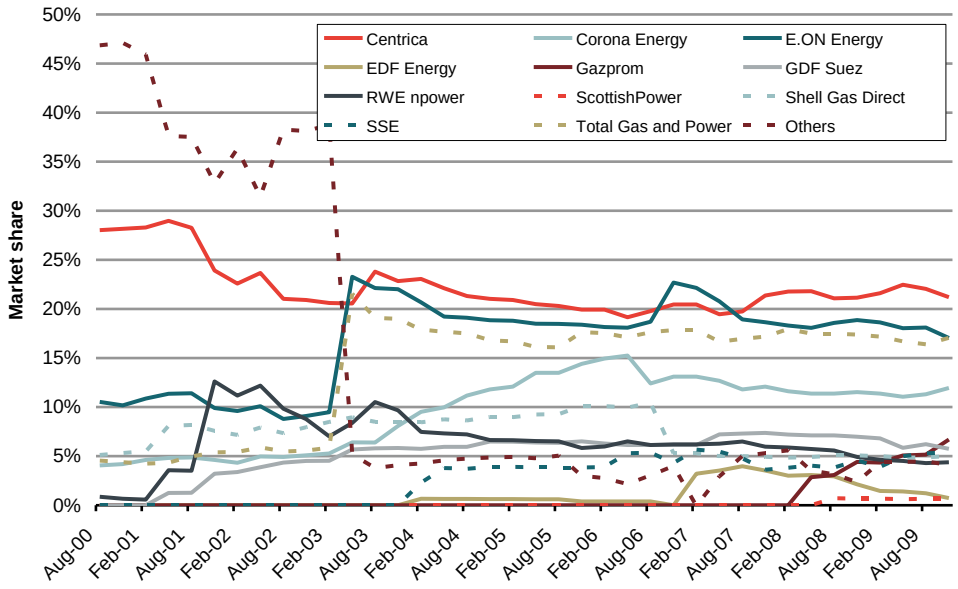
Statoil is the largest supplier in this market segment. If it were to acquire the rights to Grain 4 and by doing so somehow prevent others from procuring gas in the wholesale market and supplied the other party's customers in their place, the HHI could in theory rise by 103 to 1584. As described above, if this were a horizontal merger these HHI outcomes would be unlikely to cause competition concerns.

It is worth noting that a supplier could not both supply the same gas supplies through the daily metered market segment and the non-daily metered market segment from Grain 4. Therefore, the resultant change in HHI due to Grain 4 would in all likelihood be smaller than shown above.

Aside from the small HHI increase and the previous argument that the competitive directly affected markets mean that a holder of rights to Grain 4 could not foreclose access to wholesale gas, the market for I&C customers is generally considered to have low barriers to entry and expansion and therefore should be regarded as competitive.

This is reinforced by **Figure 15** and **Figure 16** that show the market shares over time for the non-daily metered I&C and daily metered I&C market segments, respectively. We focus only on those firms present in the market as at November 2009. We can clearly see that firms' shares vary significantly over time and entry has occurred, both of which are indicative of a competitive market. Ofgem also notes that "a number of entrants have made some inroads into the non-domestic market, especially in NDM and DM sectors"[79] and notes that one third of small business customers switched suppliers in 2007.[80]

Figure 15. Market shares over time for supply to non-daily metered I&C customers

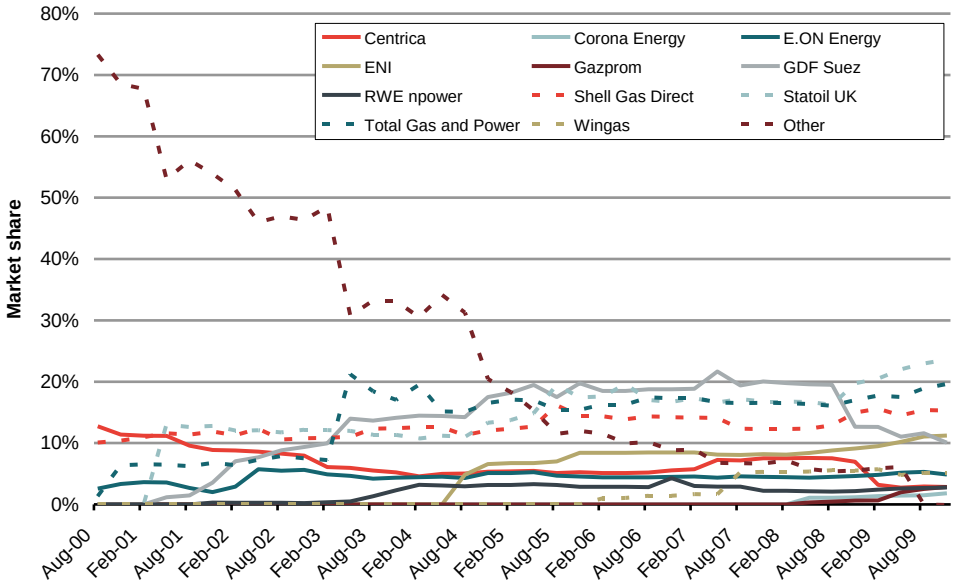


Source: Frontier analysis of data provided by Datamonitor

79 Ofgem, *2009 Great Britain and Northern Ireland National Reports to the European Commission.*

80 Ibid, page 54.

Figure 16. Market shares over time for supply to daily metered I&C customers



Source: Frontier analysis of data provided by Datamonitor

7.3.2 Supply of gas to households

There are currently six gas retail suppliers of any significance serving households. Their market sizes in terms of numbers of household gas accounts are shown in **Table 29**.

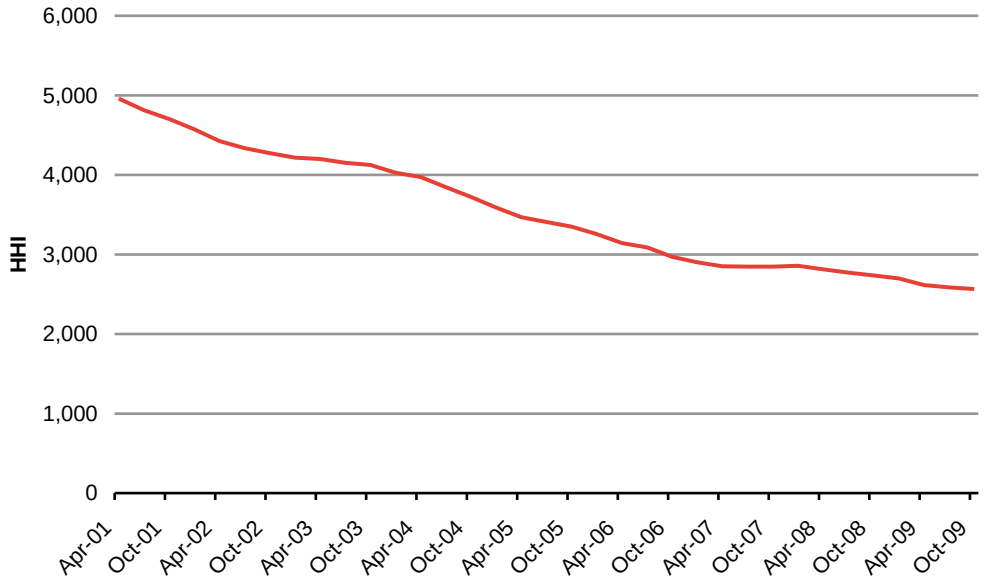
Table 29. Market shares of supply to households by customer numbers, December 2010

Supplier	Market share
Centrica	42%
SSE	16%
E.ON UK	14%
RWE Npower	11%
ScottishPower	9%
EDF Energy	8
Others	0.5%
Total	100%

Source: Ofgem, 2011 Great Britain and Northern Ireland National Reports to the European Commission

The HHI of the household supply segment in December 2010 was around 2480. Over time, the HHI of this segment has fallen significantly from 5000 in 2001, as shown by **Figure 17**. The reduction in HHI has been largely driven by the fall in Centrica's market share over the same period from 68.8% to 42%. The trend of customers switching away from Centrica is continuing.

Figure 17. HHI over time for the household retail segment



Source: Frontier analysis of data provided by Datamonitor

We would expect the barriers to entry for supply to residential customers to be relatively high due to the need to establish a brand. However, indications are that there is active competition for the supply market to household customers.

After a steady increase in the switching rate following retail market liberalisation, the switching rate has remained relatively constant over the period 2005 to 2009, ranging between 17% and 19%.[81]

Despite the falling concentration levels, relatively high switching rates and the ease of expanding in retailing, Ofgem has intimated some possible concerns with the working of the retail market for domestic consumers. In its Energy Supply Probe, Ofgem found "… that the fundamental structures of a competitive market are in place, and the transition to effective competitive markets is well advanced and continuing." However, Ofgem also "… identif[ied] a number of important areas where consumers are not yet benefiting fully from the competitive market and vulnerable consumer groups are disproportionately affected."[82]

We have not taken a view as to the competitive functioning of the domestic retail market. However, given the competitive structure of the wholesale market, it is

81 Ibid, page 55

82 Ofgem, *Energy Supply Probe – proposed retail market remedies*, April 2009.

not credible that any change to the wholesale market resulting from the Grain 4 expansion will affect the domestic retail market. A party would need to be dominant in the wholesale market in order to leverage the change in its position in the wholesale market due to the Grain expansion to gain an unfair competitive advantage in the retail market. As shown in the analysis of the UK wholesale market, even if the largest player in the market were to acquire all of the rights to use the capacity of the Grain 4 expansion, the expansion would not cause competition concerns.

We also note that in the counterfactual the largest player in the UK residential retail market in the (Centrica) is not the same as the largest player in the UK wholesale market (Petoro). If Petoro were to acquire residential retail market share in accordance with the size of the Grain 4 expansion, this would likely be beneficial to competition in the retail market since Petoro is not currently active in the market. Conversely, were Centrica to acquire rights to all of the Grain 4 expansion, the detriment to competition in the UK wholesale market would be less than the maximum possible assessed by us.

7.4 Competitive assessment conclusions

The Grain phase 4 expansion project adds capacity through which gas can be delivered to the UK system. From a static perspective, the addition of capacity must be good for consumers since it could not create a strategic opportunity for any player immediately to withdraw more capacity than it has just added.

From a dynamic perspective, our analysis shows that for all conceivably affected markets, the addition of Grain 4 with exemption from rTPA requirements would not be detrimental to competition.

The key factor leading to this conclusion is that all of the directly and indirectly affected markets have low levels of concentration without Grain 4 or with the rights to Grain 4 allocated to the worst case party in each market. The case of the UK gas market without exports results in an HHI and change to HHI that is the closest to the EC's thresholds that would indicate concern in the case of a merger. However, for the reasons set out below, we do not consider that this result suggests that Grain phase 4 would be detrimental to competition.

In the case of the vertically related retail supply markets, we anticipate no effect of Grain 4.

The conclusion that Grain 4 would not be detrimental to competition is reinforced by the fact that Grain 4 would not foreclose the UK or wider markets to further investments in LNG terminals or piped imports of gas.

The robustness of our conclusion is reinforced by the fact that our analysis is likely to err on the side of overstating the impact of Grain 4 on market concentration. This occurs for several reasons:

- In the longer term, competition relates to contracts often involving lead times that allow investment. In these circumstances, the competitiveness of a market is determined more by the number of parties that are able to compete for a contract than by existing market shares (or existing HHIs).

- We consider the change in HHI as a result of a capacity addition. The improvement in the competitiveness of the market from the counterfactual, i.e. without the project, is better than indicated by the change in HHI because of the increase in the capacity overhang in the market adding to the competitive pressure.

- We hypothesise in relation to each market that the player currently with the highest market share will acquire all of the rights to Grain phase 4. These players are not the same for each market. As a result, if the player which may be most likely to have an adverse effect on competition on one market were to acquire all the rights to the Grain phase 4, the competitive impact on the other markets will not be worse (and may well be significantly better) than those set out in the analysis.

Even if we were to find that Grain phase 4 was detrimental to competition in a market, if this were outweighed by the pro-competitive effect of the expansion elsewhere the competition test would be met. As described above, the addition of capacity is pro-competitive. Therefore, even if one were to take the view that Grain phase 4 could result in a competitive concern in the vertically domestic retail market, any such detriment would be outweighed by the benefit elsewhere of the expansion.

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To assess the likely competitive impact that Grain 4 will have on affected markets we should take account that the planned expansion is expected to become operational in 2016/17. Therefore, the competitive assessment requires a view of the market in 2016/17 and beyond. For the longer term view, we consider the market in 2021/22. This Annexe provides an overview of how we estimated the future position of parties in the UK wholesale market.

Process applied

Two demand scenarios

We have considered for our analysis two demand scenarios for the UK:

- UK demand. Demand for 2016/2017 and 2021/22 are taken from National Grid's "slow progression" scenario in it Ten Year Statement 2011. Under this scenario the interconnectors between the UK and the continent (IUK and BBL) are allowed to import (as the last supply options in the merit order).

- UK demand plus exports. Under this demand scenario we assume that IUK and BBL are only exporting and do not import. Therefore, gas supplied to the UK is required to meet UK demand *plus* demand from exports to continental Europe. The maximum export capacity for IUK is 20 bcm per year[83] and for BBL we have assumed a 20 bcm per year export limit.[84]

For the European market, we apply one demand scenario:

- For European gas demand, we take demand growth rates per country from ENTSOG's TYNDP and apply them to proprietary data Wood Mackenzie for 2010 (which give a detailed account of the market shares). We do not use ENTSOG's absolute demand projection as there are inconsistencies between National Grid's Ten Year Statement and the Wood Mackenzie data.

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83 National Grid, *Gas Transportation Ten Year Statement 2009*, page 75.

84 Currently BBL is unable to physically transport gas in the direction from the UK to the Netherlands. However, the BBL Company has raised the possibility of future export flows. It notes that "*if market conditions make it possible in the future for the gas also to flow periodically from the UK to the Netherlands, separate technical facilities will have to be added for that purpose.*" http://www.bblcompany.com/en/project-bbl. BBL's 2011 open season for capacity in the direction from UK to the Netherlands indicated insufficient market demand to invest in physical flow capacity in this direction.

UK merit order

We have established a merit order in our annual gas "dispatch" model such that gas supplied matches UK demand or UK plus export demand over the year. We do not consider seasonal or shorter term fluctuations in this model. The merit order we apply is the following:

- UKCS production;
- Norwegian gas (from the Vesterled, Tampen, Langeled and Gjøa pipelines) where available annual flow is limited to 75% of the maximum capacity of the pipelines to reflect seasonal demand and upstream outages;
- imports utilising capacity associated with phase 4 of the Isle of Grain terminal (in the scenario with the Grain 4 expansion);
- LNG imports from existing or committed terminal developments (these include Isle of Grain phases 1-3, Dragon LNG phases 1, South Hook phases 1-2 and GasPort), with individual facilities within this group being "dispatched" on a *pro rata* basis;
- LNG imports from other terminal developments (these include Dragon LNG phase 2, Port Meridian and Norsea), with individual facilities within this group being "dispatched" on a *pro rata* basis; and
- continental imports via the IUK and BBL interconnectors with individual facilities within this group being "dispatched" on a *pro rata* basis.

In practice, for both demand scenarios, demand cuts the merit order part way through the capacity to import LNG using existing or committed terminals.

Market share and HHI calculations for the UK market

Given the merit order explained above, supply levels for the different sources of gas are obtained for each demand scenario. To estimate market shares, we allocate supply to individual participants according to the following rules:

- For UKCS production we assume that companies' shares of UKCS production in 2016/2017 and 2021/22 are the same as their shares in 2010 (obtained from Wood Mackenzie proprietary data). Aggregate UKCS production is scaled down from 2010 to 2016/2017 according to National Grid's forecast for aggregate UKCS production.[85]

85 National Grid, *Gas Transportation Ten Year Statement 2011*.

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- For Norwegian gas we have assigned supply shares according to the equity interests in each pipeline as a proxy.

- For LNG imports (existing and uncommitted) we used Grain LNG proprietary data and desktop research to establish market shares and volume supplied by each company.

- For potential imports from the continent we ascribe supply shares according to the equity interests in BBL and IUK, but also taking account of GasTerra's reported capacity contract for BBL.

Once supply volumes are allocated to market participants, we calculate market shares and HHIs for the two demand scenarios.

EU market shares and HHI calculations

Given the number of operators and projects in the European market, market shares had to be estimated with a higher degree of abstraction. We allocate supply to individual players according to the following rules:

- The 2010 supply volumes are taken from the Wood Mackenzie proprietary data. We adjust them as follows:
  - As indigenous production declines, we apply the same rate of decline for production from the ENTSOG TYNDP to the production volumes of all EU producers.
  - For Norwegian supplies, we assume a constant market share as we do not expect significant output increases (which would be necessary to meet the import gap).
  - For multinational companies which own both EU production and control LNG imports, we also assume a constant market share – presuming that they replace their decline in EU production with increased imports.
  - For all other suppliers (non-EU pipeline suppliers (except Norway) and LNG suppliers), we assume that they can increase supplies so that total supplies equal demand in each country. Relative supply increases take place proportionally to the supplier's 2010 market shares.

Treatment of long term contracts

The wholesale market comprises sellers of gas and buyers of gas through long term contracts. The incentive and ability to raise price in the wholesale market by either a seller or a buyer depends upon the contractual relationships between

them. For this reason we consider the effect of long term contracts on market concentration.

If a contract locked in a price for a pre-specified volume of gas, the contract would in effect transfer the incentive to raise price in the wholesale market from the seller to the buyer to the extent of the contract volume. However, we do not know the precise terms of long term contracts such as the remaining duration of the contracts or price reset terms. Therefore, rather than assume the incentive and ability to raise price is transferred from sellers to buyers to the full extent of our knowledge of contracted quantities, we assume the incentive and ability to raise price is transferred to half of the contracted quantities known to us (i.e. a partial adjustment for contracts).

To develop a view of market shares whereby physical supply is partially adjusted for long term contracts, we undertake a three step process:

- first we calculate market shares on the basis of physical supply with no contract adjustment;
- second we re-assign supply volumes from seller to buyer according to information about the volume of long term contracts held by each party – this gives us physical supplies fully adjusted for long term contracts; and
- third we obtain the market shares for a partial adjustment for known contracts by calculating market participants' supplied volumes as being equal to the average of estimated volumes with and without contract adjustment.

To estimate the contract quantity bought and sold for each firm in 2016-2017 and 2021/22 we applied the following process:

- we obtained information (from Wood Mackenzie proprietary data) about the aggregate annual contract quantity sold or purchased through long term contracts for each firm for 2010;
- we obtained information (from Wood Mackenzie proprietary data) about the aggregate contracted sale and purchase volumes on an annual basis for the UK (or Europe) over time; and
- we assumed the firms' shares of contract sales and purchases remained constant at their 2010 levels to estimate the contract sales and purchases of each firm in 2016/2017 and 2021/22 respectively.

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Assumptions concerning future gas infrastructure in the UK

In this sub-section we set out the main assumptions made about the future gas infrastructure in the UK. We are particularly interested in the expected gas supply infrastructure when the Grain phase 4 is expected to become operational, i.e. the gas year 2016/17.

UKCS production

According to the National Grid's Ten Year Statement 2011, total gas production from UKCS fields in 2016/17 is estimated to be 35 bcm under the slow progression scenario (and 16 bcm in 2024-25). As mentioned above, we use Wood Mackenzie's market share data for 2010 and we project this forward to the relevant years, assuming that shares of UKCS production remain constant.

Grain LNG site information

Details of the capacity of the four phases of the Isle of Grain LNG import facility are shown in **Table 30**.

Table 30. Isle of Grain annual capacity by phase

(bcm/year)	Phase 1	Phase 2	Phase 3	Phase 4
BP/Sonatrach	4.4			
Centrica		Breakdown not provided for confidentiality reasons		
GDF Suez				
Sonatrach				
E.ON Ruhrgas				
Iberdrola				
Scenario dependent				8.0
TOTAL	**4.4**	**8.6**	**6.7**	**8.0**

Source: Grain LNG

Other forecast projects

We forecast available gas infrastructure in the UK in 2016/17 and 2021/22 using information published in National Grid's Ten Year Statement complemented by

information provided by Wood Mackenzie and desk top research. **Table 31** shows future gas infrastructure developments, relevant for the supply of gas to the UK, that are expected to be operational in the gas year 2016/17. Projections for which infrastructure is operational in 2021/22 are difficult. Infrastructure developments, which we do not even know yet, may be available.

In practice, the demand is insufficient to utilise this infrastructure (with the exception of Grain phase 4) when we estimate market concentration.

As the projected gas infrastructure for 2016/17 would also allow gas demand to be met in 2021/22, according to demand and UKCS supply information taken from National Grid's Ten Year Statement, we take the conservative approach that no additional infrastructure becomes operational between 2016/17 and 2021/22.

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Table 31. Future gas infrastructure developments in the UK up to the gas year 2016/17

Project name	Developer	Location	Size bcm/year	Expected comm. date	Status	Capacity split
Dragon LNG Phase 2	BG / Petronas	Milford Haven	3-6	2016+	Planning received, no FID	BG = 50% Petronas = 50%
Isle of Grain (Phase 4)	National Grid	Isle of Grain	~8.0	2016/17	Open season underway	Scenario dependent
Norsea LNG	Partners	Teesside	~20	2016+	Planning received, no FID	Total 20% ConocoPhillips 20% Statoil 20% Eni 20% Norsk Hydro 20%
Port Meridian	Hoegh LNG	Offshore barrow	~6	2013+	Planning received, no FID	Höegh LNG = 100%

Source: National Grid, *Gas Transportation Ten Year Statement 2010* and Frontier Economics

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Contract information

As mentioned above in section 7.1.2, physical supplies are adjusted according to information about long term contracts which is estimated from information provided by Wood Mackenzie on the contract sales and contract purchases of each firm in 2010, adjusted according to the change in overall contract quantities in the market to 2016/17.

Annexe 1: Estimating market shares in the UK wholesale market

Detailed market shares for UK markets

Table 32. UK without exports wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
4Gas	0.0	0%	0%
BG	4.5	5%	4%
BP	5.0	5%	5%
Calor	0.0	0%	0%
CDP Investissments	0.0	0%	0%
Centrica	7.8	8%	8%
ConocoPhillips	3.7	4%	4%
Distrigas	0.0	0%	0%
Dong	1.9	2%	2%
EDF	0.2	0%	0%
E.ON Ruhrgas	0.6	1%	0%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
Excelerate Energy	1.5	2%	1%
ExxonMobil	9.4	10%	9%
Fluxys	0.0	0%	0%
Gasterra	0.0	0%	0%
Gasunie	0.0	0%	0%
Gazprom	0.2	0%	0%
GdF	1.5	2%	1%
Höegh LNG	0.0	0%	0%
Iberdrola	1.1	1%	1%
La Caisse	0.0	0%	0%
LNG Japan	0.0	0%	0%
Medway LNG Partners	0.0	0%	0%
Norsea Gas	0.4	0%	0%
Norsk Hydro	0.0	0%	0%
Osaka Gas	0.0	0%	0%
Petoro	16.0	17%	25%
Petronas	1.9	2%	1%
Qatar Petroleum	5.1	5%	3%
Scottish Power	0.0	0%	0%
Shell	7.1	7%	7%
Sonatrach	1.6	2%	1%
Statoil	14.3	15%	15%
Total	5.2	5%	5%
Wingas	0.0	0%	0%
Other	4.2	4%	4%
Sum or HHI	**Sum: 94.9**	**HHI: 896**	**HHI: 1184**
Delta HHI			**288**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 33. UK + exports wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
4Gas	0.0	0%	0%
BG	8.7	7%	6%
BP	6.2	5%	5%
Calor	0.0	0%	0%
CDP Investissments	0.0	0%	0%
Centrica	9.6	8%	7%
ConocoPhillips	3.7	3%	3%
Distrigas	0.0	0%	0%
Dong	1.9	1%	1%
EDF	0.2	0%	0%
E.ON Ruhrgas	1.6	1%	1%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
Excelerate Energy	3.8	3%	3%
ExxonMobil	13.0	10%	10%
Fluxys	0.0	0%	0%
Gasterra	0.0	0%	0%
Gasunie	0.0	0%	0%
Gazprom	0.2	0%	0%
GdF	3.3	3%	2%
Höegh LNG	0.0	0%	0%
Iberdrola	2.7	2%	2%
La Caisse	0.0	0%	0%
LNG Japan	0.0	0%	0%
Medway LNG Partners	0.0	0%	0%
Norsea Gas	0.4	0%	0%
Norsk Hydro	0.0	0%	0%
Osaka Gas	0.0	0%	0%
Petoro	16.0	13%	19%
Petronas	4.8	4%	3%
Qatar Petroleum	13.3	11%	9%
Scottish Power	0.0	0%	0%
Shell	7.1	6%	6%
Sonatrach	4.1	3%	3%
Statoil	14.3	11%	11%
Total	5.2	4%	4%
Wingas	0.0	0%	0%
Unknown Others	4.2	3%	3%
Sum or HHI	**Sum: 126.0**	**HHI: 757**	**HHI: 879**
Delta HHI			**122**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

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Table 34. UK without exports wholesale market shares and HHIs in 2016/17 if Petoro increases its share of UKCS production – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	19%	28%
Statoil	14.0	15%	15%
ExxonMobil	9.2	10%	9%
Centrica	7.7	8%	7%
Shell	6.8	7%	7%
Qatar Petroleum	5.1	5%	3%
Total	4.9	5%	5%
BP	4.7	5%	5%
BG	4.4	5%	3%
ConocoPhillips	3.5	4%	4%
Dong	1.9	2%	2%
Petronas	1.9	2%	1%
Sonatrach	1.6	2%	1%
GdF	1.5	2%	1%
Excelerate Energy	1.5	2%	1%
Iberdrola	1.1	1%	1%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
E.ON Ruhrgas	0.6	1%	0%
Norsea Gas	0.4	0%	0%
Unknown others	3.7	4%	4%
Known others	0.3	0%	0%
Sum or HHI	**Sum: 94.9**	**HHI: 950**	**HHI: 1279**
Delta HHI			**329**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 35. UK + exports wholesale market shares and HHIs in 2016/17 if Petoro increases its share of UKCS production – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	15%	21%
Statoil	14.0	11%	11%
Qatar Petroleum	13.3	11%	9%
ExxonMobil	12.7	10%	9%
Centrica	9.5	8%	7%
BG	8.6	7%	6%
Shell	6.8	5%	5%
BP	6.0	5%	4%
Total	4.9	4%	4%
Petronas	4.8	4%	3%
Sonatrach	4.1	3%	3%
Excelerate Energy	3.8	3%	3%
ConocoPhillips	3.5	3%	3%
GdF	3.3	3%	2%
Iberdrola	2.7	2%	2%
Dong	1.9	1%	1%
E.ON Ruhrgas	1.6	1%	1%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown others	3.7	3%	3%
Known others	0.3	0%	0%
Sum or HHI	**Sum: 126.0**	**HHI: 785**	**HHI: 930**
Delta HHI			**145**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 36. UK without exports wholesale market shares and HHIs in 2021/22 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	14.8	16%	25%
Statoil	13.1	14%	14%
ExxonMobil	9.0	10%	9%
Centrica	7.5	8%	8%
Qatar Petroleum	7.2	8%	6%
Shell	5.8	6%	6%
BG	5.1	6%	4%
BP	4.0	4%	4%
Total	3.8	4%	4%
ConocoPhillips	2.9	3%	3%
Petronas	2.6	3%	2%
Sonatrach	2.3	2%	2%
Excelerate Energy	2.1	2%	2%
GdF	1.9	2%	2%
Dong	1.9	2%	2%
Iberdrola	1.5	2%	1%
E.ON Ruhrgas	0.9	1%	1%
Eni	0.8	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown others	2.1	2%	2%
Known others	0.3	0%	0%
Sum or HHI	**Sum: 90.8**	**HHI: 863**	**HHI: 1141**
Delta HHI			**278**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 37. UK + exports wholesale market shares and HHIs in 2021/22 – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	14.8	12%	18%
Qatar Petroleum	14.5	12%	11%
Statoil	13.6	11%	11%
ExxonMobil	12.1	10%	10%
BG	9.5	8%	7%
Centrica	9.1	7%	7%
Petronas	5.9	5%	5%
Shell	5.8	5%	4%
BP	5.1	4%	4%
Sonatrach	4.5	4%	3%
Total	4.3	3%	3%
Excelerate Energy	4.1	3%	3%
GdF	3.5	3%	3%
ConocoPhillips	3.4	3%	2%
Iberdrola	2.9	2%	2%
Dong	1.9	2%	2%
E.ON Ruhrgas	1.7	1%	1%
Eni	1.3	1%	1%
Höegh LNG	0.8	1%	1%
Esso	0.8	1%	0%
Unknown others	2.1	2%	2%
Known others	1.9	2%	0%
Sum or HHI	**Sum: 123.7**	**HHI: 740**	**HHI: 879**
Delta HHI			**139**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 38. UK without exports wholesale market shares and HHIs in 2021/22 if Petoro increases its share of UKCS production – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	20%	29%
Statoil	12.7	14%	14%
ExxonMobil	8.5	9%	8%
Centrica	7.2	8%	7%
Qatar Petroleum	7.1	8%	6%
Shell	5.4	6%	6%
BG	5.0	5%	4%
BP	3.6	4%	4%
Total	3.4	4%	4%
Petronas	2.6	3%	3%
ConocoPhillips	2.6	3%	2%
Sonatrach	2.3	2%	2%
Excelerate Energy	2.1	2%	2%
GdF	1.9	2%	2%
Dong	1.9	2%	2%
Iberdrola	1.5	2%	1%
E.ON Ruhrgas	0.9	1%	1%
Esso	0.8	1%	1%
Eni	0.7	1%	1%
Norsea Gas	0.4	0%	0%
Unknown others	1.8	2%	2%
Known others	0.3	0%	0%
Sum or HHI	**Sum: 90.8**	**HHI: 955**	**HHI: 1303**
Delta HHI			**348**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 39. UK + exports wholesale market shares and HHIs in 2021/22 if Petoro increases its share of UKCS production – partial contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	15%	21%
Qatar Petroleum	14.4	12%	11%
Statoil	13.2	11%	10%
ExxonMobil	11.7	9%	9%
BG	9.4	8%	7%
Centrica	8.7	7%	7%
Petronas	5.9	5%	4%
Shell	5.4	4%	4%
BP	4.6	4%	4%
Sonatrach	4.5	4%	3%
Excelerate Energy	4.1	3%	3%
Total	3.9	3%	3%
GdF	3.5	3%	3%
ConocoPhillips	3.1	3%	2%
Iberdrola	2.9	2%	2%
Dong	1.9	2%	2%
E.ON Ruhrgas	1.7	1%	1%
Eni	1.2	1%	1%
Höegh LNG	0.8	1%	1%
Esso	0.8	1%	0%
Unknown others	1.8	1%	1%
Known others	1.9	2%	0%
Sum or HHI	**Sum: 123.7**	**HHI: 784**	**HHI: 961**
Delta HHI			**177**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Market shares for different treatments of contracts

As described above, the partial adjustment of physical supply shares for sales and purchases through long term contracts is the market share measure on which we focus for the competition assessment. In this section we provide measures of market shares for UK wholesale gas for physical supply with no adjustment for contracts and physical supply with full adjustment for contracts in 2016/17.

Annexe 1: Estimating market shares in the UK wholesale market

Table 40. UK without exports wholesale market shares and HHIs in 2016/17 – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	16.9	18%	26%
Petoro	16.1	17%	17%
ExxonMobil	9.6	10%	9%
Shell	7.7	8%	8%
Qatar Petroleum	5.2	6%	5%
Total	5.0	5%	4%
BP	4.5	5%	4%
Centrica	3.9	4%	4%
BG	3.8	4%	3%
ConocoPhillips	3.7	4%	3%
Dong	2.1	2%	2%
Petronas	1.9	2%	1%
Sonatrach	1.6	2%	1%
Excelerate Energy	1.5	2%	1%
Eni	1.2	1%	1%
GdF	1.1	1%	1%
Iberdrola	1.0	1%	1%
Esso	0.8	1%	1%
E.ON Ruhrgas	0.6	1%	0%
Norsea Gas	0.4	0%	0%
Unknown Others	6.5	7%	7%
Known Others	-	0%	0%
Sum or HHI	**Sum: 94.9**	**HHI: 937**	**HHI: 1248**
Delta HHI			**311**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 41. UK + exports wholesale market shares and HHIs in 2016/17 – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	16.9	13%	20%
Petoro	16.1	13%	13%
Qatar Petroleum	13.5	11%	10%
ExxonMobil	13.1	10%	9%
BG	8.0	6%	6%
Shell	7.7	6%	5%
BP	5.7	5%	4%
Centrica	5.6	4%	4%
Total	5.0	4%	4%
Petronas	4.8	4%	3%
Sonatrach	4.1	3%	3%
Excelerate Energy	3.8	3%	3%
ConocoPhillips	3.7	3%	3%
GdF	2.9	2%	2%
Iberdrola	2.5	2%	2%
Dong	2.1	2%	2%
E.ON Ruhrgas	1.6	1%	1%
Eni	1.2	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	6.5	5%	5%
Known Others	-	0%	0%
Sum or HHI	**Sum: 126.0**	**HHI: 768**	**HHI: 902**
Delta HHI			**134**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 42. UK without exports wholesale market shares and HHIs in 2016/17 – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	16.0	17%	25%
Centrica	11.8	12%	12%
Statoil	11.7	12%	12%
ExxonMobil	9.3	10%	9%
Shell	6.5	7%	7%
BP	5.5	6%	6%
Total	5.3	6%	5%
BG	5.2	5%	4%
Qatar Petroleum	4.9	5%	4%
ConocoPhillips	3.7	4%	4%
Petronas	1.9	2%	2%
GdF	1.8	2%	1%
Dong	1.7	2%	1%
Sonatrach	1.6	2%	1%
Excelerate Energy	1.5	2%	1%
Iberdrola	1.3	1%	1%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
E.ON Ruhrgas	0.6	1%	0%
Norsea Gas	0.4	0%	0%
Unknown Others	1.9	2%	2%
Known Others	0.7	1%	1%
Sum or HHI	**Sum: 94.9**	**HHI: 892**	**HHI: 1169**
Delta HHI			**277**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 43. UK + exports wholesale market shares and HHIs in 2016/17 – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	16.0	13%	19%
Centrica	13.5	11%	10%
Qatar Petroleum	13.2	10%	9%
ExxonMobil	12.8	10%	9%
Statoil	11.7	9%	9%
BG	9.4	7%	7%
BP	6.7	5%	5%
Shell	6.5	5%	5%
Total	5.3	4%	4%
Petronas	4.8	4%	3%
Sonatrach	4.1	3%	3%
Excelerate Energy	3.8	3%	3%
ConocoPhillips	3.7	3%	3%
GdF	3.6	3%	2%
Iberdrola	2.8	2%	2%
Dong	1.7	1%	1%
E.ON Ruhrgas	1.6	1%	1%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	1.9	2%	2%
Known Others	0.7	1%	1%
Sum or HHI	**Sum: 126.0**	**HHI: 766**	**HHI: 885**
Delta HHI			**119**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 44. UK without exports wholesale market shares and HHIs in 2016/17 if Statoil increases its share of UKCS production – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	19.2	20%	29%
Petoro	15.8	17%	17%
ExxonMobil	9.3	10%	9%
Shell	7.4	8%	8%
Qatar Petroleum	5.2	6%	5%
Total	4.7	5%	4%
BP	4.2	4%	4%
Centrica	3.8	4%	4%
BG	3.7	4%	3%
ConocoPhillips	3.5	4%	3%
Dong	2.1	2%	2%
Petronas	1.9	2%	1%
Sonatrach	1.6	2%	1%
Excelerate Energy	1.5	2%	1%
GdF	1.1	1%	1%
Eni	1.1	1%	1%
Iberdrola	1.0	1%	1%
Esso	0.8	1%	1%
E.ON Ruhrgas	0.6	1%	0%
Norsea Gas	0.4	0%	0%
Unknown Others	6.0	6%	6%
Known Others	-	0%	0%
Sum or HHI	**Sum: 94.9**	**HHI: 999**	**HHI: 1352**
Delta HHI			**353**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 45. UK + exports wholesale market shares and HHIs in 2016/17 if Statoil increases its share of UKCS production – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	19.2	15%	22%
Petoro	15.8	13%	13%
Qatar Petroleum	13.5	11%	9%
ExxonMobil	12.8	10%	9%
BG	7.9	6%	6%
Shell	7.4	6%	5%
Centrica	5.5	4%	4%
BP	5.5	4%	4%
Petronas	4.8	4%	4%
Total	4.7	4%	3%
Sonatrach	4.1	3%	3%
Excelerate Energy	3.8	3%	3%
ConocoPhillips	3.5	3%	3%
GdF	2.9	2%	2%
Iberdrola	2.5	2%	2%
Dong	2.1	2%	2%
E.ON Ruhrgas	1.6	1%	1%
Eni	1.1	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	6.0	5%	5%
Known Others	-	0%	0%
Sum or HHI	**Sum: 126.0**	**HHI: 801**	**HHI: 959**
Delta HHI			**158**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 46. UK without exports wholesale market shares and HHIs in 2016/17 if Petoro increases its share of UKCS production – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	19%	28%
Centrica	11.6	12%	12%
Statoil	11.4	12%	11%
ExxonMobil	9.0	9%	8%
Shell	6.2	7%	7%
BP	5.2	5%	5%
BG	5.1	5%	5%
Total	5.0	5%	4%
Qatar Petroleum	4.9	5%	4%
ConocoPhillips	3.5	4%	4%
Petronas	1.9	2%	2%
GdF	1.8	2%	1%
Dong	1.7	2%	1%
Sonatrach	1.6	2%	1%
Excelerate Energy	1.5	2%	1%
Iberdrola	1.3	1%	1%
Eni	1.0	1%	1%
Esso	0.8	1%	1%
E.ON Ruhrgas	0.6	1%	0%
Norsea Gas	0.4	0%	0%
Unknown Others	1.4	2%	2%
Known Others	0.7	1%	1%
Sum or HHI	**Sum: 94.9**	**HHI: 949**	**HHI: 1267**
Delta HHI			**318**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 47. UK + exports wholesale market shares and HHIs in 2016/17 if Petoro increases its share of UKCS production – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	14%	21%
Centrica	13.4	11%	10%
Qatar Petroleum	13.2	10%	9%
ExxonMobil	12.6	10%	9%
Statoil	11.4	9%	9%
BG	9.3	7%	7%
BP	6.4	5%	5%
Shell	6.2	5%	5%
Total	5.0	4%	4%
Petronas	4.8	4%	3%
Sonatrach	4.1	3%	3%
Excelerate Energy	3.8	3%	3%
GdF	3.6	3%	3%
ConocoPhillips	3.5	3%	2%
Iberdrola	2.8	2%	2%
Dong	1.7	1%	1%
E.ON Ruhrgas	1.6	1%	1%
Eni	1.0	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	1.4	1%	1%
Known Others	0.7	1%	1%
Sum or HHI	**Sum: 126.0**	**HHI: 796**	**HHI: 938**
Delta HHI			**142**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 48. UK without exports market shares and HHIs in 2021/22 – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	15.6	17%	26%
Petoro	14.8	16%	16%
ExxonMobil	9.1	10%	9%
Qatar Petroleum	7.4	8%	7%
Shell	6.4	7%	6%
BG	4.5	5%	4%
Centrica	3.8	4%	4%
Total	3.7	4%	4%
BP	3.5	4%	4%
ConocoPhillips	2.9	3%	3%
Petronas	2.6	3%	2%
Sonatrach	2.3	2%	2%
Dong	2.1	2%	2%
Excelerate Energy	2.1	2%	2%
GdF	1.6	2%	1%
Iberdrola	1.4	2%	1%
Eni	0.9	1%	1%
E.ON Ruhrgas	0.9	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	4.3	5%	5%
Known Others	-	0%	0%
Sum or HHI	**Sum: 90.8**	**HHI: 899**	**HHI: 1198**
Delta HHI			**299**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 49. UK + exports wholesale market shares and HHIs in 2021/22 – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	16.1	13%	19%
Petoro	14.8	12%	12%
Qatar Petroleum	14.7	12%	11%
ExxonMobil	12.3	10%	10%
BG	8.9	7%	6%
Shell	6.4	5%	5%
Petronas	5.9	5%	4%
Centrica	5.4	4%	4%
BP	4.6	4%	4%
Sonatrach	4.5	4%	3%
Total	4.2	3%	3%
Excelerate Energy	4.1	3%	3%
ConocoPhillips	3.4	3%	2%
GdF	3.2	3%	2%
Iberdrola	2.8	2%	2%
Dong	2.1	2%	2%
E.ON Ruhrgas	1.7	1%	1%
Eni	1.4	1%	1%
Höegh LNG	0.8	1%	1%
Esso	0.8	1%	0%
Unknown Others	4.3	3%	3%
Known Others	1.6	1%	0%
Sum or HHI	**Sum: 123.7**	**HHI: 748**	**HHI: 898**
Delta HHI			**150**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 50. UK without exports wholesale market shares and HHIs in 2021/22 – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	14.7	16%	25%
Centrica	11.2	12%	12%
Statoil	10.7	12%	12%
ExxonMobil	8.9	10%	9%
Qatar Petroleum	7.0	8%	6%
BG	5.8	6%	5%
Shell	5.3	6%	5%
BP	4.4	5%	5%
Total	4.0	4%	4%
ConocoPhillips	2.9	3%	3%
Petronas	2.6	3%	2%
Sonatrach	2.3	2%	2%
GdF	2.2	2%	2%
Excelerate Energy	2.1	2%	2%
Dong	1.7	2%	2%
Iberdrola	1.7	2%	1%
E.ON Ruhrgas	0.9	1%	1%
Eni	0.8	1%	1%
Esso	0.8	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	-	0%	0%
Known Others	0.6	1%	1%
Sum or HHI	**Sum: 90.8**	**HHI: 872**	**HHI: 1144**
Delta HHI			**272**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 51. UK + exports wholesale market shares and HHIs in 2021/22 – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	14.7	12%	18%
Qatar Petroleum	14.3	12%	11%
Centrica	12.8	10%	10%
ExxonMobil	12.0	10%	9%
Statoil	11.2	9%	9%
BG	10.2	8%	7%
Petronas	5.9	5%	4%
BP	5.5	4%	4%
Shell	5.3	4%	4%
Sonatrach	4.5	4%	3%
Total	4.5	4%	3%
Excelerate Energy	4.1	3%	3%
GdF	3.8	3%	3%
ConocoPhillips	3.4	3%	2%
Iberdrola	3.0	2%	2%
Dong	1.7	1%	1%
E.ON Ruhrgas	1.7	1%	1%
Eni	1.3	1%	1%
Höegh LNG	0.8	1%	1%
Esso	0.8	1%	0%
Unknown Others	-	0%	0%
Known Others	2.2	2%	1%
Sum or HHI	**Sum: 123.7**	**HHI: 754**	**HHI: 892**
Delta HHI			**138**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 52. UK without exports wholesale market shares and HHIs in 2021/22 if Statoil increases its share of UKCS production – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	19.2	21%	30%
Petoro	14.4	16%	16%
ExxonMobil	8.7	10%	9%
Qatar Petroleum	7.4	8%	7%
Shell	6.0	7%	6%
BG	4.4	5%	4%
Centrica	3.6	4%	4%
Total	3.2	4%	4%
BP	3.1	3%	3%
Petronas	2.6	3%	3%
ConocoPhillips	2.6	3%	2%
Sonatrach	2.3	2%	2%
Dong	2.1	2%	2%
Excelerate Energy	2.1	2%	2%
GdF	1.6	2%	1%
Iberdrola	1.4	2%	1%
E.ON Ruhrgas	0.9	1%	1%
Esso	0.8	1%	1%
Eni	0.7	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	3.5	4%	4%
Known Others	-	0%	0%
Sum or HHI	**Sum: 90.8**	**HHI: 1007**	**HHI: 1379**
Delta HHI			**372**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 53. UK + exports wholesale market shares and HHIs in 2021/22 if Statoil increases its share of UKCS production – no contract adjustment

Company	Counterfactual		Statoil takes Grain 4
	Volume (bcm/year)	Market share	
Statoil	19.8	16%	22%
Qatar Petroleum	14.7	12%	12%
Petoro	14.4	12%	11%
ExxonMobil	11.8	10%	9%
BG	8.7	7%	6%
Shell	6.0	5%	5%
Petronas	5.9	5%	4%
Centrica	5.2	4%	4%
Sonatrach	4.5	4%	3%
BP	4.2	3%	3%
Excelerate Energy	4.1	3%	3%
Total	3.7	3%	3%
GdF	3.2	3%	2%
ConocoPhillips	3.1	2%	2%
Iberdrola	2.8	2%	2%
Dong	2.1	2%	2%
E.ON Ruhrgas	1.7	1%	1%
Eni	1.3	1%	1%
Höegh LNG	0.8	1%	1%
Esso	0.8	1%	0%
Unknown Others	3.5	3%	3%
Known Others	1.6	1%	0%
Sum or HHI	**Sum: 123.7**	**HHI: 805**	**HHI: 991**
Delta HHI			**186**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Table 54. UK without exports wholesale market shares and HHIs in 2021/22 if Petoro increases its share of UKCS production – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	20%	29%
Centrica	10.7	12%	11%
Statoil	10.2	11%	11%
ExxonMobil	8.4	9%	8%
Qatar Petroleum	6.9	8%	5%
BG	5.6	6%	5%
Shell	4.8	5%	5%
BP	4.0	4%	4%
Total	3.5	4%	4%
Petronas	2.6	3%	3%
ConocoPhillips	2.6	3%	2%
Sonatrach	2.3	2%	2%
GdF	2.2	2%	2%
Excelerate Energy	2.1	2%	2%
Dong	1.7	2%	2%
Iberdrola	1.6	2%	1%
E.ON Ruhrgas	0.9	1%	1%
Esso	0.8	1%	1%
Eni	0.7	1%	1%
Norsea Gas	0.4	0%	0%
Unknown Others	-	0%	0%
Known Others	0.6	1%	1%
Sum or HHI	**Sum: 90.8**	**HHI: 958**	**HHI: 1301**
Delta HHI			**343**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 55. UK + exports wholesale market shares and HHIs in 2021/22 if Petoro increases its share of UKCS production – full contract adjustment

Company	Counterfactual		Petoro takes Grain 4
	Volume (bcm/year)	Market share	
Petoro	18.3	15%	21%
Qatar Petroleum	14.2	11%	11%
Centrica	12.3	10%	10%
ExxonMobil	11.5	9%	9%
Statoil	10.8	9%	8%
BG	10.0	8%	7%
Petronas	5.9	5%	4%
BP	5.1	4%	4%
Shell	4.8	4%	4%
Sonatrach	4.5	4%	3%
Excelerate Energy	4.1	3%	3%
Total	4.0	3%	3%
GdF	3.8	3%	3%
ConocoPhillips	3.1	3%	2%
Iberdrola	3.0	2%	2%
Dong	1.7	1%	1%
E.ON Ruhrgas	1.7	1%	1%
Eni	1.2	1%	1%
Höegh LNG	0.8	1%	1%
Esso	0.8	1%	0%
Unknown Others	-	0%	0%
Known Others	2.2	2%	0%
Sum or HHI	**Sum: 123.7**	**HHI: 793**	**HHI: 970**
Delta HHI			**177**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 1: Estimating market shares in the UK wholesale market

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

We present in this Annexe data we have used in relation to:

- existing UK gas storage facilities (**Table 56**); and
- planned gas storage facilities (**Table 57**).

Other information used to calculate market shares of daily and seasonal deliverability has been provided in Annexe 1 and in the main body of the report.

Table 56. Existing UK gas and LNG storage facilities

Name	Owner	Space (mcm)	Delivery rate (mcm/day)	Injection rate (mcm/day)	Withdrawal cycle (days)
Hatfield Moor	Scottish Power	116	2	3	23
Humbly Grove	Star Energy	300	7	8.5	37
Rough	Centrica	3100	45	14.4	67
Avonmouth	National Grid	81	13	0.2	5
Aldbrough Phase 1 SSE[86]	SSE	134	8	20.1	21
Aldbrough Phase 1 Statoil	Statoil	66	4	9.9	21
Hole House	EdF	30	5.4	8.1	6
Hole House Phase Iia	EdF	25	1.6		
Hornsea	SSE	325	17	2	18

Source: National Grid, Ten Year Statement 2011, Gas Storage Europe and Wood Mackenzie

We include only existing and committed new gas storage facilities in our analysis of the flexibility market. Many planned storage facilities have been announced. However, we understand that development is committed in the case of only five facilities.

86 We list Aldbrough twice, with the capacity pro-rated according to equity shares.

Table 57. Committed new UK gas storage facilities

Name	Type	Operator	Space (mcm)	Send out (mcm/day)
Byley / Holford	Salt Cavern	E.ON UK	200	22
Hill Top Farm	Salt Cavern	EdF	100	15
Aldbrough Phase 1final	Salt Cavern	SSE / Statoil	200	25
Stublach	Salt Cavern	GDF	400	32
Isle of Portland	Salt Cavern	Portland Gas Ltd	1000	30

Source: Wood Mackenzie, National Grid 2011 TYS and Gas Storage Europe

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Detailed market shares for 2016-17

Table 58. Market shares of daily deliverability in 2016/17

Company	Counterfactual		Statoil takes Grain 4
	Volume (mcm/day)	Market share	
Statoil	72	9%	12%
Centrica	70	9%	8%
Petoro	57	7%	7%
E.On	55	7%	7%
Qatar Petroleum	48	6%	6%
ExxonMobil	46	6%	5%
GDF Suez	43	5%	5%
SSE	42	5%	5%
Portland Gas Ltd	30	4%	4%
Shell	28	4%	3%
Petronas	24	3%	3%
EDF	22	3%	3%
National Grid	22	3%	3%
Gasterra	22	3%	3%
BG	21	3%	3%
ConocoPhillips	20	2%	2%
BP	19	2%	2%
La Caisse	17	2%	2%
Total	17	2%	2%
Sonatrach	15	2%	2%
Unknown others	21	3%	3%
Known others	96	12%	12%
Sum or HHI	**Sum: 806**	**HHI: 479**	**HHI: 514**
Delta HHI			**35**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Table 59. Market shares of seasonal deliverability in 2016/17

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4613	11%	14%
Statoil	4147	10%	9%
Petoro	3819	9%	9%
ExxonMobil	2830	7%	6%
Qatar Petroleum	2698	6%	6%
E.On	2125	5%	5%
Shell	1907	5%	4%
Gasterra	1468	3%	3%
ConocoPhillips	1319	3%	3%
Petronas	1264	3%	3%
BP	1220	3%	3%
BG	1210	3%	3%
La Caisse	1160	3%	3%
Total	1106	3%	3%
GDF Suez	1021	2%	2%
Portland Gas Ltd	1000	2%	2%
Sonatrach	871	2%	2%
Fluxys	865	2%	2%
Wingas	743	2%	2%
Excelerate Energy	734	2%	2%
Unknown others	1397	3%	3%
Known others	4738	11%	11%
Sum or HHI	**Sum: 42258**	**HHI: 533**	**HHI: 580**
Delta HHI			**47**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Table 60. Market shares of daily deliverability in 2016/17 if Statoil UKCS production does not decline

Company	Counterfactual		Statoil takes Grain 4
	Volume (mcm/day)	Market share	
Statoil	80	10%	13%
Centrica	70	9%	8%
Petoro	56	7%	7%
E.On	55	7%	7%
Qatar Petroleum	48	6%	6%
ExxonMobil	45	6%	5%
GDF Suez	43	5%	5%
SSE	42	5%	5%
Portland Gas Ltd	30	4%	4%
Shell	28	3%	3%
Petronas	24	3%	3%
EDF	22	3%	3%
National Grid	22	3%	3%
Gasterra	22	3%	3%
BG	21	3%	2%
ConocoPhillips	19	2%	2%
BP	18	2%	2%
La Caisse	17	2%	2%
Total	16	2%	2%
Sonatrach	15	2%	2%
Unknown Others	19	2%	2%
Known others	96	12%	11%
Sum or HHI	**Sum: 806**	**HHI: 490**	**HHI: 530**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Table 61. Market shares of seasonal deliverability in 2016/17 if Centrica UKCS production does not decline

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4810	11%	14%
Statoil	4125	10%	9%
Petoro	3797	9%	9%
ExxonMobil	2807	7%	6%
Qatar Petroleum	2698	6%	6%
E.On	2125	5%	5%
Shell	1886	4%	4%
Gasterra	1468	3%	3%
ConocoPhillips	1305	3%	3%
Petronas	1264	3%	3%
BG	1203	3%	3%
BP	1198	3%	3%
La Caisse	1160	3%	3%
Total	1083	3%	2%
GDF Suez	1021	2%	2%
Portland Gas Ltd	1000	2%	2%
Sonatrach	871	2%	2%
Fluxys	865	2%	2%
Wingas	743	2%	2%
Excelerate Energy	734	2%	2%
Unknown others	1358	3%	3%
Known others	4733	11%	11%
Sum or HHI	**Sum: 42258**	**HHI: 539**	**HHI: 588**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Detailed market shares for 2021-22

Table 62. Market shares of daily deliverability in 2021/22

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm/day)	Market share	
Centrica	69	9%	12%
Statoil	68	9%	9%
E.On	55	7%	7%
Petoro	53	7%	7%
Qatar Petroleum	48	6%	6%
GDF Suez	43	6%	5%
SSE	42	5%	5%
ExxonMobil	42	5%	5%
Portland Gas Ltd	30	4%	4%
Shell	25	3%	3%
Petronas	24	3%	3%
EDF	22	3%	3%
National Grid	22	3%	3%
Gasterra	22	3%	3%
BG	20	3%	2%
ConocoPhillips	17	2%	2%
La Caisse	17	2%	2%
BP	16	2%	2%
Sonatrach	15	2%	2%
Excelerate Energy	13	2%	2%
Unknown Others	14	2%	2%
Known others	95	12%	12%
Sum or HHI	**Sum: 771**	**HHI: 487**	**HHI: 523**
Delta HHI			**36**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Table 63. Market shares of daily deliverability in 2021/22 if Centrica UKCS production does not decline

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm/day)	Market share	
Centrica	73	10%	13%
Statoil	68	9%	8%
E.On	55	7%	7%
Petoro	53	7%	7%
Qatar Petroleum	48	6%	6%
GDF Suez	43	6%	5%
SSE	42	5%	5%
ExxonMobil	41	5%	5%
Portland Gas Ltd	30	4%	4%
Petronas	24	3%	3%
Shell	24	3%	3%
EDF	22	3%	3%
National Grid	22	3%	3%
Gasterra	22	3%	3%
BG	20	3%	2%
La Caisse	17	2%	2%
ConocoPhillips	17	2%	2%
Sonatrach	15	2%	2%
BP	15	2%	2%
Excelerate Energy	13	2%	2%
Unknown Others	13	2%	2%
Known others	94	12%	12%
Sum or HHI	**Sum: 771**	**HHI: 494**	**HHI: 534**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Table 64. Market shares of seasonal deliverability in 2021/22

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4514	11%	14%
Statoil	3892	10%	9%
Petoro	3574	9%	9%
Qatar Petroleum	2698	7%	7%
ExxonMobil	2568	6%	6%
E.On	2125	5%	5%
Shell	1659	4%	4%
Gasterra	1468	4%	4%
Petronas	1264	3%	3%
ConocoPhillips	1161	3%	3%
La Caisse	1160	3%	3%
BG	1132	3%	3%
GDF Suez	1021	3%	2%
Portland Gas Ltd	1000	3%	2%
BP	970	2%	2%
Sonatrach	871	2%	2%
Fluxys	865	2%	2%
Total	848	2%	2%
Wingas	743	2%	2%
Excelerate Energy	734	2%	2%
Unknown others	957	2%	2%
Known others	4673	12%	11%
Sum or HHI	**Sum: 39900**	**HHI: 540**	**HHI: 593**
Delta HHI			**53**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Table 65. Market shares of seasonal deliverability in 2021/22 if Centrica UKCS production does not decline

Company	Counterfactual		Centrica takes Grain 4
	Volume (mcm)	Market share	
Centrica	4835	12%	15%
Statoil	3856	10%	9%
Petoro	3539	9%	9%
Qatar Petroleum	2698	7%	7%
ExxonMobil	2531	6%	6%
E.On	2125	5%	5%
Shell	1624	4%	4%
Gasterra	1468	4%	4%
Petronas	1264	3%	3%
La Caisse	1160	3%	3%
ConocoPhillips	1138	3%	3%
BG	1121	3%	3%
GDF Suez	1021	3%	2%
Portland Gas Ltd	1000	3%	2%
BP	935	2%	2%
Sonatrach	871	2%	2%
Fluxys	865	2%	2%
Total	811	2%	2%
Wingas	743	2%	2%
Excelerate Energy	734	2%	2%
Unknown others	894	2%	2%
Known others	4664	12%	11%
Sum or HHI	**Sum: 39900**	**HHI: 552**	**HHI: 609**
Delta HHI			**57**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 2: Daily and seasonal deliverability in the UK wholesale market

Annexe 3: Market shares in the NW Europe and European wholesale markets

Market shares for partial adjustment for contracts

Detailed market shares for NW Europe

Table 66. NW European wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		GdF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	36	11%	14%
Petoro	31	10%	10%
ExxonMobil	31	10%	10%
Gazprom	28	9%	9%
Shell	27	8%	8%
EON	18	6%	6%
Statoil	18	6%	5%
Total	17	5%	5%
Energie Beheer Nederland	14	4%	4%
Centrica	10	3%	3%
BP	9	3%	2%
BG	5	2%	2%
Distrigas	5	2%	2%
ConocoPhillips	5	1%	1%
Qatar Petroleum	4	1%	1%
BASF	4	1%	1%
RWE	3	1%	1%
BEB	3	1%	1%
Sonatrach	3	1%	1%
Wintershall	2	1%	1%
Unknown others	39	12%	11%
Others	10	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 654**	**HHI: 689**
Delta HHI			**35**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 67. NW European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – partial contract adjustment

Company	Counterfactual		GdF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	40	12%	15%
Gazprom	33	10%	10%
Petoro	31	10%	10%
ExxonMobil	29	9%	9%
Shell	25	8%	8%
EON	18	6%	6%
Statoil	18	6%	5%
Total	17	5%	5%
Energie Beheer Nederland	10	3%	3%
Centrica	9	3%	3%
BP	9	3%	2%
Distrigas	5	2%	2%
Qatar Petroleum	4	1%	1%
BG	4	1%	1%
BASF	4	1%	1%
ConocoPhillips	3	1%	1%
BEB	3	1%	1%
RWE	3	1%	1%
Sonatrach	3	1%	1%
Enel	1	0%	0%
Unknown others	43	14%	12%
Others	9	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 682**	**HHI: 722**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 68. NW European wholesale market shares and HHIs in 2016/17 if EU demand growth rate increases – partial contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	40	11%	14%
Petoro	35	10%	10%
ExxonMobil	34	10%	10%
Gazprom	34	10%	9%
Shell	29	8%	8%
Statoil	19	6%	5%
Total	19	5%	5%
EON	19	5%	5%
Energie Beheer Nederland	14	4%	4%
Centrica	10	3%	3%
BP	9	3%	2%
Distrigas	5	1%	1%
BG	5	1%	1%
ConocoPhillips	5	1%	1%
Qatar Petroleum	5	1%	1%
BASF	4	1%	1%
RWE	3	1%	1%
BEB	3	1%	1%
Sonatrach	3	1%	1%
Wintershall	2	0%	0%
Unknown others	45	13%	12%
Others	10	3%	3%
Sum or HHI	**Sum: 352**	**HHI: 668**	**HHI: 700**
Delta HHI			**32**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 69. NW European wholesale market shares and HHIs in 2016/17 with Gazprom meeting all new import demand – partial contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	32	10%	13%
Petoro	31	10%	10%
ExxonMobil	31	10%	10%
Gazprom	28	9%	9%
Shell	27	8%	8%
EON	18	6%	5%
Statoil	18	6%	5%
Total	17	5%	5%
Energie Beheer Nederland	14	4%	4%
Centrica	10	3%	3%
BP	9	3%	2%
BG	5	2%	2%
Distrigas	5	2%	2%
ConocoPhillips	5	1%	1%
Qatar Petroleum	4	1%	1%
BASF	4	1%	1%
RWE	3	1%	1%
BEB	3	1%	1%
Sonatrach	2	1%	1%
Wintershall	2	1%	1%
Unknown others	44	14%	13%
Others	10	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 638**	**HHI: 666**
Delta HHI			**28**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 70. NW European wholesale market shares and HHIs in 2021/22 – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	42	13%	15%
GDF Suez	38	12%	12%
Petoro	32	10%	10%
ExxonMobil	30	9%	9%
Shell	26	8%	8%
Statoil	18	6%	5%
Total	17	5%	5%
EON	15	5%	5%
Energie Beheer Nederland	9	3%	3%
BP	8	3%	2%
Centrica	8	2%	2%
Qatar Petroleum	4	1%	1%
Distrigas	4	1%	1%
BG	4	1%	1%
ConocoPhillips	3	1%	1%
BASF	3	1%	1%
Sonatrach	3	1%	1%
RWE	2	1%	1%
BEB	2	1%	1%
Enel	1	0%	0%
Unknown others	44	14%	12%
Others	8	3%	3%
Sum or HHI	**Sum: 323**	**HHI: 729**	**HHI: 771**
Delta HHI			**42**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 71. NW European wholesale market shares and HHIs in 2021/22 with Gazprom meeting all new import demand – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	43	13%	16%
Petoro	32	10%	10%
ExxonMobil	30	9%	9%
GDF Suez	29	9%	9%
Shell	26	8%	8%
Statoil	18	6%	5%
Total	17	5%	5%
EON	15	5%	5%
Energie Beheer Nederland	9	3%	3%
BP	8	3%	2%
Centrica	8	2%	2%
Distrigas	4	1%	1%
Qatar Petroleum	4	1%	1%
BG	4	1%	1%
ConocoPhillips	3	1%	1%
BASF	3	1%	1%
Sonatrach	3	1%	1%
RWE	2	1%	1%
BEB	2	1%	1%
Enel	1	0%	0%
Unknown others	53	16%	15%
Others	8	3%	3%
Sum or HHI	**Sum: 323**	**HHI: 682**	**HHI: 728**
Delta HHI			**46**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Detailed market shares for Europe

Table 72. European wholesale market shares and HHIs in 2016/17 – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	46	10%	12%
GDF Suez	38	8%	8%
ExxonMobil	33	7%	7%
ENI	32	7%	7%
Petoro	32	7%	7%
Shell	28	6%	6%
Sonatrach	23	5%	5%
Statoil	19	4%	4%
Union Fenosa	19	4%	4%
EON	18	4%	4%
Total	18	4%	4%
Energie Beheer Nederland	13	3%	3%
Centrica	10	2%	2%
BP	8	2%	2%
Qatar Petroleum	8	2%	2%
NOC	6	1%	1%
Edison	6	1%	1%
Enel	5	1%	1%
Distrigas	5	1%	1%
BG	5	1%	1%
ConocoPhillips	5	1%	1%
OMV	4	1%	1%
BASF	4	1%	1%
NNPC	3	1%	1%
RWE	3	1%	1%
BEB	3	1%	1%
Repsol	2	0%	0%
Wintershall	2	0%	0%
Iberdrola	1	0%	0%
Norway State DFI	1	0%	0%
Unknown others	48	11%	10%
Others	8	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 517**	**HHI: 540**
Delta HHI			**23**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 73. European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	53	12%	13%
GDF Suez	40	9%	9%
Petoro	32	7%	7%
ExxonMobil	31	7%	7%
ENI	30	7%	7%
Shell	26	6%	6%
Sonatrach	24	5%	5%
Statoil	19	4%	4%
Union Fenosa	19	4%	4%
EON	18	4%	4%
Total	18	4%	4%
Energie Beheer Nederland	10	2%	2%
Centrica	9	2%	2%
BP	8	2%	2%
Qatar Petroleum	8	2%	2%
NOC	6	1%	1%
Edison	6	1%	1%
Enel	5	1%	1%
Distrigas	5	1%	1%
OMV	4	1%	1%
BASF	4	1%	1%
NNPC	3	1%	1%
BG	3	1%	1%
ConocoPhillips	3	1%	1%
BEB	3	1%	1%
RWE	3	1%	1%
Repsol	2	0%	0%
Iberdrola	1	0%	0%
Wintershall	1	0%	0%
Norway State DFI	1	0%	0%
Unknown others	52	11%	11%
Others	8	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 543**	**HHI: 571**
Delta HHI			**28**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 74. European wholesale market shares and HHIs in 2016/17 if EU demand growth rate increases – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	57	11%	13%
GDF Suez	42	8%	8%
ExxonMobil	36	7%	7%
Petoro	36	7%	7%
ENI	33	7%	7%
Shell	31	6%	6%
Sonatrach	26	5%	5%
Statoil	21	4%	4%
Union Fenosa	20	4%	4%
Total	20	4%	4%
EON	19	4%	4%
Energie Beheer Nederland	13	3%	3%
Centrica	11	2%	2%
BP	9	2%	2%
Qatar Petroleum	8	2%	2%
NOC	7	1%	1%
Edison	6	1%	1%
Enel	6	1%	1%
Distrigas	5	1%	1%
BG	5	1%	1%
ConocoPhillips	5	1%	1%
OMV	4	1%	1%
NNPC	4	1%	1%
BASF	4	1%	1%
RWE	3	1%	1%
BEB	3	1%	1%
Repsol	2	0%	0%
Wintershall	2	0%	0%
Norway State DFI	1	0%	0%
Iberdrola	1	0%	0%
Unknown others	55	11%	10%
Others	9	2%	2%
Sum or HHI	**Sum: 502**	**HHI: 538**	**HHI: 563**
Delta HHI			**25**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 75. European wholesale market shares and HHIs in 2016/17 if Gazprom supplies all new import demand – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	48	10%	12%
GDF Suez	33	7%	7%
ExxonMobil	33	7%	7%
Petoro	32	7%	7%
ENI	32	7%	7%
Shell	28	6%	6%
Sonatrach	23	5%	5%
Statoil	19	4%	4%
Union Fenosa	19	4%	4%
EON	18	4%	4%
Total	18	4%	4%
Energie Beheer Nederland	13	3%	3%
Centrica	10	2%	2%
BP	8	2%	2%
Qatar Petroleum	7	2%	2%
Edison	6	1%	1%
NOC	6	1%	1%
Enel	5	1%	1%
Distrigas	5	1%	1%
BG	5	1%	1%
ConocoPhillips	5	1%	1%
OMV	4	1%	1%
BASF	4	1%	1%
NNPC	3	1%	1%
RWE	3	1%	1%
BEB	3	1%	1%
Repsol	2	0%	0%
Wintershall	2	0%	0%
Iberdrola	1	0%	0%
Norway State DFI	1	0%	0%
Unknown others	53	12%	11%
Others	8	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 516**	**HHI: 540**
Delta HHI			**24**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 76. European wholesale market shares and HHIs in 2021/22 – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	68	15%	16%
GDF Suez	39	8%	8%
Petoro	33	7%	7%
ExxonMobil	33	7%	7%
Sonatrach	30	6%	6%
Shell	28	6%	6%
ENI	26	5%	5%
Statoil	20	4%	4%
Total	18	4%	4%
Union Fenosa	17	4%	4%
EON	15	3%	3%
Energie Beheer Nederland	9	2%	2%
BP	8	2%	2%
Centrica	8	2%	2%
Qatar Petroleum	8	2%	2%
NOC	6	1%	1%
Edison	5	1%	1%
NNPC	5	1%	1%
Enel	4	1%	1%
Distrigas	4	1%	1%
OMV	3	1%	1%
BG	3	1%	1%
BASF	3	1%	1%
ConocoPhillips	3	1%	1%
RWE	2	1%	1%
BEB	2	1%	1%
Repsol	2	0%	0%
Norway State DFI	1	0%	0%
Wintershall	1	0%	0%
Iberdrola	1	0%	0%
Unknown others	53	11%	11%
Others	7	1%	1%
Sum or HHI	**Sum: 466**	**HHI: 611**	**HHI: 649**
Delta HHI			**38**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 77. European wholesale market shares and HHIs in 2021/22 if Gazprom supplies all new import demand – partial contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	73	16%	17%
Petoro	33	7%	7%
ExxonMobil	33	7%	7%
GDF Suez	30	6%	6%
Shell	28	6%	6%
Sonatrach	27	6%	6%
ENI	25	5%	5%
Statoil	20	4%	4%
Total	18	4%	4%
Union Fenosa	17	4%	4%
EON	15	3%	3%
Energie Beheer Nederland	9	2%	2%
BP	8	2%	2%
Centrica	8	2%	2%
Qatar Petroleum	7	1%	1%
NOC	6	1%	1%
Edison	5	1%	1%
NNPC	4	1%	1%
Enel	4	1%	1%
Distrigas	4	1%	1%
OMV	3	1%	1%
BG	3	1%	1%
BASF	3	1%	1%
ConocoPhillips	3	1%	1%
RWE	2	1%	1%
BEB	2	1%	1%
Repsol	2	0%	0%
Norway State DFI	1	0%	0%
Wintershall	1	0%	0%
Iberdrola	1	0%	0%
Unknown others	63	14%	13%
Others	7	1%	1%
Sum or HHI	**Sum: 466**	**HHI: 620**	**HHI: 660**
Delta HHI			**40**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Market shares for different treatments of contracts

As with the UK wholesale market, we also adjust physical supply for contracted sales and purchases through long term contracts for the wholesale markets of North West Europe and Europe.

The partial adjustment of physical supply shares for sales and purchases through long term contracts is the market share measure on which we focus for the competition assessment. In this section we provide measures of market shares for North West Europe and Europe wholesale gas for physical supply with no adjustment for contracts and physical supply with full adjustment for contracts.

Detailed market shares for NW Europe

Table 78. NW European wholesale market shares and HHIs in 2016/17 – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	47.4	15%	17%
ExxonMobil	37.6	12%	11%
Statoil	34.7	11%	11%
Petoro	31.5	10%	10%
Shell	31.4	10%	10%
Energie Beheer Nederland	21.0	7%	7%
Total	18.5	6%	6%
GDF Suez	17.1	5%	5%
BP	8.4	3%	2%
ConocoPhillips	5.5	2%	2%
Centrica	5.2	2%	2%
Sonatrach	5.0	2%	2%
BG	4.9	2%	2%
Qatar Petroleum	4.0	1%	1%
ENI	3.2	1%	1%
NNPC	1.7	1%	1%
RWE	1.6	0%	0%
Wintershall	1.5	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
Unknown others	39.4	12%	11%
Others	-	0%	0%
Sum or HHI	**Sum: 320**	**HHI: 844**	**HHI: 893**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 79. NW European wholesale market shares and HHIs in 2016/17 – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	55.8	17%	20%
EON	35.4	11%	11%
Petoro	31.3	10%	10%
ExxonMobil	24.9	8%	8%
Shell	21.8	7%	7%
Centrica	15.2	5%	5%
Total	14.9	5%	4%
Distrigas	9.7	3%	3%
BP	8.7	3%	3%
Gazprom	8.0	3%	2%
BASF	7.4	2%	2%
Energie Beheer Nederland	6.9	2%	2%
BEB	5.7	2%	2%
BG	5.0	2%	2%
RWE	4.8	1%	1%
Qatar Petroleum	4.6	1%	1%
ConocoPhillips	3.9	1%	1%
Enel	2.9	1%	1%
EWE	2.6	1%	1%
EDF	2.5	1%	1%
Unknown others	39.2	12%	11%
Others	9.0	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 770**	**HHI: 837**
Delta HHI			**67**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 80. NW European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	53.8	17%	19%
ExxonMobil	35.4	11%	11%
Statoil	34.7	11%	11%
Petoro	31.5	10%	10%
Shell	29.7	9%	9%
GDF Suez	20.0	6%	6%
Total	18.5	6%	6%
Energie Beheer Nederland	16.2	5%	5%
BP	8.4	3%	2%
Sonatrach	5.1	2%	2%
ConocoPhillips	4.3	1%	1%
Qatar Petroleum	4.2	1%	1%
Centrica	4.0	1%	1%
BG	3.8	1%	1%
ENI	2.4	1%	1%
NNPC	1.8	1%	1%
RWE	1.2	0%	0%
Wintershall	1.1	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
Unknown others	43.6	14%	12%
Others	-	0%	0%
Sum or HHI	**Sum:**	**HHI: 882**	**HHI: 941**
Delta HHI			**59**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 81. NW European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	59.0	18%	21%
EON	35.7	11%	11%
Petoro	31.3	10%	10%
ExxonMobil	22.7	7%	7%
Shell	20.1	6%	6%
Total	15.0	5%	4%
Centrica	14.1	4%	4%
Gazprom	11.6	4%	4%
Distrigas	9.8	3%	3%
BP	8.7	3%	3%
BASF	7.5	2%	2%
BEB	5.7	2%	2%
Qatar Petroleum	4.6	1%	1%
RWE	4.4	1%	1%
BG	3.9	1%	1%
Energie Beheer Nederland	3.2	1%	1%
Enel	3.0	1%	1%
EWE	2.6	1%	1%
ConocoPhillips	2.6	1%	1%
EDF	2.6	1%	1%
Unknown others	43.3	14%	12%
Others	8.7	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 802**	**HHI: 873**
Delta HHI			**71**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 82. NW European wholesale market shares and HHIs in 2016/17 if EU demand growth rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	55.0	16%	18%
ExxonMobil	40.4	11%	11%
Statoil	38.1	11%	11%
Petoro	34.6	10%	10%
Shell	33.8	10%	9%
Energie Beheer Nederland	21.0	6%	6%
Total	20.3	6%	6%
GDF Suez	20.1	6%	6%
BP	9.2	3%	2%
Sonatrach	5.6	2%	2%
ConocoPhillips	5.5	2%	2%
Centrica	5.2	1%	1%
BG	4.9	1%	1%
Qatar Petroleum	4.5	1%	1%
ENI	3.2	1%	1%
NNPC	1.9	1%	1%
RWE	1.6	0%	0%
Wintershall	1.5	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
Unknown others	45.2	13%	12%
Others	-	0%	0%
Sum or HHI	**Sum: 352**	**HHI: 857**	**HHI: 905**
Delta HHI			**48**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 83. NW European wholesale market shares and HHIs in 2016/17 if EU demand growth rate increases – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	60.7	17%	19%
EON	37.1	11%	11%
Petoro	34.4	10%	10%
ExxonMobil	27.9	8%	8%
Shell	24.3	7%	7%
Total	16.9	5%	5%
Centrica	15.6	4%	4%
Gazprom	13.0	4%	4%
Distrigas	10.1	3%	3%
BP	9.6	3%	3%
BASF	7.8	2%	2%
Energie Beheer Nederland	7.0	2%	2%
BEB	5.9	2%	2%
BG	5.1	1%	1%
RWE	4.9	1%	1%
Qatar Petroleum	4.8	1%	1%
ConocoPhillips	3.9	1%	1%
Enel	3.1	1%	1%
EWE	2.7	1%	1%
EDF	2.7	1%	1%
Unknown others	45.0	13%	12%
Others	9.4	3%	3%
Sum or HHI	**Sum: 352**	**HHI: 763**	**HHI: 822**
Delta HHI			**59**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 84. NW European wholesale market shares and HHIs in 2016/17 if Gazprom supplies all new import demand – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	47.9	15%	17%
ExxonMobil	37.6	12%	11%
Statoil	34.7	11%	11%
Petoro	31.5	10%	10%
Shell	31.4	10%	10%
Energie Beheer Nederland	21.0	7%	7%
Total	18.5	6%	6%
GDF Suez	12.8	4%	4%
BP	8.4	3%	2%
ConocoPhillips	5.5	2%	2%
Centrica	5.2	2%	2%
BG	4.9	2%	2%
Sonatrach	4.9	2%	2%
Qatar Petroleum	3.5	1%	1%
ENI	3.2	1%	1%
NNPC	1.7	1%	1%
RWE	1.6	0%	0%
Wintershall	1.5	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
Unknown others	44.0	14%	13%
Others	-	0%	0%
Sum or HHI	**Sum: 320**	**HHI: 848**	**HHI: 897**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 85. NW European wholesale market shares and HHIs in 2016/17 if Gazprom supplies all new import demand – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	51.4	16%	19%
EON	35.3	11%	11%
Petoro	31.3	10%	10%
ExxonMobil	24.9	8%	8%
Shell	21.8	7%	7%
Centrica	15.1	5%	5%
Total	14.9	5%	4%
Distrigas	9.6	3%	3%
BP	8.7	3%	2%
Gazprom	8.0	2%	2%
BASF	7.4	2%	2%
Energie Beheer Nederland	6.9	2%	2%
BEB	5.7	2%	2%
BG	5.0	2%	2%
RWE	4.8	1%	1%
Qatar Petroleum	4.5	1%	1%
ConocoPhillips	3.9	1%	1%
Enel	2.9	1%	1%
EWE	2.6	1%	1%
EDF	2.5	1%	1%
Unknown others	43.7	14%	12%
Others	9.0	3%	3%
Sum or HHI	**Sum: 320**	**HHI: 736**	**HHI: 795**
Delta HHI			**59**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 86. NW European wholesale market shares and HHIs in 2021/22 – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	58.1	18%	20%
Statoil	35.2	11%	11%
ExxonMobil	34.7	11%	10%
Petoro	31.9	10%	10%
Shell	29.3	9%	9%
GDF Suez	21.7	7%	7%
Total	18.5	6%	6%
Energie Beheer Nederland	14.6	5%	5%
BP	8.1	3%	2%
Sonatrach	5.4	2%	2%
Qatar Petroleum	4.4	1%	1%
ConocoPhillips	3.8	1%	1%
Centrica	3.6	1%	1%
BG	3.4	1%	1%
ENI	2.2	1%	1%
NNPC	1.8	1%	1%
RWE	1.1	0%	0%
Wintershall	1.0	0%	0%
Nuon	0.2	0%	0%
Dyas	0.1	0%	0%
Unknown others	44.0	14%	12%
Others	-	0%	0%
Sum or HHI	**Sum: 323**	**HHI: 912**	**HHI: 976**
Delta HHI			**64**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 87. NW European wholesale market shares and HHIs in 2021/22 – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	55.0	17%	19%
Petoro	31.8	10%	10%
EON	30.5	9%	9%
Gazprom	26.1	8%	8%
ExxonMobil	25.2	8%	8%
Shell	21.9	7%	7%
Total	16.0	5%	5%
Centrica	12.2	4%	4%
BP	8.5	3%	3%
Distrigas	8.3	3%	2%
BASF	6.4	2%	2%
BEB	4.9	2%	1%
Energie Beheer Nederland	4.0	1%	1%
Qatar Petroleum	3.9	1%	1%
RWE	3.8	1%	1%
BG	3.7	1%	1%
ConocoPhillips	2.6	1%	1%
Enel	2.5	1%	1%
EWE	2.2	1%	1%
EDF	2.2	1%	1%
Unknown others	43.9	14%	12%
Others	7.7	2%	2%
Sum or HHI	**Sum: 323**	**HHI: 775**	**HHI: 838**
Delta HHI			**63**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 88. NW European wholesale market shares and HHIs in 2021/22 if EU production decline rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	73.1	23%	25%
Statoil	35.2	11%	11%
Petoro	31.9	10%	10%
ExxonMobil	29.5	9%	9%
GDF Suez	28.3	9%	9%
Shell	25.3	8%	8%
Total	18.5	6%	6%
BP	8.1	3%	2%
Sonatrach	5.6	2%	2%
Qatar Petroleum	4.9	2%	2%
Energie Beheer Nederland	3.5	1%	1%
NNPC	1.9	1%	1%
ConocoPhillips	0.9	0%	0%
Centrica	0.9	0%	0%
BG	0.8	0%	0%
ENI	0.5	0%	0%
RWE	0.3	0%	0%
Wintershall	0.2	0%	0%
Nuon	0.0	0%	0%
Dyas	0.0	0%	0%
Unknown others	53.7	17%	15%
Others	-	0%	0%
Sum or HHI	**Sum: 323**	**HHI: 1063**	**HHI: 1152**
Delta HHI			**89**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 89. NW European wholesale market shares and HHIs in 2021/22 if EU demand growth rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	73.3	19%	21%
Statoil	42.1	11%	11%
ExxonMobil	40.3	10%	10%
Petoro	38.2	10%	10%
Shell	34.1	9%	9%
GDF Suez	27.6	7%	7%
Total	22.2	6%	6%
Energie Beheer Nederland	14.6	4%	4%
BP	9.8	3%	2%
Sonatrach	6.5	2%	2%
Qatar Petroleum	5.4	1%	1%
ConocoPhillips	3.8	1%	1%
Centrica	3.6	1%	1%
BG	3.4	1%	1%
NNPC	2.2	1%	1%
ENI	2.2	1%	1%
RWE	1.1	0%	0%
Wintershall	1.0	0%	0%
Nuon	0.2	0%	0%
Dyas	0.1	0%	0%
Unknown others	55.6	14%	13%
Others	-	0%	0%
Sum or HHI	**Sum: 387**	**HHI: 940**	**HHI: 996**
Delta HHI			**56**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 90. NW European wholesale market shares and HHIs in 2021/22 if Gazprom supplies all new import demand – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	59.1	18%	21%
Statoil	35.2	11%	11%
ExxonMobil	34.7	11%	10%
Petoro	31.9	10%	10%
Shell	29.3	9%	9%
Total	18.5	6%	6%
Energie Beheer Nederland	14.6	5%	5%
GDF Suez	12.6	4%	4%
BP	8.1	3%	2%
Sonatrach	5.1	2%	2%
ConocoPhillips	3.8	1%	1%
Centrica	3.6	1%	1%
Qatar Petroleum	3.6	1%	1%
BG	3.4	1%	1%
ENI	2.2	1%	1%
NNPC	1.7	1%	1%
RWE	1.1	0%	0%
Wintershall	1.0	0%	0%
Nuon	0.2	0%	0%
Dyas	0.1	0%	0%
Unknown others	53.3	16%	15%
Others	-	0%	0%
Sum or HHI	**Sum: 323**	**HHI: 899**	**HHI: 965**
Delta HHI			**66**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 91. NW European wholesale market shares and HHIs in 2021/22 if Gazprom supplies all new import demand – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm/year)	Market share	
GDF Suez	45.6	14%	17%
Petoro	31.8	10%	10%
EON	30.2	9%	9%
Gazprom	27.0	8%	8%
ExxonMobil	25.2	8%	8%
Shell	21.9	7%	7%
Total	16.0	5%	5%
Centrica	12.1	4%	4%
BP	8.5	3%	3%
Distrigas	8.2	3%	2%
BASF	6.3	2%	2%
BEB	4.8	1%	1%
Energie Beheer Nederland	4.0	1%	1%
Qatar Petroleum	3.9	1%	1%
RWE	3.8	1%	1%
BG	3.6	1%	1%
ConocoPhillips	2.6	1%	1%
Enel	2.5	1%	1%
EWE	2.2	1%	1%
EDF	2.2	1%	1%
Unknown others	53.3	16%	15%
Others	7.6	2%	2%
Sum or HHI	**Sum: 323**	**HHI: 694**	**HHI: 743**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Detailed market shares for Europe

Table 92. European wholesale market shares and HHIs in 2016/17 – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	82.9	18%	20%
Sonatrach	46.8	10%	10%
ExxonMobil	42.0	9%	9%
Statoil	38.1	8%	8%
Shell	35.0	8%	8%
Petoro	32.8	7%	7%
Energie Beheer Nederland	22.1	5%	5%
Total	20.3	4%	4%
GDF Suez	17.1	4%	4%
Qatar Petroleum	10.5	2%	2%
ENI	10.2	2%	2%
BP	8.4	2%	2%
Union Fenosa	7.2	2%	2%
NNPC	6.5	1%	1%
NOC	5.9	1%	1%
BG	5.6	1%	1%
ConocoPhillips	5.5	1%	1%
Centrica	5.2	1%	1%
RWE	1.6	0%	0%
Wintershall	1.5	0%	0%
Norway State DFI	1.3	0%	0%
OMV	0.9	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
EVN AG	0.2	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	48.4	12%	11%
Sum or HHI	**Sum: 456.7**	**HHI: 819**	**HHI: 868**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 93. European wholesale market shares and HHIs in 2016/17 – full contract adjustment

Company	Counterfactual		GdF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	58.3	13%	14%
ENI	54.5	12%	12%
EON	36.5	8%	8%
Petoro	31.9	7%	7%
Union Fenosa	30.1	7%	7%
ExxonMobil	24.0	5%	5%
Shell	20.6	5%	4%
Centrica	15.5	3%	3%
Total	14.9	3%	3%
Edison	11.4	2%	2%
Enel	10.6	2%	2%
Distrigas	10.0	2%	2%
Gazprom	8.2	2%	2%
BP	8.2	2%	2%
BASF	7.6	2%	2%
OMV	7.6	2%	2%
NOC	5.9	1%	1%
BEB	5.8	1%	1%
RWE	4.8	1%	1%
Qatar Petroleum	4.7	1%	1%
BG	3.8	1%	1%
Repsol	3.7	1%	1%
Energie Beheer Nederland	3.7	1%	1%
ConocoPhillips	3.5	1%	1%
Iberdrola	2.8	1%	1%
EWE	2.7	1%	1%
EDF	2.6	1%	1%
Thyssengas	2.6	1%	1%
Wintershall	2.0	0%	0%
Energia	1.6	0%	0%
Unknown others	47.9	10%	10%
Others	8.7	2%	2%
Sum or HHI	**Sum: 456.7**	**HHI: 607**	**HHI: 640**
Delta HHI			**33**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 94. European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	90.4	20%	22%
Sonatrach	47.8	10%	10%
ExxonMobil	39.8	9%	9%
Statoil	38.1	8%	8%
Shell	33.3	7%	7%
Petoro	32.8	7%	7%
Total	20.3	4%	4%
GDF Suez	20.0	4%	4%
Energie Beheer Nederland	17.1	4%	4%
Qatar Petroleum	10.8	2%	2%
BP	8.4	2%	2%
ENI	7.9	2%	2%
Union Fenosa	7.2	2%	2%
NNPC	6.6	1%	1%
NOC	6.1	1%	1%
BG	4.3	1%	1%
ConocoPhillips	4.3	1%	1%
Centrica	4.0	1%	1%
Norway State DFI	1.3	0%	0%
RWE	1.2	0%	0%
Wintershall	1.1	0%	0%
OMV	0.7	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
EVN AG	0.1	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	52.5	13%	12%
Others	-	0%	0%
Sum or HHI	**Sum: 457**	**HHI: 870**	**HHI: 925**
Delta HHI			**55**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 95. European wholesale market shares and HHIs in 2016/17 if EU production decline rate increases – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	60.8	13%	15%
ENI	51.8	11%	11%
EON	36.2	8%	8%
Petoro	31.9	7%	7%
Union Fenosa	30.0	7%	7%
ExxonMobil	21.7	5%	5%
Shell	18.8	4%	4%
Total	14.8	3%	3%
Gazprom	14.7	3%	3%
Centrica	14.2	3%	3%
Edison	11.3	2%	2%
Enel	10.5	2%	2%
Distrigas	9.9	2%	2%
BP	8.2	2%	2%
BASF	7.5	2%	2%
OMV	7.3	2%	2%
NOC	6.1	1%	1%
BEB	5.8	1%	1%
Qatar Petroleum	4.6	1%	1%
RWE	4.4	1%	1%
Repsol	3.7	1%	1%
Energie Beheer Nederland	3.2	1%	1%
Iberdrola	2.8	1%	1%
EWE	2.7	1%	1%
EDF	2.6	1%	1%
Thyssengas	2.6	1%	1%
BG	2.5	1%	1%
ConocoPhillips	2.3	1%	1%
Energia	1.6	0%	0%
Wintershall	1.6	0%	0%
Unknown others	52.1	11%	11%
Others	8.5	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 608**	**HHI: 643**
Delta HHI			**35**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 96. European wholesale market shares and HHIs in 2016/17 if EU demand growth rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	94.5	19%	20%
Sonatrach	51.9	10%	10%
ExxonMobil	45.3	9%	9%
Statoil	42.0	8%	8%
Shell	37.7	8%	7%
Petoro	36.1	7%	7%
Total	22.3	4%	4%
Energie Beheer Nederland	22.1	4%	4%
GDF Suez	20.1	4%	4%
Qatar Petroleum	11.7	2%	2%
ENI	10.2	2%	2%
BP	9.2	2%	2%
Union Fenosa	7.9	2%	2%
NNPC	7.2	1%	1%
NOC	6.6	1%	1%
BG	5.6	1%	1%
ConocoPhillips	5.5	1%	1%
Centrica	5.2	1%	1%
RWE	1.6	0%	0%
Norway State DFI	1.5	0%	0%
Wintershall	1.5	0%	0%
OMV	0.9	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
EVN AG	0.2	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	55.0	12%	11%
Others	-	0%	0%
Sum or HHI	**Sum: 502**	**HHI: 838**	**HHI: 884**
Delta HHI			**46**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 97. European wholesale market shares and HHIs in 2016/17 if EU demand growth rate increases – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	63.0	13%	14%
ENI	56.5	11%	11%
EON	38.0	8%	8%
Petoro	35.2	7%	7%
Union Fenosa	31.8	6%	6%
ExxonMobil	27.4	5%	5%
Shell	23.4	5%	5%
Gazprom	19.2	4%	4%
Total	17.0	3%	3%
Centrica	15.9	3%	3%
Edison	11.8	2%	2%
Enel	11.0	2%	2%
Distrigas	10.4	2%	2%
BP	9.1	2%	2%
BASF	7.9	2%	2%
OMV	7.9	2%	2%
NOC	6.6	1%	1%
BEB	6.1	1%	1%
RWE	4.9	1%	1%
Qatar Petroleum	4.9	1%	1%
BG	3.9	1%	1%
Repsol	3.8	1%	1%
Energie Beheer Nederland	3.8	1%	1%
ConocoPhillips	3.5	1%	1%
Iberdrola	2.9	1%	1%
EWE	2.8	1%	1%
EDF	2.7	1%	1%
Thyssengas	2.7	1%	1%
Wintershall	2.0	0%	0%
Energia	1.7	0%	0%
Unknown others	54.7	11%	10%
Others	9.7	2%	2%
Sum or HHI	**Sum: 502**	**HHI: 589**	**HHI: 618**
Delta HHI			**29**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 98. European wholesale market shares and HHIs in 2016/17 with Gazprom meeting all new import demand – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	85.5	19%	20%
Sonatrach	45.0	10%	10%
ExxonMobil	42.0	9%	9%
Statoil	38.1	8%	8%
Shell	35.0	8%	8%
Petoro	32.8	7%	7%
Energie Beheer Nederland	22.1	5%	5%
Total	20.3	4%	4%
GDF Suez	12.8	3%	3%
ENI	10.2	2%	2%
Qatar Petroleum	9.7	2%	2%
BP	8.4	2%	2%
Union Fenosa	7.1	2%	2%
NNPC	6.4	1%	1%
BG	5.6	1%	1%
NOC	5.6	1%	1%
ConocoPhillips	5.5	1%	1%
Centrica	5.2	1%	1%
RWE	1.6	0%	0%
Wintershall	1.5	0%	0%
Norway State DFI	1.3	0%	0%
OMV	0.9	0%	0%
Nuon	0.2	0%	0%
Dyas	0.2	0%	0%
EVN AG	0.2	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	53.2	13%	12%
Others	-	0%	0%
Sum or HHI	**Sum: 457**	**HHI: 832**	**HHI: 883**
Delta HHI			**51**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 99. European wholesale market shares and HHIs in 2016/17 with Gazprom meeting all new import demand – full contract adjustment

Company	Counterfactual		ENI takes Grain 4
	Volume (bcm)	Market share	
ENI	54.2	12%	14%
GDF Suez	53.7	12%	12%
EON	36.3	8%	8%
Petoro	31.9	7%	7%
Union Fenosa	29.9	7%	7%
ExxonMobil	24.0	5%	5%
Shell	20.5	4%	4%
Centrica	15.4	3%	3%
Total	14.8	3%	3%
Edison	11.3	2%	2%
Enel	10.5	2%	2%
Distrigas	9.9	2%	2%
Gazprom	9.8	2%	2%
BP	8.2	2%	2%
OMV	7.6	2%	2%
BASF	7.6	2%	2%
BEB	5.8	1%	1%
NOC	5.6	1%	1%
RWE	4.8	1%	1%
Qatar Petroleum	4.7	1%	1%
BG	3.8	1%	1%
Repsol	3.7	1%	1%
Energie Beheer Nederland	3.7	1%	1%
ConocoPhillips	3.5	1%	1%
Iberdrola	2.8	1%	1%
EWE	2.7	1%	1%
EDF	2.6	1%	1%
Thyssengas	2.6	1%	1%
Wintershall	2.0	0%	0%
Energia	1.6	0%	0%
Unknown others	52.7	12%	11%
Others	8.5	2%	2%
Sum or HHI	**Sum: 457**	**HHI: 588**	**HHI: 618**
Delta HHI			**30**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 100. European wholesale market shares and HHIs in 2021/22 – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm)	Market share	
Gazprom	96.9	21%	22%
Sonatrach	50.3	11%	11%
ExxonMobil	39.3	8%	8%
Statoil	38.8	8%	8%
Petoro	33.4	7%	7%
Shell	33.0	7%	7%
GDF Suez	21.7	5%	5%
Total	20.5	4%	4%
Energie Beheer Nederland	15.4	3%	3%
Qatar Petroleum	11.3	2%	2%
BP	8.1	2%	2%
Union Fenosa	7.7	2%	2%
ENI	7.1	2%	2%
NNPC	7.0	1%	1%
NOC	6.4	1%	1%
BG	3.9	1%	1%
ConocoPhillips	3.8	1%	1%
Centrica	3.6	1%	1%
Norway State DFI	1.4	0%	0%
RWE	1.1	0%	0%
Wintershall	1.0	0%	0%
OMV	0.7	0%	0%
Nuon	0.2	0%	0%
Dyas	0.1	0%	0%
EVN AG	0.1	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	53.4	13%	12%
Others	-	0%	0%
Sum or HHI	**Sum: 467**	**HHI: 906**	**HHI: 963**
Delta HHI			**57**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 101. European wholesale market shares and HHIs in 2021/22 – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	55.8	12%	14%
ENI	44.1	9%	9%
Gazprom	39.4	8%	8%
Petoro	32.7	7%	7%
EON	30.2	6%	6%
Union Fenosa	26.7	6%	6%
ExxonMobil	25.7	6%	5%
Shell	22.1	5%	5%
Total	16.5	4%	3%
Centrica	12.1	3%	3%
Sonatrach	10.2	2%	2%
Edison	9.4	2%	2%
Enel	8.8	2%	2%
Distrigas	8.2	2%	2%
BP	8.1	2%	2%
NOC	6.4	1%	1%
BASF	6.3	1%	1%
OMV	6.2	1%	1%
BEB	4.8	1%	1%
Qatar Petroleum	3.9	1%	1%
RWE	3.8	1%	1%
Repsol	3.1	1%	1%
BG	2.7	1%	1%
Energie Beheer Nederland	2.7	1%	1%
ConocoPhillips	2.3	1%	1%
Iberdrola	2.3	0%	0%
EWE	2.2	0%	0%
NNPC	2.2	0%	0%
EDF	2.2	0%	0%
Thyssengas	2.1	0%	0%
Unknown others	53.2	11%	11%
Others	9.9	2%	2%
Sum or HHI	**Sum: 467**	**HHI: 573**	**HHI: 602**
Delta HHI			**29**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 102. European wholesale market shares and HHIs in 2021/22 if EU production decline rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	114.3	24%	26%
Sonatrach	52.6	11%	11%
Statoil	38.8	8%	8%
ExxonMobil	34.1	7%	7%
Petoro	33.4	7%	7%
Shell	29.0	6%	6%
GDF Suez	28.3	6%	6%
Total	20.5	4%	4%
Qatar Petroleum	12.1	3%	3%
BP	8.1	2%	2%
Union Fenosa	7.8	2%	2%
NNPC	7.1	2%	2%
NOC	6.8	1%	1%
Energie Beheer Nederland	3.7	1%	1%
ENI	1.7	0%	0%
Norway State DFI	1.4	0%	0%
BG	0.9	0%	0%
ConocoPhillips	0.9	0%	0%
Centrica	0.9	0%	0%
RWE	0.3	0%	0%
Wintershall	0.2	0%	0%
OMV	0.2	0%	0%
Nuon	0.0	0%	0%
Dyas	0.0	0%	0%
EVN AG	0.0	0%	0%
EON	0.0	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	63.1	16%	15%
Others	-	0%	0%
Sum or HHI	**Sum: 466**	**HHI: 1075**	**HHI: 1145**
Delta HHI			**70**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 103. European wholesale market shares and HHIs in 2021/22 if EU demand growth rate increases – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	120.0	22%	23%
Sonatrach	60.6	11%	11%
Statoil	46.5	8%	8%
ExxonMobil	45.8	8%	8%
Petoro	40.0	7%	7%
Shell	38.5	7%	7%
GDF Suez	27.6	5%	5%
Total	24.5	4%	4%
Energie Beheer Nederland	15.4	3%	3%
Qatar Petroleum	13.7	2%	2%
BP	9.8	2%	2%
Union Fenosa	9.2	2%	2%
NNPC	8.3	1%	1%
NOC	7.7	1%	1%
ENI	7.1	1%	1%
BG	3.9	1%	1%
ConocoPhillips	3.8	1%	1%
Centrica	3.6	1%	1%
Norway State DFI	1.7	0%	0%
RWE	1.1	0%	0%
Wintershall	1.0	0%	0%
OMV	0.7	0%	0%
Nuon	0.2	0%	0%
Dyas	0.1	0%	0%
EVN AG	0.1	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	66.7	14%	13%
Others	-	0%	0%
Sum or HHI	**Sum: 558**	**HHI: 935**	**HHI: 984**
Delta HHI			**49**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

Table 104. European wholesale market shares and HHIs in 2021/22 if Gazprom supplies all new import demand – no contract adjustment

Company	Counterfactual		Gazprom takes Grain 4
	Volume (bcm/year)	Market share	
Gazprom	101.6	22%	24%
Sonatrach	47.0	10%	10%
ExxonMobil	39.3	8%	8%
Statoil	38.8	8%	8%
Petoro	33.4	7%	7%
Shell	33.0	7%	7%
Total	20.5	4%	4%
Energie Beheer Nederland	15.4	3%	3%
GDF Suez	12.6	3%	3%
Qatar Petroleum	10.0	2%	2%
BP	8.1	2%	2%
Union Fenosa	7.6	2%	2%
ENI	7.1	2%	2%
NNPC	6.8	1%	1%
NOC	5.8	1%	1%
BG	3.9	1%	1%
ConocoPhillips	3.8	1%	1%
Centrica	3.6	1%	1%
Norway State DFI	1.4	0%	0%
RWE	1.1	0%	0%
Wintershall	1.0	0%	0%
OMV	0.7	0%	0%
Nuon	0.2	0%	0%
Dyas	0.1	0%	0%
EVN AG	0.1	0%	0%
EON	0.1	0%	0%
Salzburg AG	0.0	0%	0%
AGSC	-	0%	0%
Unknown others	63.2	16%	15%
Others	-	0%	0%
Sum or HHI	**Sum: 466**	**HHI: 935**	**HHI: 995**
Delta HHI			**60**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Table 105. European wholesale market shares and HHIs in 2021/22 if Gazprom supplies all new import demand – full contract adjustment

Company	Counterfactual		GDF Suez takes Grain 4
	Volume (bcm)	Market share	
GDF Suez	46.5	10%	12%
Gazprom	44.1	9%	9%
ENI	43.8	9%	9%
Petoro	32.7	7%	7%
EON	30.1	6%	6%
Union Fenosa	26.5	6%	6%
ExxonMobil	25.7	6%	5%
Shell	22.1	5%	5%
Total	16.5	4%	3%
Centrica	12.1	3%	3%
Edison	9.4	2%	2%
Enel	8.7	2%	2%
Distrigas	8.2	2%	2%
BP	8.1	2%	2%
Sonatrach	6.9	1%	1%
BASF	6.3	1%	1%
OMV	6.1	1%	1%
NOC	5.8	1%	1%
BEB	4.8	1%	1%
Qatar Petroleum	3.9	1%	1%
RWE	3.7	1%	1%
Repsol	3.0	1%	1%
BG	2.7	1%	1%
Energie Beheer Nederland	2.7	1%	1%
ConocoPhillips	2.3	1%	1%
Iberdrola	2.3	0%	0%
EWE	2.2	0%	0%
EDF	2.2	0%	0%
Thyssengas	2.1	0%	0%
NNPC	2.0	0%	0%
Unknown others	63.0	14%	13%
Others	9.9	2%	2%
Sum or HHI	**Sum: 466**	**HHI: 559**	**HHI: 581**
Delta HHI			**22**

Source: Frontier analysis based on data from Wood Mackenzie and public sources

Annexe 3: Market shares in the NW Europe and European wholesale markets

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