

MEMORANDUM

LECG response to Ofgem's consultation on market power in the electricity wholesale sector

To OFGEM, re: public consultation on "Initial proposals on addressing market power concerns in the electricity wholesale sector"

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1. Introduction

LECG welcomes the opportunity to respond to the above consultation.

This paper sets out our views on the consultation. Our main conclusions are as follows:

- There are two main ways market power arises in the wholesale GB electricity markets. These are market power related to: import constraints and export constraints. In addition arbitrage between the Balancing Mechanism and the forward energy market may cause wealth transfers from customers to generators, that would not feature under alternative congestion management regimes. The policy that Ofgem adopts must consider how to address each of these issues.
- We discuss three policies that Ofgem has identified in dealing with market power concerns. Those are: improving the access of generators to the transmission network (the Transmission Access Review); changing the incentives or asset ownership of generators; and *ex post* and *ex ante* assessment.
 - We believe that the Transmission Access Review may help address issues of export market power and reduce the arbitrage opportunity when there are export constraints. However, it is unlikely to have much impact on import market power or reduce the arbitrage opportunity when there are import constraints.
 - Changes in the incentives or asset ownership may help resolve market power issues if they impact on transmission capacity and/or generation ownership structure. However, we share Ofgem's concerns that there may be some

limitations to the impact such remedies can have. For example, a fragmented market may prevent the full exploitation of generation economies of scale.

- There have been major developments in the tools and techniques for assessing market power in electricity markets since Ofgem last tried to introduce a Market Abuse Licence Condition (MALC) into the licences of major generators. As the Competition Commission acknowledged at the time, this condition was flawed as it did not give generators sufficient certainty as to when their actions would be considered abusive, and when they would be benign. However, new techniques, such as the development of pivotality measures, make it possible to reduce this level of uncertainty. However, this would involve a condition which is much narrower and limits Ofgem's discretion relative to the previous MALC.
- We believe that although *ex post* and *ex ante* assessment may require some differences in institutional and organisation solutions, these differences are more apparent than real. The two approaches have much in common and, if applied in the same way, should have the same outcome for consumers. In particular, if *ex-post* assessment is to be applied in a rigorous way, then this will require exactly the same analytical tools to be developed as for *ex-ante* assessment.
- We believe the methodology that Ofgem adopts to identify market power and restoring competition outcomes should be based on the principles of transparency and consistency. Ofgem should identify benchmarks against which market participants can judge whether they are at risk of infringing competition rules. We also believe that there may be benefits to modifying the Balancing Mechanism to settle generators based on locational marginal prices rather than on the current pay-as-bid basis.

Our response is organised as follows. In section 2 we describe our vision of the three major problems related to market power in the GB electricity market. In section 3 we discuss potential effectiveness of remedies to these problems proposed by Ofgem in the consultation document including the *ex-ante* regulation and licence condition on generators. Finally, in section 4 we propose implementation details of *ex-ante* and *ex-post* market power mitigation systems outlined in the consultation paper. In particular, in this section we lay out the principles of structural and behavioural tests of market power mitigation applicable in the GB context. We also discuss the benefits of the Balancing Mechanism based on locational marginal prices as opposed to the pay-as-bid arrangement.

2. Market power opportunities in the GB wholesale power market

According to the description of the problem presented in the Ofgem's consultation and the recent investigations by Ofgem, one can identify three major problems related to market power in the GB wholesale power market. The first problem is the exercise of market power in the Balancing Mechanism with respect to import constraints; the second is the exercise of market power in the Balancing Mechanism with respect to export

constraints; and the third problem is the arbitrage between the forward energy trades and the Balancing Market. We describe these problems in more detail below.

“Import” market power

Electricity markets are susceptible to the rise of market power due to the inelasticity of supply and demand in the short-term and the fact that electricity cannot be economically stored to any significant extent. The presence of transmission constraints reduces the geographic size of the relevant market and therefore further exacerbates the general problem of market power in electricity markets. Binding transmission constraints within a large market result in fragmented geographic sub-markets, in which the concentration of generators is often higher than at the broader market level.

When transmission constraints are binding in the direction of a large load centre, this centre becomes a separate relevant market, or a “load pocket” and generators from outside of the load pocket may not exert competitive pressure on the generators within the pocket. We will refer to such situations as market power relative to import constraints.

The incentives and ability of generators to exercise such “import” locational market power do not depend much on market arrangements; they mostly depend on the topology of the transmission network and the location of load centres and ownership structure of generators within the network.

In electricity markets where congestion is dealt with by counter-trading performed in the Balancing Mechanism (such as the market of the GB), generators that possess locational market power relative to import constraints can exercise their market power by manipulating the incremental balancing prices received from the System Operator (SO) to relieve congestion. In markets where congestion pricing is integrated within energy markets through locational marginal prices (e.g. electricity markets of the US), market power relative to import constraints can be exercised through increasing the locational price.

Cases of alleged exercise of “import” market power have been recently a subject of investigation in Spain and Italy. The situation in September-October 2007 in Scotland investigated by Ofgem might have been an example of the exercise of import market power.

“Export” market power

Under current market arrangements in the GB, no transmission congestion is assumed during the forward energy trades until gate closure. If the unconstrained market results in scheduling more output in a given area than available export transmission capacity allows, the System Operator has to reduce the output of these generators by selling power back to them at the price of generators’ balancing bids, while accepting balancing offers on the other side of the constraint. This feature of the GB market design may provide additional opportunities for generators to exercise market power. When concentration of generators in an export-constrained area is high, they can exercise their “export” market power by first, scheduling enough power to create a constraint, and then setting very low or negative buy-back balancing bids. In particular, this may happen if

there are one or several generators in the export constrained area for whom the export constraint cannot be relieved unless they reduce their output.

Ofgem refers to the evidence of such behaviour in the UK electricity market after its expansion to include Scotland. In particular, Ofgem suggests that Scottish generators have submitted lower bids than comparable generators in the rest of GB at times when the Scottish export constraint was binding.

Similar behaviour has been widely documented internationally, in particular in the Californian electricity market in which congestion within large price zones was managed through counter-trades performed in the real-time balancing market. This behaviour, referred to as the “DEC game”, has contributed to the revision of the market arrangements and adoption of the market based on locational prices.

Arbitrage between Balancing Mechanism and the forward energy trades

In the GB system, forward markets clear assuming no transmission constraints, while in the Balancing Mechanism bids and offers are accepted taking into account their impact on transmission constraints. Because forward markets and the balancing market account for transmission constraints differently, artificial arbitrage opportunities that affect bidding incentives and the price outcomes in both markets may result. Major wealth transfers between electricity consumers and producers may result, even in the absence of any market power in generation.

Such arbitrage opportunities occur when it can be expected that to relieve congestion the SO will have to accept offers of generators in the import constrained area with variable costs which are higher than the unconstrained market price. In such situations generators in that location whose variable cost would normally allow them to profitably sell in the unconstrained forward market, may prefer to offer their power in the Balancing Mechanism in the hope of receiving a higher balancing price. More generally they will not want to sell their power in the forward markets at a price lower than the one they expect to obtain in the Balancing Mechanism.

Therefore, if case congestion is expected, forward energy offers by generators located in the import-constrained areas may reflect the expectation of the highest offer price in their location accepted in the Balancing Mechanism. Alternatively, these generators may decide not to sell power forward at all and offer it in the Balancing Mechanism only. Both an increase of the forward offer price or a withholding from the forward market may result in an increase in the forward price propagating throughout the entire GB market.

Thus, artificial arbitrage opportunities created by the existence of two subsequent markets that are run assuming different network representations (one unconstrained and the other accounting for constraints) may have an impact on the offering and the price in the forward unconstrained market.

The exercise of such arbitrage does not by itself represent the exercise of market power. This arbitrage opportunity can arise in perfectly competitive situations and be exercised by any small generator that has no impact on any price. Yet, there are several reasons why it is important to keep in mind the possibility of such an arbitrage opportunity when discussing market power issues:

- First, this arbitrage suggests that the exercise of “import” market power in the Balancing Mechanism through inflation of accepted offer prices in import constrained areas should not be expected to be contained within the Balancing Mechanism. Instead, such market power will have a wider impact on the unconstrained forward market.
- Second, this arbitrage will tend to occur when significant and persistent congestion can be anticipated by market participants. If Ofgem is correct in expecting that constraints will become more of an issue in the future, then the amount of such arbitrage should be expected to increase dramatically as soon consistent congestion patterns become apparent. This could result in large shifts of power trades from forward market trades into the Balancing Mechanism. This is significant as the Balancing Mechanism is intended to be relatively small in volume compared to the forward trades. This may have a snowball impact on the balancing costs of National Grid. The presence of market power would further aggravate the impact on National Grid’s costs.
- Finally, the possibility of such arbitrage implies that *ex-ante* or *ex-post* investigation of operators’ behaviour in the forward market is meaningless. Any suspicious offer in the forward market or absence thereof can be a result of artificial arbitrage opportunities provided by the co-existence of the unconstrained forward market and the constrained Balancing Mechanism.

3. Policies addressing market power

In this section we address the potential of the policies discussed in Ofgem’s consultation in dealing with each of the three problems outlined above. In particular, we discuss here the Transmission Access Review, alignment in the TO and SO incentives, and changes in assets and ownership structures. In the end we address the general aspects of the *ex-post* and *ex-ante* market power mitigation.

Transmission Access Review

Transmission Access Review (TAR) led by Ofgem and the UK Department for Business, Enterprise and Regulatory Reform (BERR) is aimed at improving the access of generators to the existing transmission network. Certain models considered within the TAR suggest modifications of market arrangements in which generators in the export constrained areas would face marginal price of energy at their location rather than nation-wide unconstrained prices. These models are Model B – Market Model and Model C – Locational Marginal Pricing approach¹. Locational energy price accounting for existing export constraints is expected to result from at least two market mechanisms suggested by these models. First, locational marginal prices will result from locational overrun costs attributed to generators whose output in excess of the amount of their

¹ Ofgem and BERR, Transmission Access Review – Final Report, 26 June 2008

transmission access rights creates such overrun (Model C and Model B). Second, the locational energy price may be the result of the secondary trading of short-term transmission access rights within an export-constrained area (Model B).

These models may have several implications for the market power issues:

- First, if TAR models introduce elements of locational marginal pricing this should not be expected to have much impact on import market power. In markets, in which congestion pricing is completely integrated within energy markets through locational marginal prices, import market power can still be exercised through increasing the locational price.
- Second, TAR models B and C may help address the issues of export market power. When confronted with the prospect of facing the marginal price in their export-constrained location, generators will have no incentive to schedule output in excess of export transmission capacity. In fact, a correctly calculated locational marginal price should be the result of the schedule that respects the export transmission capacity limitations. The mitigating effect of locational marginal pricing relative to export market power has been confirmed by the experience of the US markets, e.g. California.
- Finally, TAR models B and C could help reduce artificial arbitrage opportunity between the Balancing Mechanism and the forward markets, by already addressing some constraint issues at the forward market stage. However, the TAR models mostly focus on allocating export transmission capacity. It is therefore unclear to what extent they will be able to reduce the arbitrage opportunity in case of import constraints and import market power. The TAR should consider a full-scale locational marginal price mechanism in the forward market to efficiently remove all artificial arbitrage between the forward and the balancing markets due to constraints.

Assets, ownership, and incentives

Changes in incentives and assets ownership may only help resolving the issue of market power as long as they impact on the available transmission capacity and/or generation ownership structure and help prevent firms from being in a position of market power.

We therefore agree with Ofgem that improved mechanisms to align SO and TO incentives can contribute to relieving market power issues as long as these incentives help increasing available transmission capacity during constrained periods.

We also agree that investing in transmission capacity and addressing generators ownership structure through complete divestiture or virtual power plants has a direct impact on market power.

However, we also share the view of Ofgem that all these measures may have a limited and/or temporary impact in addressing market power. For instance, structural remedies needed to effectively mitigate local market power issues may induce a highly fragmented generation industry structure, thus preventing full exploitation of generation scale economies. These are also a very intrusive measure, which interfere with property rights and should only be carried out as a last resort.

Ex-ante and ex-post approaches: differences and analogies

Although we believe that export market power can be to some extent mitigated by the choice of the right TAR model, addressing the issues of import market power may require regulatory control of bidding behaviour that can be performed *ex-post* using the market power licence condition or *ex-ante*, using the market power mitigation measures similar to those applied in the electricity markets of the US. We discuss these two approaches below.

In the consultation document, Ofgem highlights the differences between the Market Power Licence Condition (MPLC) that would enable Ofgem's to carry out *ex-post* investigations of generator behaviour and impose fines if participants were found to be exploiting a position of market power, and the *ex-ante* framework for controlling market power and potential undue exploitation.

In Ofgem's view, the *ex-ante* approach provides greater certainty to market participants regarding what is "acceptable" behaviour and is less complex to administer once the procedure is established compared to *ex-post* investigations under licence condition. On the other hand, Ofgem is cautious that the *ex-ante* approach may be overly intrusive and may unduly suppress the price signals necessary for efficient investment.

We would like to comment on Ofgem's view of the relative merits of the two approaches. In particular, although we agree that the two approaches may indeed require different institutional and organisation solutions, we would like to stress that the two approaches have very much in common and may require development of identical analytic tools for identification of potentially abusive behaviour and restoring the competitive outcomes. These comments are presented below.

- First, in order for the *ex-post* approach to provide the same level of certainty for market participants as the *ex-ante* approach, it should apply a standardised and transparent methodology for identification of potentially abusive bidding behaviour. The *ex-post* investigations should be triggered by clearly identified market conditions and the investigation methodology should be applied in a non-discriminatory way to all participants. Such standardised methodology of *ex-post* investigations would set a clear signal to the market participant on what is an acceptable behaviour and would help reduce uncertainty. As a result, such *ex-post* investigations will trigger and identify potentially abusive behaviour in much the same way as would the automatic *ex-ante* market power mitigation.
- Second, the two systems may be perceived to be different in acting upon establishing abusive behaviour. With the *ex-ante* mitigation mechanism, abusive behaviour is prevented and the market outcome does not reflect any abusive exercise of market power. With *ex-post* mitigation mechanism customers pay exploitative prices and have to take actions to seek compensation from the generator found guilty of abusive behaviour. The *ex-post* investigation would then be undoing the damage incurred to the market by the abusive behaviour, whereas *ex-ante* regulation will not let this damage happen. In order to reduce the customer's uncertainty relative to their exposure to the exploitative prices, the *ex-post* approach would have to apply standard methods to restore competitive market outcomes after

the fact. Therefore, again, if applied using consistent criteria, the two approaches would yield an identical result.

- Finally, the extent to which both mechanisms are intrusive depends on the exact details of the mechanism. For example, in some European countries (e.g. Belgium) balancing offers and bids are cost-based. This is equivalent to having all offers and bids *ex-ante* mitigated at all times. As opposed to this extreme case of *ex-ante* regulation, *ex-ante* regulation used in the US is much less intrusive, addressing only a small fraction of the balancing offers and bids based on a pre-defined set of criteria of potentially abusive offers. All other offers remain market based. Statistics presented in the appendix to this response suggests that the average frequency of *ex-ante* market power mitigation in PJM Interconnection is marginal.

Thus, there might be little difference in the choice between these two approaches from an economic standpoint as long as the two approaches use and apply identical criteria for identification of abusive behaviour and to restore the competitive market outcome. Both methods can and should be adjusted to provide a reasonable trade-off between preventing undue price exploitation and unduly suppressing price signals. Screens and tests identifying market power exercise should be designed to minimize the risk of a false positive outcome and regulatory intervention when no market power has actually been exercised. Regardless of whether the *ex-ante* or *ex-post* method is chosen, the screens should be constantly reviewed and modified to provide the best trade-off.

4. The building blocks of market power mitigation system

In this section we discuss essential elements of a methodology for identifying market power and restoring competitive outcomes that can be applied in the context of either *ex-post* investigations or automatic *ex-ante* market power mitigation procedures.

Structural market power screens

An investigation of exploitative market power behaviour, whether performed *ex-ante* or *ex-post* should first of all verify whether the firm or firms involved are in a position of market power.

Although the structure of the electricity market in GB as a whole is perhaps competitive most of the time, this may not be so in particular time-periods at particular locations due to internal GB transmission constraints.

Pivotality tests can be adapted to measure competitiveness with respect to constraints. This would mean that a firm would have market power if National Grid had no alternative but to purchase power from that firm or sell power to it in a given half-hour to relieve a transmission constraint². Pivotality tests can be developed to screen the indispensability of operators to relieve individual constraints or the combination of monitored constraints.

² This can also be due to some other ancillary service e.g. operating reserves or reactive power where the firm is the sole provider

Such tests may be applied both for import and export constraints. Structural tests assessing the indispensability of operators relative to constraint relief are an integral part of the automatic mitigation procedures used in several control areas of the U.S., including PJM Interconnection.

The essential element of such pivotality tests is the set of generator shift factors³ relative to all monitored constraints. That is, the impact of the incremental output of each generating unit on the flow over each monitored constraint. These parameters of the transmission grid must be available to NGET from the optimisation procedure it performs to clear the Balancing Mechanism. In addition, consideration should be given as to whether mitigation procedures are applied to one-off instances, or are only applied when the pivotality is repeated.

Offers and bids of an operator whose units are indispensable to relieve the constraint due to their electric proximity to the constraint and the capacity of the units could be subject to further examination of bidding behaviour and potential offer and bid mitigation. At the same time, offers and bids of operators that are not individually indispensable to relieve any constraint may be assumed to be competitive and be exempt from subsequent examination of bidding behaviour and mitigation.

The procedure for establishing generator's position of market power relative to constraints base on pivotality can be transparent and easily auditable by interested parties or independent market surveillance.

Behavioural screens: competitive benchmarks for BM offers and bids

If firms have been identified as having structural market power, then Ofgem would need to have a view on which actions may constitute exploitation of that market power. Such behavioural screens of operators' conduct would require comparison of the firms' offers and bids with those that would have resulted in a competitive outcome.

However, in the context of the Balancing Market administered by the NG it is impossible to devise a unique reference price level for a given generating unit against which offers and bids can be compared under all market conditions to identify suspicious behaviour. The pay-as-bid system of the BM incentivises even the most competitive operators to adjust BM offers and bids depending on current market conditions. For instance, a competitive operator may find it profitable to revise offers and bids depending on the expected marginal price in a particular location given the expected demand, availability of generators in the system, and available transmission capacity. Thus, simple comparison of offers and bids to a predefined price reference may not be a viable option for behavioural screening in the current BM system.

A competitive benchmark appropriate for the pay-and-bid system is the set of competitive locational marginal (cleared) prices simulated using offers and bids from each unit equal to the marginal cost of energy. The simulation should take into account all transmission constraints and all dynamic constraints of generating units solved by the NGET when running the Balancing Mechanism. The simulation should also allow the locational prices

³ Also known as Power Transfer Distribution Factors (PTDFs).

to increase above the marginal cost of any online unit in case there is locational shortage of energy or operating reserves. This can be done for instance by introducing the demand price elasticity at the price levels close to the value of the lost load. Such shortage pricing is needed in order to allow peaking units to receive enough profits to pay their fixed costs even when offering at the marginal cost of power generation.

Such simulated locational marginal prices would constitute a relevant competitive benchmark for offers and bids submitted into the Balancing Market. These prices would represent the cost to deliver an additional MWh in each generator location given all constraints. Thus, these prices would set the highest offer price that would have been accepted in the pay-as-bid Balancing Mechanism under cost-based bidding. Competitive operators can only be incentivised by the pay-as-bid market to offer up to this level.

This competitive benchmark can be used both for identification of abusive behaviour of generators that are pivotal relative to the constraints and as a reference level for offers mitigated *ex-ante* or *ex-post*.

In order to provide continuous information on competitive benchmarks of offers and bids in all locations of the system, the cost-based locational price simulation should be run in parallel to the Balancing Market at least in each half-hour.

The simulation of competitive marginal prices can be transparent and easily auditable by interested parties or independent market surveillance.

Locational marginal price in the BM

There may be benefits of modifying the Balancing Mechanism to settle generators based on locational marginal prices rather than on the pay-as-bid basis. Under such market arrangements, competitive generators will be incentivised to submit offers and bids at marginal cost regardless of market conditions. In such market a simpler behavioural screen based on the reference bids for each generating unit can be adopted.

However, Ofgem expresses caution with respect to such an arrangement in the Balancing Mechanism. It expects that the BM based on locational marginal prices would increase costs to consumers because the bid setting the marginal price might reflect a specific locational or timing requirement, and not be representative of the bulk of the actions taken for that period and that as a result, some generators would be over rewarded.

This caution is largely unwarranted. On the contrary, there are reasons to believe that pay-as-bid market arrangements may result in at least the same or higher cost of power generation than the marginal price market arrangement. The two following arguments should clarify this statement:

- In the pay-as-bid market, no matter how competitive it is, market participants do not bid at cost. Rather they try to guess the market clearing price (the highest accepted offer or bid). If the cleared price is expected to be higher than their cost, they bid just below that price. In the ideal case of perfect information, the outcome of a pay-as-bid system should be expected to be identical to the outcome of the marginal price system. Same units are dispatched and all offers with cost below the marginal price

receive that marginal price. In the pay-as-bid system this would be the case because all participants would have correctly guessed the marginal price and have submitted offers equal to it less 1 penny to ensure that the offer is cleared.

- In the case of imperfect information, massive guessing about the marginal price leads to massive errors. In particular, generators that overestimate the marginal price do not get cleared although their energy is economic, which leads to an inefficient dispatch and potentially increased cost to consumers.

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Appendix: Frequency of ex-ante market power mitigation in PJM Interconnection

PJM applies a structural screen for offer capping based on assessment of generators' pivotality with respect to constraints that arise during the market clearing run. More precisely, PJM assesses whether any three suppliers in a given load pocket are simultaneously pivotal. PJM applies offer capping only to units that fail the three pivotal supplier test. PJM performs such screening and bid mitigation both in the Day Ahead and the Real-Time (Balancing) markets. The table below provides the statistics of the offer capping by PJM between 2002 and 2006 in terms of percentage of unit-hours and MW capacity capped.

Table 1: PJM annual offer capping statistics, 2002-2006

Year	Day Ahead		Real Time	
	Unit-hours capped	MW capped	Unit-hours capped	MW capped
2002	0.7%	0.1%	1.6%	0.3%
2003	0.4%	0.2%	1.1%	0.3%
2004	0.6%	0.2%	1.3%	0.4%
2005	0.2%	0.1%	1.8%	0.4%
2006	0.4%	0.1%	1.0%	0.2%

Notes: Certain units located in particularly small load pockets are mitigated (price capped) more often than others. For example, 5 units (or about 1 percent of all units) were offer capped for more than 80 percent of their run hours and had offer-capped run hours of 200 hours or more in 2006.

Source: 2007 PJM State of the Market Report, Table 2-5