Oxera

Near real-time information release

Report prepared for UK Offshore Operators Association

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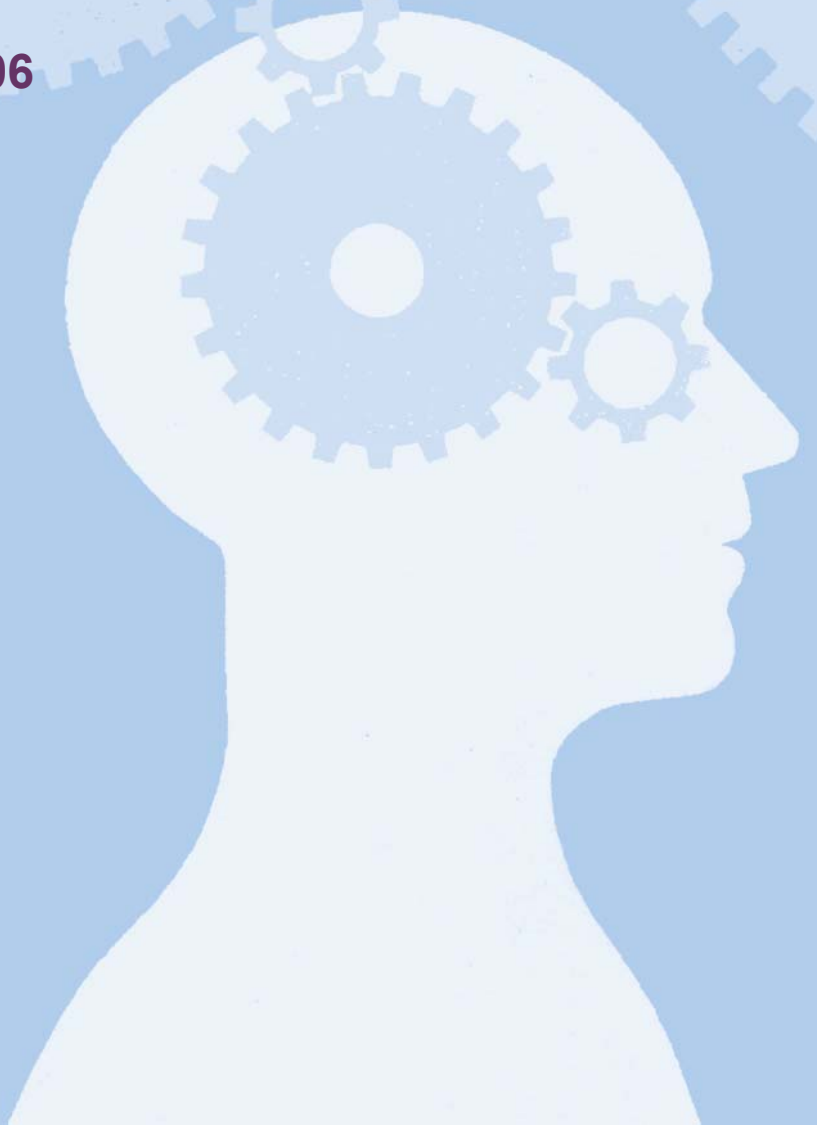

Final report

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1 Introduction

This report, produced for the UK Offshore Operators Association (UKOOA), addresses two specific issues in relation to the current Ofgem impact assessment of UNC Modification Proposal 006.[1] The components of the analysis are:

- a commentary on the approach and analysis undertaken by Ofgem as part of its impact assessment;
- an analysis of the implications of incremental information release for levels of risk and volatility in the gas market.

The main findings of the report are as follows.

- The assessment of the benefit of improved economic signals from the release of near real-time information may be flawed:
  - the is no evidence to indicate that the econometric pricing equation has been tested for robustness;
  - the assumption that near real-time information release will automatically reduce risk premia in the market, and by different magnitudes depending on the size of outage, is not justified by any evidence;
  - it is incorrect to reflect the reduction in risk premia solely through an adjustment to the impact of beach flows on prices—the impact of lower risk will depend on the overall supply–demand balance at the time and the availability of additional supplies from other sources.
- It cannot be assumed that the release of additional private information is always beneficial for the market. There are circumstances when additional public information may have no incremental benefit (when private information is already conveyed quickly to the market through the actions of individual market participants), or where the information may be destabilising (leading to excessive volatility in the market).

[1] Ofgem (2006), '3rd Party Proposal: Publication of Near Real Time Data at UK Sub-terminals', February.

2 Comment on Ofgem's analysis

The impact assessment presented in the February 2006 consultation underpins Ofgem's decision to accept the proposed modification. The assessment shows net benefits[2] over a 15-year period (2006–21) of between £82.87m and £122.46m, arising from three main areas:

– economic signals;
– system balancing; and
– market volatility.

Of these three areas, new analysis is only presented for the first. The analysis of the other two areas is carried over from the May 2005 impact assessment,[3] and comments made regarding the validity of the analysis at that time still hold. In particular, it should be noted that the system balancing benefit may not be a true resource cost saving, but may, in part or full, represent a transfer of cost from National Grid Gas (NGG) to shippers. To the extent that this is the case, and the costs are passed on by the shippers, there is no net benefit to the consumer. An incremental benefit will arise only if one or both of the following hold:

– the cost of balancing actions falls (eg, due to higher liquidity and lower prices on the on-the-day commodity market (OCM));
– the total volume of balancing actions undertaken by NGG and shippers falls.

This section of the report focuses on the new analysis undertaken by Ofgem in order to quantify the benefits arising from improved economic signals. Although it is far from clear in the February 2006 document what the exact approach adopted was, Oxera's interpretation is as follows:

– an econometric relationship between the within-day price (proxied by the system average price (SAP)) and a number of key factors, including beach flows, has been estimated;
– the information release is assumed to reduce the risk premium component of the market price, proxied by a reduction in the coefficient on beach flows in the econometric equation;
– the resultant differential in price (using the adjusted and unadjusted beach-flow coefficient) for a given outage size (large, medium or small) is applied to the expected number of outages of each type.

Below, aspects of the first two steps in this process are critiqued, drawing the conclusion that, on the available information, the approach is unlikely to be robust or an appropriate representation of the impact of additional information release. This is an important conclusion since 'economic signals' account for up to 50% of the net benefit of the proposed modification.

[2] The net benefits are adjusted for the direct reported costs that NGG NTS would incur—estimated at £1.4m—although Ofgem believes that any indirect costs would be 'significantly lower' than the estimated benefits.
[3] Ofgem (2005), '3rd Party Proposal: Publication of Near Real Time Data at UK sub-terminals, Modification Reference Number UNC006 (0727): Impact Assessment', May.

2.1 Ofgem's regression analysis

Ofgem (2006) estimates a linear regression to explain the current market price of gas with the following explanatory variables:

– temperature;
– prices in Zeebrugge;
– beach flows;
– interconnector flows; and
– storage flows.

Independence of variables

As part of its approach, Ofgem (2006) assumes that the explanatory variables are independent of each other. However, without direct evidence of the strength of the relationship between the explanatory variables in the regression, it is likely that this assumption will be violated. For example:

– beach, storage and interconnector flows are likely to be strongly related;[4]
– prices in Zeebrugge will be closely related to interconnector flows—price expectations determine the direction and the volume of interconnector flows.

The closer the relationship between the explanatory variables in the regression, the more difficult it is to estimate the partial effect of any of the explanatory variables on the market price of gas. This problem complicates the interpretation of the coefficients obtained from the regression.

Significance of coefficients

There is no evidence presented to suggest that statistical tests have been undertaken to determine whether the value of the coefficient associated with beach flows is statistically different from zero. If the coefficient were found not to be statistically different from zero, this would imply that beach flows have no significant impact on gas prices over the sample used in Ofgem's 2006 analysis, when other explanatory variables are controlled for.

Causality

Ofgem (2006) interprets the positive coefficient on beach flows as suggesting that an increase in beach flows leads to an increase in gas prices. However, this interpretation may be complicated by problems of causality—do beach flows increase in response to a rise in price, or do prices increase as a result of a rise in beach flows? Further problems may arise, since gas prices in the UK may affect prices in Zeebrugge, instead of prices in Zeebrugge affecting UK prices, as implied by Ofgem's 2006 regression. Statistical tests can be carried out to infer the direction of the causality, which could suggest that more complicated estimation procedures would be needed to ensure the robustness of the results.

Model specification

In any regression analysis, further statistical tests should be undertaken to assess the potential for the coefficients to be biased. A comparison of actual gas prices with the predicted gas prices from the regression is not sufficient. However, the plot of these series does indicate that the predictions from the regression diverge from the actual gas price over the last few months of the sample, indicating a deterioration in the model's performance. The accuracy of the regression may improve with the inclusion of lagged values of the explanatory variables. Other problems could arise as daily gas prices and flows are likely to

[4] Correlation analysis can be used to measure the degree of dependence between the explanatory variables in the regression.

be volatile, and if the volatility is not controlled for in the regression, the coefficients may be biased.

2.2 Outages and the risk premium

For the purposes of the analysis, Ofgem characterises the within-day prices as including a risk premium associated with uncertainty that exists when an offshore outage occurs, and it is claimed that 'better information would allow market participants to improve their management of risk with respect to intra-day price spikes in the longer run'. Hence, Ofgem's analysis quantifies the impact on gas prices from an increased provision of sub-terminal information, by making assumptions about the relationship between offshore outages and the risk premium—ie, that more information reduces the coefficient of beach flows on prices, hence lowering within-day prices.

This approach raises concerns above and beyond the fact that the econometric relationship may not be a correct representation of the dynamics of within-day price formation:

– there is no explanation of the nature of the relationship between information release and the level of the risk premium that has been assumed;
– there is no acknowledgement of the potential market reaction when a beach outage occurs.

Information release and the risk premium

There is an assumption that greater information release will lead to a reduction in the risk premium on the within-day price, but there is no evidence provided to substantiate this qualitatively or quantitatively. Ofgem has made assumptions to this end, but there is no reason why any such relationship should exist. Or, more correctly, there is no reason that a link between the timing of the release of the information at or near real-time as opposed to D+2 as it is at present should exist, since the risk is that of an outage occurring, and views on this are likely to be formed from historical experience (ie, the near real-time aspect of information release is not vital).

Furthermore, this unsubstantiated relationship between real-time information and the risk premium undergoes a further transformation as the reduction in risk premium is then represented as a reduction in the beach-flow coefficient in the econometric equation. Ofgem provides no evidence of how the reductions in the size of the beach-flow coefficient have been estimated or how they relate to a measure of the risk premium in prices.

Impact of interdependence in explanatory variables

The application of certain reductions to the beach-flow coefficient assumes that an outage will only influence gas prices and beach flows. However, it is likely that an outage will affect the relationship between gas prices and the other explanatory variables, and as such, the impact of the outage should be estimated directly from the linear regression (appropriately specified).

3 Information release, expectations and price formation

There are two strands of theory that could challenge the presumption that there are obvious efficiency benefits from the incremental information release:

– *the efficient markets hypothesis*—'private' information is already conveyed to the market quickly via the pricing mechanism and therefore the incremental information release will not alter the pricing behaviour; and
– *the social value of public information*—that more public information may increase rather than decrease market volatility because it coordinates behaviour around itself at the expense of private information.

Aspects of both may be relevant in assessing the effect of UNC 006, but neither represents a conclusive, or unchallengeable position from the theoretical or practical perspective. However, combining aspects of these two theoretical models can lead to the conclusion that the information release has the potential to be destabilising for the market and that the only distributional benefit is not from producers to consumers, but from producers and consumers to traders. The efficient markets hypothesis was discussed in more detail in the previous report for UKOOA in May 2005, and the discussion here therefore focuses on the social value of information.

3.1 Social value of information

The underlying premise of the modification proposal is that increased provision of information on sub-terminal gas flows will be beneficial for the efficient operation of the UK's wholesale gas market. Part of the justification for this is that the greater information will reduce volatility in the market. However, there is academic evidence that suggests that greater provision of public information may, on occasions, lead to agents 'overreacting' to the information provided, thereby increasing volatility. The work is based on Morris and Shin (2002).[5]

3.1.1 Key findings and arguments

Morris and Shin (2002) contend that public information has two roles. First, it provides information on the underlying 'state of the world'. Second, it plays a 'signalling' role (ie, it acts as a coordination device), indicating to participants what a 'recognised authority' considers the state of the market to be.

All agents have two sources of information: private information known only to themselves and public information known to all players. Both types of information are random variables—ie, there is a degree of (independent) noise regarding how informative both the public and private information are in terms of revealing the true state of the world.

Morris and Shin use this model to answer the question: what happens to welfare (the aggregation of each agent's utility) in the event that accuracy in the public signal increases (ie, the variance on the random error term on the public information signal declines)?

They find that, when the accuracy in the public signal increases—ie, the variance on the random error term on the public information signal declines—there are circumstances in which, as the accuracy of the public information increases, welfare declines. The logic behind

[5] Morris, S. and Shin, H. (2002), 'Social Value of Public Information', *American Economic Review*, December.

this result is that, as the precision of the public information increases, agents give more and more weight to this in determining their actions, recognising that everyone else will also do so. Consequently, even if there is less noise in the public information, the amount of additional weight the information is given overcompensates for this improvement in precision, and so magnifies the impact of the remaining noise in the information. As the authors state:

> In short, although public information is extremely effective in influencing actions, the danger arises from the fact that it is too effective at doing so. Agents overreact to public information, and thereby magnify the damage done by any noise.

Morris and Shin are able to identify two factors that make this damaging overreaction more likely:

– it is more important to act in accordance with the actions of others in the market than it is to act in accordance with the underlying fundamentals (ie, it is better to be 'wrong', but to be safe in the knowledge that everyone else has got it wrong too);

– the existing private information, prior to the new public information, is such that all agents can be considered already well-informed. As the authors state:

> As a rule of thumb, when the private sector agents are already very well informed, the official sector would be well advised not to make public any more information, unless they could be confident that they can provide public information of very great precision.

3.2 Application to the UK wholesale gas market

There is no simple mapping of this framework onto the gas market.

– *There is a key 'expectation' against which companies will act*—ie, their expectation of the supply–demand balance over a relevant period, and hence of the prices of gas at that point in time. However, it is not clear that it is always better to act in accordance with the rest of the market. For example, if an agent believes an outage is temporary, and everyone else believes it is prolonged, that agent may gain by relying on its own information if it turns out that it is correct (as the market price should adjust to reflect this over time).

– *The level of public and private information differs between groups of market participants (even if it is only in the timing of the information dissemination)*—this also affects the extent to which different groups can be thought of as well-informed initially (the second factor identified by Morris and Shin, above, that makes the excess volatility likely), although the existing level of information provision is substantially greater than in other markets, and the historical information is available to all with only a small delay.

Consequently, it may be difficult to argue that this theoretical framework fully explains the UK market.

3.3 Practical example of the destabilising impact of near real-time information

Consider the hypothetical situation in which an unplanned field outage occurs. First, it should be noted that this is private information to the field operator (ie, the presumption that the asymmetry of information is solely between the upstream and downstream segments of the

market is false—the real distinction is between the field operator and the rest of the market).[6] The reaction by the field operator will depend on the nature of the outage—ie, whether it is temporary or prolonged—and the flexibility within its current portfolio.

If the outage is temporary (for example, a few hours), the operator has several options available:

– purchase some additional volumes on the OCM to cover the expected exposure;
– increase production or offtake from another part of the portfolio to cover the shortage;
– increase production above the current daily flow rate at the field when it returns to operation so that balance is maintained across the gas day;
– do nothing and accept the exposure to the imbalance prices as a result of NGG's balancing activities.

If there is no spare capacity in the portfolio, the field operator (or NGG) will have to enter the OCM. Assuming an operator would always want to avoid imbalance charges and therefore enters the market itself, there should be an increase in the bid activity on the OCM. If there is plentiful supply in the market as a whole, there may be no price reaction, but if there is a tight market, offers of supply can be expected to increase—this reflects the operation of the efficient markets hypothesis.

Similarly, if there is a prolonged outage—eg, over a few days or more—the additional course of action is to enter the forward market to cover the short position that will be created by the outage. Once again, the efficient markets hypothesis would imply that the act of entering the market and placing bids for purchases should result in price responses that immediately signal the change in the demand–supply balance at that period.

Where this often breaks down is when the market does not clear instantaneously at a single price for all participants, but is characterised by a series of sequential trades (albeit with a high degree of transparency if these occur on the OCM or the exchanges). Thus, it is not necessarily the case that the field operator will face the marginal cost of gas for that time period. It may be the large user or trader that has taken a position in the market. This can be seen as a distributional issue brought about by a timing discrepancy, and it can be argued that it is this distributional aspect that the proposed modification is seeking to rectify.

However, the counterfactual illustrates that there is unlikely to be a significant gain for other purchasers in the market. If it was known with certainty that there was an outage of a particular level that would require the field operator to go to market, the symmetrical release of information would result in sellers increasing prices to the expected marginal price instantaneously. Therefore, consumers would be no better off, but the sellers in the short-term markets would gain additional producer surplus (ie, they would all charge the 'marginal' price, rather than demand revelation occurring more slowly).

This position is exacerbated when we consider that it is not necessarily the case that anyone in the market will know with certainty whether an outage is temporary or prolonged, not to mention whether (and when) the field operator will need to enter the market to cover its position. The near real-time information release will not remove this uncertainty, but it may act in a similar way to the social value of information. That is, when sub-terminal flows are seen to fall, the presumption is that this is an outage that will require the field operator to go to market; therefore, there will be an immediate reaction on both the bid and offer sides of the market. The sellers have very little to lose—if their offers are not taken up, they can lower

[6] This is an important point because, to the extent that remedial action is taken by the field operator in the within-day or forward markets, other field operators are potential suppliers to this party and they are subject to the same asymmetry of information as other purchasers or traders on the market.

prices later in the day—the buyers may have to purchase because of the risk of not covering their position (particularly in the forward market).

Thus, behaviour coordinates around a piece of publicly released information that is incomplete. If it emerges that the outage is not prolonged, it is possible that the market will actually have overreacted and volatility will have increased. Not only does this have an effect on the short-term benefit assessment in relation to the modification, it may also have longer-term implications for new investment in production facilities—increased volatility in the OCM increases the exposure for producers and will therefore increase the average cost of supplies.

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