Oxera

What are the costs and benefits of near real-time gas information?

Report prepared for UK Offshore Operators Association

May 2005

Executive summary

July 2005 will see the completion of Phase 3 of the voluntary information disclosure scheme in the GB gas market. This scheme, negotiated between UKOOA, Ofgem, Transco and the Department of Trade and Industry, has already increased transparency regarding the long- and medium-term operation of offshore gas fields and the final phase will see near real-time information on the flow of gas into the National Transmission System (NTS) released to all market participants.[1]

With the industry already committed to provide this information, energywatch has proposed a modification to the Network Code (Modification 727) that would result in a further incremental increase in the information released, requiring NTS flow data to be provided both in real-time and disaggregated by sub-terminal.

The disclosure of additional information regarding the functioning of a market is generally considered beneficial, leading to more efficient price signals and hence better operation of the market itself. In its recent consultation on further information disclosure, Ofgem estimated that these benefits may be £265m per annum.[2] However, it also showed that there was a significant increase in the direct costs associated with Mod 727 that would not be incurred under the Phase 3 scheme. Thus, it is necessary to consider whether the incremental benefit of Mod 727 justifies these additional costs.

This report presents an assessment of the range of benefits that may arise from the release of more near real-time information into the gas market and discusses the potential incremental benefit of moving from information presented on a Phase 3 to a Mod 727 basis. Setting these benefits against an assessment of the costs of each option allows the relative net benefits to be compared.

Benefits and costs

Oxera has identified two main benefits and two types of cost associated with these proposals.

– **More efficient prices**—the available evidence suggests that the GB gas market is relatively, but not perfectly, efficient at disseminating information. This implies that placing private information into the public domain will make prices more efficient, reflecting more closely the fundamental drivers of supply. In theory, this should lead to improved allocative efficiency. However, it was not possible to estimate the magnitude of this benefit.

– **Smaller spreads at times of uncertainty**—additional public information may help to reduce uncertainty that may result from shocks to demand or supply in the market. Greater certainty may allow market participants to trade with narrower spreads at such times. Oxera estimated this benefit to be in the region of £39m–£176m net present value (NPV) over 15 years.

– **Direct costs**—Ofgem, energywatch and Transco have calculated a wide range of direct cost estimates. These suggest that Phase 3 will cost less than £2m to implement, but that implementing Mod 727 could cost up to a further £20m.

[1] Information on gas flows aggregated on a north/south basis will be provided hourly, and flows by sub-terminal will be provided with a lag of one day.

[2] Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February.

– **Indirect costs**—additional public information may result in excessive volatility if the market is imperfectly competitive. Oxera's analysis suggests there are at least some reasons to believe that there may be scope for destabilising or inefficient trades. Although it was not possible to estimate the magnitude of these costs, they may be substantial, particularly if there are errors or noise in the near real-time data. Indirect costs could plausibly be higher under Mod 727 than under Phase 3 due to the greater disaggregation of the data and its real-time nature.

The available cost estimates distinguish between the two increments of investment: the first to implement Phase 3; the second to implement Mod 727. It was not possible to determine precisely what proportion of the benefits is attributable to each of these increments, but at least some benefits are likely to be associated with both stages of information disclosure. Table 1 summarises the costs and benefit estimates.

Table 1 Summary of total costs and benefits from completing Phase 3 and implementing Mod 727, 2005 (NPV, £m)

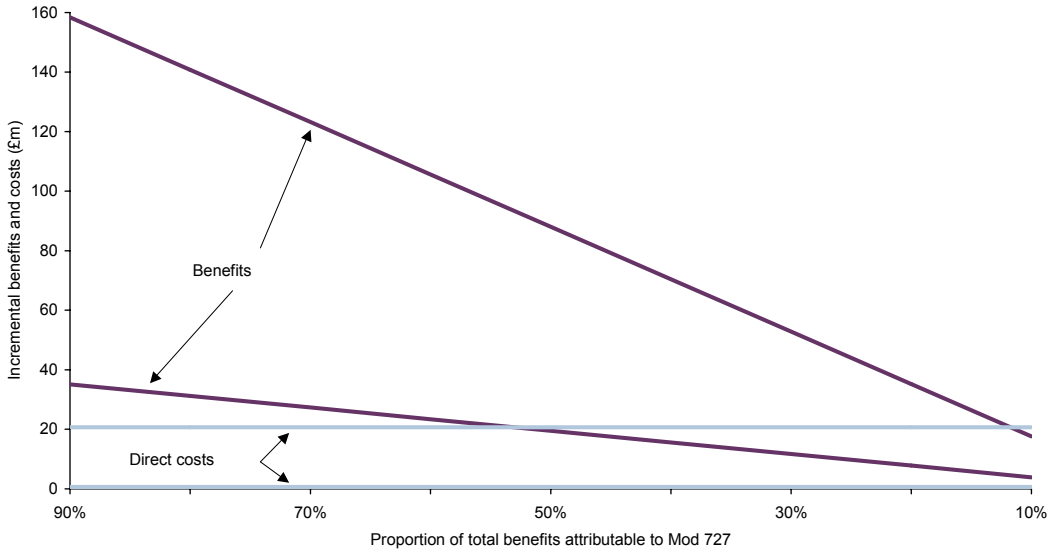
	Low cost, high benefit	High cost, low benefit
Benefits		
More efficient prices	Positive	Positive
Smaller spreads at times of uncertainty	175.6	38.6
Costs		
Direct costs	1.60	22.25
Phase 3 completion	*0.95*	*1.55*
Mod 727 in addition to Phase 3	*0.65*	*20.70*
Indirect costs	Positive	Positive
Aggregate net benefits	174.0	16.35

Source: Oxera.

Since a potentially large benefit and a potentially large cost could not be quantified, caution needs to be exercised when drawing any firm conclusions about the net benefits of either Phase 3 or Mod 727. However, since the quantified costs associated with Phase 3 are relatively small, even if only a small proportion of the total benefits can be attributed to this phase of disclosure, there is at least some evidence to suggest that it is likely to offer net benefits to consumers.

Such a conclusion is not possible for Mod 727. Figure 1 shows how the balance between incremental costs and benefits associated with Mod 727 change depending on the proportion of benefits for which Mod 727 is responsible. The figure shows that if less than half the benefits can be attributed to this proposal, it is not clear that this further phase of disclosure offers net benefits to consumers. This is because the lower end of the benefits range falls below the upper estimate of the direct costs, which suggests that this proposal could have net negative consequences for consumers. It may therefore be prudent to wait for a period after the implementation of Phase 3 to estimate more accurately the likely outturn benefits to consumers of proceeding with additional disclosure, such as that proposed in Mod 727.

Figure 1 Incremental costs and benefits of Mod 727



Source: Oxera.

Comparison with previous benefit estimates

Oxera's estimate of the benefits associated with near real-time information disclosure is substantially smaller than the benefits estimated by both Ofgem/Barclays Capital and energywatch. The NPV over 15 years of Oxera's quantified benefits is between £39m and £176m. Both of the two previous estimates were originally quoted as benefits expected per annum, and were in the region of £250m; a comparable NPV of the Ofgem/Barclays Capital and energywatch's estimates is more than £2.7 billion—ie, between 15 and 70 times higher than the Oxera estimates.

The primary reason for the difference is that the Ofgem/Barclays Capital estimates, which also form the basis of the energywatch analysis, consider the benefits from a considerably wider range of information disclosure than the two proposals examined here.

Contents

List of tables

List of figures

1 Introduction

This report assesses the main costs and benefits associated with greater disclosure of information on offshore gas production. In particular, it assesses the benefits associated with the completion of:

– the near real-time elements of the third and final phase of the voluntary information disclosure scheme, negotiated between UKOOA, Transco, Ofgem and the DTI, with information aggregated on a north/south basis and provided hourly. It is intended that this information will be published from around July 2005. The issue was recently the subject of an Ofgem consultation. The information disclosure programme is referred to as the Phase 3 information within this report;[3]

– energywatch's proposed network code modification 727 (Mod 727), which would release the same information, but disaggregated on a sub-terminal basis and in real time.[4]

Although commissioned by UKOOA, the representative organisation for the UK offshore oil and gas industry, the analysis in this report represents an independent review by Oxera of the costs and benefits associated with this information disclosure.

Oxera has carried out this project focusing on desk-based research. This has involved reviewing a wide range of documents, including responses to Ofgem's consultations, data on the gas market (eg, Heren data), and academic literature. This was supplemented by informal discussions with participants in the gas market, including representatives from upstream shippers, downstream shippers, vertically integrated shippers, banks/other non-physical delivery traders, and large industrial consumers.

There are two notable limits to the analysis undertaken by Oxera. First, Oxera has not sought to examine every area of potential cost or benefit in detail—instead, following initial analysis, the study has focused on areas that appeared to represent the main costs and benefits. Second, this analysis does not consider the data provision mechanism, which was considered at length in Ofgem's consultation—eg, whether a voluntary provision mechanism is adequate.[5]

1.1 Report structure

Since this cost–benefit analysis concerns a change in the nature and timing of information availability, the report first examines in some detail the baseline information available to the industry, and how this is expected to change under the two proposals. Sections 3 and 4 examine the crucial benefits and costs that Oxera considers are likely to arise from this disclosure. Section 5 examines the balance of costs and benefits between the Phase 3 information disclosure and energywatch's Mod 727. Section 6 discusses whether the analysis should consider aggregate welfare or consumer welfare alone, and therefore which benefits should be included in the cost–benefit analysis. Section 7 concludes.

[3] Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February.

[4] energywatch (2004), 'Transco Network Code Modification Proposal No. 0727: 3rd Party Proposal: Publication of Near Real Time Data at UK Sub-terminals', November.

[5] Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February.

2 Changes in information availability

This section briefly sets out the information that is currently available to gas market participants and shippers, such that a relevant benchmark with regard to additional information can be accurately established.[6] It also discusses the difference between public and private information and the role information plays in determining market prices.

2.1 What information is currently available?

The range of information currently available to gas market participants is considerable, covering both current system performance and longer-term forecasts of the supply, demand and infrastructure positions. Oxera has examined the data available to gas market participants in order to understand clearly the baseline level of information available. A detailed analysis of this is contained in Appendix 1, and a summary of the most relevant data is presented below in Table 2.1.

The two information release options under consideration in this report affect short-term information flows, providing information on how the system is operating at that particular point in time. The majority of this information is released to market participants within two days of the gas day to which the data relates. However, a selection of data is released earlier—some forecast data is published on a day-ahead basis, some on the day, and some with only a one-day lag. This is summarised in Table 2.1 below.

[6] The appendix to this report provides a more detailed summary of what data is available to whom and with what frequency or lag at present.

Table 2.1 Short-term information available to gas market participants

Blue (light) shading = Phase 3 data to be provided in July 2005.
Red (dark) shading = data proposed under energywatch Mod 727.

Day-ahead	On the day	One-day lag
Interruptible capacity available	Likelihood of interruption	Daily balance report
Likelihood of interruption	Forecast demand by each LDZ and in aggregate[1]	MSEC auctions
Forecast demand by each LDZ and in aggregate	End-of-day aggregate forecast flows into the NTS, disaggregated by north/south (hourly)	Actual demand
End-of-day aggregate forecast flows into the NTS, disaggregated by north/south	System nomination balance (incl. requested energy and scheduled energy) (hourly)	Entry and exit capacity trading (within-day and futures)
System nomination balance (including requested energy and scheduled energy) (hourly)	Projected closing linepack and opening linepack	Projected throughput
Projected closing linepack and opening linepack (hourly)	Auction capacity available	Weather correction factor
	Capacity volume and price for active within-day firm capacity bids by ASEP	Price information (eg, data on bilateral deals via Heren)
	System nomination balance	Customer nominations for Hornsea
	Aggregate site nominations for Rough storage site[2]	Natural gas price index
	Aggregate site nominations for Hornsea storage site[2]	Number of trades on OCM, WAP, energy (th), values (£)
	Price information (eg, via screen-traded markets)	SMP Buy, SAP and SMP Sell
	Hourly data on actual flows into the NTS, aggregated into north/south zones	Actual flows into the NTS at individual sub-terminals
	Real-time data on actual flows into the NTS at individual sub-terminals	

Notes: [1] LDZs are now known as distribution networks (DNs). Information reported here as presented on Transco's website. [2] The data highlighted for Hornsea and Rough storage sites is indicative. It does not present the only data available from storage sites based on an exhaustive search.
Source: Publicly available information from multiple sources, such as company websites.

2.2 What information is to be made available under Phase 3

Phase 3 of the Ofgem/DTI/UKOOA/Transco information initiative is currently being implemented.[7] Three of the four information categories to be provided in this phase have already been introduced (deliverability with respect to planned maintenance, sub-terminals 'end of day' flow information, and forecast flows into the NTS disaggregated on a north/south basis). It is planned that, from July 2005, hourly data on north/south gas flows into the NTS will be released.[8]

[7] Phases 1 and 2, which have already been implemented, have improved the standardisation and timely provision of operational data to Transco by upstream parties, as well as other data to support Transco in refining the annual 'Transporting Britain's Energy' (TBE) processes.
[8] It was recognised that real-time data could be inaccurate; thus, an agreement was reached that the data would be released on an hourly basis. For the forecast flows into the NTS, it was also agreed that data would be aggregated at a north/south level, rather than at a sub-terminal level.

The information initiative was prompted by the DTI's wish to enhance the efficiency of the UK wholesale gas market. Peter Hain, Energy Minister at the time, told the Trade and Industry Select Committee in February 2001 that a well-informed market was the basis for an efficient market, and that this would help the domestic market to function more effectively.[9]

2.3 Additional information proposed by energywatch

In addition to this forthcoming information, energywatch has proposed that additional information should be made available, specifically requesting that gas flow data be released for each sub-terminal on a real-time basis.[10] energywatch envisages that this will include all entry points owned and operated by Transco (ie, storage entry points on the transmission system covered by price control regulation), and entry points or individual sub-terminals where the gas flow capacity is greater than 10mcm/d. This proposal contrasts with the current information initiative agreement, which allows for this data to be published on a north/south basis every hour.

2.4 Public versus private information

Central to this cost–benefit analysis are the notions of private and public information. Private information is the information held by a single, or limited number of parties, and which is not generally available to others, or is only available to others with a lag (at which point the information becomes public). Examples of private information include an upstream shipper's expected flows onto the NTS, and the positions that particular market participants hold in the wholesale gas market.

In contrast, public information is information that is widely available to any party. In this context, public information includes the data set out in Table 2.1 above. As the table makes clear, public information includes aggregated forms of private information, such as forecast flows into the NTS on a north/south zonal basis.

Market participants use both the public and private information available to them when trading in the wholesale gas market.

2.5 Use of information in wholesale gas markets

It is to be expected that the main impact of additional information would be on the price signals produced by the market, in terms of making these signals more efficient and increasing the transparency of the key drivers of prices. However, a range of prices is published across several different trading platforms, and it is realistic to assume that new information would have a differential impact on price formation for various contracts because the drivers of price formation for each contract may vary.

For example, within-day trading can be characterised as being driven largely by the interaction of individual portfolio positions and the immediate supply–demand balance on the system (which is a function of demand variations and supply availability). This is why the linepack information provided on a near real-time basis is often presented as the driver of short-term trading by the major price reporters, as it represents the most accurate information of the current system balance.

However, a year-ahead price, while still reflecting the value to a purchaser of the gas, would be based on expectations of longer-term supply–demand balance and views on new

[9] DTI (2001), 'DTI Response to Consultation on Gas Issues (URN 02/1306)', p. 7.

[10] This was put forward in its November 2004 proposal: energywatch (2004), 'Transco Network Code Modification Proposal No. 0727: 3rd Party Proposal: Publication of Near Real Time Data at UK Sub-terminals', Version 1, November.

investment, demand growth, etc. Thus, real-time information on the status of the system today would not necessarily have a significant impact on this contract, or, strictly speaking, any delay in the production of this information would not be expected to lead to a substantive change in the operational or investment behaviour related to these contract maturities.

On this basis, the release of additional near real-time data is likely to have a greater impact on short-term prices—prices quoted on the on-the-day commodity (OCM) market or day-ahead prices—than on longer-term forward prices. To assess the potential impact of these alternative information options on this pricing segment of the market, three main questions must be addressed.

– Does additional production flow data enhance participants' understanding of the supply–demand balance?

  By providing more information on the supply-side position, it may be argued that there is an improvement in the information available to participants. However, an alternative view is that, as information is only being added on one side of the market—there is no extra information on the demand side—the additional supply-side data is of little incremental value to the proxy balance data provided by the linepack disclosures.

– Does disaggregated data add incrementally to the information set over and above the equivalent aggregated data?

  One issue here is whether knowing what is happening on an entry point basis tells a market participant any more about the aggregate system balance than aggregated data. Two points are worth noting on this. First, further disaggregation of data may release what would be commercially sensitive information, allowing discriminatory behaviour in the market (ie, it would not add to the efficiency of the market, but would allow rents to be extracted from distressed sellers). Second, disaggregated information may create excessive volatility because participants will react to a number of partial pieces of data, or news, in a manner that does not reflect the broad market fundamentals.

– Does real-time data provide additional value over and above hourly lagged data?

  If the new information is valuable for efficiency then real-time data may be preferable. However, this benefit must be considered against the cost of ensuring that the data provided in this manner is accurate. If there is a trade-off between accuracy and timing of publication then 'quicker' information provision may not provide the benefits anticipated.

Although a definitive answer to these questions is not within the scope of this analysis, it is by no means obvious that more information or quicker information will always enable market participants to improve the efficiency of their behaviour in the market.

2.6 Key conclusions

The above summary illustrates that there are new initiatives that will lead to additional information being provided to the market. A stylised representation of the position would comprise two levels of new information provision that need to be distinguished between:

– the step from the current position to the completion of Phase 3 of the information initiative in July 2005;

– the optional further incremental change from the Phase 3 position that would be implied by the adoption of Mod 727.

The main differences between the two levels of information provision essentially revolve around the timing and disaggregation of the data provision (as shown in Table 2.2 below). This distinction is central to any consideration of the incremental benefit associated with Mod 727 since it focuses attention on the extent to which the different levels of information provision will affect the trading behaviour and price formation mechanisms in the market. That is, whether the incremental information released will have a proportionate impact on the efficiency of trading behaviour.

Table 2.2 Comparison of information scenarios

	Phase 3	Mod 727
Timing	Hourly	Real-time
Disaggregation	North/south	Sub-terminal

Source: Oxera.

Even at this stage, it is important to recognise that, between the Phase 3 and Mod 727 proposals, no additional information is being created. Rather, there is a difference in how quickly elements of the data are made available in the public domain, and in how much detail. Once more, therefore, the focus is returned to the transmission of private information to the market and the relative efficiency of each level of information provision.

3 Benefits

Oxera's analysis indicates that there are at least two major benefits from providing additional information of the sort set out in section 2:

– this may result in more efficient, although not necessarily lower, wholesale gas prices, reflecting more closely the fundamentals;

– this may help reduce uncertainty, allowing market participants to trade with greater certainty, and thereby reducing spreads.

The previous Barclays Capital study and Ofgem's February consultation set out other possible benefits from greater information disclosure.[11] Having reviewed these, Oxera does not consider that they represent significant benefits, which is reflected in the balance of the assessment in this section. Further discussion on why these points are likely to be less significant is contained in section 3.3.

3.1 Information and more efficient prices

To understand the impact that the provision of additional public information may have on the gas market, the role that information plays in markets needs to be understood more generally. Work by Fama (1965) on the efficient markets hypothesis (EMH) discusses this issue.[12]

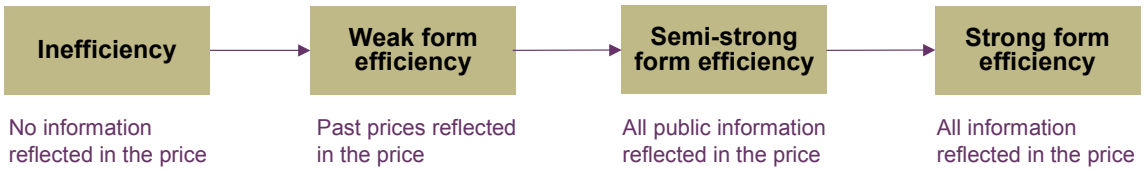
According to the EMH, in an efficient capital market, prices fully and instantaneously reflect all available relevant information. For example, if a company issues a statement propounding that it expects lower profits in the next year (and market participants were not aware of this information in advance of this publication), the EMH states that this event would be reflected in a reduction in the share price in an efficient market.

Three forms of efficiency have been defined in the literature on EMH (see Figure 3.1), each based on the type of information that is reflected in prices in efficient markets:

– weak form efficiency;
– semi-strong form efficiency;
– strong form efficiency.

In the absence of these, a market would be considered inefficient.

Figure 3.1 Forms of market efficiency



Source: Oxera.

[11] Barclays Capital (2003), 'Benefits from Greater Information Release in the UK Gas Market', December; and Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February.
[12] Fama, E. (1965), 'Random Walks in Stock Market Prices,' *Financial Analysts Journal*, September/October.

A market is weak form efficient when prices fully reflect past price data. All other public and private information is not reflected in the price, and therefore traders can make profits using this information. A market is semi-strong form efficient when prices fully reflect all publicly available information. However, private information is not reflected in prices in this form of efficiency; thus, profits can be made from the possession of private information. Finally, a market is strong form efficient when prices fully reflect all (public and private) information. In a strong form efficient market, no profits can be made from the possession of private information, meaning that this information is worth nothing.

The forms of efficiency that apply to the gas market are most likely to be the semi-strong form and the strong form. It is justifiable to assume that the gas market is beyond weak form efficiency, since prices almost certainly reflect public information other than past prices. Therefore, this report will focus on semi-strong and strong forms of efficiency.

Although the literature on EMH seems to imply that there are only three forms of market efficiency (weak, semi-strong and strong form), it is not unreasonable that a market may be located between two forms of efficiency. For example, the prices in the gas market may reflect all public information as well as some private information. This would imply that the gas market was more than semi-strong efficient, and yet not strong form efficient. In other words, rather than having three discrete forms of efficiency, efficiency can be thought of as being continuous, with three clear benchmark points.

Although there are no formal definitions of market structure that need to hold for a market to be efficient, if some, or all, of the following hold, the market is more likely to be efficient:

– large number of parties in the market;
– an absence of parties with market power;
– liquid markets;
– parties behave rationally.

For the price to reflect all available information, there need to be a large number of parties in a market (ie, traders in the gas market). If the number of parties is low (ie, only two), these players will have bilateral agreements, which might reflect their relative positions rather than the expectation of an efficient cost-reflective price. Therefore, the more players there are in the market, the more likely it is that the market will be efficient.

Furthermore, if there are only a few players, at least some of them are likely to have market power, and consequently the ability to affect the price. These players might use their private information to move the price away from the efficient level in an attempt to achieve other, potentially anti-competitive, aims.

Markets are more likely to be efficient if they are highly liquid, since this implies that many trades are taking place, and that small trades do not substantially affect the price. If small trades were able to do this, the market price would not be robust to the actions of minor players that may not have an accurate interpretation of information.

Finally, market participants need to behave in a rational, profit-maximising manner. If they do not, prices may well not reflect information relating to fundamentals of demand and supply, but instead the objectives that the non-profit-maximising players are seeking to achieve.

3.1.1 Implications from the EMH

Additional information in the gas market will have varying impacts depending on where the gas market is located along the efficiency continuum. If the gas market is strong form efficient, all the public and private information is already reflected in prices; therefore, if some (or all) of the private information becomes public, it will have no effect on prices.

However, if the gas market is semi-strong form efficient, when some (or all) of the private information becomes public, this new public information will be reflected in prices, which will make the prices more efficient, but will not necessarily lower them.

If the cost of obtaining private information is not reflected in the price, when this private information is converted into public information, the incentives of obtaining the private information in the first place would be lower. Therefore, less private information may be generated, and hence reflected in the prices.

3.1.2 How efficient is the UK gas market?

An overview of the stylised facts associated with the UK gas market gives an insight into how efficient a market it is likely to be.

- **The number of players**—the UK wholesale gas market contains a large number of players (in March 2005 there were approximately 100 unique registered shippers[13]), and the International Petroleum Exchange lists 31 members actively engaged in natural gas trading on its futures exchange.

- **Players behave rationally**—the vast majority of the registered gas shippers are private commercial entities, and therefore can be assumed to trade on the market in a rational, profit-maximising way.

- **Liquid markets**—various estimates for the turnover of the UK gas market are available. Barclays Capital estimates that turnover is equal to around 10 times physical deliveries, while the International Energy Agency (IEA) estimates it to be around17 times.[14] In comparison, the churn rate for the Zeebrugge hub is approximately seven times physical deliveries, while it is 100 times deliveries for the Henry hub in the USA.[15]

- **A competitive market structure**—although the market structure is much less concentrated than comparator European gas markets, there may remain some issues regarding vertical integration and market concentration compared with the benchmark competitive market.

This brief review of the gas markets suggests that it is at least semi-strong form efficient; however, since there are several large players involved in the market, there may be market power, making it unlikely that the market is strong form efficient. This conclusion is supported by the Barclays Capital report:

> far from being a 'cost' imposed on producers by greater information release, these 'costs' would represent a benefit to consumers (ie, information release would transfer the value of private information from producers to consumers).[16]

This suggests that upstream producers can profit from the private information they possess; if this is the case, from the point of view of this analysis, it may be optimal to characterise the UK gas market as being semi-strong form efficient.

If the market is semi-strong form efficient then releasing previously private information into the public domain will assist in making wholesale gas prices more efficient, but not necessarily lower—instead, they will reflect the fundamentals more closely. While more

[13] Oxera calculation based on Transco (2005), 'All Gas Licensee's—Registered Addresses', March 30th. Some shippers have more than one shipper licence; these have only been counted as one unique shipper.

[14] Barclays Capital (2003), 'Benefits from Greater Information Release in the UK Gas Market', December; and IEA (2002), 'Flexibility in Natural Gas Supply and Demand', an OECD publication, p. 79.

[15] IEA (2002), op. cit., pp. 80 and 86.

[16] Barclays Capital (2003), op. cit., p. 3.

efficient prices are a positive benefit, it is not possible to estimate the value they provide, since this requires a detailed assessment of how much additional efficiency will result from the new information.

3.2 Information and spreads

The provision of additional short-term information may reduce the uncertainty faced by market participants, particularly at times when unexpected events, such as sub-terminal failures, have occurred. This may allow decisions to be made with greater certainty, which in turn may reduce the spreads observed in the wholesale market.

3.2.1 Risk versus uncertainty

Economics adopts clear definitions for risk and uncertainty:[17]

– risk—the likelihood of an event is known, or can be robustly estimated;
– uncertainty—the likelihood of an event is unknown.

In practice, either pure risk or pure uncertainty is unlikely to arise; as such, the two concepts can be regarded as two possible extremes, since most situations will contain a mixture of both. Nonetheless, certain situations may be characterised by being more uncertain than others.

In the context of the gas market, if market participants face risks rather than uncertainties, they can estimate the likelihood and consequences of certain events and can trade with these quantified estimates in mind. However, if the market participants face uncertainty, they will be unable to quantify the probability of an event occurring. Market participants are likely to react to this by withdrawing from the market completely or demanding a premium price in order to trade. Both reactions will tend to increase spreads.

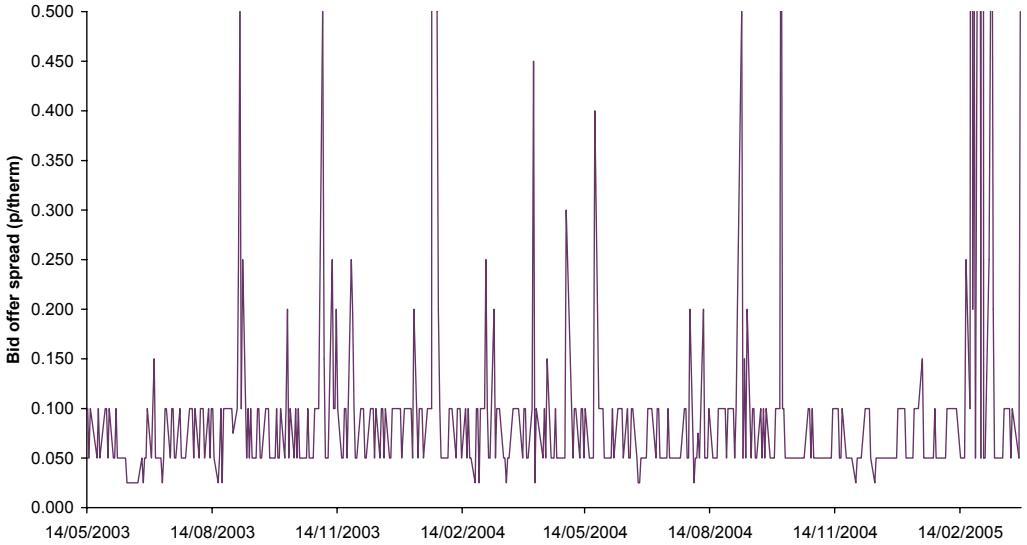
An extreme example of the impact that the difference between risk and uncertainty can have is illustrated by the reactions in the airline insurance markets following September 11th. Previously, airlines could acquire substantial amounts of cover for all risks in return for relatively modest premiums. Following September 11th, re-insurers considered that they could no longer adequately estimate either the likelihood or the impact of terrorism on airlines, and as a result, withdrew from the market.

3.2.2 Evidence that uncertainty widens spreads

Spreads in the UK day-ahead gas market are generally between 0.05p and 0.10p/therm (see Figure 3.2 below). However, as shown in the figure, there are frequent instances where the spreads are considerably wider than this, with several spikes exceeding 1p/therm.

[17] This distinction was first set out by Knight, F. (1921), *Risk, Uncertainty, and Profit*, Boston: Hart, Schaffner & Marx; and subsequently discussed in Keynes, J.M. (1936), *The General Theory of Employment, Interest and Money*, London: Macmillan.

Figure 3.2 Bid–offer spread (p/therm)



Source: Heren.

There is at least some anecdotal evidence that these wider spreads occur at times when there is significant uncertainty. Two examples highlight this point:

– late January 2004—concerns over Centrica's Rough storage facility resulted in a highly volatile market, with day-ahead prices reaching intra-day highs of £1/therm and lows of 50p/therm. Spreads for day-ahead on January 23rd were reported by Heren as being 10.0p/therm;

– early March 2005—field glitches and rumours of unexpected sub-terminal closures resulted in a volatile market. Spreads for day-ahead on March 2nd were reported by Heren as being 4.5p/therm.

Barclays Capital took a similar view when it assessed the benefits that might accrue from a wide range of information if it were to be provided publicly, stating that:

> market spreads increase significantly when market participants face unmanageable and unknown risks concerning demand and supply and that in these circumstances the spread has to be higher to compensate market participants for the increased trading risks that they bear.[18]

The relationship between uncertainty and spreads has been documented more formally in other trading markets. For example, Cheung & Wong (2000) carried out a survey of foreign exchange market participants to identify the drivers of various exchange rate dynamics.[19] A critical observation from this study was that bid–offer spreads for key currency pairs fell within a small range during most periods, but widened significantly in the presence of uncertainty. Indeed, uncertainty, caused by major news events/releases, unexpected changes in market activity and increased market volatility, was the most important reason cited for deviating from the more typical narrow range of spreads. Other explanations for the deviation, such as when trading with an informed counterparty, received little support in this study.

[18] Barclays Capital (2003), op. cit., p. 2.

[19] Cheung, Y. & Wong, C.Y. (2000), 'A survey of market practitioners' views on exchange rate dynamics', *Journal of International Economics*, **51**, 401–09.

3.2.3 Impact of more information on spreads

The discussion above has demonstrated that increased uncertainty has the potential to widen spreads in the gas market. By providing market participants with more information, or more timely information, market participants may be able to form clearer views on the likelihood of events occurring, reducing the uncertainty they face or the length of time that uncertainty prevails.

The impact of this new information could exhibit itself as a general lessening of uncertainty in the market, potentially reducing spreads at all times. Alternatively, the new information may only reduce spreads at times when uncertainty is high, bringing them closer to the spreads observed at times of greater certainty. The previous benefit estimation by Barclays Capital indicated that the second of these two possibilities most closely reflected reality:

> higher spreads and lower liquidity result when there is significant uncertainty on fundamental supply and demand conditions. We would therefore estimate that the release of greater market information could, on average, reduce market spreads by around 0.05p/therm by bringing the spreads at less liquid times down to a similar level to the premiums observed when the market is working well.[20]

3.2.4 Estimating the benefit

To estimate the impact of more information via the spread, three values are required:

– the size of the reduction in the spread;
– the volume of trades to which this spread reduction applies;
– the elasticity of demand.

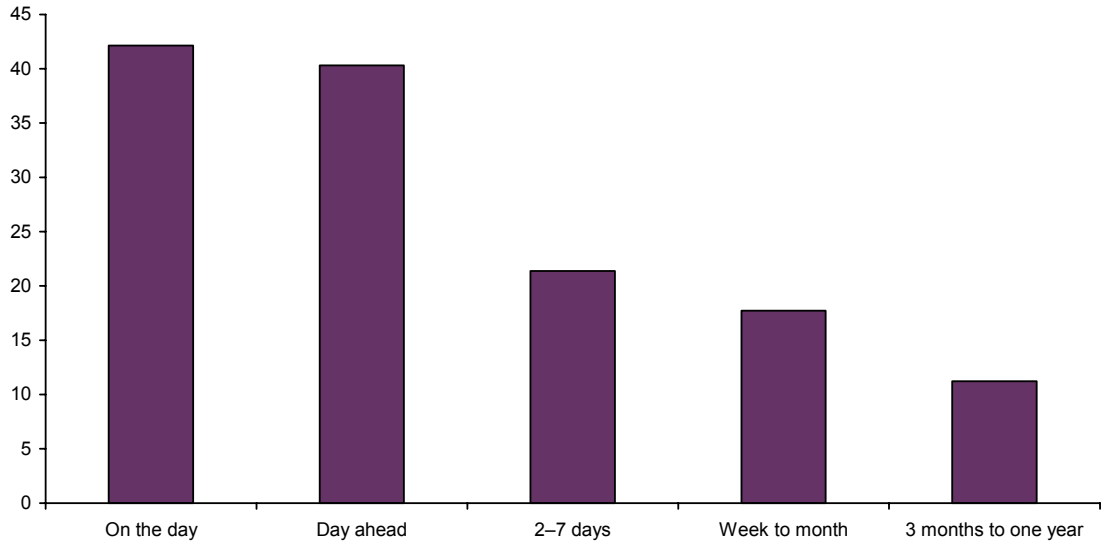
As noted above, Barclays Capital estimated that the impact of additional information provision on the spread could be around 0.05p/therm on average, although this estimate was based on more general information provision than that discussed in this report. Nonetheless, in response to Oxera's informal survey, another bank confirmed that it believed that the estimate of a 0.05p/therm reduction was a reasonable estimate of the impact given the particular information disclosure being discussed, although it admitted that this value was based on trader sentiment, rather than empirical evidence. In the absence of more robust information, Oxera has adopted the 0.05p/therm reduction as the current best estimate.

The total volume of trades in the UK gas market is in the region of 10–17 times the total physical deliveries reported in Transco's '2004 Ten Year Statement' of around 1,150TWh (39.2 billion therm) in 2004.[21] However, since the information being proposed for release is short-term in nature, it is only likely to be able to have significant impact on uncertainty, and hence spreads, in the short-term markets, such as the OCM and day-ahead. As a result, the volume of trades that might be affected by reduced spreads is less. If the trading pattern observed in the Heren reports is taken as a proxy for the broader market (see Figure 3.3 below), around 60% of the total market may be affected.

[20] Barclays Capital (2003), op. cit., p. 2.

[21] IEA (2002), *Flexibility in Natural Gas Supply and Demand*, an OECD publication, p. 79; and Barclays Capital (2003), op. cit., December, p. 2.

Figure 3.3 Volumes traded in different timeframes, 2003 (reported bilateral trades, m therm)



Source: Heren and Oxera analysis.

As noted above, it is likely that spreads will only be reduced for trades during more uncertain periods of the market, currently characterised by wider spreads. Table 3.1 shows the proportion of trading days reported as having spreads in excess of 0.1, 0.2 and 0.3p/therm.

Table 3.1 Proportion of trading days with large spreads in the day-ahead market

Spreads (p/therm)	Proportion of trading days (%)
Greater than 0.3	3.2
Greater than 0.2	4.9
Greater than 0.1	8.5

Note: Proportions calculated for the period May 14th 2003 to March 30th 2005. Proportions are not cumulative.
Source: Oxera analysis of Heren data.

Oxera is not aware of any robust estimates for the price elasticity of trading volumes in the wholesale gas market and has therefore adopted an assumption that the elasticity is equal to –1.0. This implies that a 1% reduction in price results in a 1% increase in volumes. The elasticity is used to calculate the potential impact of a reduction in spread on the volumes traded. However, the volume effect is minimal, as discussed below.

Table 3.2 below sets out high and low estimates of the benefits that could accrue if more near real-time information were published. The range between the two estimates is quite large; this is driven partly by the range of estimates for the volume of trades in the wholesale market, and partly by the difference in the proportion of trading days affected, depending on what is assumed to constitute a wide spread (see Table 3.1).

Table 3.2 Estimated benefits from reduction in spreads (£m, 2005)

Benefits	Benefits due to reduced spreads	Benefits due to increased volume of trades
Benefits in one year: high[1]	17.3	<0.1[3]
Benefits in one year: low[2]	3.8	<0.1[3]
NPV of benefits over 15 years: high[4]	175.6	0.1
NPV of benefits over 15 years: low[4]	38.6	<0.1

Notes: [1] High values calculated using higher volume of total trades and assuming that all trading days with spreads greater than 0.1p/therm are affected by the reduction in spreads. [2] Low values calculated using lower volume of total trades and assuming that all trading days with spreads greater than 0.3p/therm are affected by the reduction in spreads. [3] These calculations use an elasticity of –1.0 and assume a linear demand curve. Adopting other assumptions, such as a parabolic demand curve or more elastic demand (eg, –2.0) do not increase the benefits above the 0.1 level. [4] The NPV calculation is undertaken over 15 years using a discount rate of 6.25%. Source: Oxera calculations.

Two types of benefit are shown in Table 3.2.

– **Benefits due to reduced spreads**—this assumes that a reduction in the spread reduces (increases) the purchase (sale) price of gas faced by downstream shippers, in effect transferring benefits from other participants in the market to downstream shippers. In other words, consumer welfare is generated, but overall welfare remains unchanged (see section 5). In turn, the downstream shippers could pass these benefits to end-consumers via lower charges. This value is calculated by multiplying the total volume of trades in the market by 60% to arrive at the volume of trades that could be affected by the new information. The resulting value is then multiplied by the proportion of trading days that display higher spreads (these values are show in Table 3.1) and by the 0.05p/therm reduction in spread.

– **Benefits due to increased volume of trades**—this uses the elasticity of demand value noted above to estimate the additional number of trades that might take place if spreads were reduced. Since extra trades take place, additional welfare is generated. The volume of extra trades is calculated by multiplying the volume of trades on the higher-spread days by the 0.05p/therm reduction in spread and the –1.0 elasticity. The welfare generated by these extra trades is calculated by multiplying the volume of extra trades by the spread reduction, and multiplying the resultant value by half.[22]

3.3 Other suggested benefits

Ofgem's draft impact assessment set out a series of benefits that it believed could arise from the publication of additional near real-time gas information; much of the analysis was based on work carried out by Barclays Capital. Of the five potential benefits, two are anticipated to be significant in relation to the particular information disclosure being discussed: the benefits from increased competition and from more efficient risk management. These are broadly equivalent to the more efficient prices argument and potential reductions in spreads discussed in the previous two sections.

Qualitative assessment of the other three benefits suggests that these are likely to be less important.

– **Better coordination of outages**—it was argued that greater information disclosure might lead to better coordination of outages between Transco and market participants.

[22] This assumes a linear demand curve.

However, the information disclosure discussed in this report will not provide Transco with any additional information; thus, it is difficult to see how planned outages can be better coordinated. Furthermore, planned outages tend to take place in the summer when demand is lower, minimising the impact on supply and hence price. By their nature unplanned outages are not predictable; as such, the additional information being discussed cannot assist in planning their coordination. In addition, the relevant participants tend to find out in a relatively short timescale if there is to be a major outage, for example, at a particular sub-terminal, and can therefore coordinate around it. It is not clear that the additional information proposed will assist coordination further.

– **Improved security of supply**—Ofgem's consultation suggests that security of supply concerns 'generally relate to unanticipated demand and supply imbalances or shocks that emerge over timescales where the market is unable to respond'.[23] This is similar to the DTI statements that 'in the short term, security of supply covers understanding of, and then working collectively to minimise, the risks of a physical unplanned interruption in energy supplies.'[24] Therefore, information disclosure that might allow more accurate prediction of, or more accurate market signals relating to, such imbalances, thereby allowing market participants to take more appropriate action, may help improve security of supply. However, it is not clear that the information releases being proposed at present will allow more accurate prediction. In particular, Transco, which has the duty to balance the system, does not receive any improved information, and the actions it takes in the OCM are therefore unlikely to change significantly.

  However, the new information may result in more accurate market signals since other participants in short-term markets will now have a wider range of information on which to base their decisions. More accurate market signals should improve efficiency, resulting in at least some positive benefit. However, security of supply concerns are often more focused on long-run issues, such as the adequacy of investment being undertaken to provide storage, rather than these shorter-run issues about the market's response to problems. This suggests that, while the security of supply benefits are likely to be positive, they are also likely to be relatively small in size.

– **Reduced balancing costs**—it was argued that providing improved information to Transco would enable it to manage the transmission system more optimally, thereby reducing balancing costs for the industry. However, as noted above, under the current proposals Transco will not receive any additional information; consequently, no change in the volume of balancing is expected unless third parties engage in more of their own balancing. Were they to do so—for example, because of more accurate market signals—they would still be incurring costs in order to balance the system. Thus, while the volume, and hence cost, of balancing undertaken by Transco may fall, the costs to the industry will not necessarily fall in aggregate.

[23] Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February, para 1.32.
[24] DTI website, accessed April 2005: http://www.dti.gov.uk/energy/domestic_markets/security_of_supply/index.shtml

4 Costs

Oxera analysis indicates that there are at least two major cost categories associated with providing additional near real-time gas information. Most obvious are the direct costs associated with the installation and operation of monitoring equipment, as well as the development of a website to give access to this information. In addition, Oxera analysis indicates that providing this information may result in indirect costs, caused by excessive volatility in prices. It is not possible at present to provide an estimate of these indirect costs since the impact of this near real-time information on price volatility is not known.

4.1 Direct costs

Oxera has not sought to quantify its own estimate of the costs associated with the proposed information provision, and has instead collated the industry estimates that have been drawn up (see Table 4.1). In an effort to benchmark the proposed costs, Oxera examined comparator investment programmes (eg, work by Elexon on non-half-hourly automatic meter reading).[25] However, detailed costing was not available for these and the relevance of the available comparisons was also not clear.

Table 4.1 Costs, 2005

	Minimum start-up costs	Maximum start-up costs	Ongoing costs	NPV of costs over 15 years[5]
Phase 3				
Ofgem	£135,000[1]	£735,000[2]	£85,000 per year[3]	£0.95–1.55m
energywatch Mod 727: costs in addition to Phase 3				
Transco	£650,000	£20.8m	[4]	£0.65–20.8m
energywatch		£20.1m	£2,000 per year	£20.12m

Notes: [1] Options two and three costs. [2] Option one costs. [3] The Ofgem report did not explicitly state that the ongoing costs are annual; however, there was also no mention of the NPV or the time period over which the figure applies. It is therefore Oxera's assumption that the costs are annual. [4] The Transco paper mentions ongoing costs, although it does not provide a value. [5] Calculated over 15 years, using a real 6.25% discount rate. Sources: Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February; and Transco (2005) 'Draft Modification Report 3rd Party Proposal: Publication of Near Real Time Data at UK Sub-Terminals Modification Reference Number 0727', February.

According to Ofgem, Transco has sanctioned expenditure of £135,000 to implement the final parts of Phase 3 national and zonal information on near to real-time flows and forecasts. Ofgem's higher estimate includes Transco's assumption that a further £600,000 will be needed for system development activities and enhancements, redevelopment of the Information Exchange software and hardware, and redevelopment of the interfaces between IT applications, which was included in the Ofgem estimate. A further £85,000 would be needed for ongoing support and maintenance of real-time information flows.

energywatch provides an estimate of £20.1m of the maximum start-up cost associated with implementing Mod 727, which includes the installation of meters (with back-up), plus the installation of a high-grade communications line for 20 sub-terminals,[26] and the setting up of

[25] Elexon (2004), 'Automatic Meter Reading', Elexon Fact Sheet, November.

[26] This includes the possibility of new build.

a web-based reporting service. An additional £2,000 per annum maintenance charge also applies.

Transco's estimate of £650,000 for the Mod 727 implementation includes the development costs for the Category one and two deliverables, and system development costs. If there were a requirement for Transco to install duplicate metering at the UK sub-terminals, and this were also necessary for other NTS system entry points, this would incur further one-off costs of approximately £20m, according to Transco's estimates, together with additional ongoing maintenance costs.

In summary, while there is not absolute clarity with regard to the cost estimates provided so far, the incremental costs of implementing Phase 3 of the information initiative are likely to cost in the region of £1m–2m on an NPV basis, while implementing the energywatch proposals could cost up to a further £20m NPV.

Finally, it is not clear whether the higher costs of the energywatch and Transco forecasts will fully address the concerns, expressed by the DTI, UKOOA and Ofgem, that more frequent data will potentially be inaccurate and therefore destabilising. Thus, the decision to agree on hourly data release in Phase 3 reflects the view that less frequent, but more accurate, data is of greater value.

4.2 Indirect costs: information and volatility

As discussed in section 3.1, when markets are strong form efficient, they effectively aggregate all available public and private information into the price, allowing optimal decisions to be made about resource allocations. Another strand of economics literature has examined the functioning of markets when they are imperfectly competitive—ie, the market contains some large firms with market power.

Analysis by Shin and others has examined a model where firms have access to their own private information pool, and a shared pool of public information.[27] Firms use both the public and private information to make their pricing decisions, in the same way as they would if the market were efficient. However, since the market is imperfectly competitive, and the actions of one firm affect others, they also seek to second-guess the pricing behaviour of their competitors; to do this, they use the pool of publicly available information.

The result of this behaviour is an excessive focus on the public information, since it serves as a focal point for decision-making. In turn, this can crowd out valuable private information, making prices less representative of fundamentals. This crowding-out effect can lead to excessive volatility in prices, particularly if there is any noise or estimation error in the public information being produced. Shin & Morris (2002) concluded that:

> Public information has attributes that make it a double-edged instrument for public policy. Whilst it is very effective at influencing the actions of agents whose actions are strategic complements, the trouble is that it is *too effective* in doing so. Agents overreact to public information, and hence any unwarranted public news or mistaken disclosure may cause great damage.[28]

[27] See Shin, S. and Amato, J.D. (2003), 'Public and Private Information in Monetary Policy Models', Bank for International Settlements Working Paper Number 138, September; Shin, H. and Morris, S. (2002), 'Social Value of Public Information', London School of Economics Working Paper, January; and Townsend, R.M. (1988), 'Forecasting the Forecasts of Others', *Journal of Political Economy*, **91**:41.

[28] Shin and Morris (2002), op. cit, p. 26.

Shin & Morris highlighted an example where this overreaction was felt to be problematic:

> Australia moved from a monthly calendar in reporting its balance of trade figures to a quarterly calendar because it was felt that the noise in the monthly statistics were injecting too much volatility into the price signals from financial markets.[29]

As noted above in section 3.1.2, there is at least some evidence that the UK wholesale gas market is imperfectly competitive, with some players having a degree of market power. This suggests that the notion of excessive volatility is relevant to this discussion of near real-time information.

This excessive focus on public information may induce herd-like behaviour. A representative of an upstream shipper, responding to Oxera's informal survey, expressed a concern that the release of additional near real-time public information might encourage more 'sheep-like' behaviour, which they believed was currently observed around linepack data. Another respondent from a trading bank noted that linepack data was one of the crucial pieces of information used by them for trading. These responses suggest that it is plausible that some public data receives excessive attention at present.

Interestingly, one further respondent (an upstream shipper) noted that the provision of near real-time or real-time sub-terminal-level data might perversely create new profit opportunities for upstream operators. Consider an example: an upstream shipper's sub-terminal goes down for a short period for unplanned maintenance, and the shipper is informed by the engineering team that the outage is only short-term in nature, and that, once the sub-terminal is back online, the flow can be increased so that all of that day's planned deliveries can be made. Without sub-terminal-level data, the market is unlikely to react substantially to this action, since the market is unlikely to be aware that it has occurred, and the upstream shipper delivers on all its contracts. However, with sub-terminal-level data, other participants would become aware that this particular sub-terminal was down. If these participants are not aware that this outage is only short-term in nature, they may react as though it is a longer-term outage, resulting in an excessively large price increase caused by a short-term outage. Indeed, the upstream shipper now has a way to profit from the knowledge that the outage is only short-term. As the price rises on the publication of the sub-terminal-level data, the upstream shipper sells gas; once the price falls again when the sub-terminal returns to the system, the upstream shipper buys the gas back at a lower price.

4.2.1 Impact of excess volatility

Excessive volatility has two impacts on a market:

– it results in less efficient prices, since the price is unduly focused on the publicly available information;

– greater volatility increases the trading costs for the market participants—empirical analysis of equity markets has found that there is a robust positive relationship between volatility and implicit trading costs; higher volatility raises the costs of trading on the market.[30]

The potential for additional near real-time information to generate excess volatility is linked to both the accuracy of the data provided and the ability of market participants to interpret correctly the implication of the data for the underlying cost of gas. Since these factors cannot be quantified precisely, it is not possible to estimate the indirect costs. However, it is possible to draw some clear conclusions from this discussion: there is an important trade-off between

[29] Shin and Morris (2002), op. cit, p. 5.

[30] Domowitz, I., Glen, J. and Madhavan, A. (2000), 'Liquidity, Volatility, and Equity Trading Costs Across Countries and Over Time', University of Southern California Working Paper Number 322, March. See Table 3 for correlations.

more timely data and accurate data, which implies that it may be preferable to provide data less frequently, or with a delay, if it can be produced more accurately. If this trade-off is not optimal, it may cause excess volatility, which theory predicts can actually destroy economic welfare. This, in turn, raises a key question concerning the proposed information release: are the proposed data systems robust enough to ensure that the data being provided is accurate?

The Phase 3 information disclosure programme proposes to release data less frequently (on an hourly basis) and at an aggregated level (north/south), thereby giving time to ensure data accuracy and potentially smoothing out data inaccuracies via aggregation. In contrast, the energywatch Mod 727 proposes to provide real-time data on a disaggregated basis. The estimated costs of providing more frequent and disaggregated data are expected to be somewhat higher as a result. However, this raises a question about whether this proposed spend is adequate to make the data accurate enough, since there is a trade-off between money saved on the direct costs of installing monitoring equipment, and increases in indirect costs due to any data inaccuracies that result.

5 Balance of benefits between Phase 3 and energywatch

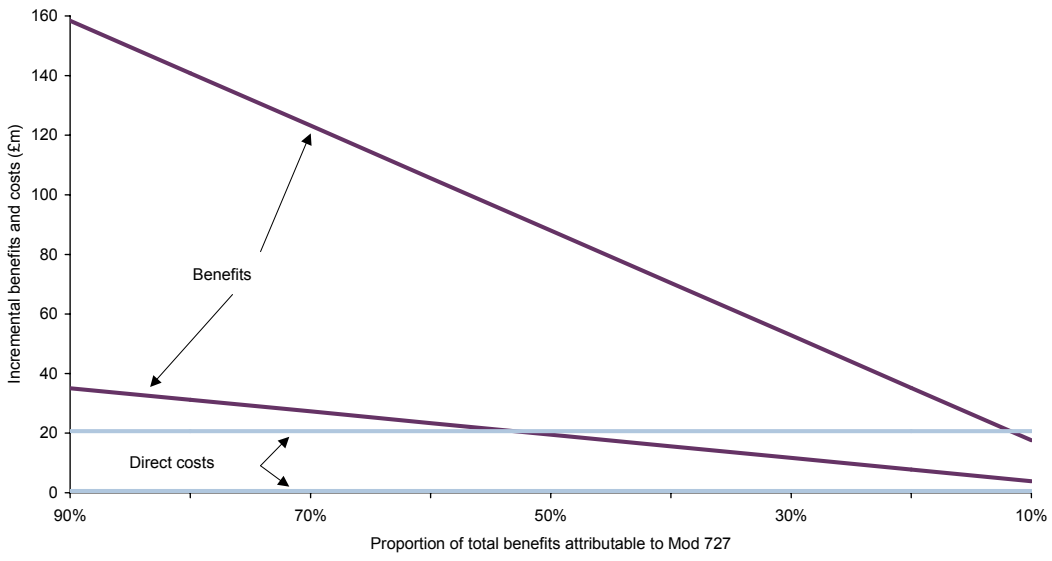
The analysis of the benefits above has so far not drawn a clear distinction between the two proposed information disclosures, and has instead treated them largely as one. Therefore the benefit estimates are effectively for both changes in information availability combined. The reason for doing this is that it is difficult to distinguish robustly the effects on market participant behaviour of moving first from the current situation of information availability to the disclosure proposed under Phase 3, and then moving again to the information disclosure proposed by energywatch under Mod 727.

Cost–benefit analyses generally consider proposals on an incremental basis, comparing the incremental costs of a particular change with the incremental benefits. The analysis of the costs in section 4.1 suggested that the incremental costs associated with implementing Phase 3 information disclosure are relatively low (less than £2m), but that the incremental costs of implementing the energywatch proposals are substantially higher (in the region of £20m).

If the majority of the benefits from information disclosure are expected to accrue from implementing Phase 3, this implies that the benefits associated with the additional costs of the energywatch proposals will be commensurately small. Indeed, there may be no net incremental benefits associated with the energywatch proposals, particularly if the incremental costs are in the region of £20m.

Figure 5.1 illustrates this point graphically. The graph shows the incremental costs and benefits of implementing Mod 727. The left-hand side of the graph shows the costs and benefits when Mod 727 accounts for 90% of the total estimated benefits, with Phase 3 accounting for 10%. The right-hand side shows the reverse, when Phase 3 accounts for 90% of the benefits and Mod 727 10%.

Figure 5.1 Incremental costs and benefits associated with energywatch Mod 727 (NPV £m, 2005 prices)



Source: Oxera analysis.

If a large proportion of total benefits is expected to be attributable to the energywatch proposal then, as Figure 5.1 shows, it is likely that this proposal can be justified in terms of the incremental costs and benefits. However, if less than half the benefits can be attributed to this proposal, it is not as clear-cut, since the lower end of the benefits range falls below the upper estimate of the direct costs, suggesting that this proposal could have net negative consequences for consumers.

This conclusion is reinforced in the presence of significant indirect costs. For example, were there to be a further £20m of indirect costs in addition to the £20m upper estimate of direct costs associated with the implementation of Mod 727 then, even if Mod 727 were responsible for 100% of the low-end benefits, it would result in net negative consequences for consumers.

The discussion in section 2.5 suggests that most short-term trading is related to changes in the actual and expected supply–demand balance on the day, as it is this which affects the likely cost of covering a short position or unwinding a long position in the market. Since both the energywatch and the Phase 3 options relate only to the supply side of the market, trading decisions would be expected still to rely on the linepack data provided to proxy the overall position on the system. Thus, on this basis, the benefit may be expected to differ very little between the energywatch and Phase 3 information.

Furthermore, the indirect cost implications may be differentiated between the energywatch and the Phase 3 information options. One potential issue is that both options release partial private information—they provide information on what the actual flows are, but do not give reasons for why the flows are what they are. This may create excess volatility because market participants react to transitory news in an inefficient manner. This outcome is more likely when there are more items of information that the market has to absorb.

Whatever the proportion of benefits that may be attributable to energywatch, the potentially large incremental costs, combined with potentially small incremental benefits, suggest a need for more thorough analysis of the relative benefits. Alternatively, there may be merit in waiting for a sufficient period after the implementation of the Phase 3 information changes so that the associated costs and benefits can be more accurately calculated. Waiting for this period may also make it possible to derive more accurate estimates of the incremental costs and benefits associated with the energywatch Mod 727, making it clearer whether this further stage of information provision is expected to yield net benefits.

6 Which benefits matter?

When undertaking a cost–benefit analysis, it should be considered which costs and benefits are of most concern, or alternatively from whose point of view the costs and benefits are being assessed. There are two broad perspectives to this.

– *The costs and benefits to society as a whole*—the broadest approach is to consider the costs and benefits to society as a whole by estimating the aggregate welfare impact of a particular proposal. This entails estimating the costs and benefits for both producers and consumers. It also generally involves assuming that any benefits/costs incurred by either group are given the same weight—ie, there is no preference for consumer benefits over producer benefits.

– *The costs and benefits to consumers only*—the alternative approach is to consider the costs and benefits purely from a consumer perspective. This approach might be adopted in instances where the objectives of the regulator specifically relate to protecting consumers.

Neither Ofgem nor energywatch specifies to which welfare standard they are operating in their cost–benefit analyses. However, in previous cost–benefit analyses, such as the gas distribution network sale impact assessment, Ofgem has examined only the impact on consumers.[31] Ofgem discussed the issue in its February consultation stating that:

> it is difficult to assess in overall welfare terms the relative balance of costs and benefits between downstream and upstream players. There may be commercial costs to producers from the loss of private information, but some of the value of this information may simply transfer to consumers as a benefit as they are now able to trade on the basis of that information.[32]

This discussion, and the fact that one of Ofgem's statutory duties is to 'protect the interests of consumers in relation to gas conveyed through pipes', suggests that Ofgem will adopt the consumer benefit approach.[33] Therefore Oxera estimates of the costs and benefits are from the consumer welfare perspective.

6.1 The timing of benefits

A further issue is that the benefit and cost estimates provided so far have not taken into account the timing and duration of cost and benefit streams. It is conventional in cost–benefit analysis to aggregate costs and benefits over a period of time, using an appropriate discount rate. In this study, Oxera has calculated the NPV of costs and benefits over a 15-year period (approximately equal to three of Transco's regulatory periods), using a real discount rate of 6.25%, equal to Transco's current cost of capital for transmission activities. This is similar to the approach used by Ofgem in its impact assessment of the sale of Transco's gas distribution networks.[34]

[31] Ofgem (2004), 'National Grid Transco—Potential Sale of Gas Distribution Network Businesses: Final Impact Assessment' November, document number 225/04a.

[32] Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February, para 4.17.

[33] Ibid., para 3.3.

[34] Ofgem (2004), 'National Grid Transco—Potential Sale of Gas Distribution Network Businesses: Final Impact Assessment' November, 225/04a.

7 Discussion and conclusions

Table 7.1 summarises the total costs and benefits of completing Phase 3 of the information initiative and implementing energywatch's Mod 727.

Table 7.1 Summary of total costs and benefits from completing Phase 3 and implementing Mod 727, 2005 (NPV, £m)

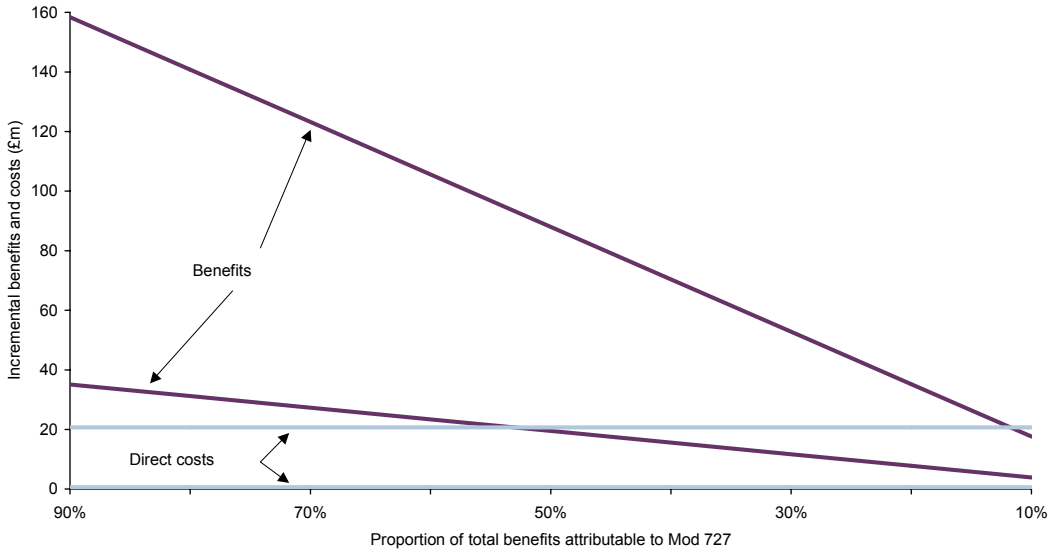
	Low cost, high benefit	High cost, low benefit
Benefits		
More efficient prices	Positive	Positive
Smaller spreads at times of uncertainty	175.6	38.6
Costs		
Direct costs	1.60	22.25
Phase 3 completion	*0.95*	*1.55*
Mod 727 in addition to Phase 3	*0.65*	*20.70*
Indirect costs	Positive	Positive
Aggregate net benefits	174.0	16.35

Source: Oxera.

Since a potentially large benefit and a potentially large cost could not be quantified, caution needs to be exercised when drawing any firm conclusions about the net benefits of either Phase 3 or Mod 727. However, since the quantified incremental costs associated with Phase 3 are relatively small, even if only a small proportion of the total benefits can be attributed to this phase of disclosure, there is at least some evidence to suggest that it is likely to offer net benefits to consumers.

In contrast, it is not as clear that implementing energywatch's Mod 727 will necessarily yield net consumer benefits, since, based on the quantified costs and benefits, the incremental direct costs could exceed the incremental benefits. This point is illustrated graphically below in Figure 7.1, which shows the quantified incremental costs and benefits associated with Mod 727 next to one another.

Figure 7.1 Incremental costs and benefits associated with Mod 727, 2005 (NPV, £m)



Source: Oxera.

If a large proportion of total benefits is expected to be attributable to the energywatch proposal then, as Figure 5.1 shows, it is likely that this proposal can be justified in terms of the incremental costs and benefits. However, if less than half the benefits can be attributed to this proposal, it is not as clear-cut, since the lower end of the benefits range falls below the upper estimate of the direct costs, suggesting that this proposal could have net negative consequences for consumers.

This conclusion becomes stronger the smaller the proportion of the total benefits that are assumed to be derived from energywatch's Mod 727. This suggests that it may be prudent to carry out further analysis of the impact of this type of data once Phase 3 is complete, since market data will be available which may allow more accurate estimation of whether Mod 727 offers incremental benefits to consumers.

7.1 Benefits and costs from information

The four benefits and costs highlighted in this study are as follows.

– **More efficient prices**—the available evidence suggests that the UK wholesale gas market is not strong form efficient. This implies that placing private information into the public domain will make prices more efficient, reflecting the fundamentals more closely. In theory, this should lead to improved allocative efficiency. However, it was not possible to estimate the magnitude of this benefit.

– **Smaller spreads at times of uncertainty**—additional public information may help reduce uncertainty that may result from shocks to demand or supply in the market. Greater certainty may allow market participants to trade with narrower spreads at such times. Oxera estimated this benefit to be in the region of £39m–£176m NPV over 15 years. To put this into context, it is equivalent to a 0.03–0.13% reduction in the wholesale gas price of 35p/therm.[35]

[35] Assumes physical deliveries of 39.2 billion therms/annum at 35p/therm, with annual benefits of £3.8m–£17.3m.

– **Direct costs**—Ofgem, energywatch and Transco have produced a wide range of direct cost estimates. These suggest that implementing Phase 3 will cost less than £2m NPV, but that implementing Mod 727 could cost up to a further £20m.

– **Indirect costs**—additional public information may result in excessive volatility if the market is imperfectly competitive. Oxera's analysis suggests there are at least some reasons to believe that it is imperfectly competitive. Although it was not possible to estimate the magnitude of these costs, they may be substantial, particularly if there are errors or noise in the near real-time data. Indirect costs could plausibly be higher under Mod 727 than under Phase 3 due to the disaggregation of the data and its real-time nature.

7.2 Comparison with previous benefit analyses

Table 7.2 compares the benefit values estimated in this report with those provided by Ofgem (based on work by Barclays Capital) and by energywatch. The Ofgem and energywatch values are relatively similar, and were both originally presented as benefits per annum. To aid comparison, both sets of values have been converted into NPV values in the same way as used for the Oxera values.[36]

Perhaps the clearest observation from Table 7.2 is that Oxera's estimates of the benefits from greater near real-time or real-time information disclosure are an order of magnitude smaller than those provided by Ofgem and energywatch, which suggest benefits of around £2.7 billion, while Oxera's estimates suggest values of between £39m to £176m, ie, the Ofgem and energywatch estimates are between 15 and 70 times higher than the Oxera estimates..

Table 7.2 Comparison of estimated total benefits, 2005 (NPV, £m)

Benefits	Oxera	Ofgem/ Barclays Capital	energywatch
More efficient prices/increased competition	Positive	457	660
Smaller spreads at times of uncertainty/more efficient risk management	39 to 176	2,030	2,030
Better coordination of outages	Zero	203[1]	145[1]
Improved security of supply	Positive, but small	Positive	Positive
Reduced balancing costs	Positive, but small	Positive	Positive
Aggregate benefits[2]	**39 to 176**	**2,690**	**2,835**

Note: [1] Both the Ofgem/Barclays Capital and energywatch values are calculated using £20m benefit per annum. However, the energywatch calculation assumes that no benefits are accrued for the first five years , since energywatch states that this benefit is likely 'to take longer to achieve' than the others. [2] Includes quantified benefits only.
Sources: Oxera; Ofgem (2005), 'Offshore Gas Production Information Disclosure: Initial Consultation and Draft Impact Assessment', February; and energywatch (2005), 'Modification 727: Publication of near real-time data at UK sub-terminals: Additional information paper', January 6th.

The primary reason for the substantial difference is that the Ofgem/Barclays Capital estimates, which also form the basis of the energywatch analysis, consider the benefits from a considerably wider range of information disclosure than the two proposals examined here—ie, to some extent, the estimates are for different changes in information availability.

[36] The NPV is calculated over 15 years, using a 6.25% real pre-tax discount rate, assuming the flows of benefits are constant in real terms every year.

Appendix 1 Summary of gas market data availability

Table A1.1 below presents the information available to gas market participants. The first two columns detail the information provided and to which party—ie, Transco, shippers, the general public (or other categories within this). The third column shows the timing of this data becoming available and categorises this according to who receives it. The fourth and fifth columns show the frequency of the data release and its source.

The table is split into several sections, covering:

– information provided to all market participants by Transco;

– information provided to shippers by Transco;

– information provided by other market participants to the market;

– further information requested by energywatch under Mod 727;

– information provided to Transco by producers;

– information provided to Transco by shippers;

– information provided to Transco by all market participants.

Within each section, data entries are presented beginning with the most frequent. For example, day-ahead data is listed ahead of monthly data. D indicates gas day (ie, from 06:00 to 05:59); M indicates month.

Table A1.1 Short- and long-term information available to gas market participants

Information provided by Transco to all market participants

Information/data	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Interruptible capacity available (volume and location of available capacity)			✓			Prior to the day	Various times before the day	ANS
Interruptions (volume of interruption by LDZ for previous day for NSLs, non-NSLs and tests. Probability of interruption for each LDZ for the next day Background information is also provided on: reasons for interruption, interruption procedure, failure to interrupt, Transco's promises and customers' obligations, information services, fast facts, LDZ maps, expected and historical annual levels of interruption			✓			Likelihood to interrupt 18.00—D–1 Actual interruption volumes 13.00—1-day lag	Daily	Transco website
End-of-day aggregate forecast flows into NTS (mcm)—data also disaggregated into north and south—for a single gas day			✓			From midnight prior to the gas day concerned	Hourly	Transco info website
System nomination balance (also requested energy and scheduled energy)			✓			From midnight day-ahead to 03:00 within day	Hourly	Transco info website
Likelihood to interrupt (five-day forecast)			Subscription service			On the day	Daily fax	
Linepack—opening, two projected closing (mcm)			✓			From midnight forecast day-ahead to final forecast at 03:00 within day	Hourly	Transco info website
Forecast demand (mcm) in each LDZ and in aggregate			✓			Within day and day-ahead	Within day: 4–5 times a day Day-ahead: 3 times	Transco info website
Auction capacity available (by ASEP p?]and at each hour within day gives capacity available and the floor price attached)						Processed each hour within day	Daily	Gemini Information publication

Information/data	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Capacity volume and price for active within-day firm capacity bids by ASEP for the current capacity day			All system users			Updated as required within the capacity day	Daily	Gemini Information publication
Daily balance report (total system balance (nominations + actual inputs/ outputs) with storage injection and withdrawal shown separately. Summary of balancing actions, system information and prices. Daily interruption by LDZ (Transco and emergency)			✓			1-day lag (updates on D+2 and D+7)	Daily	Transco info website
MSEC auctions, by ASEP for each tranche (total number of bids, total number of successful bids, highest and lowest accepted bid prices and energy sold at that price. Weighted average price of accepted bids)			✓			24 hours after auction	Daily	RGTA website
Actual demand for each LDZ			✓			1-day lag	Daily	Transco info website
Entry and exit capacity trading report—terminal/entry zone—average, low, high and total daily traded capacity. Within day and futures			✓			1-day lag	Daily	Transco info website
Within-day entry capacity traded—transactions. Total number requests, offers, deals confirmed. % of deals pre-arranged and % confirmed, single-day trades as % of total, average capacity of single-day trades			✓			1-day lag	Daily	Transco info website
Future entry capacity traded—by terminal/entry point and by month			✓			1 day lag	Daily	Transco info website
Gas demand—commercial demand (mcm) in each LDZ, sum of all LDZ demand. Throughput for NTS			✓			1 day (also 6 days after gas day incl. data amendments)	Daily	Transco info website
Weather correction factor, scaling factor values (forecast and allocated) in each LDZ, for given gas day			✓			1 day (also published daily until 6 days after gas day, incl. data amendments	Daily	Transco info website
Price information—system average price, system marginal price (buy and sell)			✓			1 day	Daily	Transco info website

Information/data	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Gas trading report (number and volume of NBP gas trades. average, highest and lowest trade size)			✓			2-day lag	Daily	Transco info website
Total shipper entry point nominations (kWh)			✓			2-day lag	Daily	Transco info website
Total storage withdrawal nominations (kWh)			✓			2-day lag	Daily	Transco info website
Total shrinkage nomination (kWh)			✓			2-day lag	Daily	Transco info website
Total input nominations (kWh)			✓			2-day lag	Daily	Transco info website
Aggregate output nominations to end-users (kWh)			✓			2-day lag	Daily	Transco info website
Total storage injection noms (kWh)			✓			2-day lag	Daily	Transco info website
Total shrinkage estimate (kWh)			✓			2-day lag	Daily	Transco info website
Total output nominations (kWh)			✓			2-day lag	Daily	Transco info website
Aggregate nominations imbalance (kWh)			✓			2-day lag	Daily	Transco info website
Total input at entry points (kWh)			✓			2-day lag	Daily	Transco info website
Total storage withdrawals (kWh)			✓			2-day lag	Daily	Transco info website
Total shrinkage input (kWh)			✓			2-day lag	Daily	Transco info website
Total actual inputs (kWh)			✓			2-day lag	Daily	Transco info website
Total delivered to end-users (kWh)			✓			2-day lag	Daily	Transco info website
Total storage injections (kWh)			✓			2-day lag	Daily	Transco info website

Information/data	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Total shrinkage (kWh)			✓			2-day lag	Daily	Transco info website
Total actual outputs (kWh)			✓			2-day lag	Daily	Transco info website
Gas trading data (average, high and low volume traded, non-matching trades)			✓			2-day lag	Daily	Transco info website
Shrinkage information—quantity bought/sold, number of trades executed (buys and sells), weighted average price (buys and sells), bought price and sold price (min. and max.)			✓			5-day lag	Daily	Transco info website
NTS entry end-of-day flows			✓			2-day lag (daily updates until 7 days after gas day)	Daily	Transco info website
Retrospective monthly entry capacity auction reports—baseline capacity sold going forward			✓			Every six months	Monthly	Transco info website
Deliverability with respect to planned maintenance—forward-looking until end of 2005 (on north/south basis)			✓			Forward-looking	Annual	Transco info website
Cash-out prices (daily SAP, daily SMP Buy, daily SMP sell, SAP 7-day rolling, SAP 30-day rolling.)			✓			Not stated	Daily	Transco website
Operational summary—weather details, demand details, supply overview, entry capacity overview (details of scaleback, buyback, and TFAs)			✓			Not stated	Daily	Transco website

Information provided by Transco to shippers

	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Interconnector interruption		✓ (interconnector shippers only)				As required (Surefax)	As required	
Linepack system status (current system demand, projected closing linepack and opening linepack)		✓ External shipper view				D–1 and D0 updates as required	Daily	AT Link
System status history (trend in system demand, projected closing linepack and opening linepack)		✓ External shipper view				D–1 and D0 updates as required	Daily	AT Link
Price information history (SAP, SMP Buy and SMP Sell)		✓ External shipper view				D–1 and D0 updates as required	Daily	AT Link
Meter energy list, on daily basis: initial and latest aggregate energy measurements at all input meter IDs and at selected output meters (shippers can only see their own output meters)		✓ External shipper view				1-day lag with measurement changes possible up to 5 days after	Daily	AT Link

Information provided by other market participants to the market

	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Aggregate site nominations for Hornsea storage site (kWh)		✓			Real-time		3 times a day	Scottish & Southern Energy's 'Hits' website
Aggregate site nominations for Rough storage site—injections and withdrawals (kWh)			✓			Real-time	3 times a day	Centrica STORIT website
Customer nominations for Hornsea storage site (kWh)		✓			1 day		Daily (4pm)	Scottish & Southern Energy's 'Hits' website
Natural gas price index			✓			1 day	Daily	IPE website
Number of trades on OCM, WAP, energy (th), values (£)			✓			1 day	Daily	Extranet account on APX Gas website
SMP Buy, SAP and SMP Sell			✓			1 day	Daily	Extranet account on APX Gas website
Net interconnector gas flows (MMJ)			✓			4 days	Daily	Interconnector UK website
Natural gas price index			✓			Month-end	Monthly	IPE website
Exchange volumes for natural gas futures			✓			Length of lag unclear	Monthly	IPE website

Further information requested by energywatch

	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Flow data for each sub-terminal (incl. Transco entry points, and entry points and sub-terminals capable of accepting flows greater than 10 mcmd)	Not yet available					Real-time	Hourly	Transco is proposed provider

Information provided to Transco by producers

	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Field reserves remaining (bcm) (gas year 2004/05 onwards)	✓			Responses from producers due in February of baseline gas year	Responses published in July of baseline gas year	Responses published in July of baseline gas year	Annual	Transco website: TBE consultation process
Calorific value (MJ/m3) (gas year 2004/05 onwards)	✓			As above			Annual	As above
Forecast annual supply (gas year 2004/05 onwards) (mcm/d)	✓			As above			Annual	As above
Forecast maximum daily supply (gas year 2004/05 onwards) (mcm/d)	✓			As above			Annual	As above
Gas composition (mole %) (gas year 2004/05 onwards)	✓			As above			Annual	As above

Information provided to Transco by shippers

	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Annual supply—forecast annual delivery (mcm) (2004/05, 2005/06, 2006/07)	✓			Responses from shippers due in February of baseline gas year	Responses published in July of baseline gas year	Responses published in July of baseline gas year	Annual	Transco website: TBE consultation process
Annual demand—forecast annual delivery (mcm) (2004/05, 2005/06, 2006/07)	✓			As above			Annual	As above
Peak supply—forecast max daily demand (mcm/d) (2004/05, 2005/06, 2006/07)	✓			As above			Annual	As above
Peak demand—forecast max daily demand (mcm/d) (2004/05, 2005/06, 2006/07)	✓			As above			Annual	As above
New demands (NTS loads and new LDZ customers) (2004/05, 2005/06, 2006/07)	✓			As above			Annual	As above
Delivery profile (average daily flow mcm/d) by month for NBP and/or each terminal (2004/05, 2005/06, 2006/07, 2007/08)	✓			As above			Annual	As above
Interruptible supply (proportion portfolio, type of contract/limitations, days allowed in contracts, access to alternative fuels)	✓			As above			Annual	As above
Gas prices (nature of pricing structure, differentiation)	✓			As above			Annual	As above

Information provided to Transco by all market participants

	Available to			Timing of availability			Frequency	Source
	Transco	Shippers	All	Transco	Shippers	All		
Views about gas demand	✓	✓	✓	Responses from market participants due in February of baseline gas year	Responses published in July of baseline gas year	Responses published in July of baseline gas year	Annual	Transco website: TBE consultation process
Views about gas prices	✓	✓	✓	As above			Annual	As above
Views about gas supplies	✓	✓	✓	As above			Annual	As above
Views about demand management	✓	✓	✓	As above			Annual	As above

Oxera
Blue Boar Court
Alfred Street
Oxford OX1 4EH
United Kingdom

Tel: +44 (0) 1865 253 000
Fax: +44 (0) 1865 251 172

www.oxera.co.uk