



**POOL PRICE
A CONSULTATION BY OFFER**

FEBRUARY 1999

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1. Introduction

The problems of the present arrangements for wholesale electricity trading are well known. Work is in progress to replace the present Electricity Pool ("the Pool") with a more market-based set of arrangements. In the meantime, it is important that the Pool, in its last months of existence, operates as an orderly market, and is not subject to manipulation. There is strong evidence that manipulation of Pool prices has in fact been occurring; that participants in the Pool have been operating within the existing Pool Rules to take advantage of those rules for their commercial interests – the "gaming" of complex rules; that prices have been manipulated; and that higher wholesale prices have been established which will result in higher prices for customers. The occurrence of this manipulation has been accelerating.

The challenge presented by these problems is both important and urgent. It is important because it affects industrial competitiveness and consumer welfare – that is, jobs and living standards. It is urgent because Pool prices are an important reference point for negotiations between generators and their customers, now in train, on long term contracts. It is central to the duties of OFFER, of protecting customers and promoting competition in the electricity industry.

Chapter 2 summarises the evidence of gaming within the Pool Rules. Chapter 3 sets out ways in which the Pool Rules have been manipulated and Chapter 4 sets out for consideration possible changes to the present arrangements designed to stop these abuses.

Views Invited

OFFER requests that the Pool Executive Committee give consideration to the solutions proposed in this paper, namely:

- a) the desirability of using simpler bidding structures by:
 - i) limiting generators to the use of a single incremental bid; and
 - ii) limiting generators to a single price bid by removing no load and start-up prices as well as allowing only one incremental bid
- b) the desirability of removing inflexibility markers
- c) the desirability of combining simple bids with the removal of inflexibility markers.

In addition OFFER invites views more widely on the proposed solutions identified above and on any other issues and possible solutions which respondents feel should be addressed in this context.

Since the problem is urgent, the timescale for consultation is short. Comments are requested by 15 March 1999.

Comments should be sent to:

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Responses will be published by placing them in the OFFER library. Please make it clear whether any part of your comments should be regarded as confidential.

2. The Pool: The Evidence of Abuse

2.1 Report on Pool Prices: June 1998

In June 1998 OFFER published its Report on Pool Price Increases in Winter 1997/1998.¹ The report concluded that in real terms System Marginal Price ("SMP") was over 26 per cent higher in Winter 1997/1998 than it had been in the corresponding period of 1996/1997. In money terms the increase was over 30 per cent. The increase could not be explained by an increase in demand, since demand growth was minimal, nor by reduction in available capacity, since the capacity margin was high. OFFER found that increases in SMP, and more generally the systematic pattern of substitution between SMP and capacity payments, reflected an unacceptable extent of market power and that steps needed to be taken to increase the competitiveness of the generation market. Subsequently PowerGen and National Power announced their divestment proposals for Ferrybridge and Fiddlers Ferry and Drax respectively.

Despite OFFER's inquiry into Pool prices and the ensuing prospect of disposals, wholesale electricity prices in the Pool are still failing to reflect underlying supply and demand, or movements in costs. The failure of Pool prices to reflect market fundamentals is not a new phenomenon but is one which has frequently characterised movements in Pool prices. In particular:

- i) The rise in SMP since 1996/97 runs contrary to the movement in generators' fuel costs, which have fallen significantly for both coal and gas fired generators;
- ii) The rise in SMP also runs contrary to the cost of new entry to the generation market. Between 1993 and 1995, the new entry cost of a CCGT generator fell by up to 25 per cent and remains significantly below Pool prices.

2.2 Recent Evidence: Price Spikes

Over the last twelve months the incidence of 'price spikes' has increased dramatically. Defining a price spike as SMP greater than £60/MWh, Table 1 below shows the number of price spikes increasing from 11 in Q4 1996 to 234 in Q4 1998 and 180 in the first month of 1999. If the definition of a spike is changed, for example to £70/MWh or £80/MWh, a similar message emerges - the incidence of price spikes is increasing significantly.

Table 1 - SMP Price Spikes

Number of times SMP greater than:	Q4 1996	Q4 1997	Q4 1998	Jan 1999
£60/MWh	11	178	234	180
£70/MWh	4	121	138	96
£80/MWh	3	93	117	59

¹ Report on Pool price increases in winter 1997/98, OFFER, June 1998.

High prices in any half hour are entirely consistent with the operation of an efficient market if the prices reflect underlying fundamentals. But this has not been the case in the electricity Pool. Price spikes have consistently occurred in periods of relatively low demand, leading to an unjustifiable increase in SMP.

Table 2 - Number of Price Spikes Above £60/MWh Set by Generators

Generator	Q4 1996	Q4 1997	Q4 1998	Jan 1999
Eastern	4	48	80	68
French Exports	3	0	0	0
Edison Mission Energy	3	84	52	16
OCGT Peaking plant*	1	30	10	23
National Power	0	12	3	20
Brigg	0	0	85	27
PowerGen	0	4	4	26
Total	11	178	234	180

* includes Redditch and Indian Queens OCGTs.

Table 2 shows the number of times each generator set prices above £60/MWh for the last quarters of 1996, 1997, 1998 and the first month of 1999. It might be expected that generators operating peaking plant, such as Edison Mission Energy, Redditch and Indian Queens, will more frequently set high prices due to the nature of their operation and their costs of production. However, while some plant may be expected to be setting prices for a greater proportion of time than others, this does not account fully for

the large increase in the number of price spikes associated with such peaking plant. Also of considerable concern is the price spiking activity of other generators, in particular Eastern, who have been setting an increasing number of spikes, and Brigg, which set a significant number of spikes in the latter part of 1998. In January 1999 the two main price setting generators, National Power and PowerGen, also began to set a significant number of price spikes.

The increase in SMP spikes has important implications for the operation of the Pool and ultimately for prices to customers. Average levels of SMP in the first 10 months of 1998/99 remained similar to 1997/98. But the increase in the number of spikes will have increased significantly the level of risk associated with Pool prices when viewed from the perspective of suppliers. This higher level of risk is likely to be translated into higher premiums for contracts designed to hedge suppliers from the exposure they would otherwise face from purchasing directly from the Pool.

Higher contract premiums will lead to higher prices for customers. For example, a large (>1MW) customer might typically have an annual electricity bill of £250,000 - £500,000, of which around three quarters will be associated with the costs of generation (including any contract premium). Any

increase in contract premium will be translated directly into higher prices for customers which will, in turn, lead to a reduction in competitiveness.

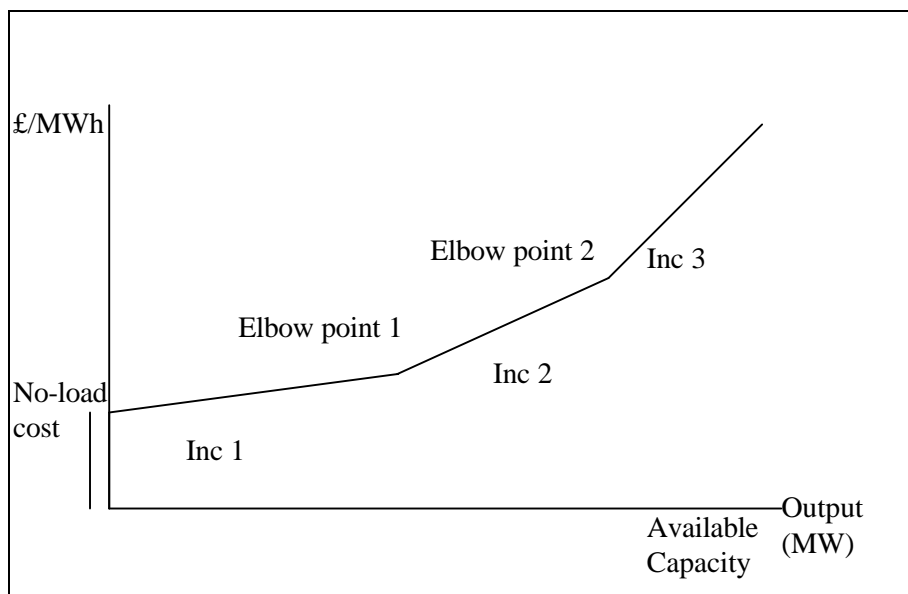
3. Manipulation of the Pool Rules

The bidding strategies employed by some generators in the current Pool mechanism are resulting in unrepresentative prices. The use of such bidding practices is tantamount to gaming the Pool mechanism. Gaming may take a number of forms including the inappropriate use of high incrementals, high no loads and start ups and the use of inflexibility markers.

3.1 High Incremental Bids

Large price spikes, which do not reflect underlying fundamentals, are largely due to the relatively complex bidding structures in the Pool. The complexity of bidding structures offers the potential for generators to significantly increase prices, in a manner which is not fully cost reflective, whilst operating within the existing Pool Rules. A generator's bid into the Pool comprises a large number of elements, including five price parameters: a start-up price, a no-load price, and three incremental prices. The no-load and incremental prices define the price of the operating plant at different levels of output once the plant has been synchronised. These parameters were chosen as being representative of the way that engineers characterise the cost curves of thermal stations. The resulting cost curve for a genset is known as a Willan's Line and might look like that shown in Figure 1. The points where the first incremental switches to the second and the second to the third are known as elbow points.

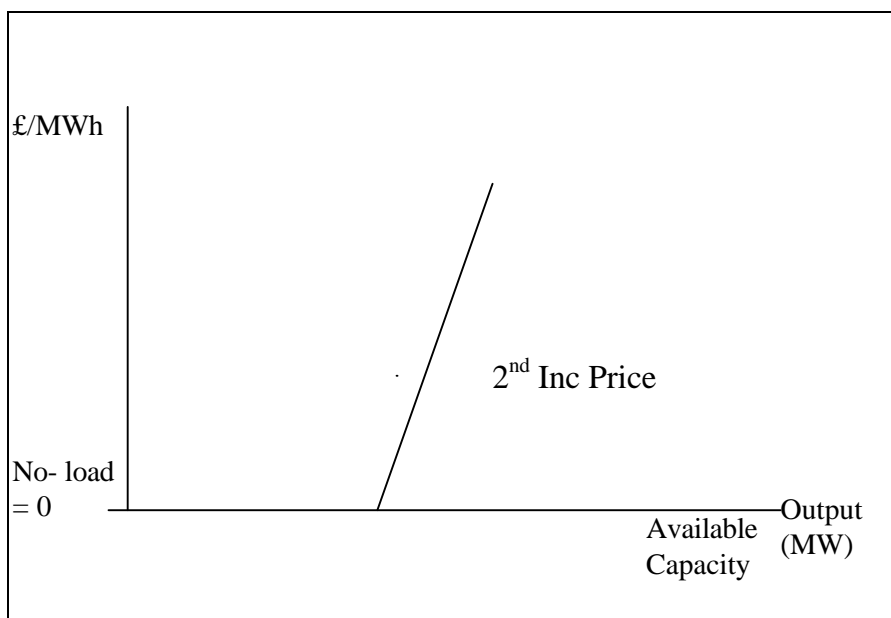
Figure 1 - Willan's Line



The increasing incidence of price spikes discussed above is associated with the use of high incremental bids. A generator can structure its bid so that a high price is charged for the last few MW of its output. While the bid for these few MW may (or may not) reflect the cost of producing those few MW, the price set flows through to all scheduled generation. It is permissible within the

Pool Rules for a generator to submit a first incremental bid of zero, with zero start-up costs and zero no-loads. The second increment is then priced at an extremely high level, often in excess of £100/MWh. The resulting cost curve is shown in figure 2 below.

Figure 2 - Willan's Line - High Incrementals



In certain periods the scheduler's optimisation tool selects the genset with the very high second incremental as the most economic for the few extra MW covered by the second incremental price. When the system requires this relatively small increment of energy, SMP is set by the very high incremental price. This is open to manipulation by generators seeking to increase the incidence of price spikes.

Over the past 18 months the use of very high second incrementals has become increasingly common, resulting in the price spikes discussed above. While the incremental price might, in some cases, be reflective of the costs of producing the few additional MW, it is not reflective of the costs of the genset's entire output.

3.2 No Loads and Start Ups

In conjunction with high incremental bids some generators have been using a combination of high no loads and start ups with close elbow points. The complexity of the scheduling process has allowed one generator effectively to be paid start up costs twice. A change to the Pool Rules was made to combat this. More recently the generator has switched to a pattern of high no load prices, which, when combined with a very small difference between elbow points and availability profiling (ie. the variation of plant availability throughout the day), has allowed this generator to set off peak SMP at a higher level than would normally be achieved. This higher SMP is achieved with no risk to the generator.

3.3 Inflexibility Markers

There are a number of inflexibility markers that can be used by generators bidding into the Pool. One of the most commonly used is the greater than or equal to (GE) inflexibility declaration which can be made by a generator for a genset the generator wishes to run, regardless of price, in any individual half hour. The generator specifies a minimum level of output below which the set must not be run. Once the genset has been declared inflexible it is not permitted to set SMP. The rationale underpinning the use of all inflexibility markers is laid out in the Grid Code, not the Pool Rules. The inflexibility markers were originally intended to be used by plant which, for particular technical reasons, were able to operate only in specific ways. Inflexibility markers enabled a generator to secure a mode of operation consistent with the technical capabilities of the plant.

The basis for the use of inflexibility markers appears increasingly less valid in a generation market characterised by a growing number of generators and in which the prospects for competition should be good. For example, large oil-fired power stations built in the 1960s were designed to operate as inflexible base-load plant. With changing production costs associated with large increases in oil prices in the 1970s, investments were made at these to secure greater flexibility of operation and single and double shifting of the plant became feasible. It is to be expected that investments will continue to be made to improve flexibility at some power stations traditionally considered to be “technically” inflexible where the owners consider such investments to be profitable.

Inflexibility therefore arises not only, or even most often, as a result of direct technical imperatives but as a result of commercial decisions made by generators as to whether to upgrade performance in the light of changing market conditions. Generators may also consider plant to be inflexible because of the nature of commercial contracts associated with the purchase of fuel and the sale of power. For example gas fired power stations with high take or pay gas contracts will frequently consider themselves to be inflexible because of the very low avoidable costs of generation until the minimum volumes of gas specified in the contract have been used.

It is now clear that inflexibility markers are being used in ways that were not envisaged when the Grid Code was established and which may bear no relationship to a narrowly defined concept of technical inflexibility. Some plant is being assigned a GE inflexibility marker for all periods of the day – in particular the nuclear and most independent CCGT plant. Others are assigning markers for part of the day – in particular Eastern and a small number of independent CCGTs.

Plant which has a GE inflexibility marker for all 48 half hour periods of the day cannot set SMP and therefore its contribution to price setting competition is blunted. Plant which is assigned an inflexibility marker for only part of the day can have a significant impact on prices in those half hours when the marker is off. The plant has, in effect, been forced onto the system in the half hours where the marker was applied. This then makes it likely that it will be selected to run in subsequent half hours, when it can set SMP, as the inflexibility flag has been removed. If this strategy is used in conjunction with high second incremental bids, the likelihood of a price spike is increased.

Systematic 'cycling' of inflexibility flags on the same genset is prima facie evidence of the flags being used for purely commercial reasons.

Overall, the use of inflexibility markers for commercial reasons is increasing. Most generators now indulge in the commercial use of inflexibility markers. As a result the amount of plant which is available to set the price in any half hour is reduced. Table 3 shows, for a random sample of days in 1997 and 1998, the total amount of output totally inflexible, partially inflexible and totally flexible.

Table 3 - Inflexible Output (%)

	1997	1998
Flexible	75	57
Totally Inflexible	23	39
Partially Inflexible	2	4

In 1997 some 23 per cent of output on the days chosen was completely inflexible and incapable of setting SMP at any time of the day. A further 2 per cent of plant was partially inflexible (that is inflexible for only part of the day) forcing itself onto the system in an attempt to generate in periods of highest price and to influence prices. Some 75 per cent of output was entirely flexible and able to set the price for all 48 half hour periods. In 1998 the amount of entirely flexible output on the days sampled fell to 57 per cent, while that which is totally inflexible rose to almost 40 per cent. Choosing different sample days to examine the question of plant inflexibility produced similar results to those shown in Table 3. For example, on a number of days in the summer of 1998 over 50% of output was totally inflexible. The use of inflexibility markers is clearly increasing, leading to a reduction in price setting competition.

These are examples of the use of particular bidding strategies to influence prices. The impact of such strategies is not always seen in SMP, but may also be reflected in the Uplift component of the Pool price.

4. Proposed Solutions

Chapter 2 above indicates that there has been a very significant increase in the incidence of pool price spikes. Chapter 3 describes how this arises partly from generators' use of complex bidding structures and partly from the use of inflexibility markers. The complexity of the bid structures used ensures that detection is made difficult, and remedial action can be frustrated as the generator moves to another variation of a similar theme, destroying the impact of the remedial action. In the case of inflexibility declarations there is a more readily identifiable problem, namely the increasing use of inflexibility markers to reflect a broad range of commercial considerations rather than being driven by the operating characteristics of the plant.

4.1 *The Pool's Initiatives*

OFFER has raised these concerns with the Pool Executive Committee. It welcomes the agreements made at the Pool Executive Committee meeting on 18 February on a number of initiatives:

- i) to establish an Expert Group that will respond to concerns raised by OFFER about pricing behaviour in the Pool;
- ii) to make an adjustment to the scheduling software to reduce the incidence of price spikes;
and
- iii) to consider and implement modifications to the price setting software which would prevent small volumes of highly priced electricity setting SMP.

4.2 *OFFER's Proposals*

These initiatives, if pursued rapidly and effectively, could reduce the damage caused by specific gaming techniques which have been adopted by generators in the Pool. But they would leave the general problem fundamentally unchanged. The general problem is a set of Pool Rules of such complexity that further gaming techniques can readily be devised. Because of this, in addition to the initiatives taken by the Pool, OFFER now believes that a number of other measures should be considered.

There would appear to be two principal areas where changes to the Pool Rules could significantly reduce the present problems, namely the use of less complex bidding structures and the removal of inflexibility markers.

a) *The use of Simpler Bidding Structures*

Removing the ability of generators to offer up to three incremental bids would be a step in the right direction. With only a single incremental bid, it would be more difficult for generators to engineer spikes in Pool prices.

However, this change may not be sufficient to remove or reduce significantly the abuse associated with bidding behaviour. Many generators have demonstrated the ease with which they can change strategies to create high or unstable prices by changing significantly their no load and start-up prices as well as their incremental bids. The use of such bidding strategies is far removed from what was envisaged when the Pool was established. At that time it was thought that five price parameters were necessary to enable generators accurately to represent the costs of their production. In practice, this flexibility has enabled generators to engage in a complex pattern of abuse that is difficult for most customers to detect, let alone understand. Consideration should therefore now be given to allowing generators to submit only a single price bid to the Pool by removing no-load and start-up prices.²

b) *The Removal of Inflexibility Markers*

The second area where changes to the Pool Rules might alleviate the problems associated with the manipulation of Pool prices concerns the use of inflexibility markers. With an increasing number of generators using inflexibility markers across a range of plant, the proportion of price setting plant, and therefore competition in the price setting areas of the market, is reducing. The removal of GE inflexibility markers could mitigate this effect. However, the removal of GE markers alone might not be sufficient to alleviate manipulative behaviour as generators may switch to the use of other inflexibility markers to achieve the same ends. Consideration therefore needs to be given to removing the use of all inflexibility markers.

The removal of such markers would not in practice prevent generators from reflecting within their bids the technical constraints which all plant face. For example, generators would still be able to submit a wide range of dynamic parameters associated with operation, including ramping rates, minimum times for generation, minimum levels of stable generation and synchronisation time. The removal of inflexibility markers would therefore reduce the ability of generators to manipulate prices whilst ensuring that full account could still be taken within the scheduling process of the technical parameters associated with all plant.

The removal of some or all inflexibility markers in conjunction with a simpler bid structure would have the advantage of simplicity and transparency. It would also reduce the ability of generators to manipulate prices and would be a step in the right direction with regard to proposals for the longer term reform of the electricity trading arrangements.

² This proposal is different from the new trading arrangements proposed to replace the Pool (the "RETA" programme). Under RETA, although a generator's offer to the market would comprise a single price, such a price need not be used for all the output of a generating set. Indeed, under the new arrangements, a generator with, say, a 500 MW set could choose to make a large number of offers to the market for relatively small quantities of capacity, all at different prices. The new arrangements will therefore provide considerably greater benefits in terms of flexibility to generators, and to customers who might bid on the demand side, than would the move to simple bids within the Pool suggested above.

OFFER invites views on:-

- a) the desirability of using simpler bidding structures by:
 - i) limiting generators to the use of a single incremental bid; and**
 - ii) limiting generators to a single price bid by removing no load and start-up prices as well as allowing only one incremental bid****

- b) the desirability of removing inflexibility markers**

- c) the desirability of combining simple bids with the removal of inflexibility markers.**