The Regulator's Review of the English Electricity Pool

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Background

The Electricity Pool of England and Wales has received constant criticism by the media, from the regulatory body, Offer, and from the House of Commons Trade and Industry Committee since its launch in 1990.[1] The Committee's report of February 1992 presents many of the criticisms which continued to be levelled at the Pool, and reveals the difficulty the Committee had in deciding whether the complex arrangements and behaviour observed in the Pool were evidence that it either was or was not fulfilling its tasks. Indeed, they noted that the purpose of the Pool had no-where been set out, but they understood its three main functions to be determining the merit order, determining the prices for services traded, and ensuring sufficient capacity to maintain the system security. 'The Director General found "an element of artificiality about Pool prices which is unsettling for customers and generators alike, and which gives misleading signals to both groups" thereby casting doubt on the Pool's ability to fulfil any of its three functions' (HC, 1992, §103).

In May 1997 a Labour Government was elected, ending 18 years of Conservative rule under which the electricity supply industry had been restructured and privatised. In October 1997, the Minister for Science, Energy and Technology asked the Director General of Electricity Supply (DGES, the regulator) to consider how a review of electricity trading arrangements might be undertaken and to report results by July 1998. Offer's objectives, approved by the Government, were to consider whether, and if so what, changes in the electricity arrangements will best meet the needs of customers with respect to price, choice, quality and security of supply; enable demand to be met efficiently and economically; enable costs and risks to be reduced and shared efficiently, provide transparency; respond flexibly to changing circumstances; promote competition in electricity markets, facilitating entry and exit from such markets; avoid discrimination against particular energy sources; and be compatible with Government policies (Offer, 1998d, pp83-4).

The Pool also set up a Pool Review Steering Group to propose a set of objectives for these trading arrangements. They agreed the overall objective was 'that trading arrangements should deliver the lowest possible sustainable prices to all customers, for a supply that is reliable in both the short and long run' (Electricity Pool, 1998). They also

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[1] See especially Offer (1992a,b,c; 1994a,b)

listed a number of subsidiary objectives - that the trading arrangements should facilitate efficiency in generation, transmission, distribution, trading and consumption, they should minimise entry and exit barriers, should support systems security, minimise transactions costs, and minimise unnecessary and unmanageable commercial and regulatory risk. These objectives are similar to Offer's, though they place greater emphasis on the importance of minimising costs and concerns about longer run sustainability.

This was not the only review of the electricity industry in progress. Apart from a general review of the whole system of utility regulation (DTI, 1998a), the Government decided to review energy sources for power generation (DTI, 1998b). This was precipitated by the ending (in March 1998) of the above-market price contracts for coal forced on the industry after the earlier collapse of the coal industry in 1993. The Government responded to the prospect of a second collapse of coal by imposing a moratorium on gas-fired generation and undertaking this energy review. The House of Commons Trade and Industry Committee also visited the question of fuel choice in March 1998 in its *Coal Report*, criticising the gas moratorium and also the behaviour of the Environment Agency for poor policy making on emission limits (HC, 1998).

By the time the *Pool Review* reported in July 1998, energy policy was in complete disarray, with obvious tensions between the desire to foster coal in generation and meeting the agreed Kyoto CO_2 emission limits, and between encouraging competitive pricing of electricity while raising entry barriers to new generation to protect British coal. The Government seemed unwilling to tackle the structural problems in generation while hoping that major surgery to the trading arrangements would solve all the problems. The final proposals of the *Pool Review* were published in July (Offer, 1998e) and recommended far-reaching reforms. This article presents a critical assessment of the *Pool Review*'s proposals, and suggests that they fail to present an adequate analysis of how the proposed solutions address the problems, and may well be counter-productive if the real source of the problem, namely market power, is properly addressed.

The workings of the Pool and its shortcomings are well described in the series of Offer papers produced in the course of the inquiry (Offer, 1998a-c). Briefly, the distinctive features of the English Pool are that it is a compulsory, day-ahead, last-price auction in which generators have firm rights to transmission but no firm obligations to generate. Systems Operation, Market Operations (ie Pool Settlement), and Transmission Operation are all supplied by National Grid Co. (NGC), and the Pool operates under an indefinite legal contract with its members, the Pooling and Settlement Agreement. The form in which bids are required to be submitted was largely determined by the computer scheduling programme (GOAL) used in the previously vertically integrated Central Electricity Generating Board (CEGB), which relies on the correct revelation of energy prices and technical parameters to achieve least cost dispatch, but which instead receives daily bids and daily redeclarations of technical parameters that are guided by commercial considerations.

The Pool sets a System Marginal Price (SMP) each half hour as the computed unit cost of electricity from the most expensive unconstrained generation unit called on to operate. Unconstrained generators are all paid the same SMP plus a capacity payment,

equal to the Value of Lost Load (VOLL) *less* SMP, times the Loss of Load Probability (LoLP), which together make the Pool Purchase Price, or PPP. Generators available but not dispatched also receive the capacity payments, while constrained generators receive their bid price, if they are required to generate within an import-constrained zone and bid above the SMP, or their lost profit (SMP *less* bid price) if they are in an export constrained zone.

Consumers pay the Pool Selling Price, or PSP, which includes uplift for ancillary services and capacity payments to unscheduled stations. They also pay for transmission services, made up of the cost of transmission losses and transmission constraints (which are smeared equally over all consumers), the Transmission Network Use of System (TNUoS) charged on capacity, £/MW, and Distribution Use of System (DUoS) charges (for capacity and energy).

Criticisms of the Pool

The main criticisms are about market manipulation, market design (including criticisms about capacity payments, constraint payments and transmission charges), and the governance structure. Reforming (or replacing) the present governance structure is critical to making changes now and in the future, as the Pool has demonstrated its inability to reform itself under its present structure. That will be taken as self-evident in what follows, and there are sensible suggestions for reform from Offer, and in Barker et. al (1997) and Henney and Bidwell (1998).

The most serious criticism of the performance of the electricity market is that the restructuring in 1990 created an effective duopoly, in which National Power and PowerGen set the price over 90 per cent of the time. These two firms have maintained their price setting ability, despite the subsequent massive entry of gas-fired combined cycle gas turbine plant. Even after National Power and PowerGen were induced to divest 6000MW of coal-fired plant to Eastern, they did so with earn-out payments that encouraged Eastern to bid the plant exactly as before, and if anything National Power and PowerGen raised their prices in winter of 1997-98, sacrificing market share to Eastern and other generators in a successful attempt to keep Pool prices up while fuel costs continued to fall (Offer, 1998f).

The *Pool Review* commented on the extent to which National Power and PowerGen had exercised market power, and recognised the extent of concerns expressed in the consultation, but it decided that 'it would not be sensible to overload the very full agenda.' (Offer, 1998e, p114, §8.18). Nevertheless, the DGES published elsewhere a forthright criticism of their behaviour in winter 1997/98 (Offer, 1998f) in which he recommended that these two generators be required to divest more coal-fired plant, and he repeated this advice when requested to respond to the *Energy Review* (DTI, 1998b, p26). The DGES apparently took comfort from 'The Government's statement on Fuel Sources (which) endorsed the importance of achieving a competitive market and in particular proposed to seek practical opportunities for divestment of coal-fired plant by the major generators.' (Offer, 1998e, §8.20.) Whether this will be achieved by negotiations between the companies and the DTI as part of the approval process for

mergers (for example, the current agreed merger between Powergen and the US-owned English REC East Midlands),[2] or whether it will require a reference to the Monopolies and Mergers Commission (MMC) is not yet clear, but it could be argued that the Government must now take responsibility for reducing market power. The main question for the *Pool Review* is whether its proposals are compatible with (or even necessary after creating) a more competitive market in generation.

The *Pool Review* concentrated its attention on market design issues, where the main criticisms are that it is only half a market with inadequate representation of the demand side, that is opaque, unpredictable, and therefore hard to hedge using standard contracts, that is compulsory which prevents trading outside the Pool and hence discourages contracting. Paying all generators the same marginal price (except to those constrained) further discourages contracting and aggressive bidding, and the SMP is typically between twice and four times the marginal energy price that GOAL relies on to select the merit order. In addition, capacity payments are volatile, unpredictable, and excessive.

The *Pool Review* proposals

The review process argued that the complexities of price formation in the Pool allowed the generators to exercise more market power than would have been possible had the market been structured more like a classic commodity market. The *Pool Review* recommended that the Pooling and Settlement Agreement should be replaced by a Balancing and Settlement Code. The Pool as such would end and be replaced by four voluntary, overlapping and interdependent markets operating over different time scales - bilateral contracts markets for the medium and long run, forward and futures markets operating up to several years ahead, a short-term bilateral market, operating from at least 24 hours to about 4 hours before a trading period, and finally, a balancing market from about 4 hours before real time. The System Operator would trade in this market to keep the system stable, and use the resulting prices for clearing imbalances between traders' contracted and actual positions. This structure mirrors that emerging in the British gas market, and has similarities with electricity markets in Scandinavia, Australia and the United States.

Criticisms of the *Pool Review*

It is to the credit of the review process that it has been able to define plausible alternative trading arrangements. The unanswered question is whether the proposals are superior to (and, ideally, also the best alternative to) the present system. There is a danger that because the conditions that the new system must meet are quite challenging, any solution that meets them will automatically be considered better than the present system with all its obvious faults. But the conditions that the new arrangements have been tested against - simple bidding, demand side involvement, firm bids, transparency, opportunities for market innovation, etc - are considerably removed from the conditions that an economist

[2] *Financial Times*, Friday June 26, p23

might require and do not even directly address the objectives set out by the Pool Review Steering Group set out above.

To an economist, there are two issues that command attention before most others -- efficiency and equity. Efficiency has three dimensions - the short-run costs of generating and delivering the electricity, the prices that guide the consumers in their decisions to use the electricity, and the dynamic or longer run issues of efficient investment and discovering better ways of producing and trading electricity, that is, promoting technical and institutional innovation. Equity arises at several levels, but most obviously in the wholesale market it concerns the level of prices, which divide the rents between shareholders and consumers. If production is efficient but prices high, there will be some (possibly small) allocative inefficiency, but the main effect will be to transfer income from consumers to owners. There are likely to be considerable consequential inefficiencies due to excess entry and other forms of rent seeking, which in turn are likely to prompt regulatory intervention with its inevitable attendant inefficiency. These inefficiencies should not be underestimated, and the present *Review of Energy Sources* shows every sign of encouraging them in abundance. There is a real danger that the underlying forces leading to high prices have not been adequately addressed either by the *Pool Review* or the *Energy Review*, but have slipped between the cracks, as each proposes partial and possibly inconsistent remedies.

There are other types of equity issues that are important but less directly relevant to the pool review. There is the legal concept of equity where shareholders and contract holders find that the value of their rights has been unreasonably diminished. Equity in the sense of distributive justice in the prices paid by the poor or vulnerable is primarily an issue for recovering the fixed costs of the transmission and distribution system, but that is not directly part of the trading system and in any case is subject to separate regulatory oversight. If the resulting consumer prices still cause fuel poverty then in a market economy these social needs are best addressed through the social benefit system.

Efficiency issues

The last of the three aspects of efficiency, that of dynamic efficiency, is possibly the most important and certainly the hardest to measure or predict. Newbery and Pollitt (1997) estimated the net benefits of the restructuring and privatisation of the CEGB as equivalent to a permanent cost reduction of 0.16p/kWh, (with a range from 0.06p/kWh to 0.22p/kWh and possibly an additional 0.05p/kWh in environmental benefits from reducing coal consumption). That is equivalent to about 6% of the average Pool price, or 3% of the final sales price of electricity. The costs of restructuring, which have been deducted to give the net benefits, were considerable - nearly one quarter of the gross benefits, or nearly 2% of the average Pool price. Almost all the benefits came from increased efficiency, with a modest net benefit from fuel switching (away from nuclear and coal, but with premature and possibly excessive entry of gas reducing the gains). Almost all the gains were reaped by shareholders, with the public exchequer making a very small net return (easily reversed to a net loss on alternative views of the counterfactual), while consumers as a whole lost.

The lesson to draw is that the potential gains from restructuring are modest (but worth having); that it is unlikely that everyone will gain, and that a very small increase in inefficiency could reverse the gains completely. Headlines such as 'labour productivity doubled', or 'fossil fuel cost/kWh fell by 45% in real terms and nuclear fuel cost/kWh fell by 60% in real terms' are eye-catching, true, but tend to exaggerate the overall benefits, and are certainly silent on who benefits. The *Pool Review* attempts a rough calculation of the costs of restructuring (Offer, 1998e, §8.72) and puts them at £100-£110 million per year for the first five years, representing about 1.25% of the average Pool price. No estimates of the benefits are provided, though it is observed that a 1% fall in retail electricity prices (2% fall in wholesale electricity prices) 'would more than cover a conservative estimate of the costs' (§8.74). A fall in prices is not the same as a fall in costs (and the net benefits of restructuring at privatisation described above were associated with an *increase* in consumer prices relative to the counterfactual). Unless costs also fall, it is doubtful that prices can be sustainably reduced without a change in the market structure to create more competition. If, as hoped, the market is restructured to make it more competitive, then prices will be set closer to costs, and any further lowering of prices would need a lowering of costs.

It may be that the main benefits from restructuring the trading arrangements will be these dynamic effects on innovation and improved X-efficiency, but there are reasons to be somewhat sceptical, and reasons for being somewhat cautious in how such gains are best obtained - a theme returned to below. The major part of easily won dynamic gains have already been reaped, first in generation, and rather later in transmission and distribution, with improved incentives, competition in the capital markets, and increasing supply competition. There may be more benefits to come, but it is no longer necessary for England to be the guinea pig in order to learn new tricks. Electricity reforms around the world, and especially in the different states of the US, are now beginning to provide useful and relevant evidence, and there is a case for studying these carefully to see what works in systems sufficiently similar to ours to be relevant. That time has not yet arrived. What we need above all is a Pool governance structure that allows the industry to benefit from worthwhile innovations discovered both here and abroad. That is one of the main objectives of the reform, and might be the most important.

The issue can be put more sharply. Will the trading reforms create markets with the efficiency of commodity futures markets or markets for financial instruments? Is electricity more like cocoa or life insurance? Cocoa, cotton and the like are traded in highly liquid markets for remarkably small trading costs, allowing ownership of claims on the underlying commodity to change hands perhaps 10-20 times with transaction costs measured in tenths of a percentage point or less. Financial products are also traded on very liquid markets but need to be bundled and rebundled by portfolio managers at considerable cost. Consider a typical unit trust with annual management fees of 1% of revenue, as well as entry and exit charges which can amount to 5% of capital value. If, over long periods of time, real returns are 6%, and if holding times are 5 years, then the management and entry/exit fees absorb one third of the total profit. High street banks extract an even larger fraction of the return on the assets they manage for their services.

The key question is whether all these new markets and incentives or requirements to hedge will more closely emulate the low transaction costs of commodity futures markets or the high transaction costs of more individualised financial markets. Given the highly non-homogenous nature of electricity, with 48 half-hourly prices for 365 days per year, it is difficult to see the commodity futures market for highly standardised products being a good analogy.

While dynamic efficiency is hard to measure, short-run cost efficiency is relatively easy to quantify. Unfortunately, there is no attempt to do so in either the *Pool Review* or in earlier Offer documents. The question to ask is whether the present arrangements result in higher cost generation and distribution of electricity than alternatives. It has been claimed that the short time frame in which the dispatch order is drawn up hinders efficient dispatch, as do the discrepancy between the SMP and the incremental price of the marginal generating set, and the mismatch between the apparent avoidable cost of the take-or-pay gas contracts for CCGT and the true value of that gas. The natural benchmark for measuring short-run efficiency is the ideal in which generation sets are dispatched according to true costs. These true costs are reasonably easy to compute, as the technical characteristics and the fuel costs of each station are known (and should not be hard to validate). It would then be possible to run the scheduling program GOAL using the correct costs and characteristics and compare the actual dispatch schedule with an efficient schedule and quantify the costs of inefficiencies. Does it matter that the SMP differs from the incremental bids? At the opportunity cost of gas indicated by the gas spot market, are CCGTs in the right part of the merit order?

This last question deserves careful analysis, and is at the heart of the Government's case that coal is disadvantaged and needs temporary respite via a moratorium while the relative merits of coal and gas are clarified. The argument that take-or-pay contracts distort the bidding of CCGTs sits uncomfortably with the assumption elsewhere that market traders will be good at seeking out cost reducing and innovative solutions to problems. If it is true that at the gas spot price CCGTs would benefit from flexible running, then there is money to be made out of selling the gas rather than turning it into electricity, and that should provide an incentive for a contract renegotiation, coupled perhaps with a threat that unreasonable restraints on such renegotiation constitutes an abuse of dominant position by the gas supplier, and should be referred to the DGES and/or the Office of Fair Trading.

On the face of it, if gas is available at an opportunity cost (spot market price) of 15p/therm (ie slightly less than 0.5p/kWh) then the avoidable fuel cost is very roughly about £10/MWh (depending on the vintage of CCGT).[3] If coal is available at the power station at £1/GJ (about £24-26 per tonne, depending on its calorific value) then its avoidable cost will also be about £10/MWh. Gas is often cheaper (and except in the winter months the spot price in 1997/98 was 10-11p/therm giving an avoidable price of

[3] At the higher recent thermal efficiencies of 55% of net calorific value, which is equivalent to 50% of gross calorific value, the avoidable fuel cost of generation is twice the gas price in pence/kWh. Earlier stations may have a multiplier of 2.2, turning gas at 0.5p/kWh into electricity at £11/MWh.

less than £8/MWh), but not at the winter peak, while coal is often more expensive, delivered to the station. Electricity generated by Eastern group which carries £6/MWh earnout will be at least £16/MWh and probably more, and hence would not displace CCGT, except perhaps on days of high gas prices (which are likely to be days of high electricity demand when this part of the merit order is not very relevant).

Are the stations that have closed of higher (medium to long run) avoidable costs than the total costs of the new entrants? One would hope that Offer might already have done or commissioned to be done such investigations as part of their market monitoring role, particularly as they have to scrutinise proposals to retire plant held by the dominant generators (mainly coal and oil fired stations). The recent House of Commons Trade and Industry Fourth Report on Coal (the *Coal Report*) provides evidence that there are willing buyers of currently unused coal fired stations but they are stymied by three impediments (HC, 1998, §26-29). Two of these impediments relate to the deeply unsatisfactory state of environmental regulations, which are presumably open to the Government to address, but to which they seem curiously reluctant to draw attention or to encourage serious debate.

The main obstacle is that the total amount of coal that can be burned is limited by the emissions targets set by the Environment Agency (EA). The *Coal Report* actually says that it is the site-specific limits that are binding and that 'any change in ownership would be unable to increase the coalburn at any individual power station' (HC, 1998, §27 (b)). It seems incredible that this should be the case, given that the various agreements, of which the Second Sulphur Protocol is the most important, set national emissions targets, usually for some future year. For the Government to choose to allow these overall *future* limits to be translated into *current* site-specific targets is to allow environmental considerations to take complete precedence over economic issues and is incompatible with the very concept of BATNEEC under which the EA is supposed to operate. BATNEEC (Best available technology not entailing *excessive* costs) should properly be interpreted as requiring a cost-benefit analysis of any proposed environmental constraint (such as a site-specific emissions limit) to show that the benefits exceed the costs (and that the same benefits cannot be obtained at lower costs) for otherwise *excessive* costs have been incurred.

Unless this central issue is resolved any serious competition between coal and other fuels is made far more difficult, because the EA is effectively determining the quantity of coalburn, which should then enjoy a shadow value equal to the cost of displacing coal by new generation. Now it may be that the Select Committee was not well informed about the tightness of these limits (and the ability of the EA to get its act together is revealed by the *Coal Report* to be quite appalling, so this is possible). In that case we turn to the other very revealing impediments to increasing the coalburn, which have effectively to do with market power. §27(a) states that 'National Power and Powergen have argued that any change of ownership of coal-fired capacity will not increase the market for coal but will, instead, *increase competition between the various coal-fired generators*' (my italics). §27(c) states that 'The coal-fired generators are likely to charge prospective leasers of their redundant capacity a high fee in order to maintain

shareholder values, again militating against the price competitiveness of coal relative to other fuels.'

If the plant would otherwise be idle, it has an option value as it can be re-opened if mothballed, or a scrap value plus site value (valuable for the access to transmission assets), both of which can be estimated, and presumably buyers could be expected to pay those amounts. In a competitive market that would be all that they are worth, but if the market is uncompetitive then the price of electricity would be lowered by divestiture and the sellers would forego profits not just on the value of the divested plant (which would be covered by the purchase price) but on their other plant (which would not unless the plant were sold for more than it were worth to the buyer). We are then left with the second aspect of environmental regulation - the tricky issue of non-site-specific emissions limits set by the Second Sulphur Protocol and translated into company limits by the EA. These limits confer rights which are valuable (and if properly priced should avoid the nonsense in which the plant with FGD moves down the merit order and runs less than other coal plant).

The earnouts paid by Eastern of £6/MWh or 0.6p/kWh were justified as the shadow price of sulphur, given that FGD can raise costs by 0.6p/kWh (a number repeated as the high end in the *Coal Report* at §31). Again, if the emissions limits are binding at the country level, then the effective cost of coal increases, going some way to justifying the present prices bid. If indeed the shadow price of sulphur were such as to completely justify the present bids of marginal coal (which sets the Pool price much of the time) and if this were reflected in the price of sulphur rights transferred to new buyers, and if the least cost (including the shadow price of sulphur) set of plant were already operating at the most efficient level, then divestiture would make no difference to bidding behaviour (and that certainly seems to be the case with Eastern).

It is therefore central to the Government's case for divestiture and to the argument that the main problem is the uncompetitive behaviour of the major generators that these issues be investigated quantitatively and the results published, for otherwise it will be impossible to judge the validity of the case for change.

Of course, generation costs are not the whole story, and it would have been useful to know the importance of other costs, whether they can be judged too high or not, and how they might be affected by the proposed reforms. Certainly the evidence that incentivising NGC's management of ancillary services and transmission uplift reduced uplift is encouraging, though again it would be helpful to know what happened to costs, not just to charges. Thus Offer (1998e, §5.44) reveals that the payments for constraints has fallen from £255 million in 1993/94 to £25 million in 1997/98 not because of changes in the volume of constrained trade, but in the convergence of bids of constrained plant to SMP, and may not have reflected any change in costs at all.

The relation between costs and prices

The main thrust of the discussion in the *Pool Review* is not so much on costs as on prices, where the claim seems to be that prices are too high, that they give misleading signals (and are therefore failing in their efficiency role), and that they hinder the provision of

adequate risk management services. There is a danger that too many issues are being conflated in the discussions. There is widespread agreement that the present market is inadequately competitive, though some of the demonstrations are not very convincing (ie that prices are above short run avoidable costs). As mentioned above, sulphur emissions complicate the analysis of costs, as their shadow price needs to be taken into account. If the overall sulphur limits are non-binding, and if the EA can be persuaded to relax site-specific constraints unless it can show good cause (effectively closing down that station), then the shadow price will be zero and can be ignored, but unless the limits are relaxed until the due date for the Sulphur Protocol, they will surely bind in the near future, and that will affect future costs and hence current opportunities for divestiture.

I have not seen a careful analysis (but I hope one is available or has been commissioned) to see whether, if the existing capacity were to be distributed among more participants, prices would be lower (and if so, by how much), and whether they would then provide a market return on the costs of new entry. If not (perhaps because there is more than adequate capacity and the competitive price is therefore below the entry price), then how long would it be before demand rose to the entry price at which new plant would be justified at a market return?

If the answers to these questions are - significantly lower, and 3-5 years or more, the next step is to ask whether there is a strong case for further divestiture, induced by irresistible offers to the company (cf Powergen's merger with East Midland) or enforced by a reference to the MMC, or whether the market power can be remedied by other means, such as a reform of trading (to which the *Pool Review* is unfortunately narrowly constrained). It may be that a trading reform can alleviate market power in the short run, but an important question is whether it would leave unchanged, improve, or worsen the situation once new investment is required. It is also important to ask whether the trading reforms will themselves precipitate market restructuring which is desirable or undesirable, and whether the reforms can be reversed if they prove to have adverse consequences.

In short, one should ask what the underlying problems are - market power and/or other impediments to efficient dispatch, risk management, and pricing - whether the most appropriate remedy is being deployed to address each concern, what future changes may be precipitated or precluded by the chosen remedy, and whether the final outcome is compatible with a sustainable and adequately competitive equilibrium. Some solutions (abolishing capacity payments?) may reduce market power in the short run but rule out more competitive market structures in the longer run.

The *Pool Review* is precluded by its terms of reference from examining remedies that directly reduce the market power of the two major price setting generators, National Power and PowerGen, and does not examine how their market power might evolve with something like the present Pool system (perhaps modified in minor but desirable ways) under supply competition and with a viable threat of entry (ie assuming an intelligent resolution of the current moratorium on new CCGT). The lack of some view of future developments with business as usual (but with supply competition) is unfortunate, as it makes it harder to compare the proposed reforms against a plausible counterfactual. (The MMC reports into vertical mergers devoted considerable space to the possible evolution

of the industry to see what problems might arise as a result of the proposed mergers and that would seem good practice for any report on the case for changing trading arrangements.)

The Government's consultation on the *Energy Review* hints that *practical* coal-plant divestiture of coal-fired plant would improve competition and lower prices, hence possibly deterring future CCGT entry and preserving a market for coal until the plant must be retired because of age or emissions constraints (DTI, 1998b, p8, §13), though it does not comment how this might be achieved.[4] But the *Energy Review* makes little mention of the malign influence of the EA, nor does it invite comments on the robust criticisms of the EA by the Select Committee in its *Coal Report* in §72-87, and so it is not clear whether the *Energy Review* will address these extremely important constraints. The apparent fact that PowerGen is willing to divest plant in exchange for approval of its merger with East Midlands suggests that these emission constraints are not insuperable, but, given the evidence of Eastern, nor does it suggest that if constraints are properly priced, this will in fact lead to any noticeable change in prices or the degree of competition.

Instead of examining direct changes in market power, a major part of the case for radical reform in the *Pool Review* seems to be that abolishing the present Pool as the price-setting mechanism would in fact itself reduce market power and hence lower prices. Is this plausible?

Will replacing the price-setting role of the Pool reduce prices?

The claim is that delinking the balancing market from the contract and forward market will make the influence of the price setting generators on the price level less direct, compared to the present system in which the balancing market is the Pool which determines the price for all generation, and serves as the guide price for setting contracts. The argument here is that because any generator can sell into the Pool without any contractual cover and receive the PPP, while any consumer can buy at the PPP (plus Uplift) instead of on contract, in the long run the contract prices can only differ from the relevant average Pool price by a (modest) risk premium. If, on the other hand, the balancing market is thinly traded, dominated by the small number of generators with flexible plant, and viewed as an unpredictable and possibly penal alternative to bilateral contracting, then the prices revealed there will not be relevant for contracting, while the incentive to contract will be greatly increased and will be driven by the normal balance of commercial considerations which guide price formation in other markets.

It may also be argued that the Pool is too transparent, in the sense that the price is immediately available for analysis by the price setting generators, who can craft their bids to maximise their profits, and possibly even tacitly collude, in a way that a less transparent contract market might make harder, offering as it does opportunities for price

[4] The consultation document attributes the suggestion to the DGES's response on p26, which Offer (1998e, §8.20) quotes back in defence of not considering the issue further, giving the impression that neither side is willing to take responsibility for addressing this issue.

shading, under-bidding and other competitive rather than cooperative strategies.

These arguments may carry weight, but a number of issues are also relevant and do not seem to have been given the attention they deserve. The central part of the claim is that because participants can no longer rely on buying in the Pool they will have to contract. Note that at present some 90% of electricity is traded under contracts, so that is hardly new. The claim is that on the one hand price discovery will be encouraged once the Pool price ceases to be a good guide to trading terms, while on the other hand the lack of a clear reference Pool price will encourage harder bargaining over the terms of these contracts, and they will be driven closer to cost. These two claims cannot easily be reconciled. If plant owners know the likely contract price, why should they accept less? Why should this be any different from the present situation in which plant owners cannot predict the future Pool price with any confidence (as convincingly demonstrated in the reports) and so must choose on what terms to contract?

Perhaps the argument is that removing the option of being guaranteed sale at Pool prices alters the outside option in the bargaining game between the generator and supplier, forcing down the bargained price. This may be true in the short run, but what effect will it have on the conditions of entry? At various points it is recognised that the Pool reduces the entry risks for new entrants (especially merchant plant) by providing them with this outside option. If the returns for entrants are made riskier and less attractive, the obvious conclusion is that there will be less entry, and that the threat of entry will have less downward pressure on prices. Suppose, as we are required to by the terms of the inquiry, there is no change in the ownership of capacity, what will be the response of the incumbents? Surely they will raise prices, if not immediately, then as soon as the market tightens because of a reluctance to enter?

There is one scenario under which the market might avoid becoming less competitive in the medium run, and that is one in which entry is by gas producers selling electricity, and perhaps more generally by a rush to vertically integrate generation and supply (with or without distribution, depending on whether supply can be separated, or whether the regulatory authorities look more favourably on vertical integration next time round). The reason for expecting vertical integration or gas company entry is that it lowers the transaction costs of hedging risks, which become more important with the ending of the gas and electricity franchises. If the present arrangements for contracting are disrupted, then participants may lack confidence that the new contracting markets will evolve rapidly enough to offer superior alternatives to vertical integration.

Putting the most optimistic view of this process, it may be that vertical mergers for the two majors would be allowed in exchange for divesture, as a negotiated route to a world in which at least four and preferably five modest sized vertically integrated generators cum supply and/or distribution companies compete. Such a model would produce an illusion of demand side bidding, but by eliminating much of the liquidity of the Pool would make entry more difficult, and, as capacity tightens relative to demand, would allow the gradual escalation of prices, and an evolution towards the German model of a cosy cartel.

A cynic might conclude that an impetus to vertical integration might be politically

attractive as a mechanism to help coal to survive by discouraging IPP gas entry, while at the same time forcing down the prices paid to existing nuclear and IPP CCGT base-load plant, giving higher revenues to the owners of the coal-fired stations through their control over flexible plant and an overall but rather short run price fall. This may be aided by more intense attempts to gain or protect market share, while leaving the players content that after the shake-out or learning period they would be able to return to profits as usual. It might therefore appeal to almost everyone in the short run. Whether it would protect coal more than temporarily must be doubtful, for a major gas producer might buy up IPP CCGT plant and gas and electricity supply businesses as a lower risk way of marketing gas. It must be even more doubtful that lower prices would persist as demand rises, because it will be less easy to enter such a vertically structured market with no Pool, and hence the incumbents can gradually tighten the market to support more profitable prices.

The model, which is claimed to be one in which suppliers are required or motivated to be as fully contracted as possible, and preferably well ahead of time, sounds like one in which suppliers are more likely to under-contract and offer less attractive terms to their customers, as a more profitable strategy than over-contracting and then trying to woo customers for fear of receiving an unattractive price when selling back unwanted supply. It would seem to describe a world in which competition for non-metered customers (ie domestic customers) is less intense than one in which being less fully contracted is less costly (ie one in which there is a deep and liquid Pool). Throughout the *Pool Review*, reference to the consumers who will benefit from the trading arrangements and who support the reforms is curiously silent as to which consumers these are. It seems likely that they are the large well organised consumers who believe (possibly incorrectly) that a move to a more negotiated market (rather like that with the old CEGB?) will allow them to benefit at the expense of less well represented domestic consumers.

Finally, it is worth asking what kind of model is being assumed by those who argue that a balancing market plus forward and contracting markets will give radically different outcomes than the present Pool plus EFA and contract markets. If the balancing market is where supply and demand are in fact balanced, and if players choose to be uncontracted to some degree so that they will have to access the balancing market, and if the prices in that market are the same to buyers and sellers, and if players have rational expectations about the prices, then we seem to have essentially no difference from the present trading arrangements. If balancing market prices are systematically higher than comparable contract prices (ie weighted by the same pattern of demand), what is to stop a base-load supplier like NE offering baseload power into the balancing market? If the market operator (MO) is supposed to choose bids to minimise the cost of meeting imbalances and if flexible plant requires a higher price for flexibility, a good MO would build up a portfolio of cheap inflexible plant and expensive flexible plant to minimise costs, as in the present Pool. If the balancing market is systematically below the contract price then generators will try and overcontract and traders will be reluctant to contract, tending to drive up demand in the balancing market and perhaps drive down the contract price, again causing convergence. So the claim that the balancing market will be divorced

from the other markets is hard to sustain unless inefficient impediments preventing arbitrage are introduced, with the risk of reducing efficiency and raising costs.

Note two other points which suggest caution before thinking that the proposed set of markets will improve on the present set. First, the dominant players in the balancing market with flexible plant are the dominant players in the present Pool and the contract market, and with no change in their market power, they will presumably continue to exercise market power much as at present, except that it will be even harder to monitor what goes on. Simple bids, far from making the market more transparent, will have to combine fixed costs, startup costs, and views about the likelihood of incurring flexibility costs, and will be harder to examine for the exercise of market power. Second, if the result of the balancing market is to increase the rewards to flexibility, then there will be inefficient and costly oversupply of flexibility. In the integrated CEGB, some plant could operate very inflexibly because it was cheaper for other plant to specialise in supplying that service. If the new model is one in which the entry ticket to earn reasonable returns is to provide flexibility, then plant for which this is costly (nuclear?) may nevertheless find it privately profitable to supply it. This will be a pure deadweight loss.

What is wrong with the present contracting system?

The more drastic reforms involve replacing one set of markets by another. The lack of any analysis of what is wrong with the present contract and EFA market means that it is extremely difficult to judge the desirability of relying on extensive forward, futures and bilateral markets for trading electricity. At first sight it appears that almost all of the outcomes that could be achieved by any of these institutional arrangements can, perhaps with very modest adjustments to the present institutional arrangements, be achieved under the present system. What we need to know is where the impediments to contractual innovation lie. Is it the absence of a market maker or the presence of transactions costs that would be avoided under the new system that stops these desirable changes? Or is it the lack of liquidity inherent in the extremely diverse products traded in each half hour at present that prevents improvements, and if so, how do the changes address that technological fact? Is it thought that simplifying bids increases liquidity, and if so, how does the fact that the balancing market will be thinner ensure this?

In short, the present *Pool Review* fails to identify the costly inefficiencies in the present system, the reasons for their existence and continuance, and the reasons why changes might reduce these costs whereas present contract negotiators, after 7 years of practice, are apparently unable to do so. Instead of producing evidence, the report leans heavily on differences between the electricity market in the UK and electricity markets in other countries (which have either very different balances of hydro and thermal, or very different competitive structures in generation), and with commodity markets, in almost all of which storage is possible. To observe that the English system differs from these may be correct but is not in itself persuasive without meeting the obvious claim that the reason the other markets work as they do is because their circumstances are different. The only other market that looks directly comparable is in Victoria, which is considerably more competitive, and even that can draw on the hydro Snowy River Scheme. It is also

worth observing that the capacity market there is not thought to have worked well, and there are doubts as to whether adequate entry or investment can be induced without considerable increases in price. Balancing markets where gas or water can be stored can work well - the problem is to establish that they can work well in the absence of these features.

One argument that English electricity is not so different from other markets with cheap storage is that stations can be operated with a margin in reserve, and that these stations can increase output rapidly, just as storage hydro can be rapidly accessed. While this may be true, the obvious question is how much more flexibility is required under the new market structure compared to the Pool with its day-ahead planning, and how much extra this additional spinning reserve will cost. Such information ought to be available from Ancillary Services which contracts for such reserve.

Demand side bidding

The *Pool Review* is strongly supportive of demand side bidding (DSB). It is important to remember that its viability in Scandinavian countries depends on special circumstances there, where many of those bidding are integrated utilities using the Pool to balance their own demand and supply. Typically they have hydro capacity which they are either willing to use for meeting their customer demand, or to replace by lower cost electricity, given their view about the value of water (ie the future price of electricity). In short, most demand side bidding in Scandinavia is essentially water trading. There is some true demand side bidding, where bidding is for final demand (rather than the net trade of those with access to flexible existing capacity) where large customers can switch fuel (especially for steam raising) and that is also true in Britain (where it is contracted for by NGC) as well as in the Pool.

Note that to the extent that the balancing market or the short-term forward market are partly rebalancing trading positions which are revealed to be over or undercontracted at a late stage, the apparent demand side bidding is no more than the kind of swaps that the EFA market was intended to provide, and is hardly true DSB. At one point there is the rather speculative claim that traders will be able to submit their own VOLL, which is a nonsense. A loss of load affects all those in an area, not isolated customers, unless they choose to bid to reduce load as at present. Again, currently feasible strategies are being dressed up under a different description and offered as an innovative new service.

The *Pool Review* and other reports recognise that there are a variety of obvious problems with true DSB - that most consumers buy variable and unpredictable amounts at fixed prices, and that there is no natural level from which to measure decrements in demand. One might also observe that customers with standard (fixed-volume) contracts for differences have every incentive to adjust demand in response to Pool prices because marginal consumption is priced at Pool prices, and ought to be at least as responsive as the outcome of most of the mechanisms proposed here. It may be that the present scheduling algorithms fail to allow for such responsiveness, but if so, that could presumably be dealt with by obvious and relatively simple adjustments. There already exist mechanisms for contracting for interruptible power and if valuable these could

doubtless be extended. The *Pool Review*, however, fails to analyze the benefits from feeding the demand information back from those consumers who face very volatile Pool prices at the margin. My concern would be that a solution with very high transaction costs would be provided for very little gain or one that could be obtained at lower cost by other means. The *Pool Review* seems to incline towards a permissive approach, which one hopes means that if it can be introduced at low cost then it would be worth doing so. Provided it is accepted that DSB cannot be a major reason in itself for making large changes to the market structure, but allowing it at low cost may be a minor side benefit of reforms chosen for other reasons, then it is harmless.

Contracts, forward, futures and balancing markets

The *Pool Review* lacks an analysis of why the present system of contracts of differences and the variety of increasingly exotic alternative contracts offered by traders, combined with the EFA market, fail to provide the kinds of risk hedging and contracting services that the new markets might offer. The argument proposed in the *Pool Review* is that these proposed new markets would naturally evolve in response to commercial logic. One should ask why, if these new markets are so valuable, they have not already evolved, or if they have evolved, why they need to be replaced. It may be that until the ending of the franchise, suppliers had little need to actively trade as they could pass through contracting costs, in which case the ending of the franchise may well solve some of the perceived problems. It would be unsatisfactory if the old trading arrangements were scrapped and replaced by new markets just at the point that the old arrangements were about to be properly tested.[5] Of course, it is always best to introduce a reform when things are about to get better anyway, as this will conceal the possibly adverse effects of the reform. It helps to have supply competition introduced as the old coal contracts allow the price to fall by 10% anyway, and it would help the new reforms to point to a flurry of new trading activity, even if that is prompted by supply competition and not new markets.

It could of course be argued that if the present market is destroyed, then there will indeed have to be some commercial activity devoted to recreating the present risk sharing arrangements, but that is hardly an argument for destroying the existing market structure. What needs to be done is to demonstrate that the transaction costs involved in the present system are excessive and could be reduced by an alternative arrangement. Some evidence might usefully be applied to support such a claim. Nor is the fact that traders confidently assert that this would be the case prove anything - creating markets in which existing players have an advantage can be privately profitable, but that does not guarantee that it will lower total costs and be socially desirable.

There is also an inconsistency by making the balancing market thinner and less predictable than the Pool in order to decouple contracting and trading prices from balancing prices, and the view that the whole set of trading arrangements will lower

[5] One innovation that one might expect to evolve under the present system in response to domestic supply competition is futures trading in the domestic profile, which is a (moderately) standard commodity which could eliminate the risk between generators and domestic suppliers.

transaction costs and be more predictable.

The *Pool Review* fails to explain what can be done with bilateral contracting under the new arrangements that cannot already be done with the existing system of bilateral contracting, and what a physical contract can achieve that a financial contract cannot improve upon or at least replicate. This debate has been aired extensively in the US, and little persuasive has been added to date, except the observation that some market makers have an agenda driven by a desire to raise the costs of their rivals' contracting activities (Stoft, 1997). It is worrying that there is so little analysis of the problems of constraints and of locational pricing and contracting, as in many constraint zones there is only one price-setting company. It would have been helpful to have some examples of how trading outside the Pool could provide greater choice and flexibility than intelligent contract design cannot already achieve.

To the extent that some 90% of electricity is currently traded on contracts, the Pool operates as a more transparent balancing market than the proposed balancing market is likely to provide, and the argument that the Pool prices are hard to predict and therefore hard to hedge, while true, is not counterbalanced by evidence that a rather thin balancing market would be more predictable and more easy to hedge. Indeed, the central argument seems to rely on it being less predictable and hard to hedge to force contracting by other routes. As this would seem to raise contracting costs, the argument is then forced back to the market power argument that sequential contracts markets would reduce market power more than the Pool. While it is true that contracts reduce the incentive to manipulate the balancing market or Pool as most revenue will already have been secured in the contracts, the real issue that is not addressed is what, given present allocations of plant, will determine these contract prices. I believe that the prices are set by the conditions of entry and will continue to be so set until more competition is introduced into the price setting part of the market - a claim that I maintain will be as true under the new trading arrangements as under the old.

Capacity payments

While there is much wrong with the present system of capacity payments, the *Pool Review* fails to provide a convincing analysis of these criticisms, and does not recognise one of their considerable advantages, that differences between peak and off-peak prices are amplified by the mechanism and as such more closely approximate competitive prices than would otherwise occur in what will for the future be a moderately oligopolistic market. At present there is strong evidence that average PPPs are set by the conditions of entry, and it is therefore no surprise that if capacity payments go down, SMP rises correspondingly to preserve the PPP. (The evidence for this inverse relationship can be found in Offer, 1998f).

If the market were made more competitive in the mid-merit order, things might differ and be considerably improved. What is not clear is whether the new system would work any better without a change of market power, for the incumbents will still wish to raise prices in the balancing market (as in the Pool) to encourage buyers to settle for adequately remunerative contracts (as at present). Indeed, their market power may be

enhanced because of the possibly greater impediments to entry created by the less transparent and shorter term contract system. Worse, generators with a mix of plant (and that is only the current market makers) will face relatively less risk than their competitors under the proposed system, and since they set prices based on the costs faced by their rivals, not their own costs, they are more likely to raise than lower prices.

It should be remembered that the Victoria pool is concerned about their treatment of capacity payments and the need to remunerate seldom-run plant. One conclusion might be that capacity payments are not necessary in an oligopolistic market, where generators can set an adequate price, but are likely to reduce risk in competitive markets where generators have less control over prices. If the object is to make the market more competitive it may be worth keeping some form of capacity payment, while if they are to be abandoned, that may be effectively a tacit acknowledgement that the English market is not to be made any more competitive (and is indeed likely to be thereby protected from becoming more competitive).

One additional concern is that part of the original logic for capacity payments was the absence of an obligation to supply. The final removal of the franchise does not give one confidence that suppliers will feel the need to contract adequately in advance for plant to be built to meet future demands, given the risk of stranded contracts, and it is not clear who else would take that task on without additional regulatory intervention and cost pass through - which at least the capacity payment system avoids.

It is possible that over-optimistic potential entrants will conclude that the new arrangements offer greater market power to portfolio generators, who will therefore be expected to sustain higher prices, in response to which there may be excess entry, but that is hardly a compelling argument for moving to a system which would dissipate more rents in the form of excess investment and the premature closure of viable coal fired plant.

The relative positions of different fuels

At various points it is claimed that coal is disadvantaged under the present system, though no quantified evidence is given of this, and in any case it would be difficult to disentangle the fact that the coal plant is owned by the dominant price-setting generators exercising market power from the characteristics of the plant itself. It is claimed that the greater flexibility of coal and possibly some open cycle and even modern combined cycle gas turbines is not recognised by the Pool, to which the obvious response is that various ancillary services do pay for flexibility and it is therefore for this review to argue that residual flexibility is both valuable and underpaid. It is of course possible to design a market in which flexible plant is over-rewarded by placing constraints and increased transaction costs on dealing with less flexible plant, but this would be to artificially favour flexible plant through the institutional design. If flexibility is more valuable, then presumably base load contracts are less valuable than those with options and flexibility, and base load plant which would most likely be almost fully contracted would therefore earn a lower return than flexible plant under the existing system. It is not necessary to redesign the market to reflect the value of such flexibility.

Assessment

There is much that can be improved with the present arrangement, particularly Pool governance and at a more fundamental level market power (and the handling of sulphur emissions limits). There are modest improvements that should certainly be made, to firm bidding and possibly closer tracking over the course of the 24 hours. It may be that bids should be simplified, though it ought to be possible to quantify the potential benefits of the present multi-part bidding system (and see whether they are realised and if not why not). It may also be that some or all of the technical parameters in the bids should be set for longer periods (perhaps a year), or possibly even abandoned altogether. One would hope that alternative bids could be evaluated in the way in which any proper US regulatory review would certainly ensure occurred. The present review appears to have relied mainly upon unsubstantiated claims, inappropriate analogies, unquantified criticisms, and a remarkably uncritical assessment by the participants of the debate, without commissioning the kind of detailed analysis one might have expected from a regulatory agency claiming industry expertise.

There are good reasons for thinking that the most efficient structure for the electricity industry is one of competitive generation with no cross-ownership with other parts of the industry, and that the only way to sustain this structure is to preserve a single price open access Pool and prevent horizontal and vertical mergers. On this view the *Pool Review* is moving in exactly the wrong direction, for it is likely to precipitate vertical mergers that will be justified as reducing the transaction costs that the new markets impose. The almost certain outcome is towards a more vertically integrated industry with a small number of players who would benefit relative to their rivals from their ability to internalise risks after the removal of existing markets and instruments which allow other independent generators to manage their risks. In the process much of current information that might allow external observers to judge whether the outcome was an improvement or a deterioration from the perspective of the customers would disappear.

The most obvious way forward is to reform the governance structure of the Pool so that experiments can be conducted more efficiently to test out sequentially which of the various innovations proposed would in fact improve matters, rather than attempting to make large scale reforms simultaneously, that will fail to distinguish between those components of the change which are beneficial, and those which are doubtful value, let alone those which merely add transaction costs and reduce the contestability of the market. The industry has a demonstrated tendency to undertake reforms whose costs are extremely large for relatively modest improvements (eg retail competition in 1998 discussed by Green and McDaniel, 1998). Given that, it seems important to undertake lower cost experiments, particularly as the potential efficiency gains are small and the potential costs of mistakes are relatively high.

In this context it would have been helpful if the *Pool Review* had distinguished between minor changes which could be made to the existing system, and which would almost certainly improve matters, and fundamental changes, which can only be justified if there is a good chance that they will improve the present system, given the risks involved that they might make matters worse, and perhaps substantially worse.

In the first category, requiring bids to be firm, adjusting the timing of bids to synchronise with the gas market, and perhaps adopting a rolling four hour ahead market, might be easy to adopt (given the required changes in Pool governance to permit changes anyway). They could be tried while retaining most of the present features of the Pool, would constitute a minor adjustments to deal with obvious problems, and if they made matters worse they could be abandoned at low cost. There are a number of other changes that could also be adopted on an experimental basis - simpler bids, bids which cannot be changed more than so many times per year, technical parameters that have to be justified and retained for long periods, etc. The obvious model here is the Gas Network code which can be varied (and has been many times) in response to suggestions from within the industry, after consultation and under regulatory approval. Before abandoning the whole structure, one might consider less drastic and incremental reforms that have a higher chance of cumulatively producing some improvement and which run far lower risks of a large increase in costs.

References

Barker, J., B. Tenenbaum and F. Woolf (1997) *Governance and Regulation of Power Pools and Systems Operators: An International Comparison*, Washington DC: World Bank Technical Paper 382

DTI (1998a) *A Fair Deal for Consumers: Modernising the Framework for Utility Regulation*, Department of Trade and Industry, London: HMSO, CM 3898

DTI (1998b) *Review of Energy Sources for Power Generation: Consultation Document*, London: Department of Trade and Industry.

Electricity Pool (1998) *Pool Review Steering Group Response to Offer's Interim Conclusions of June 1998*, London: Electricity Pool

Green, R.J. and T. McDaniel (1998) 'Competition in Electricity Supply: Will "1998" be Worth It?', *Fiscal Studies*, Vol 19, No 3, pp. 273-293

HC (1992), *Consequences of Electricity Privatisation*, Energy Committee, House of Commons, London: HMSO 1113-1

HC (1998), *The Coal Report*, Trade and Industry Committee, House of Commons, London: HMSO

Henney, Alex and Miles Bidwell (1997) *Reforming the Pool of England and Wales - a report for Mr John Battle, Minister for Energy, Science and Industry and Pool Members*, London: EEE Ltd

Newbery, D.M., (1997) 'Pool Reform and Competition in Electricity', DAE Working Paper 9734, Cambridge, forthcoming in M. Beesley (ed.) *Lectures on Regulation Series VII*, London: Institute of Economic Affairs

Newbery, D.M. and M.G. Pollitt (1997), 'The Restructuring and Privatisation of the CEGB- Was it worth it', *Journal of Industrial Economics*, XLV (3), 269-303

Offer (1992a), *Report on Constrained-on Plant*, Office of Electricity Regulation, Birmingham, October 1992.

Offer (1992b), *Review of Pool Prices*, Office of Electricity Regulation, Birmingham, December 1992.

Offer (1992c), *Review of Economic Purchasing*, Office of Electricity Regulation, Birmingham, December 1992.

Offer (1994a), *Decision on a Monopolies and Mergers Commission Reference*, Office of Electricity Regulation, Birmingham, February, 1994

Offer (1994b), *Trading outside the Pool*, Office of Electricity Regulation, Birmingham, 14 July.

Offer (1998a) *Review of Electricity Trading Arrangements: Background paper 1 - Electricity Trading Arrangements in England and Wales*, February, Birmingham: Office of Electricity Regulation

Offer (1998b) *Review of Electricity Trading Arrangements: Background Paper 2 - Electricity Trading Arrangements in other Countries*, February, Birmingham: Office of Electricity Regulation

Offer (1998c) *Review of Electricity Trading Arrangements: Working Paper on Trading Inside and Outside the Pool*, March, Birmingham: Office of Electricity Regulation

Offer (1998d) *Review of Electricity Trading Arrangements - Interim Conclusions*, June, Birmingham: Office of Electricity Regulation

Offer (1998e) *Review of Electricity Trading Arrangements*, July, Birmingham: Office of Electricity Regulation

Offer (1998f) *Report on Pool Price Increases in Winter 1997/98*, June, Birmingham: Office of Electricity Regulation

Stoft, S. (1997), 'What should a power market want', *Electricity Journal*, June