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What Are the Issues in Mergers and Acquisitions  
Arising from Electricity Market Restructuring?

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**DAVID NEWBERY**

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## **Abstract**

The energy merger was precipitated by energy market liberalisation that was often accompanied by restructuring and privatisation putting companies into play and creating new market risks that could be internalised by merging generation and supply. Electricity mergers pose distinctive challenges for competition policy - in market definition and for modelling price impacts in markets with no storage, inelastic short-run demand and transmission constraints. The EU has taken a more relaxed approach to merger assessment than the tighter screens of FERC despite greater market concentration and is poorly placed to deal with domestic mergers that impact external energy flows. Britain in contrast has used to desire for vertical mergers as a lever to reduce horizontal market power, and the EU should take more account of mergers foreclosing options for a future more competitive single energy market, notably for horizontal mergers, where cross-border interactions are important. The paper argues that vertical (convergent) mergers between electricity and gas raise particular concerns, given current EU gas market power, exemplified by the E.On-Ruhrgas merger. The form of the Emissions Trading System amplifies these concerns.

**Keywords:** merger policy, electricity, gas, convergent mergers, vertical integration, emissions trading

**JEL classification** G34, L22, L94, L95, Q5



## 1. Introduction\*

European electricity liberalisation was set in train by the EU Electricity Directive 96/92 that aimed to functionally unbundle the competitive segments of generation and supply (retailing) from the natural monopoly segments of transmission and distribution. In some countries (notably the UK, but also the Netherlands and Spain) the resulting restructuring was accompanied by privatisation, in others, such as Germany, private ownership was already common, while yet others retained public ownership (notably France) or partial privatisation (Italy). The following dramatic merger wave was driven by a number of factors. The first and most obvious was that privatisation put a considerable number of new companies into play on the stock market. The second was that electricity demand is growing slowly so organic growth is slow, leaving profits either to be returned to shareholders or spent on acquisitions. Managers (and their merchant bank advisors) typically benefit more from the second than the first.

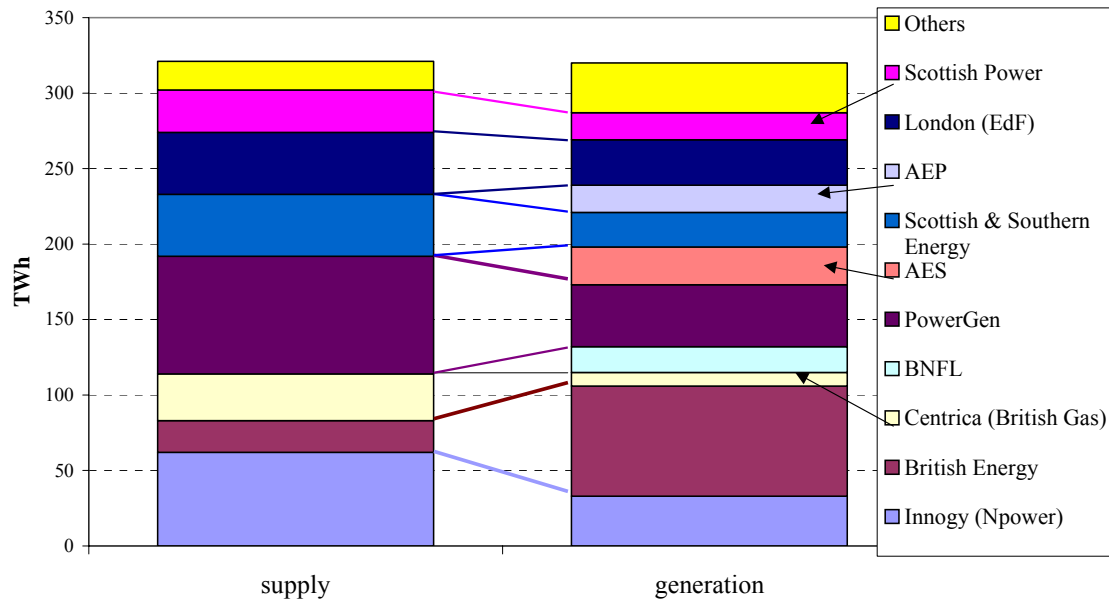
One often neglected reason for mergers in electricity is that unbundling creates a wholesale electricity market into which generators sell and from which suppliers buy (mainly on contract but also in spot and over-the-counter or OTC markets). Compared to the former vertically integrated and/or franchise monopoly structure, competitive wholesale markets create new risks that are complementary for generators and suppliers. Thus if wholesale prices are high, generators' profits are high but suppliers who have already contracted to sell at fixed prices facing rising costs and falling profits, and vice versa. These negatively correlated risks create both a demand for and supply of hedging, but if contract markets are thin or illiquid, hedging is incomplete and both sides of the market bear risks that vertical integration of generation and supply automatically cancels. Mergers between generation and supply are therefore an attractive risk-reducing and hence synergistic strategy. If both upstream and downstream markets were competitive such mergers would not normally raise competition concerns.

Figure 1 below gives the market shares in generation and supply in Britain in 2002, showing first that concentration is higher in supply than generation, and second that all suppliers have integrated with generation (but not vice versa). What is not so obvious is that once one company starts such a process it often rapidly escalates. As firms become vertically integrated, they become less reliant on spot and OTC markets, making those markets less liquid. That raises costs to those still dependent on contracting to reduce risk, and raises the benefits of further mergers. The end result can be pro-competitive in that it encourages de facto contracting, which reduces the incentive to manipulate spot markets (Newbery, 1998), but it can be anti-competitive in that it raises barriers to the entry of merchant generation or pure supply companies. In an industry as prone to tacit collusion as electricity, entry barriers are particularly undesirable.

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## Supply and Generation in Britain 2002



**Figure 1 Degree of vertical integration in British generation and supply**

Source: R Green

## 2. Merger policy in the European Union

In contrast to the United States, mergers between energy companies in Europe have been subject to rather relaxed standards, and consequently many mergers have been allowed to proceed that would cause economists considerable disquiet. In the U.S. until relatively recently, energy companies were subject to tight regulation at the state and federal level, and were prohibited from mergers. Recent liberalisation has changed this somewhat but the Federal Energy Regulatory Commission, FERC, retains jurisdiction over those states that are interconnected by AC links (i.e. every state except Texas, which is electrically isolated), on the good physical grounds that any activity within an interconnected network potentially affects all parts of that network, and thus will impact on other states, requiring federal oversight.

Under the Federal Power Act 1935, FERC has a statutory obligation to ensure that wholesale prices are 'just and reasonable'. If an electric utility wishes to sell at market-determined wholesale prices, this will be only allowed providing 'the seller (and each of its affiliates) does not have, or has adequately mitigated, market power in generation and transmission and cannot erect other barriers to entry.'<sup>1</sup> FERC therefore assumes that market pricing is 'just and reasonable' so long as it is competitive. A reason for its concern to ensure that markets are competitive when they are liberalised is that any FERC-approved form of pricing greatly restricts the competition authorities from intervening. At the same time, existing antitrust laws are relatively powerless to prevent excessive pricing, absent other anti-competitive conduct. In the U.S., provided a firm acquires a dominant position legally (by innovation, superior efficiency or foresight) and does not act to exclude competition or leverage its market power into other markets, it is free to exercise that market power. In

<sup>1</sup> *Heartland Energy Services, Inc*, 68 FERC 61,223, at 62,060 (1994), cited by Bogorad and Penn (2001). Experience with the deregulated California market suggests, however, that the FERC might apply a high threshold for intervention in the presence of market power.

the EU in contrast, it is illegal for firms with a dominant position (exercised either singly or collectively) to abuse their market power.<sup>2</sup> ‘Antitrust remedies are thus not well-suited to address problems of market power in the electric power industry that result from existing high levels of concentration in generation.’ (DOE, 2000). Consequently, any merger will attract considerable FERC scrutiny, and in response FERC has developed increasingly sophisticated techniques to assess their impact on competition (Gilbert and Newbery, 2006)

In contrast the EU seems poorly equipped to either assess or prevent damaging mergers. As in the U.S., electricity flows according to the laws of physics, not nation states, throughout the UCPTE system (roughly the Continental EU but including non-members such as Switzerland, future members such as Romania and Bulgaria, and others such as the Balkans). Nevertheless, mergers between mainly domestic energy companies are left to national competition authorities, even when they have significant impacts on other member states. Thus the E.On-Ruhrgas merger (which was condemned by the German Monopolies Commission but approved by the German government) did not fall under the jurisdiction of the European Commission, even though Germany is a key transit route for gas to the EU and E.On controls interconnectors into neighbouring states. Similarly the widely criticised Gas Natural bid to take over Endesa in Spain could not be judged in Brussels (despite attempts by Endesa to seek such a reference), even though it would clearly have a significant impact on Portugal.

Even where the Commission has jurisdiction, it has not yet developed an adequate set of economic tests to properly determine the potential for current or future harm to competition. The first problem is that many member states have relatively weak information disclosure requirements for energy companies, and too often accept the argument that information is commercially sensitive and therefore should not be disclosed to national regulatory agencies but only made available in response to a formal competition authority investigation into market abuse. Market surveillance is therefore often weak, and ill equipped to collect the evidence that would justify such an investigation. Even in the case of the natural monopolies of transmission and distribution, where there can be no case that the information is commercially sensitive, the information is often not automatically forthcoming. This is particularly problematic where transmission and interconnectors are owned by a company that also owns generation that would benefit from the market surveillance committee’s lack of information.

The Commission also appears to take unwarranted comfort from Article 82 of the Treaty of Rome that makes abusing that market power illegal. In the U.S., provided a firm acquires a dominant position legally (by innovation, superior efficiency or foresight) and does not act to exclude competition or leverage its market power into other markets, it is free to exercise that market power. In the EU in contrast, it is illegal for firms with a dominant position (exercised either singly or collectively) to abuse their market power.<sup>3</sup> Specifically, such firms are not allowed to charge

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2 ‘The concept of abuse is an objective concept relating to the behaviour of an undertaking in a dominant position which is such as to influence the structure of a market where, as a result of the very presence of the undertaking in question, the degree of competition is weakened and which, through recourse to methods different from those which condition normal competition in products or services on the basis of the transactions of commercial operators, has the effect of hindering the maintenance of the degree of competition still existing in the market or the growth of that competition.’ (Judgement of the Court of 13 February 1979. - Hoffmann-La Roche & Co. AG v Commission of the European Communities. - Dominant position. - Case 85/76 at

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consumers prices that are excessive. Proving that prices are excessive would require evidence that the margin of prices above costs were well above the normal commercial range for competitive firms producing the same product (not an easy test to apply in any market, let alone electricity markets, as explained below).<sup>4</sup> The Commission may therefore be overly sanguine that Article 82 will ensure that merging companies that acquire greater potential to exercise market power will be dissuaded from market abuse, leaving only the synergistic benefits without the market damage.

The interpretations of the EU competition laws (especially Article 82) give a list of facilitating conditions that give rise to the potential for joint market dominance, almost all of which are satisfied in many EU electricity markets.<sup>5</sup> Consequently, although generating companies must be somewhat cautious in their exercise of market power, exactly how cautious is unclear. Specifically, the short-run elasticity of demand can be very low in the short periods during which scarcity can arise (because of an outage, or extreme demand conditions) and the market clearing price can reach very high levels (certainly well above 1000 Euros/MWh). Just how high it is acceptable to allow prices to reach, given the need to cover fixed costs from a small number of very profitable hours, is a matter for the firms to judge and may vary across jurisdictions with differing attitudes to anti-trust enforcement. It is hard to predict what might happen following a merger, and tempting to suppose that market abuse will always be deterred.

This suggests a further contrast on the two sides of the Atlantic, reflecting the prior histories of the electricity industry on the two continents. Deregulation in the United States was in principle a cautious relaxation of regulatory control over prices, with considerable awareness of the potential problems of market power. Electricity restructuring in Europe has tended to overlook issues of market power, and instead has concentrated on introducing wholesale and often retail markets in the expectation that they will be naturally competitive. In part this reflects the political dynamics of liberalisation, where Britain was an enthusiastic proponent first of privatisation, and then, somewhat belatedly, of competition to restrain the privatised monopolies. Most Continental countries were happy with their existing energy structures, and would only accept EU Energy Directives that allowed them to retain their existing market structures with minimal change. If the Commission had followed the U.S. approach of allowing liberalisation only after any concerns about potential market power had been addressed, then it is doubtful that energy market liberalisation would have occurred in more than a few countries, and probably would have faltered at the first sign of trouble (e.g. after the California crisis).

The other limitation confronting the Commission is the tension between the longer run objective of creating integrated and competitive energy markets, and the short-run test of the impact of a merger. If the current situation is one of considerable concentration, as Figure 2 shows is the case in many member states, then mergers may not make matters worse, and as such it can be legally argued they do no damage.<sup>6</sup> On the other hand, Britain demonstrates that mergers offer opportunities to actually make matters better and to facilitate the transition to a more competitive market structure. When the major

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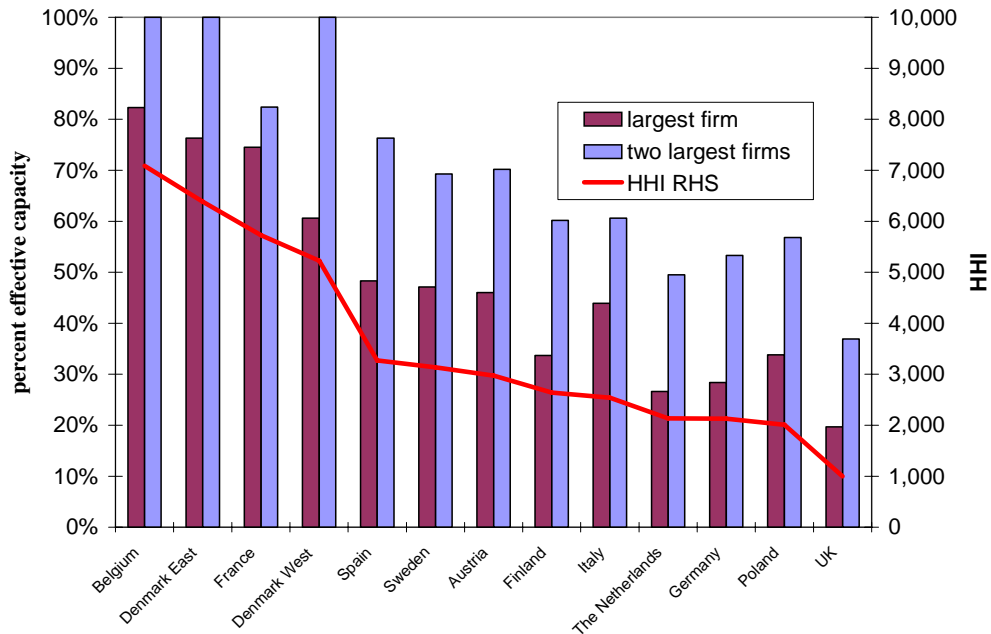
4 The European Commission has found it difficult to sustain charges of excessive pricing. The first such case, *United Brands* (Case 27/76 [1978] ECR 207: 1 CMLR 429) was rejected by the Court as lacking sufficiently strong evidence, specifically a detailed cost analysis. In 1995 the Commission issued a formal statement of objections to Belgacom (the Belgian telecommunications operator) claiming that the prices Belgacom charged directory publishers for access to its data were abusive. In response, Belgacom dropped the charge from 200 BEF per line of data to 67 BEF/line and the Commission reached a settlement in 1997 (EC, 1997). The UK has been more energetic in pursuing such cases, where the Competition Act 1998 transposes Arts 81 and 82 into UK law. The Office of Fair Trading successfully brought a case of excessive pricing against Napp Pharmaceuticals (see *Napp Pharmaceutical Holdings Ltd v Director General of Fair Trading* [2002] CAT 1). See Slot and Johnstone (2006).

5 The market characteristics that are conducive to joint dominance or tacit co-ordination include concentration, transparency, maturity, with a homogenous product produced by companies with similar costs and market shares, facing an inelastic demand, and with barriers to entry – an almost perfect description of the electricity market.

6 HHI is the Herfindahl Hirschman Index, the sum of the squared percentage market shares. The measures may under or overstate market power as they ignore capacity tightness and import options.

incumbent generating companies in Britain wanted to merge with distribution companies (that were then bundled with supply), the Government denied them that opportunity, making it very clear that vertical integration when generation was so concentrated would not be acceptable.<sup>7</sup>

### Concentration in EU Electricity, 2004

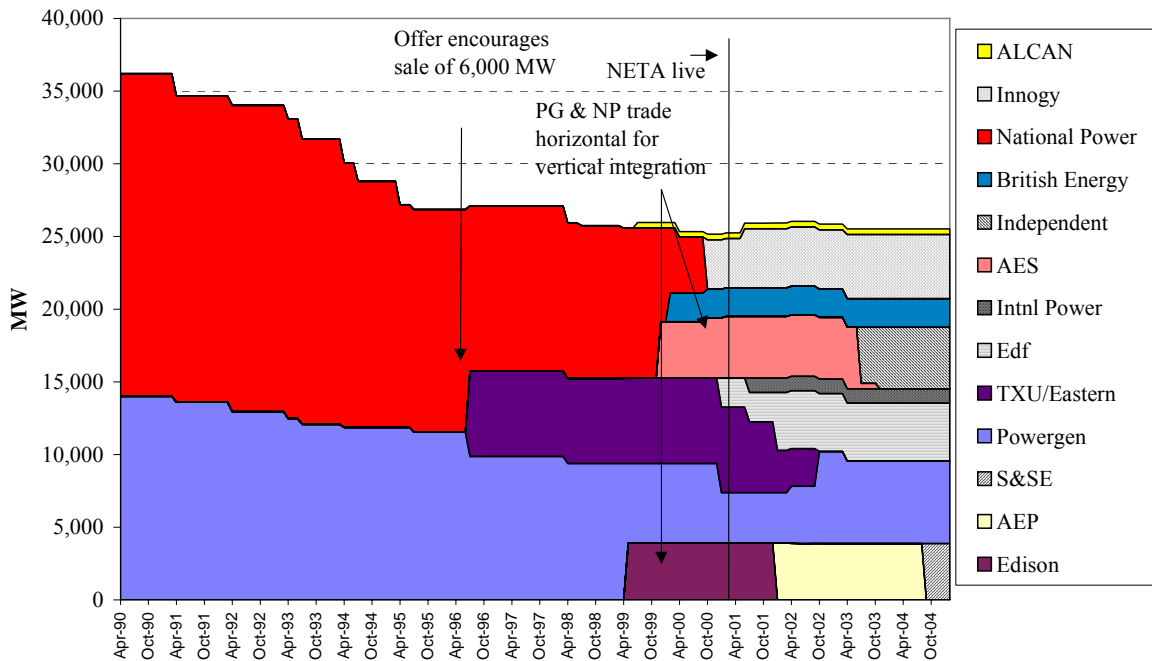


**Figure 2 Most Continental electricity wholesale markets are highly concentrated**  
 Source: EC (2006)

The subsequent compromise was that the large generators would trade off horizontal market power for the right to vertically integrate into supply (and supply was legally separated from distribution). Figure 3 illustrates the consequences of this activism.

<sup>7</sup> The Monopolies and Mergers Commission found a potential for adverse competition effects from the mergers, but was prepared to accept them subject to various remedies. The Government could then only overturn MMC recommendations in cases where potential adverse effects were identified, as here, and so could intervene. Under the subsequent Competition Act the MMC (now the Competition Commission) is determinative on mergers and such intervention would not now be possible.

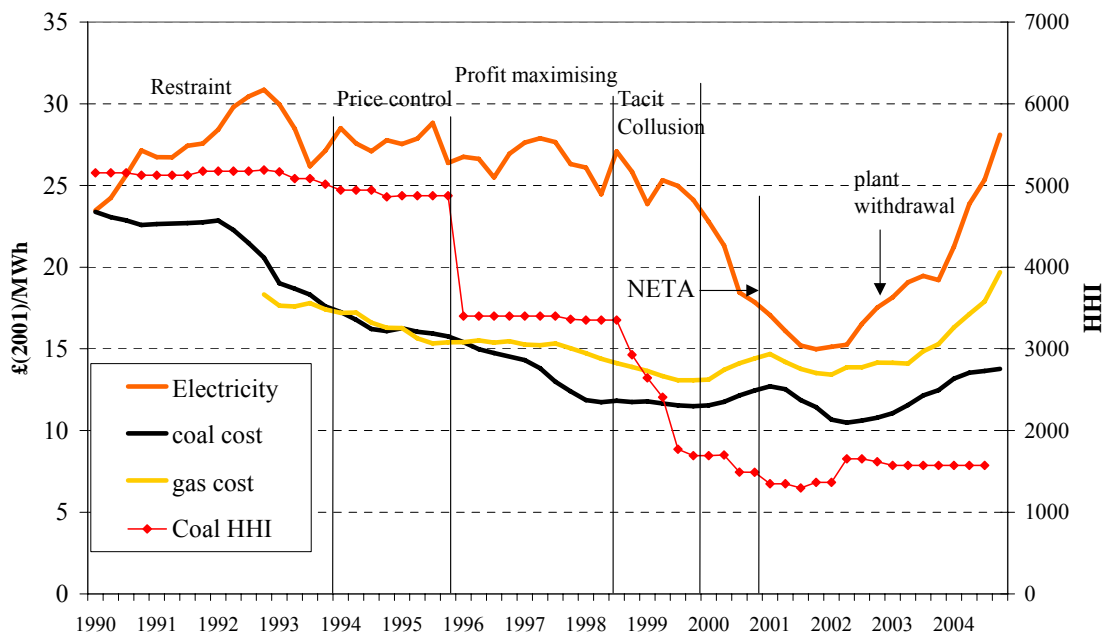
### Capacity Ownership of Coal Generation 1990-2005



**Figure 3 Evolution of ownership of British incumbents' original coal-fired plant**

The first divestiture in 1996 was in response to claims by the regulator that prices had not fallen in line with costs, as figure 4 showed in the period 1990-94, and that therefore the two incumbents would accept a price cap on wholesale average prices until they had sold sufficient plant to create more competition in the wholesale market.

### Real electricity and fuel costs 1990-2005



**Figure 4 Real British electricity prices and costs**

Whereas until 1994 the two dominant incumbents had restrained prices below the profit maximising level, in the period after the first divestiture the three firms appear to have been profit maximising (that is, each firm, taking the bids of the others as given, bid to maximise its own profits), as Sweeting (2001) found. Subsequently, as plants were sold (shown in figure 3 and the HHI fell as shown is the line with diamonds in figure 4) the larger firms appear to have tacitly colluded to keep prices higher than the individually profit maximising bids would have yielded. That is, each firm bid a higher price than would appear individually rational, and so collectively they were able to sustain a more profitable outcome than individually. This was important to persuade potential buyers of the plant to be divested that past profitability would be a reasonable guide to future profits, justifying a high price for the plant. In due course, as plant with a low load factor was sold, their buyers were tempted to increase output. Prices collapsed shortly before the start of the New Electricity Trading Arrangements, NETA (justified as a means of breaking generator market power). The end result of this regulatory activism was a workably effective wholesale market of the kind the EU urgently needs. Indeed the price-cost margin initially fell to unsustainably low levels until plants that could not cover its fixed costs were withdrawn, the market tightened and margins were somewhat restored.

Perhaps because liberalisation was unwillingly accepted by some member states, the member states have not been pro-active in creating more competitive markets by restructuring in the way that FERC and U.S. State regulators obliged those wishing to liberalise in the U.S. Most countries resisted breaking up state-owned companies at privatisation, leaving them in dominant domestic positions, with some countries (Spain) merging existing separate companies to create national champions. In the Netherlands the Government's original intention was to merge the four large electricity companies to create a national champion, but this failed as the parties could not agree to satisfactory terms (van Damme, 2005). The European Commission continues to resist the notion of national champions as fundamentally incompatible with the concept of the Single Market, but is limited (to date) in its powers to intervene in merger cases where the parties have more than two-thirds of their sales within the member state. The two recent examples that highlighted the weakness of the Commission (and of industry experts within the countries) were the E.On-Ruhrgas merger in 2002,<sup>8</sup> and the attempted takeover of Endesa by Gas Natural in 2005,<sup>9</sup> although the latter bid was apparently trumped by E.On in May 2006 (and on this cross-border bid the Commission did have jurisdiction).

Perhaps the widespread concern over the E.On-Ruhrgas merger caused the Commission to reconsider its views about growing concentration in energy markets, although the start of carbon trading under the European Emissions Trading System in January 2005, coinciding with a sharp rise in the price of gas, produced both high energy prices and high energy company profits that stimulated consumer complaints in early 2005. That provided the impetus for the Commission to launch a Sector Inquiry into the energy industries in June 2005. The European Commission had been concerned for some time that the Internal Electricity Market suffered from a range of structural problems, exacerbated by inadequate interconnections between member states that limit the number of competing generation and supply companies that can access customers. The Sector Inquiry was described as 'a competition investigation based on Article 17 of Regulation 1/2003, which assesses the competition conditions on European gas and electricity markets and examines whether current indications of market malfunctioning result from breaches of competition law' (European

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8 The Federal Cartel Office (Bundeskartellamt) prohibited the merger on 21 Jan 2002, (see [http://www.bundeskartellamt.de/wEnglisch/News/Archiv/ArchivNews2002/2002\\_01\\_21.shtml](http://www.bundeskartellamt.de/wEnglisch/News/Archiv/ArchivNews2002/2002_01_21.shtml)) and the Monopolies Commission argued against the merger on competition and public interest grounds, but the Government then approved the merger in August 2002.

9 The regulatory authority, CNE was divided in its judgment of this case, although the European Competition Commissioner, Neelie Kroes, considered that the case justified a change in EC merger rules to permit the Commission to examine such mergers (*European Power Daily*, 16 Nov 2005). This represents a change in the Commission's stance compared with the earlier Ruhrgas merger, where the Commission was less active in contesting the merger even though it had considerably larger impacts on other member states, given the central role of Germany in cross-border trade in both electricity and gas.

Commission, 2006). This Regulation is recent (coming into effect on 1 May 2004), and appears to offer a strengthened approach to dealing with the exercise of market power.<sup>10</sup>

Thus the Commission can propose structural remedies for current or past abuses and these would appear to be particularly relevant in dealing with market power in energy markets. Article 7 of the Regulation states that ‘Where the Commission, acting on a complaint or on its own initiative, finds that there is an infringement of Article 81 or of Article 82 of the Treaty, it may by decision require the undertakings and associations of undertakings concerned to bring such infringement to an end. For this purpose, it may impose on them any behavioural or structural remedies that are proportionate to the infringement committed and necessary to bring the infringement effectively to an end. Structural remedies can only be imposed either where there is no equally effective behavioural remedy or where any equally effective behavioural remedy would be more burdensome for the undertaking concerned than the structural remedy. If the Commission has a legitimate interest in doing so, it may also find that an infringement has been committed in the past.’ (European Commission, 2004).

An optimistic interpretation would be that the Commission will eventually be able to follow the British model, in which liberalisation is interpreted to mean that market solutions are to be preferred where feasible, and regulation confined to natural monopoly components (and only so long as they remain natural monopolies).<sup>11</sup> If the unregulated sectors are to function efficiently, their ability to abuse market power needs to be restrained, either by regulation (behavioural remedies) or by structural remedies. The Californian evidence might suggest that any behavioural remedy to address the abuse of market power in deregulated electricity markets ‘would be more burdensome for the undertaking concerned than the structural remedy’ (EC, 2004), opening the prospect of (gradually) restructuring the EU energy sectors to create sufficiently numerous competing firms in each market that their pursuit of profits did not amount to market abuse. The model would be the British electricity market that finally reached a satisfactory structure by 2000 as described above and in (Newbery, 2005a).

Whether this new activism will lead to a more rigorous and sceptical treatment of energy sector mergers, either by member Competition Authorities concerned that favourable treatment of domestic mergers would be overturned by another sector inquiry, or directly by the Commission for cross-border mergers, remains to be seen.

### 3. Treatment of horizontal mergers

It follows from the arguments above that the test of the effect of a proposed merger should not just be on its immediate impact on market power, which in an already concentrated industry may be modest, but whether it would damage market conditions in the future desired market structure. Put another way, allowing a horizontal merger may foreclose an option to create a more competitive market in the future. Of course, if the merger creates one modest sized and more viable company out of two previously sub-sized companies, then it may move industry structure in a desirable direction, but such mergers would be unlikely to trigger concern in the first case.

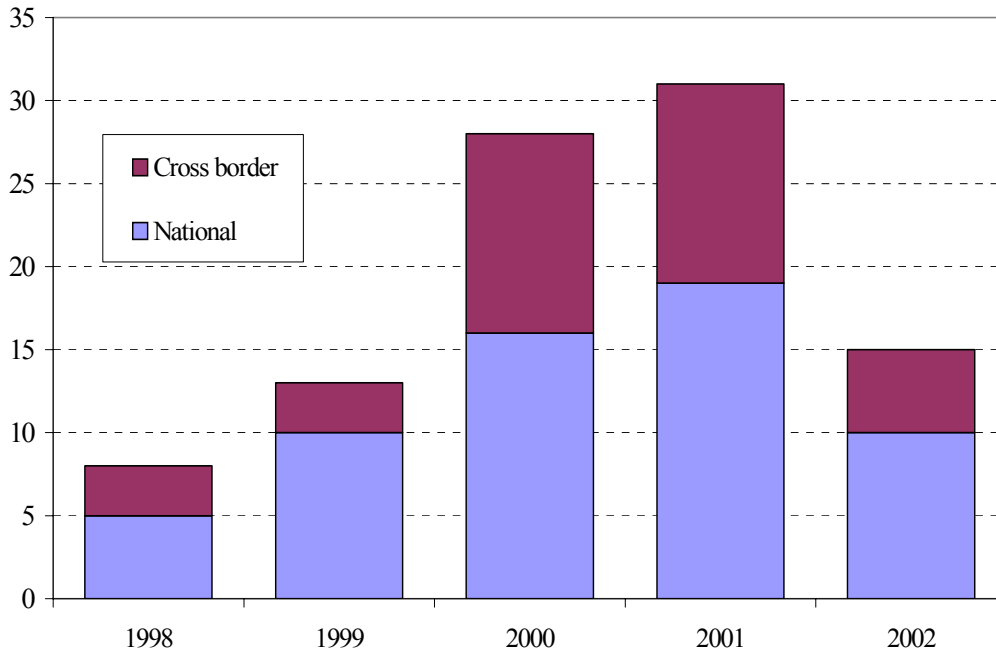
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10 Article 17 of the Regulation deals with Article 81 and 82 infringements (Investigations into sectors of the economy and into types of agreements). Where the trend of trade between Member States, the rigidity of prices or other circumstances suggest that competition may be restricted or distorted within the common market, the Commission may conduct its inquiry into a particular sector of the economy or into a particular type of agreements across various sectors. In the course of that inquiry, the Commission may request the undertakings or associations of undertakings concerned to supply the information necessary for giving effect to Articles 81 and 82 of the Treaty and may carry out any inspections necessary for that purpose. The Commission may in particular request the undertakings or associations of undertakings concerned to communicate to it all agreements, decisions and concerted practices. (European Commission, 2004).

11 Thus in telecommunications, the Communications Directives require National Regulatory Authorities to conduct market reviews and to determine which markets shall be deemed to be effectively competitive, and which markets are susceptible to *ex ante* regulation. The cumulative effect of these Directives is to limit regulation to those markets where competition law would be inadequate, and then further to restrict the scope of regulation to the minimum justifiable level.

Any economic analysis of a potential merger should start with a definition of the relevant market, and here the Commission has often assumed without proper investigate that markets are coincident with national borders. That is particularly in interconnected electricity markets, where the relevant markets are defined by set of generators that can serve the specified area. This can be smaller than the national market where interior transmission capacity constraints prevent the import of additional power, or it can be broader where international interconnectors are unconstrained. The Dutch competition authority, NMa, in its consultation on mergers in the energy sector and has published a report by Brattle that is careful to properly define the markets relevant to potential mergers.<sup>12</sup>

**Number of national and cross-border mergers and acquisitions**



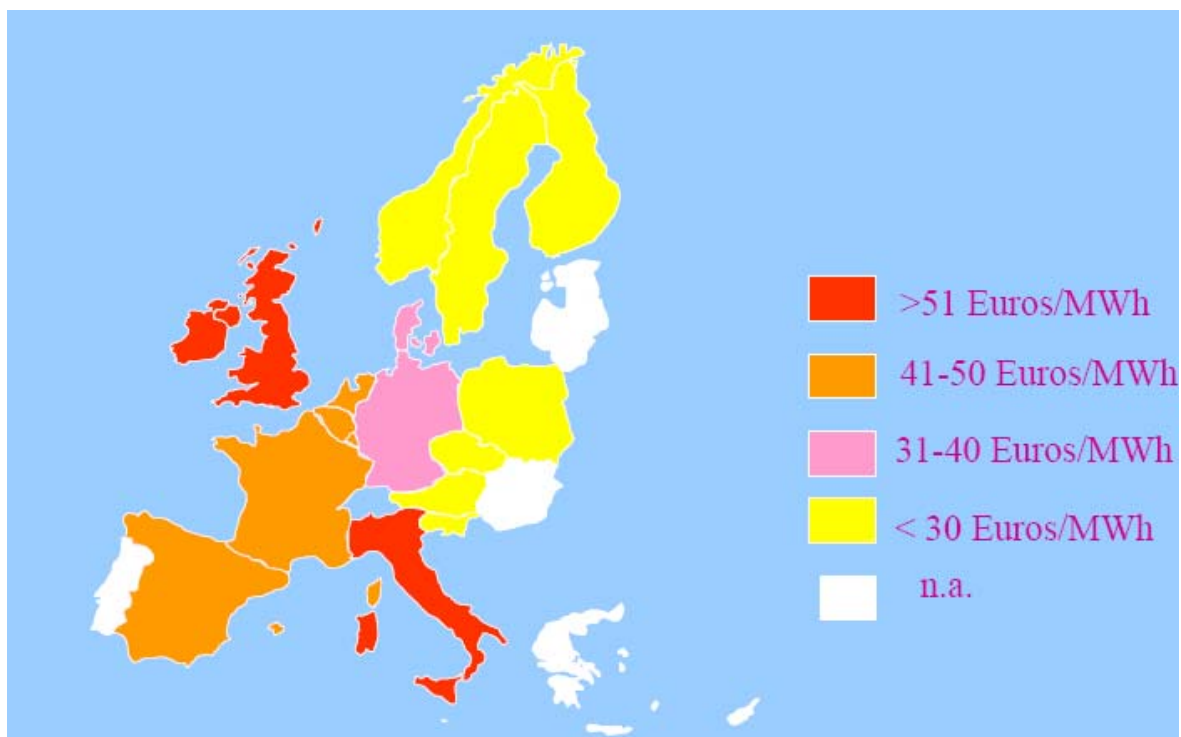
**Figure 5 The extent of cross border energy mergers**

*Source:* Codognet, Glachant, Leveque and Plagnet (2002)

Cross border mergers are another striking feature of recent merger activity, as figure 5 shows, and raise additional questions for merger analysis, although at least the Commission is likely to have jurisdiction over such mergers. First, if accepted, they raise questions for country energy regulators, who may not have access to information about market activities of the merged firm in the adjacent market, at least without close and harmonious co-operation between neighbouring regulators. Second, in the current energy market structure where ownership unbundling of generation and transmission is not required, companies straddling borders may also control access to the interconnectors. This access is currently inefficiently allocated through the failure so far to enforce netting for interconnector flows and to simultaneously clear neighbouring day-ahead power exchange and interconnector auctions (known as coupling).<sup>13</sup> Figure 6 shows that prices in neighbouring markets still differ significantly, making access to interconnectors valuable.

12 The consultation was launched on 14 June 2006 - see <http://www.nmanet.nl/engels/home/Index.asp>. The Brattle report is also available in English as Moselle, Newbery and Harris (2006).

13 Netting means that contracted export flows are netted off import flows (or v.v.) to make full use of the available capacity, but requires that contracted flows are obligations not options (see Gilbert, Neuhoff and Newbery, 2004) Market coupling



**Figure 6 Day-ahead price levels 2005**

Whereas the Commission's standard approach to the measurement of market power starts from market shares or HHI measures, electricity markets have distinctive features that make such measures potentially very misleading. Electricity cannot be stored, must instantaneously match supply to demand, and thus requires real time control over some part of supply over a time period in which demand is effectively very inelastic. Gilbert and Newbery (2006) argue that it is more useful to examine the merger's effect on market power in the residual market, defined as available capacity *less* contract positions and less the capacity of the merging firms. Although this is data intensive, the data should be readily available to a merger inquiry.

A key variable for the analysis of market power is the extent of forward contracting, which has a potentially very significant impact on spot market bids.<sup>14</sup> If a producer is completely hedged (i.e. he has sold as much power forward as he expects to generate) then his optimal spot bid is marginal cost, regardless of other bids. If the spot price is less than his short-run marginal cost, he is better off reducing output and buying in the spot market to meet his contractual obligations, avoiding the higher marginal cost of generation, and vice versa. If he has sold forward more than his expected generation, he has an incentive to drive the spot price below marginal cost, as he will be a net buyer in the spot market to discharge his contract position. Only if he is under-contracted does he have an incentive to drive the spot price above marginal cost, and his profit is limited to the difference between output and contract position.

It is possible to estimate dynamic bidding strategies, but these add additional layers of complexity. Allaz and Vila (1993) model the choice of forward sales in a Cournot duopoly model, and show that the extent of forward cover depends on the number of contract rounds, assuming full disclosure of

(Contd.) \_\_\_\_\_

means clearing the neighbouring power exchanges and the interconnectors simultaneously as in Nordpool, with a single price unless interconnector capacity is scarce.

<sup>14</sup> Most spot markets are actually cleared some time before supply and demand are realised (either day-ahead or within the day at least an hour before 'gate closure').

contract positions after each round. In the limit as the number of rounds increases, market power diminishes to zero. If contract positions are not revealed, then market power remains. It is possible to extend this model to any number of firms. In the symmetric case with constant costs and linear demand, when contract positions are not revealed, the contract cover will be  $1-H$ , where  $H$  is the Herfindal Hirshman Index (HHI) expressed as a fraction.<sup>15</sup> A further complication is that in repeated games (and electricity markets are repeated at high frequency) contract positions can be used to support collusive behaviour (Green and Le Coq, 2006). In merger analysis the problem is even more complex, as the aim is not just to understand past price-setting behaviour, but to predict the future with and without the merger, to determine the potential price-raising effect of the merger. One would expect contract cover to change and with it the incentive to bid above marginal cost. In the simple static Allaz and Vila model contract cover would fall from  $1-H_0$  to  $1-H_1$  where  $H_0$  is the pre-merger HHI and  $H_1$  the post-merger HHI. Thus if the pre-merger HHI were 1,667 and post-merger were 2,000, the predicted contract cover would fall from 83% to 80%. The effect on the predicted price-cost margin of ignoring the change in contract cover would be to understate the margin by 14% (Newbery, 2006).

#### 4. Treatment of vertical mergers between generation and supply

We have already noted that unbundling creates new risks that can be mitigated by contracts between generators and suppliers and/or customers, or, more effectively by vertical integration between generation and supply. Contract markets are typically not very liquid outside Nordpool, and offer a limited range of contract types of limited future duration (base-load, peak, months, quarters and years ahead) which do not adequately deal with the varying time profiles of customers' demand patterns, which can all be handled within vertically integrated companies. As such, vertical mergers can reduce contracting costs and provided the upstream and downstream markets are competitive, would seem to be efficiency enhancing and hence desirable. It does, however, require ownership separation of supply from distribution, otherwise the usual problems of self-dealing and favourable information gives the merged company additional market power in supply.

There is another potential benefit from vertical mergers apart from the reduction in transaction costs, if as a result the extent of de facto contract coverage is increased. The larger the extent of contract cover, the lower the incentive to exercise spot market power, as noted above. Switching costs make it costly to lose customers, and so vertically integrated companies are likely to lock in current customers, leaving a relatively modest amount of surplus generation to be sold on the wholesale and contract markets if they are long, or, better still, (as in the case of Centrica in figure 1) they will be net buyers on these markets with an incentive to drive prices down.

Whilst there is growing agreement about the appropriate techniques to employ for analysing horizontal and vertical electricity sector mergers, that is not true for cross-fuel mergers involving an input fuel, gas into the electricity sector (exemplified by both the E.On-Ruhr gas and Gas Natural-Endesa bids).

#### 5. Vertical mergers involving gas and electricity<sup>16</sup>

Gas is increasingly an important input into electricity generation and a final energy source that competes with electricity in the retail market. When global power generation orders peaked at over 180 GW in 2001, 150 GW were for gas turbines and more than half of all orders since 1990 have been for gas turbines (OECD 2003). Liberalisation (particularly when associated with privatisation and

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15 The HHI is normally measured as the sum of the squared market shares of the firms in the market, with a maximum value of 10,000 for a monopoly. Here the market shares are taken as a fraction, with the monopoly value =1, and for  $n$  firms  $H=1/n$ .

16 The remainder of this paper is taken from Gilbert and Newbery (2006).

unbundling) opens the prospect of gas and electricity companies entering each other's markets for the final product (gas or electricity supply) and acquiring firms in the other fuel market. Such mergers can be viewed as vertical integration (upstream gas and downstream electricity) or as convergence mergers (extending the company's reach from one energy source into two and reducing the difference between gas and electricity suppliers). The opportunity has clearly been attractive. Hunger (2003) cites 22 gas/electricity mergers with an asset value greater than \$500 million counted by the US Energy Information Agency between 1997 and 2000.<sup>17</sup> Recently mega-mergers such as E.On-Ruhrgas in 2002, and the attempted take-over of Endesa by Gas Natural in 2005, have awakened concerns both about the ability of the European Commission to rule on such mergers and to prevent mergers that are likely to be anti-competitive.

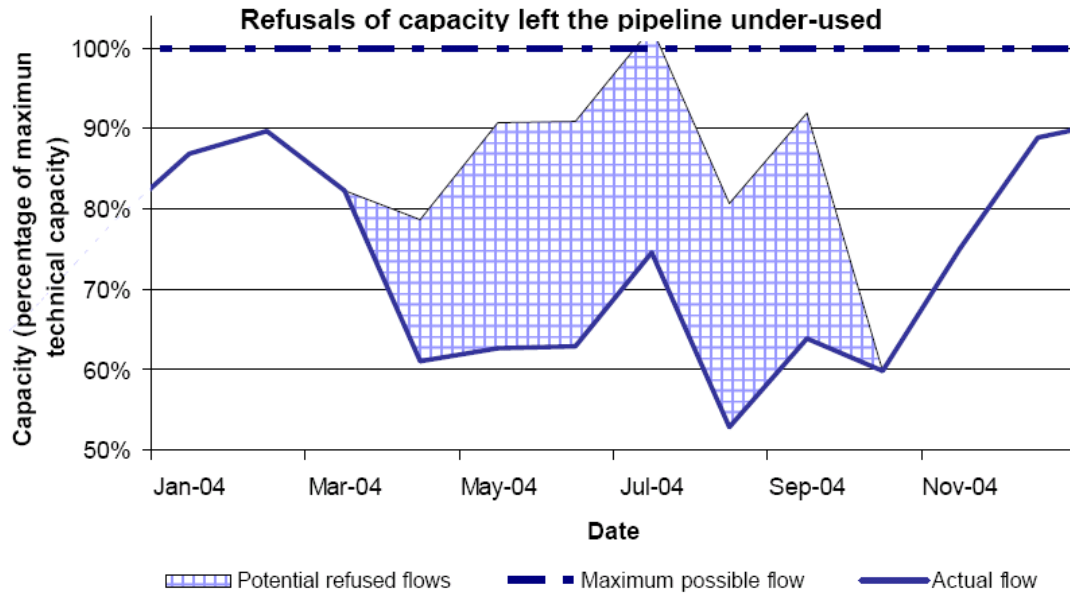
The standard argument for believing that vertical mergers are benign is that by reducing the inefficiency of transactions between up and downstream they lower costs and hence lower prices in the final market. Further, if the upstream (gas) company has market power, it can only extract monopoly profits once, and has no additional market power through ownership of the downstream (electricity) company. Indeed, if the upstream market power involved mark-ups on marginal cost in selling to the downstream firm, to the extent that the merger eliminated these, electricity prices would fall, not rise. In contrast to a horizontal merger that removes competitors, vertical mergers do not remove competitors. However, the conditions under which these arguments can be rigorously established are stringent and, as with horizontal mergers, vertical mergers require careful scrutiny to assess their welfare effects.<sup>18</sup> Vertical integration may make it profitable for the upstream firm to raise downstream rivals' costs (Salinger, 1988; Ordover, Saloner and Salop, 1990), although Perry (1989) argues that the damage is likely to be limited.

This is not the place to rehearse the debates on the anti-competitive effects of vertical integration in general, but to see whether one should be particularly concerned with gas-electricity mergers. The first point to note is that many European countries still suffer from considerable incumbency concentration in both electricity and gas markets as figure 2 demonstrated for electricity and the Sector Inquiry finds even more true for gas.

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17 An example is the merger of Enova and Pacific Enterprises to form Sempra Energy in 1998. Enova was a supplier of electricity and a net purchaser of natural gas in southern California. Pacific Enterprises was the largest supplier of intrastate natural gas transport and storage in the region. The U.S. Federal Energy Commission approved the merger with nondiscrimination conditions on gas sales. The U.S. Department of Justice required divestiture of about two-thirds of Enova's electricity generating capacity and imposed limits of the reacquisition of electricity generation (see U.S. Department of Justice Competitive Impact Statement, available at <http://www.usdoj.gov/atr/cases/fl1700/1789.htm>, accessed September 11, 2006.)

18 For example, fixed coefficients in input proportions by the downstream firms. If these are relaxed the results become ambiguous (see e.g. Church, 2004).



**Figure 7 Control over gas pipeline access enhances market power**

Figure 7 is taken from the Preliminary Report (EC 2006) and shows that gas companies owning pipelines clearly have effective control over access to those pipelines and hence to the market, thus conferring very substantial market power on such companies. Electricity and gas are actual and potential competitors in a broader market for energy services. In the medium run, the best placed potential entrant into the electricity market is a gas supplier, who has access to the fuel needed for combined cycle gas turbines (the natural choice for entrants), and who can (partially) hedge gas price risk by selling gas directly or as electricity. If that potential entrant merges with an electricity supplier, a major entry threat is reduced.

Next, and following the same line of reasoning as above, if the gas company has market power and takes over an electricity company, and if it raises the price of gas, then whenever gas is the marginal fuel in electricity, the price of electricity will rise. This will increase the inframarginal profits of the plants now under the control of the vertically merged company. The electricity part of the merged firm will have increased profits, *additional* to the normal monopoly profits of the gas part of the merged firm (and which were presumably already being maximised). Thus although the merger offers no additional *opportunities* to raise gas prices, it provides an additional *incentive* so to do.<sup>19</sup>

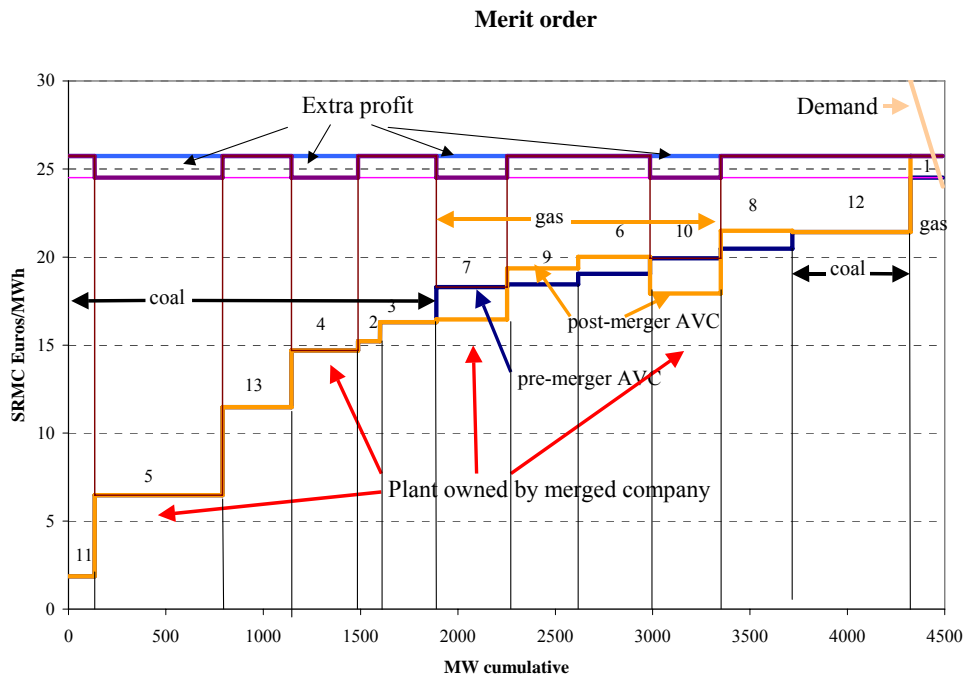
The natural way to examine this incentive is similar to the horizontal electricity merger analysis set out in section II. The competitive supply schedule for the electricity industry can be computed for the pre-merger price of gas, and then for successive increases in the price of gas sold by the upstream (gas) part of the merged firm, taking account of the ability of electricity companies to buy gas from other gas suppliers. If the gas market is imperfectly competitive, then one can assume that the pre-merger gas price-cost margin reflects the pre-merger market power of the gas company – the (residual) elasticity of demand facing the gas company will be the pre-merger inverse Lerner Index.<sup>20</sup> That should allow the impact of raising the gas price on gas profits to be computed (they should fall

19 As noted below, a higher gas price lowers the firm's profits from its gas operations, but this is a second-order effect for a small deviation in the price of gas from its stand-alone profit maximizing level.

20 The Lerner Index is (price-MC)/price, and is equal to the inverse of the residual demand elasticity facing the firm in a static non-collusive equilibrium.

slightly), while the impact of raising gas prices on the merged firm's electricity profits can also be computed (and these should be positive whenever gas is at the margin).

Figure 8 shows the application of this technique to a market in which company A (the vertically merged gas-electricity company) owns plants 5, 4, 7 and 10 (the plant numbers are indicated above the steps in the figure). The base-load plants 11, 5, 13, 4, 2 and 3 are coal-fired, the rest, except for coal-fired plant 12, are gas-fired. Before the merger the average variable costs (i.e. the short-run marginal costs) are shown by the heavy stepped line, with price set by the marginal (gas-fired) plant 1, not owned by firm A. After the merger company A now internalises the price of gas as the true marginal cost and so SRMC falls (by an assumed 10%) for gas-fired plants 7 and 10, but if the price of gas sold to other power companies rises by 5% then so does the SRMC from other gas-fired plant (but not from coal-fired plant 12). The marginal (gas-fired) plant 1 continues to set the price and A's extra electricity profit from increasing the price of gas is shown by the (arrowed) rectangles between the old price line and the new price line. The extra profit while plant 1 sets the price is company A's total capacity times the change in the electricity price shown. If other firms' gas-fired plant continued to set the price as demand varied, it would be straightforward to quantify the incentives to raise the gas price, as follows.



**Figure 8. Effect on company profits of raising the market price of gas by 5%**

Suppose that demand for A's gas by the other electricity generators before the merger is  $G(g)$  where  $g$  is the sales price of gas to the ESI.<sup>21</sup> In order to raise the price of gas, A reduces sales by  $\Delta G$ , and if no other gas company increases output this raises the gas price by  $\Delta g = g\Delta G/(\varepsilon G)$ , where  $\varepsilon$  is the firm-specific residual elasticity of demand for gas (as a positive number). The change in profits from gas sales caused by the reduction in A's gas supply will be  $G\Delta g + (g-c)\Delta G$ , where  $c$  is the cost of the gas. This can be written as  $(1 - \varepsilon L)G\Delta g$ , where  $L$  is the Lerner Index for A's sales of gas to these firms. Pre-merger, this is zero for a small change in the gas price from the conditions of profit maximisation (and  $L = (g - c)/g = 1/\varepsilon$ ). If the marginal plant is owned by another company and is gas-fired with heat rate,  $h_m$ , then the change in electricity price  $\Delta p = h_m \Delta g$ . If company A has fraction  $\alpha$  of

21 This assumes that gas suppliers price discriminate between the ESI and other sectors, otherwise the analysis would need to deal with the loss in profits elsewhere from any price rise.

total electricity sales  $Q$  and the gas consumption of the remaining generators is  $G = (1 - \alpha)\beta h_a Q$  (where  $h_a$  is the average heat rate of the gas plants and  $\beta$  is the share of gas in their electricity capacity), then the change in gas profits is  $(1 - \alpha)\beta h_a Q(1 - \varepsilon L) \Delta g$

The extra profit to company A from electricity sales is  $\alpha Q \Delta p = \alpha Q h_m \Delta g$ . The change in profits of merged company A is then

$$\Delta \Pi = [\alpha h_m + (1 - \alpha)\beta h_a(1 - \varepsilon L)]Q \Delta g, \quad (1)$$

assuming that the demand for electricity is insensitive to its price (which has increased by  $\Delta p$ ). In the pre-merger equilibrium,  $L = 1/\varepsilon$ , but after increasing the gas price  $L > 1/\varepsilon$ , so the second term is initially zero and decreasing but effectively second order, while the first term is positive and first order.<sup>22</sup> The incentive to raise the price of gas (assuming that this is possible) therefore increases with the merger, and the post-merger mark-up for A's gas sales will be maximised for a value of  $L$  that equates (1) to zero (i.e. when  $d\Pi/dg = 0$ ):

$$\varepsilon L = 1 + \frac{\alpha h_m}{(1 - \alpha)\beta h_a}. \quad (2)$$

If the elasticity of residual gas demand,  $\varepsilon$ , is constant, then the pre-merger gas mark-up would be  $L = 1/\varepsilon$ , so the ratio of the post- to pre-merger gas mark-up is then the right-hand side of (2).

In general, as demand varies the marginal plant is unlikely to always be another firm's gas-fired plant (and the merit order may change – here if A bids SRMC plant 10 would move down to just above plant 7, but could stay where it is if A prices up to the bids of other firms). If another firm's gas plant is only at the margin a fraction  $\gamma$  of the time, then A's electricity expected profit will only rise by  $\gamma \alpha Q h_m \Delta g$ , and the ratio of the expected post- to pre-merger gas mark-up will be

$$1 + \frac{\alpha \gamma h_m}{(1 - \alpha)\beta h_a}. \quad (3)$$

If some of the time A's gas-fired plant sets the price, then matters become more complicated, as the merger allows A to consider the opportunity cost of gas as its marginal cost, not the marked-up price of gas sold to the electricity sector by an independent gas supplier. On the one hand, A has an incentive to lower its bid price for its gas-fired plant and steal market share from its rivals, at the expense of a lower (gas) profit on its gas-fired plant, while on the other it can choose to limit price at the (marked-up) electricity price of its rivals. Without computing the optimal strategy it is hard to say exactly what the outcome will be.

Hunger (2003) illustrates this type of analysis while Henriksson (2005) applies Hunger's approach to the E.On-Ruhrgas merger and argues that it gives rise to anti-competitive concerns. Ruhrgas controlled (directly or indirectly through cross shareholdings) 80% of sales of gas to the ESI, while E.On had cross shareholdings of a further 3% in the gas market, giving the merged firm control over 83% of gas sold to the ESI. Ruhrgas' control over pipelines meant that only Wingas (market share 11%) could supply gas to generators served by Ruhrgas (Henriksson, 2005, p55). Ruhrgas likely had significant market power in sales of gas to the ESI, particularly given its control over access.

E.On supplied  $\alpha = 27\%$  of the German electricity market, but its control over its German grid, and ownership of generation in neighbouring countries provided increased market power. The other

22 Local concavity of the profit function, which is required for profit-maximization, implies that  $L(p)\varepsilon(p)$  is increasing in  $p$ . Hence,  $L > 1/\varepsilon$  after a small increase in the gas price above the pre-merger profit-maximizing level.

German electricity companies had 20% of their capacity gas-fired ( $\beta = 20\%$ ), but in 2004 the load factor for gas-fired plant was only 25% (Brunekreeft and Tweleemann, 2005), so that the estimated shares of gas-fired generation in the total were E.On 1.4%, others 5.8%,<sup>23</sup> so  $\gamma$  may have been quite low, possibly as low as 20%. If E.On priced its gas plant to retain its position in the (new) merit order, and if  $h_m/h_a = 1.2$ , then the factor in equation (3) is 1.44, which is not insignificant. Of course, if the gas market is competitive, the original mark-up will be small (or zero) and the vertical merger will have no adverse effects. If entry is reasonably unimpeded then the effects will be transitory (until entry drives down the mark-up over the supply price). If, for example, it is possible to build new LNG import capacity easily in Spain, and if the pipeline system and storage and balancing services are unbundled from other gas suppliers (notably Gas Natural), then the incentive of Gas Natural to raise gas prices to the ESI will be limited to the period before new LNG terminals can be built and sourced. Contracts would further limit the incentive to exercise market power.

These calculations suggest that the merged firm has an incentive to increase gas prices above their pre-merger levels. The analysis, however, does not demonstrate that the merger would necessarily have an adverse impact on electricity consumers. The reason is that, as noted above, the merger eliminates the mark-up on gas that would occur when an unintegrated electricity supplier purchases gas. The lower mark-up is a potential benefit from the merger when gas is the marginal electric plant, which could more than compensate for a higher natural gas price. However, as argued above, such beneficial effects are less likely when the merged company has little gas-fired generation setting the price, or when the merged company chooses to price up to the level of its rival's gas-fired plant, and where this is often at the margin.

Empirical studies of markets that have experienced vertical mergers do not provide substantial evidence that such mergers are anti-competitive.<sup>24</sup> The empirical record is, however, quite thin and much more analysis is needed to better assess the potential risks to competition from vertical mergers involving natural gas and electricity.

## 6. The impact of free allocations under the Emissions Trading System

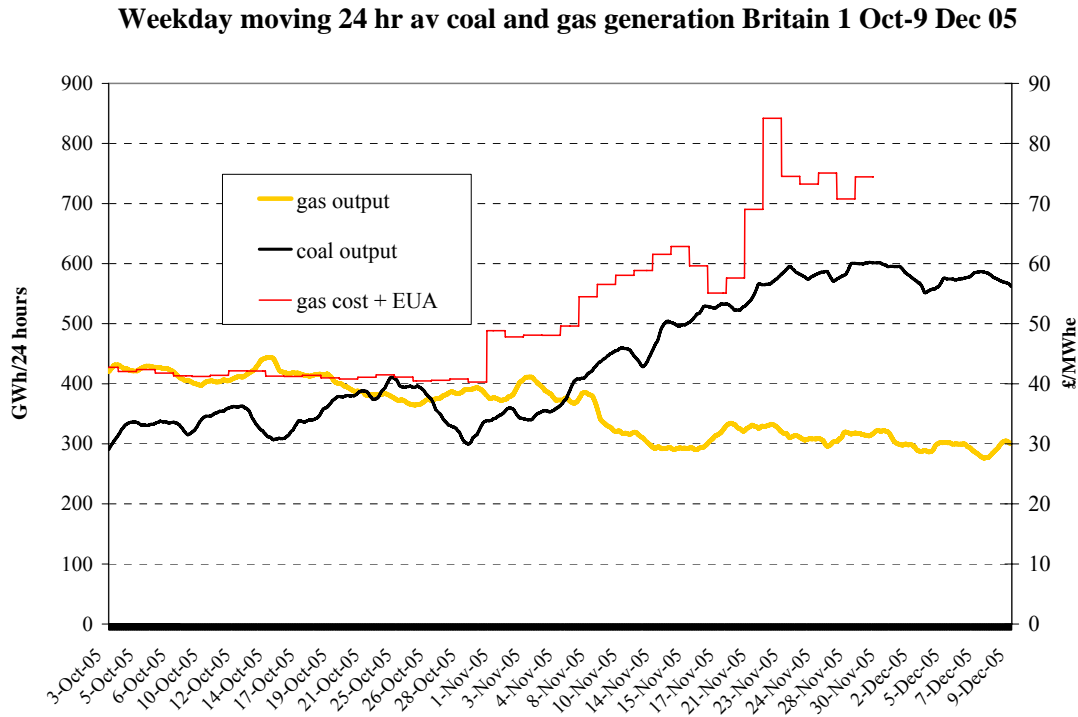
The European Emissions Trading Scheme (ETS) limits CO<sub>2</sub> emissions from covered sectors, especially electricity (accounting for about 56% of the total). In order to persuade companies and governments to agree to the ETS, companies, especially generating companies, were given free allocations of EU Emission Allowance (EUAs) for about 95% of their baseline emissions. As economists predicted, the market price of allowances is reflected in electricity prices, which have increased above the cost of marginal fuel by the cost of the allowances required for the marginal plant. That means the generating companies make a windfall profit roughly equal to the value of the original allocation (with some variation depending on the change in merit order between coal and gas-fired plant).

Newbery (2005b) shows that the price of EUAs is increasing in the price of gas, for the following simple reason. If gas prices increase, then electricity generators switch out of gas-fired plant into coal-fired plant, as shown in figure 9.

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23 These numbers are estimated from the TWh generated by fuel given the data in Brunekreeft and Tweleemann, (2005), for which E.On-Ruhrgas would appear to have generated 7.1 TWh from gas and the remaining firms 28.5 TWh out of total generation of 494 TWh.

24 Hastings and Gilbert (2005) show modest increases in wholesale prices from a vertical merger in the gasoline industry, but do not provide evidence of effects on retail prices. Hortacsu and Syverson (2005) show no adverse effects on retail prices from vertical mergers in cement and concrete. Chipty (2001) offers evidence that cable companies integrated into premium television services exclude rival services, but also sell more total services.



**Figure 9 Impact of gas price increases on gas demand in the British ESI**

This increases the demand for EUAs as coal-fired plant requires almost twice the number of EUAs per MWh generated as modern gas plant. The increased demand with a fixed total supply increases the EUA price, and thus increases the windfall profit of incumbent electricity companies from their free allocation. This in turn greatly enhances the attraction for gas suppliers with market power (and able to raise the price of gas to electricity) to vertically integrate into generation.

Thus in addition to concerns about removing potential competitors to over-concentrated incumbent generators, vertical gas-electricity mergers amplify the market power that gas suppliers already have, both by giving them a stake in raising the price of electricity and in raising the price of EUAs. Both of these amplify potential inefficiency (and the costs of inefficiency rise as the *square* of the price mark-ups).

## 7. Conclusions

European electricity and, even more so, gas markets are concentrated at the country level, with inadequate interconnection between countries outside Scandinavia to import competition. Electricity has special features that make the exercise of market power particularly likely, as short-run demand elasticities are very low, supply cannot be stored, and even competitive wholesale markets are naturally highly volatile, making the distinction between efficient peak-load pricing and abusive pricing problematic. Companies with modest market shares have both the ability and incentive to raise prices when markets are tight and suppliers pivotal, rendering standard tests of market power (HHI or market shares) less effective. This complicates the analysis of mergers, which we argue should be based on a more careful model of electricity supply. Fortunately the cost data for such analysis is (reasonably) readily available and can be obtained by competition authorities.

Vertical mergers between electricity companies and gas companies with market power in the gas market (often secured through their control over the pipeline network and storage and balancing services) are also problematic, as the incentive to raise gas prices may be enhanced through ownership

of electricity generation. When gas-fired generation is at the margin, raising gas prices increases inframarginal rents, and by driving up the price of EUAs, enhances the value of the grandfathered free allocation of EUAs.

The implication is that competition authorities must be particularly vigilant in scrutinising mergers in the electricity and gas sectors, at least until the gas markets are workably competitive, and they must be willing to adopt more sophisticated methods of analysis to properly examine the consequences of mergers. Finally, given that the Commission intends energy markets to become workably efficient, any merger that forecloses or makes that outcome more difficult should be resisted. There is something to be said for using mergers as an opportunity to advance the agenda of a single European energy market.

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