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THE ASSESSMENT: EUROPEAN NETWORKS—COMPETITION, INTERCONNECTION, AND REGULATION

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Recent events, such as the California energy crisis, the failures of the UK's railways, and the consequences of the third-generation (3G) mobile licence auctions, have called into question the European reliance on a strategy of network industry liberalization. Substantial concentration in energy and telecoms markets has also raised the issue of the consistency of competition policy with the creation of internal energy and communications markets. The paper considers the multiple market failures in these industries, and the problems raised by a series of national policy approaches which fail fully to reflect the economies of scale and scope and the European-level public goods. Security of supply in energy, the roll-out of broadband, and the gains for an overarching approach to climate change require a more European focus. This in turn will require institutional reform at the European level. Failure to address this Europe-wide agenda will leave Europe behind the USA.

I. INTRODUCTION

Infrastructure networks provide the frameworks within which modern industrialized countries function. The energy, communications, and transport networks are complementary to the rest of the economy: over-provision at the margin wastes resources, but under-provision can seriously disrupt economic activities. The recent failures in the Californian electricity industry illustrate the severity of these costs, as does the experience with the railway industry in the UK.

In the 1980s and 1990s, it became fashionable to rely increasingly on markets to provide infrastructure. This was partly a reaction to the limits on public borrowing and finance, but it also reflected a more fundamental shift in economic policy. Where the private sector had previously been restricted to the *production* of state-owned infrastructure, now it

[1] Comments from Christopher Allsopp and Margaret Stevens are gratefully acknowledged. The errors remain the author's.

increasingly was relied upon to own and *allocate* it, too. The old notions which had justified state intervention—notably security of supply—gave way to an optimism that markets could provide incentives to create and sustain more efficient assets. The development of mobile phone and Internet networks provided the example *par excellence*, as had the railways in the nineteenth century. But in energy, too, the old rationale for state ownership, vertical integration, and monopoly—that only a centralized integrated monopoly could secure long-term fuel supplies and invest in the right overall balance of capacity—gave way to the ideas of competition, spot markets, and financial risk hedging.

California, British railways, doubts about the speed of broadband roll-out, the problems arising from the third-generation (3G) licence auctions, and the growing dependence on imported gas in Europe have separately contributed to an overall sense of unease with the degree of reliance on market forces across Europe. For those who never really embraced the liberalized competition model, this represents a welcome return to their preferred corporatist model. For those who did—including, notably, the UK—the doubts that have emerged have been accompanied by a vacuum of ideas about how to respond.

There is, behind this unease, a coherent set of policy questions which need to be addressed, and by addressing them, some answers in terms of appropriate policy responses can be gleaned. The questions are: will markets deliver sufficient infrastructure capacity? does it matter much if infrastructure is over-provided? does market failure require direct intervention (and possibly state ownership)? what kind of regulatory framework should be created to deliver policies? and what sort of sectoral policies should be developed? These are the issues which confront the European Commission and member states, especially in the energy sector.

The answers depend upon context and historical circumstances. In periods of surplus—such as the 1980s and 1990s in energy—the policy priorities were quite different from during periods of excess demand. In periods of rapid technical change, such as the 1980s and 1990s in telecoms and information technology, competition to develop technical and market dominance tended to produce excess supply and excess investment. Network policy, however, tends to be good at solving the problems of yesterday's context: and it is far from clear that these broad features of the last 20 years will characterize the first decades of the twenty-first century.

This assessment focuses on this new context, and on how the insights which economic theory provides can assist the Commission and member states to design policies for infrastructure networks relevant to the next couple of decades. Its focus is primarily on energy, but with examples from other infrastructures, notably telecoms. The structure is as follows. Section II looks back at the liberalization policies of the 1980s and 1990s and the legacy they have created. The conventional wisdoms of these decades are scrutinized critically. Section III turns to the underlying multiple market failures and explains why the market will not provide optimal networks in the absence of regulation and sectoral policies. Section IV considers the content of European liberalization and regulatory policies, and the continued lack of consistency between national approaches. Section V discusses the appropriate regulatory institutions, and section VI concludes.

II. THE LIBERALIZATION APPROACH OF THE 1980S AND 1990S

In 1980, the network infrastructures of Europe were overwhelmingly provided by nationalized industries under conditions of monopoly. Most countries had national champions in each sector. In electricity, Britain's Central Electricity Generating Board (CEGB) and France's Electricité de France (EdF) were among the largest electricity utilities in the world. Telecommunications were provided by the Post Office (UK), the Bundespost (Germany), and the Direction Générale des Télécommunications (France). (British Telecom, Deutsche Telekom, and France Télécom were formed in 1981, 1989, and 1988, respectively.) The pattern was repeated for the railway, gas, and postal industries. At the local level, municipalities were extensively involved across Europe in the provision of electricity and gas distribution and water supply.

These predominantly state-owned companies were, generally speaking, legally responsible for providing universal services and a secure supply. They planned network developments with government, and policy

was typically organized through their business plans. To an important degree, the system worked: energy supply expanded to meet the growing demands of the post-war economic boom, and the newer utility services, such as natural gas and modern telecoms, were developed along coherent national lines.

In the 1980s and 1990s, this model came under sustained attack. In energy, the fall of the oil price in the mid-1980s, together with an abundance of supplies, shifted the economic priorities from investment to cost reduction. With little extra capacity needed, economic efficiency focused on sweating the existing assets.[2] Competition was advocated as a necessary part of the solution. Where investment continued—as with the French nuclear programme and, in Britain, in new telecom exchanges—the state found that the competing demands on public finances increasingly forced trade-offs between current and capital expenditures. Rising unemployment in the 1980s, together with a shift towards more conservative governments with tax-cutting agendas, led to more radical solutions to investment, and (outside France) encouraged more reliance on the private sector.

Privatization provided a way forward, first in Britain and then subsequently across much of Europe. By selling assets to private investors, governments gained three advantages: they raised money to pay for other public expenditure (or to finance tax cuts); they created balance sheets for the privatized companies which could be geared up to pay for future investment; and, through regulation, they created vehicles for transferring wider policy objectives on to utilities and, hence, customers' bills rather than through their tax returns. Of these, the second — private-sector balance sheets—was to emerge as the most important, giving rise to what has been described as the *private-sector borrowing requirement* (Helm, 2001*a*).

None of these three advantages to the governments in power was necessarily one which enhanced efficiency. That remained an empirical issue. The proceeds from sales represented a capitalization of future dividends from nationalized industries. The financial restructuring of balance sheets would allow gearing, but at a higher cost of capital than that at which government could borrow, and with the requirement that customers would have to repay the debt at some future date. And the transfer of obligations changed the distribution of the costs between customers and taxpayers, but not necessarily their levels. Only if the private sector is more efficient than the public sector in creating and managing infrastructure assets, and sufficiently more efficient to offset the higher cost of capital, would there be net welfare gains from the policy of privatization. Though there are a number of industry studies on post-privatization performance, it is too early to reach any firm conclusions, given the nature of the assets.

In practice, the effects of privatization have been complex. There have been significant reductions in costs. Staffing levels have fallen, in some cases dramatically, and with these reductions in operating costs, prices have typically fallen too. Some of these reductions have been due to the incentives created by regulation, some by new management practices, some by the reduction in union power, and some by the application of the new information technologies which were particularly relevant to networks.

It is impossible to estimate with much precision how great the changes would have been in the state sector had privatization not taken place. However, some comparisons are instructive. In the public sector, EdF's work-force remained at a stable (high) level throughout the period. The British Post Office, too, maintained its employment levels. This resistance to cost reduction in the public sector is not surprising: theories of public enterprise predicted a labour bias, relative to the capital stock, and with respect to wages (see Rees, 1984*a*,*b*). Political theories of union behaviour and the influence of interest groups on political parties pointed in a similar direction. Indeed, the unions have opposed privatization for precisely these reasons—as in recent examples in Britain of the Post Office in the mid-1990s and, more recently, the London Underground.

[2] In England and Wales, the peak demand on the electricity system at the end of the 1990s was about the same as in 1980. The 1980–2 recession in the UK also changed the composition of energy demand, as heavy manufacturing industry declined in its share. See Helm (2001*b*).

The change in ownership changed the incentives with respect to cost reductions. It also changed the cost of capital, as noted above, and with it the discount rate applied to new investment projects. For infrastructure this was particularly important. Long-term R&D conducted by nationalized industries effectively ceased with privatization. The CEGB's significant programme of R&D into nuclear and renewables technologies was a particular casualty, to be contrasted strongly with the continuation of such R&D in France. Investment itself was also affected: a higher cost of capital shifted the emphasis towards projects which matured quickly and, where possible, asset replacement was slowed down by substituting maintenance spending on existing assets.

These trends towards a more short-term perspective were reinforced by the regulation of privatized monopolies. This took two forms—rules covering prices and the introduction, where possible, of competition. In the UK, and increasingly elsewhere, incentive regulation replaced the traditional rate-of-return approach. In practice, this meant 5-year fixed-price contracts, and utilities and regulators focused on a shorter-term horizon and on how to minimize costs within these limited periods. RPI – X regulation encouraged a management style based upon cost minimization rather than investment. (In the next section, this is examined in greater detail.)

Regulators and governments also used competition as a policy instrument to encourage economic efficiency. In most networks, competition was restricted to inputs—to competitive tendering and contracting out. Franchising was also employed, notably in water (France) and in railways (the UK). However, some commentators went further, questioning whether there were *any* natural monopolies at all, and for a while the telecoms sector seemed to indicate that the costs of infrastructure networks might become so low that many could be provided. Mobile phone networks challenged the incumbent fixed-link network operators, and the Internet threatened to undermine them further. In practice, however, the scope for network competition proved limited, and, even where network competition emerged, natural oligopolies tended to dominate. In most cases, these were interdependent, in the sense that the new entrants required access to the incumbents' networks to sustain their businesses.[3]

By the end of the 1990s, although much privatization had taken place across Europe, there still remained a significant number of state-owned companies. Furthermore, although many new entrants had contested the core utility markets, consolidation and concentration had reaffirmed the role of (very large) dominant incumbents. These may have had different configurations, with firms such as Vodafone joining the major telecoms players, and E.ON (formed out of VEBA and VIAG) contesting the European energy market alongside EdF, RWE, and Enel. The policy-induced unbundling and disaggregation created through the privatization processes and subsequent regulatory initiatives are now arguably more than offset by this merger and acquisition activity. In the energy sector, most of the largest firms in these markets are larger than they were in the 1980s. All the large telecom companies have a pan-European presence, and a trend towards further consolidation is widely anticipated.

To these consolidating developments should be added the policy response to the most significant network failures in the 1980s and 1990s. Two stand out as examples which have had direct impact—California and the British railway industry. The energy crisis in California, where the lights went out, has widely (and usually simplistically) been seen in Europe as the logical consequence of using British-style competitive market structures without a clear obligation to supply. The argument, to which we return in section III, is that the British electricity model only 'worked' in the 1980s and 1990s because there were abundant cheap energy supplies, and the gas bubble encouraged a building programme of gas power stations (the so-called dash-for-gas) while the government tried to protect coal production.[4] The British model, on this argument, did not *solve* the security of supply issue. It merely ignored it, because in this historical period it could afford to do so.

[3] Local-loop unbundling is a case in point (see Oftel, 2000).

[4] On the California experience, see the article by Paul Joskow in this issue, and also Sioshansi (2001). On the gas bubble, see the article by Alexander Kemp and Linda Stephen in this issue.

The British railways example, where a single accident at Hatfield in October 2000 reduced the entire network to semi-paralysis (and put Railtrack eventually into receivership), focused attention on the ability of privatized and fragmented structures to maintain existing networks. Critics have argued that the separation of track from train operation, paralleling the split of electricity and gas networks from supply, has raised costs and blurred responsibility for maintaining a safe railway system. Relying on a network of contracts to provide the coordination that integrated monopolies had previously delivered has been argued to have been a policy mistake.

In the case of 3G licences, the auctions were designed to allocate spectrum to the most efficient users. It was argued that the revenues raised represented sunk costs to the acquirers, and hence would not affect their behaviour (see Klemperer, 2001). Critics here point to the consequences of the higher levels of borrowing this has entailed, the fall in share prices which has in part resulted, and the knock-on effects on capital expenditure (see the article by Martin Cave and Luigi Prosperetti in this issue). Other auctions, such as that for capacity in the gas transmission system in Britain, have also been controversial, albeit for somewhat different reasons. It has been argued that auctions may have a considerable role in allocating *existing* capacity, but are less good at determining investment (see below).

In retrospect, the 1980s and 1990s policy approach has not provided a settled consensus on the network infrastructure policy. In several European countries there has been a reappraisal, and a return towards the more monopolistic model. In the 3G licence case, Germany has actively encouraged the winning bidders to cooperate in sharing network development costs, and France has now reduced the price *ex post*. In Germany and the UK, consolidation in energy markets has been permitted. These trends have been augmented by a recognition of the need for policy intervention to facilitate new network developments—such as the roll-out of broadband networks, and the gas infrastructure networks for the import of gas from Russia. The European Commission has now begun to address this new agenda—notably in the Security of Supply Green Paper (EC, 2000).

Many of the policy discussions are clouded by lobbying from particular interests—notably the dominant incumbents. Where there are large economic rents at stake, very considerable asymmetries of information between the companies on the one hand, and governments and regulators on the other, and where companies have direct linkages with politicians and the political process, the outcomes will be as much the result of political processes as economic analysis.[5] But to see how much economic content there is to the new approaches, and to elucidate further the economic border between the state and private sectors in network infrastructure industries, we need some economic theory, to which we now turn.

III. MARKET FAILURES AND OPTIMAL NETWORKS

Utilities and utility networks display *multiple* market failures, and hence the optimal network (and the optimal form of regulation) depends upon a simultaneous solution to each. This is especially important since the 'right' regulatory response to one sort of failure, considered in isolation, can worsen the misallocation of resources with respect to another. The most obvious example is the interaction between natural monopoly and environmental concerns. Interventions to curb the abuse of dominance encourage regulators to lower prices, while the inclusion of environmental externalities tends to lead to increases in price. This example has a direct application: in the British system, the duties laid on the regulators have led them to focus almost exclusively on the former, with the result that the latter has been neglected, in turn requiring the provision of formal government guidance to regulators through the Utilities Act 2000. The result has been an attempt to combine lower electricity prices with interventions to promote specific technologies.[6]

[5] There are numerous examples of these interactions in the energy sector, notably the appointment of ex-ministers to boards of regulated monopolies, ex-company directors to political positions, ex-regulators to industry consultancies, and, in the French example, considerable switching between civil servants and state-owned industries. The extreme example is provided by Gazprom in Russia. Young (2001) provides a detailed account of the way politics has determined British regulatory practice.

[6] The Department of Trade and Industry (DTI) has a public service agreement with the Treasury to keep UK electricity prices *below* the European average, while simultaneously reserving 10 per cent of the generation market for renewables.

The focus on the problem of natural monopoly has dominated regulatory practice (and the associated economics literature), and, in turn, explains the emphasis on the setting of prices through two main mechanisms, price-cap or rate-of-return constraints, almost to the exclusion of the other market failures. There is now an extensive literature on the relative merits of these forms of control,[7] and, not surprisingly, economists have tended to favour RPI – X over rate of return on the grounds that the former puts most weight on incentives while the latter focuses on the financial protection of utility returns. But, surprisingly, little research effort has been applied to the trade-offs between the two—between the lower costs of capital under rate of return as opposed to the claimed efficiency gains under price-cap regulation. The reason for this empirical neglect is in part that efficiencies are hard to measure and in part because, for many privatized utilities, investment was not a priority in the 1980s and 1990s, as noted in section II above.

In practice, the sharp theoretical differences between the two regimes have not been reflected in practice because neither has been applied in its pure form. US rate-of-return regulation has always been supplemented by efficiency reviews of one form or another, and British RPI – X regimes have witnessed repeated interventions *within* periods, thereby undermining incentives (Helm, 1994). In the case of the latter, in addition to changes in capital investment requirements and claw-backs in returns within periods, there have been windfall taxes, customer benefits payments in exchange for permitting mergers and demergers, and new social and environmental obligations. Furthermore, in a period of falling inflation, price changes in the USA have lagged, replicating some of the features of the fixed-period approach in the UK. It is therefore hardly surprising that there is little evidence to suggest that US utilities are *in general* less efficient than their British counterparts, and some support for the opposite conclusion. A theoretical preconception, tied to a receptive political and economic context, encouraged policy conclusions to be drawn in advance of the empirical investigation.

The mechanism for the capping of prices in one form or another does not in itself *solve* the natural monopoly problem (or, indeed, the other market failures). In order to set prices, some assumptions need to be made about the level of capital and operating costs required to provide the services. The former creates formidable regulatory problems, for at least two reasons: the normal linkage *from* prices to investment is reversed; and the natural monopoly is typically a complementary good to the rest of the economy.

In a competitive industry, firms are price-takers. As capacity margins become tighter, it is to be expected that prices will rise. Higher prices in turn raise the expected returns from new investment, and this then is induced, bringing supply back in line with demand. Prices then fall back. Where capital is lumpy, this 'saw-tooth' profile of pricing might be expected to be marked.

The market approach to this problem has been to propose the introduction of capacity auctions. Recent examples include the proposals from the Economic Regulation Group of the Civil Aviation Authority (CAA) to auction landing slots at Heathrow, and the gas capacity auctions introduced by Ofgem (CAA, 2001; Ofgem, 2000*a*,*b*, 2001*a*; Helm, 2001*b*; and, more generally, Newbery, 2000).[8]

Some have argued that the use of capacity auctions might be *sufficient* to reward existing infrastructure owners and to ensure optimal investment. There are, however, at least two major flaws in this argument: that auctions provide little protection for sunk costs; and that the network owner will have an incentive to exploit its monopoly by keeping capacity tight *if* it receives the revenues from the auctions. In other words, auctions undermine the incentive to sink capital by raising the risks that assets will be stranded, and encourage monopoly to be exploited. Auctions are therefore no guarantee of optimal investment.[9] Regulators have therefore had to circumvent the signals which such auctions give with price caps on total revenue (so that incumbents do not receive the full revenues dictated by the auction

[7] The literature focuses on critiques of rate-of-return regulation—notably Averch and Johnson (1962). The price-cap literature is reviewed in Armstrong *et al*. (1994).

[8] At Heathrow, which is one of the world's busiest airports, landing fees are very low. In gas transmission, Ofgem argues that Transco, as owner and operator, has little incentive to invest optimally.

[9] See Newbery (2000). This is distinct from their role in balancing *existing* networks and allocating *existing* capacity.

outcomes), and by engaging in investment planning. In the British gas industry example, a belt-and-braces regime has emerged, involving long-term auctions, price caps, and a duty to secure supplies.[10]

The perverse investment incentives created by auctions would be of concern in any industry where there are monopoly assets effectively standing *between* producers of goods and services and their customers. These assets are strategic, in the sense that they are the gateway (and, possibly, the bottleneck) between producers and consumers. But in utility networks, they are of special concern because the activities are complementary to the rest of the economy. Failure to supply has asymmetrical costs on the whole economy relative to over-provision. The costs imposed by the failures to supply in the California and British railways examples, in the presence of demand uncertainty, imply that the optimal networks are those which are somewhat gold-plated and with somewhat excessive operating resources.

The importance of this point was much neglected by the advocates of RPI – X regulation. In their enthusiasm to focus on the costs of rate-of-return regulation, the question of whether gold-plating and excess costs might actually be desirable was largely ignored.[11] And there was a good reason for that neglect in most utilities in the 1980s and 1990s, as noted in section II above. Excess supply (in electricity and later gas) and rapid revenue growth (in telecoms) meant that these concerns were not relevant, apart from in the water and railways industries, where, not surprisingly, RPI – X was much less successful.[12]

These mechanisms for 'solving' the natural monopoly market failure have, over time, been less successful than some envisaged, and the benefits confined largely to sweating the existing assets and to increasing information, rather than *solving* the investment and pricing problems.[13] In the end, the need for detailed appraisal of operating costs and investment plans cannot be evaded, and some element of planning has been increasingly seen as essential.

One regulatory response to this recognition has been to try to drive competition as far as possible into the networks themselves—by arguing that the natural monopoly is confined to the *coordination* of networks, rather than producing the outputs—and by unbundling as much as possible of the networks themselves.[14] This strategy has had some successes, particularly as information technology has changed the cost structures (and hence the domain) of natural monopolies, but it runs into yet another market failure—the public goods problem.

Unlike most economic activity, networks display interdependencies such that the sum of the individual parts is not the same as the whole. Put simply, changing any one part of a network can potentially affect all the other components. For example, if a power station is added to the north-east of the national grid, it will cause changes in power flows throughout the network, requiring investments in reinforcements in its different parts.

It follows from this public-good dimension that users of the network benefit from the network *as a whole*, and not just the disaggregated part to which they immediately have access. Therefore, the basis of charging to recover network costs cannot be easily disaggregated. Networks are necessary to ensure that the actions of any one user do not unduly limit those of others. By providing a *system*, they in effect provide the insurance that, should a consumer need the service, it will be available on demand. The correct charging mechanism therefore is, in an important sense, a matter of regulatory choice, given that the service is provided by a monopoly with a monopolist's tax base. (On network pricing struc-

[10] Ofgem (2001*b*) sets out proposals for this approach.

[11] The classic reference here is DTI (1983), known as the Littlechild report after its author. It is here that RPI – X is first advocated as a regulatory tool in the context of British Telecommunications.

[12] See Helm and Rajah (1994) and Cowan (1997) on water, and Helm (2000) on rail.

[13] Note, too, that RPI – X takes the existing price level as *given*, making no attempt to address the serious mispricing inherited from the public sector.

[14] This approach is to be distinguished from that of separating out natural monopoly from competitive activities, such as electricity grids from generation.

tures, see the articles by Claude Crampes and Jean-Jacques Laffont and by Robin Mason and Tommaso Valletti in this issue.)

The existence of a tax base allows revenue to be raised to meet the costs of the network on a variety of criteria. If efficiency is the sole objective, then access pricing regimes divide in practice between those that focus on long-term investment incentives and those that focus on the efficient use of the existing networks. In theory, as we saw above in discussing auctions, the two should be connected, but in practice they are often not. A good example is the development of new infrastructure networks. In the case of the building of the natural gas networks in Britain, a *shallow* connection charges regime was used, such that new customers joining the network paid approximately the short-run marginal costs. This encouraged the growth of the customer base, yielding an externality benefit to existing customers through a wider base to spread the fixed costs. Something similar has been provided by the mobile phone and Internet start-ups in recent years. By contrast, the treatment of additional small-scale embedded generation on the British electricity network has been rather different. Given that the existing network is based on large-scale power stations, the costs of small intermittent suppliers in the distribution network are considerable, with the result that *deep* entry charges (i.e. charging the *full* system costs of connection) have been advocated by some interested parties. However, had the network been built to accommodate diffuse embedded generation, the deep costs would have been much lower. Indeed, such a network might actively want to encourage new entry to increase the portfolio diversity, leading to a focus on shallow-entry costs.[15]

Efficiency is not, however, the sole objective of network provision and pricing. Most have universal service obligations which entail requirements to discriminate in favour of more isolated geographical locations and poorer customers. (Industrial policy may also play a part.) The extreme version of this approach is the postage stamp—a universal price and service provision, independent of the costs of providing the different components of the service.[16]

The merits of an approach to distributional issues through cross-subsidization depend upon the ranking of objectives (which is ultimately a political matter) and the relative efficiency of cross-subsidy as against other ways of achieving the distribution objective, such as social security. This is a complex matter because the form of the cross-subsidy has a number of distinct efficiency consequences. For example, the universal service obligation in postal and telecoms services provides a positive externality to other users: the fact that a customer can send a letter to anyone in Britain within 1–2 days is a valuable option; and the fact that a customer can be telephoned by people in remote areas adds to the value of them having a telephone.[17] In other words, a distributional policy in favour of rural customers might approximate the setting of short-run marginal cost prices, which could be advantageous in efficiency terms if these more remote customers are also more demand elastic.

A final major source of market failure is the environment. Most utility networks convey pollutants to customers, or create or facilitate pollution. The users of road and rail networks generate emissions, and take up large tracts of land to the detriment of biodiversity. The conversion of fossil fuels by energy industries is responsible for much global warming and acid rain. Other networks—such as telecoms, the Internet, and postal services—potentially reduce the need to travel and can reduce energy demand. Any environmental policy will therefore have a substantial impact on network utilities.

These examples illustrate the complexity of the environmental impacts. In the case of energy, it is cars, power stations, and domestic boilers which transform energy and lead to emissions. Transport of gas and transmission of electricity themselves lead to energy losses, methane leakage, and land use.

[15] These costs are also reflected in the new electricity trading arrangements (NETA), through higher balancing charges. See Ofgem (2001*c*) regarding NETA and renewables. On the role of spot markets and NETA, see the article by Richard Green in this issue.

[16] As its name implies, postal services have typically been provided on this basis, creating considerable problems for the introduction of competition—see Postcomm (2001).

[17] See Armstrong (1998). See also the article by Mason and Valletti in this issue.

The demand for these products is determined by a combination of the component prices which customers face *in aggregate*. Thus, charging for road usage will reduce the amount of car pollution, and higher transmission and transportation charges will reduce electricity and gas demand. There is also a locational aspect to pollution: inner-city car use has different environmental costs to rural use. Any regulatory regime for network infrastructures should incorporate these effects into final prices—but few, if any, actually do so.

The conclusions that emerge from this brief review of the various sources of market failure are that it is the *interaction* of market failures which provides the source of many of the difficulties in network regulation. First-best solutions to each failure considered separately will not necessarily produce optimal networks or optimal prices. Seductive though it is to imagine a set of prices which provide a 'solution' for each failure, there is little practical escape from the need for detailed regulatory oversight and an element of network planning. Market-based approaches *complement* the traditional network focuses of regulatory control, but they cannot on their own provide a complete substitute.

Important, too, for policy purposes is to note that *none* of these market failures is *solved* through liberalization and competition. Thus much of the thrust of European policy, to which we turn in section IV, has had implications for networks, but has not addressed them directly.

These interactions between the market failures have an institutional context: they take place *between* governmental and regulatory bodies. Monopoly regulation has typically been part of the apparatus of controlling cartels, the province of industrial policy and ministries of finance, whereas environmental regulation has typically been dealt with through environmental agencies and separate 'green' ministries. The ways in which these political and institutional interests are played out is largely unresearched in the economics literature, and poorly researched in the political literature. Government failure is typically modelled as a principal–agent problem, with a difference in objectives and asymmetric information between the regulated and the regulator. Perhaps more important are the games between the principals—between departments and regulatory offices within countries, and between national governments at the European level.

IV. POLICY IN PRACTICE AND SECURITY OF SUPPLY

European Commission policy towards network utilities has had two broad dimensions: the promotion of the liberalization agenda; and the encouragement of network construction and interconnection. In practice, in the 1980s and 1990s, the former has had priority, while the latter has been left largely, but not exclusively, to companies and governments.

The liberalization agenda has its origins in the EC's 1986 White Paper on *Completing the Internal Market* and its manifestation in the 1992 programme.[18] Concerned that Europe was lagging behind the USA economically, and with progress towards monetary union in some difficulty in the mid-1980s, the 1992 programme was ingeniously designed to bring together a host of different liberalization measures within a single package, which would *in aggregate* make every member state a winner, even if there were losers for each of the individual components.[19]

The utilities were initially excluded from this programme for the very good political reason that agreement was unlikely to be forthcoming among member governments. Instead, a separate set of initiatives was launched, centring on the completion of the internal energy market and the liberalization of telecoms. (Postal services and transport were regarded as politically 'too difficult' at this stage, and were to be added later.)

Although there are close parallels between the energy and telecoms initiatives, we here concentrate on energy. The draft energy directives were designed upon classic Commission policy lines. There was to be a series of stages which would

[18] See the article by Jacques Pelkmans in this issue for a comprehensive analysis of the host of liberalization initiatives in each of the sectors.

[19] See the issue of this journal concerning the European internal market: *Oxford Review of Economic Policy*, Vol. 9 No. 1, 1993.

'peel the onion' gradually back, exposing the natural monopoly core, and introducing competition in generation and supply. Crucially, these early draft directives recognized that negotiated third-party access (TPA), by which the dominant players entered into bilateral arrangements on a contractual basis with each other, themselves typically vertically integrated, would be unlikely to result in significant actual competition, and that regulated TPA would be preferable.[20]

These draft directives ran into very considerable political difficulties, because of the combination of powerful incumbent resistance and the more general climate of the debate about European integration. Thus, opposition from dominant incumbents, such as EdF, Ruhrgas, and RWE, was reinforced by concerns about European security of supply and subsidiarity. In this latter case, it was recognized that the creation of a well-functioning set of energy markets would require regulation at the European level to set tariffs for grid access and to police conduct. This was strongly opposed by member states wishing to limit the accumulation of power in Brussels and the transfer of sovereignty from national governments and regulatory institutions.

Most of the 1990s were spent in attempts to gain acceptance from France and Germany for liberalization in energy markets and eventually a weak electricity directive and an even weaker gas directive were agreed in 1996 and 1998 respectively.[21] Indeed, while national governments failed to agree at the European level, the main impetus came from their own domestic liberalization plans. Britain gradually opened up its supply markets in a transition plan from 1990 through to 1998/9; Germany allowed full supply competition in 1998; and there were initiatives in all the European member states, with the exception of France. At the end of the decade, the Commission tried once more to bring in further European legislation to speed up the process and to establish a degree of harmonization to the internal energy market. Proposals for new directives were taken to the Stockholm Summit in 2001, but a combination of French and German interests defeated the initiatives.

In the meantime, changes in market conditions had begun to shift the emphasis away from the competition model towards one of oligopoly. At the industry level, a series of mergers took place which reduced the number of players. Large-scale mergers occurred notably in Germany, where, as noted above, VIAG and VEBA merged to create E.ON, which in turn gained a major stake in Ruhrgas, which in turn was the leading foreign company allied with Gazprom. The German market now has two overwhelmingly dominant players in the electricity market (RWE and E.ON). EdF, the largest electricity utility in the world, has also expanded its position in the European market, with significant acquisitions in Germany, Italy, Austria, Hungary, Switzerland, and the UK.

These consolidations have been facilitated by benign neglect from the Directorate-General for Competition in the European Commission, which has tended to treat each separate country market as the basis for assessment of dominance. Thus, when EdF bid for London Electricity and then for SWEB's supply business, the Commission considered the British market as the relevant domain, including only the value of electricity exported from France through the interconnector as additionally relevant in estimating market share. Similarly, when EdF bid for a share of the Germany utility, EnBW, it was argued that, since EdF did not have a presence in the German market, its acquisition would increase competition *in the German market*.

Although this approach was no doubt legally correct, there was a disconnect between the policy of *creating* an internal *European* market in energy, and the *facilitation of greater concentration* by the dominant players in the name of increased competition in markets. The result in electricity is that around seven companies now dominate a European market of some 350m customers, and that further liberalization will probably be confined largely to a game between a small number of dominant (regional) monopolists or oligopolists. In an important sense, this will be a competition with not enough players, and the lesson is that policies aimed at promoting competition in particular sectors need to

[20] See the issue of this journal on energy: *Oxford Review of Economic Policy*, Vol. 7 No. 2, 1991.
[21] COM 96/92/EC and COM 98/30/EC.

have a supporting merger policy regime. It is now probably too late to create a competitive electricity and gas market in Europe along the Commission's original model of the early 1990s.

There are two broad defences to the twin failures (weak directives and allowing concentration) which have been put forward. These are: first, to claim that the *European* gas and electricity markets are immature compared to *national* markets, because the former lack an integrated infrastructure, while most of the latter typically have well-developed electricity grids and gas systems and hence it is not surprising that little European-level competition has developed; and, second, to claim that the priority for Europe is to address security of supply, in the context of growing gas dependency and environmental constraints.

Let us start with the claim for immaturity and the focus on interconnection. On the development of greater interconnection, the Transit Directive 1990[22] was designed to encourage the building of new electricity transmission and gas pipeline assets, but has had only limited success. The benefits from interconnection are twofold: it should increase the resilience of any particular national market to shocks; and the portfolio effect of more power stations and gas fields interconnected means that the overall capacity margins can be reduced. In electricity, this is likely to result in a significant economic gain.[23]

Interconnection is not, however, necessarily in monopolists' interests. Connections *between* regional or national geographic monopolies are the route through which not just electricity or gas, but also competition is transmitted. For this reason, the creation of national electricity and gas systems has either been the task of public bodies—as through the Central Electricity Board in the 1930s and the Gas Council and British Gas in the 1970s and 1980s in Britain, and through EdF and Gaz de France in France—or through collusive oligopolies, as in Germany. Interconnection does not happen spontaneously in liberalized markets: it requires intervention. On this argument, as with the creation of a competitive market, the role of the Commission is not one of facilitation, but rather a more proactive one of intervention. And, as with the competition approach, that runs into political objections on the grounds of subsidiarity.

In practice, in energy markets, the Commission has had to rely on 'soft' legislation, building on a series of methodological papers and working with national regulators to try to gain acceptance of the need for a more regulated approach to TPA, to unbundling and the creation of separate system operators acting independently of generators and suppliers.[24] The weakness of the 1996 and 1998 directives, and the failures at Stockholm have given it little choice.[25] The main institutional instruments have been the so-called Florence and Madrid processes, whereby the individual member states' regulators try to form a coalition of interests at the European level. This, however, has been painfully slow, not least because there is, as yet, no German energy regulator in a context in which Germany accounts for around a quarter of the European population and even more of the European economy, and where France's nuclear interests need to be taken into account. Without further legal powers to create markets and market institutions, progress is bound to be limited.

The second policy response to the failures of the directives and to increased concentration has been to shift the focus to security of supply. In 2000, the Commission published a Green Paper entitled 'Towards a European Strategy for the Security of Energy Supply' (EC, 2000). It has two key points: that Europe will be 60 per cent dependent on imported gas by 2010; and that emissions of carbon dioxide (CO_2) are set to rise sharply in the next two decades. The gas dependency has a political dimension, since the main sources of supply will be Russia and, to a lesser extent, Norway. The CO_2 growth has led to further advocacy of specific technologies, notably nuclear power and renewables, neither of which is likely to prosper in the British style of liberalized electricity markets. It is argued that Europe ought to change tack from the Stockholm draft directives to a more interventionist policy. In

[22] Council Directive 90/547/EEC, 29 October 1990.
[23] See Helm (1991,1993).
[24] See DG TREN (2000) and European Transmission System Operators (2000, 2001).
[25] See EC (2001*a*,*b*,*c*).

this context, it is further claimed that large firms with market dominance are more likely to be able to carry the investment costs of nuclear and renewable projects, because of the ability to impose the costs on consumers (implicitly, rate-of-return regulation) and because of economies of scale and portfolio benefits.[26]

The problems posed by gas dependency and the development of nuclear and renewables are often ignored by advocates of the competitive markets approach. It is argued that markets will price in security-of-supply concerns, and that with the development of capacity auctions and energy trading, futures markets will enable the risks of dependency to be hedged. However, in the current context, with significant market power and consequently thin futures markets, this route is unlikely to be available. Furthermore, the long-term take-or-pay contracts which nuclear and renewables would need will not be forthcoming from the kinds of energy trading markets being developed, notably in Britain. Long-term take-or-pay contracts will need active policy intervention, as demonstrated by renewables policy across Europe. Nuclear risk will ultimately need to be underpinned by governments, since the liabilities cannot be contained within the limited-liability status of private firms.

It does not, however, follow from these remarks about the need for a proactive European energy policy that markets and competition have little or no role to play. On the contrary, market mechanisms are generally likely to be the most effective policy instruments. In the case of gas dependency, the problem is that there is no price placed upon system diversity. Yet diversity is not an absolute constraint, but rather one with costs and benefits. Electricity network owners and operators typically have a duty to ensure supply and, in meeting this, they face a number of competing options. There is no reason why these cannot be priced. On CO_2 and related greenhouse gases, there are a number of supply-side options (including, but not limited to, renewables and nuclear), as well as opportunities to increase energy efficiency and bear down on energy demand. The carbon tax is the first-best instrument to sort of which of these options is least-cost, and emissions trading a second-best in the context of pre-set supply-side quotas (Helm, 2001*d*).

These considerations of the energy sector indicate an important role for policy institutions at the European level. The alignment of competition policy with the liberalization process needs to be set in the wider context of (i) increasing interconnections and (ii) policies aimed at properly rewarding diversity and non-carbon technologies. Solutions to these problems will not occur naturally, through a policy solely based upon liberalization and *laissez-faire*. They require an active energy policy. To achieve this, new institutions will be needed to address these multiple market failures in a consistent fashion, and it is to these which we now turn.

V. EUROPEAN REGULATORY INSTITUTIONS

As discussed in section III, the widespread prevalence of multiple market failures, combined with the importance of these network industries to the European economy, means that network utilities will need regulation for the foreseeable future. Private-sector natural monopolies or natural oligopolies will not set optimal tariffs or access prices, and where these are vertically integrated, competition may be inhibited. Furthermore, and crucially, monopolies are unlikely to invest optimally.

These economic theoretic insights have, as we saw in section IV, been poorly reflected in the practice of network policies at the European level in the 1980s and 1990s. The energy networks remain fragmented and largely nationally based, grouped together around a small number of very large dominant companies. Environmental costs have not been fully met. The conclusion that follows is that the Commission's attempts to create competitive or environmentally reflective European energy markets have largely failed. In other network utilities, the record is more mixed, but the presence of rapid technical change and strong demand growth has no doubt been a significant factor in encouraging competition to develop. Nevertheless, the roll-out of broadband and the

[26] For a critical note, see Helm (2001*c*), a submission to the House of Lords inquiry into the Green Paper.

consequences of the (nationally organized) 3G licence auctions are hard to regard as optimal.

It is tempting to blame this failure on mistakes in the design of specific policies and directives. Market design and the details of legal rules matter greatly—as Paul Joskow illustrates in his review of the California crisis in this issue. However, markets do not exist in a vacuum, but rather in the context of complex sets of property rights, themselves represented in conduct rules placed on market participants. Some of these are defined by general competition and contract law, but in utility markets, where access to network facilities is a necessary condition for supplying services and the effects of pollution are complex, sectoral regulation is an essential prerequisite. Regulators need to set the rules and police the consequent conduct.

As noted above in section IV, regulation of networks has been largely a national affair, particularly in energy, while competition policy is increasingly at the European level. The inconsistencies between the sectoral and general policies have, as also noted above, resulted in a level of concentration which prejudices a competitive energy market. This is, however, less a mistake by the Directorate-General of Competition, or the Directorate-General of Energy and Transport (DG TREN)'s failure to exercise proper influence, but rather a reflection of the disconnect between the *location* of regulatory institutions.

For these reasons, there is a case for the creation of European regulatory institutions, where primary duties relate to the Europe market *as a whole*, rather than to the special interests of member states. Common rules with regard to transmission rights and access terms would considerably improve both the location and form of investment in infrastructure assets. The gains from interconnection accrue *between* countries rather than to individual markets, providing a European public good. For example, the gas interconnector between Britain and the Continent improves the security of supply in *both* Britain and on the Continent in Germany, the Netherlands, and Belgium. Interconnection of EdF's base-load nuclear power stations would allow other countries to invest more in peaking plant and yield the benefits of a wider European portfolio.

A European regulatory body would not necessarily need to carry other implementation functions. It could be focused narrowly on the setting of regulatory rules and have a role in adjudicating in cases where agreement is hard to reach by national regulatory bodies. It would operate within the context of an overall energy policy created by the Commission through the usual political channels.

As with energy, communications also needs European regulation. Both sectors have seen their natural monopoly networks migrate to the European level, and as a general proposition, regulation ought to be co-extensive with the domain of the natural monopoly. In the inter-war period, most networks were local, and regulated at the local level. After the war, most migrated to the national level, and in consequence, most countries developed a national focus to regulation, often through nationalized monopolies. The changes in the underlying cost functions now dictate a further, upwards, migration.

Consistent regulation of network utilities at the European level would assist in promoting efficiency in the use of the existing networks, and promote interconnections. But, as noted in section III, the market failures are multiple, and include environmental and social components. Where the different concerns are dealt with by different political and regulatory bodies, the outcomes are likely to reflect the relative powers of overlapping institutions, rather than the optimal policy mix.

For these reasons, there has been considerable interest in the further coordination and integration of sectoral bodies with environmental departments and regulatory agencies. In the UK, the Department of the Environment was merged with transport in 1997 to form a Department of the Environment, Transport and the Regions. In 2001, environment was taken away from transport and merged with agriculture to form the Department of Environment, Food and Rural Affairs. These restructurings were dictated as much by politics as by the need for policy coherence, but there remains an unease about the sectoral linkages with environmental policy. It has also been reflected in the placing of environmental objectives on energy and transport regulators across Europe—in the UK by the placing of formal govern-

ment guidelines on environmental and social matters on Ofgem in the Utilities Act 2000.

In the economics literature, there have been a few attempts to analyse the effects of competition between regulatory institutions. The idea, advanced notably by Siebert and Koop (1993), is that the performance of regulatory bodies will affect the competitiveness of the regulated industries, and differences in performance will thereby feed back to regulatory reform. In time, there will be convergence on the 'correct' model. Harmonization of regulation should, in Siebert and Koop's view, be the *outcome* of a competitive process between regulatory bodies, not imposed from above.

Regulatory competition is not, however, as transparent as competition in product markets. There are myriad factors which determine outcomes in network industries, and the gains and losses accrue to different interest groups. Bureaucratic bodies acquire their own objectives, typically involving a growth in budgets and staff levels. These tensions are reflected particularly strongly when different institutions compete for influence over a particular variable—such as the price of electricity or the level of environmental capital expenditure. Although there are many drawbacks to the creation of large overarching institutions cutting across market failures, the absence of defined trade-off between objectives leaves the allocation of resources to be determined in terms of institutional bargaining. The outcomes are unlikely to be optimal.

At an early stage in the development of both sectoral and environmental regulatory institutions at the European level, it may be premature to suggest anything more than an attempt by the different bodies to engage in joint research, consultation exercises, and cooperative working procedures. However, as the environmental constraints increasingly bear down on energy and transport, in a very real sense energy and transport policy become sub-sets of environmental policy. Institutional change to reflect these new concerns is likely to follow.

VI. CONCLUSIONS

After a decade of excess supply and low oil prices in energy markets, and an explosion of telecoms-related technologies, the focus of network policy has begun to shift away from liberalization and a primary reliance on competition towards a greater concern for investment. It is increasingly being recognized that network utilities comprise a significant complementary component of the European economy, and that a legacy of leaving policy to a large extent to nation states has stunted the development of internal markets for the energy sector, and, to a lesser extent, telecoms, and resulted in inefficiencies and lack of interconnection, and undermined some network integration economies of scale. The European networks are, in these senses, inefficient, and this conclusion has a significant, though difficult to quantify, effect on the productivity and competitiveness of the European economy.

Network policy is inevitably complex because there are multiple market failures. Yet the interactions between monopoly, competition, and environmental policy are often ignored. The results have been detrimental in energy—with merger policy reducing the scope for future European competition very significantly, and liberalization favouring gas-fired power stations over non-carbon fuels.

Because market failures are multiple, a coherent policy for energy is, therefore, inherently hard to design, and inevitably policy will require detailed implementation and regulatory oversight. General competition policy is unlikely to be sufficient, being narrowly focused on one market failure and poorly designed to address natural monopoly. Sector-specific policy is therefore required, which in turn requires appropriate institutions.

For as long as the creation of European regulatory bodies to oversee European networks is resisted, the incoherence of current policies is likely to remain, and therefore the focus will continue to be on the national interests of member countries. The current Energy Policy Review in the UK is an example of this approach (as were the different national approaches to the 3G licence auctions). The result is the loss of the additional economic benefits which potentially arise at the European level. The failure to capture these European benefits will in turn continue to undermine European attempts to compete with the more integrated, yet still federal, structure of the US economy, where the Federal Energy Regulatory Council and the Federal

Communications Commission play analogous roles to those advocated here for the European Commission.

Such institutional reform is a necessary condition for greater policy coherence, but it will also need to incorporate environmental and other concerns. The political resistance to further concentration of regulatory powers at the European level also inhibits such developments, and will probably continue to do so. However, it is important to recognize that it does this at a price to the European economy as a whole.

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