

In this chapter the interrelationships between gaming, market power and regulation in the New Zealand context are explored, with a deconstruction of each intended to isolate when, if and how each has its place in a healthily evolving electricity sector. We begin by contrasting gaming with market power, since they are distinct phenomena with differing implications. Circumstances in which either is malign, benign or simply tolerable are discussed. Given the particular difficulties that can arise with market power, the discussion traverses not only its incidence in each major sub-sector of the electricity industry but also the issues associated with measuring market power. The discussion then turns to regulation, considering its purpose, rationale and approach (with further details discussed in Appendix 9.1). Ownership options representing alternatives to regulation are raised, including one – for Transpower – which was raised but shelved early in New Zealand’s reforms. Finally, some reflections on New Zealand’s evolving regulation of the electricity sector are offered. In short, current regulatory settings are overly blunt and excessive given certain existing arrangements and alternatives.

INTRODUCTION

The discussion in Chapter 8 – regarding the impact of governance changes on the incentives various parties have to make the large, long-term and irreversible investments required for a growing electricity sector – presages a wider discussion. By now it is probably apparent, if not self-evident, that the interdependencies in the electricity sector arising from network physics and economics only intensify the interrelationships characterising any sector of the economy. In the case of electricity these interrelationships extend not just between governance and investment, but between those matters and issues of market power (whether seen as a necessary evil or otherwise) and its nemesis, regulation. Often tarred with the same brush as market power is the issue of “gaming”, frequently leading to similar calls for regulatory intervention, but it would be both inaccurate and, as we shall see, potentially misguided.

GAMING

Gaming and market power are often perceived as co-evils in the electricity sector. Whereas market power in this context typically takes on its usual meaning of market participants having some capacity to increase prices beyond cost-based levels and/or to restrict output to increase profits and prices, gaming appears to sometimes degenerate to mere tautology. In New Zealand it most commonly refers to the ability of generators to push the boundaries of market rules under which the wholesale electricity market operates, to increase electricity prices above what is argued to be reasonable. Allegations of gaming often arise in the context of transmission constraints causing the wholesale market to “separate” or “regionalise”,

resulting in fewer generators in the resulting sub-parts of the electricity system meeting existing demands. They are at their loudest during extreme events such as winter supply shortages or transmission outages (as discussed in Chapter 6).

In its plainest sense gaming is simply a fact of life, and one which many of us accept and at times even value. This is the sense in which gaming is simply playing the rules to one's own advantage, in a situation where others might be affected as a consequence and whose responses might also affect the gamer's own outcomes. New Zealanders do this at every general election – particularly since the introduction in 1996 of mixed-member proportional representation, which gives each voter the ability to vote for both an electorate candidate and a political party whose winning candidates are drawn from a predetermined party list. Every time a voter exercises their votes, they game, and if they consciously exercise their two votes in favour of either the same or different political parties, they do so strategically. So far so good.

Pernicious Overtones

Gaming takes on more pernicious overtones when it nears the point of rule-breaking, when it is regarded as being exercised by parties with excessive absolute or relative “power”, or where the “rules of the game” are seen to unduly or deficiently afford power to some groups over others. Such power might be attributed to structural matters such as the number (e.g. lack) of competing generators, or bottlenecks in the transmission grid that can lead to localised increases in the ability of generators (or demand) to manipulate prices to their advantage. Alternatively, market power might involve a vertically integrated generator and retailer driving up wholesale spot prices while holding or lowering retail prices to financially stress non-vertically-integrated retailers exposed to rising wholesale prices. The Market Surveillance Committee (MSC) of the New Zealand Electricity Market (NZEM), however, in considering allegations of the latter during the 2001 winter supply crisis, regarded such actions as expressions of market power.¹ In doing so it distinguished them from “manipulative activity”, which it defined as “the use of a device or technique which artificially sets (or attempts to set) a price in a market which does not reflect the basic forces of supply and demand at work in that market”.² Accordingly, the dark side of gaming requires alternative substantiation.

An aspect of gaming that bears closer scrutiny relates to the potential for market rules to be used in ways not intended, or outright circumvented by fair means or foul.³ As should be evident from the discussion in Chapter 2, electricity markets are an artifice, sometimes created with a “big bang” (and sometimes succeeded by a number of

¹ Indeed, the Committee noted that the alleged use of market power was in fact directed at competing retailers, while consumers remained relatively insulated from its effects, or even enjoyed electricity prices allegedly at less than cost. Such short-term consumer gains must be balanced against any longer-term adverse consequences, which the Committee acknowledged and we discuss subsequently.

² New Zealand Electricity Market (2001).

³ Gaming-type actions are also constrained by the Commerce Act.

smaller bangs, or even fizzes), reflecting the fact that they arise from a background of centralised, planned control – with a central planner seeking to inject greater market and competitive forces – rather than evolving as a consequence of such forces. It is therefore too much to expect that the reformers get it completely right, on successive tries let alone first time, particularly when institutional and other obstacles to change are considered. The rules applied to reformed electricity markets may well need refinement. As stated by Crew and Kleindorfer (2002) in their “helicopter” tour of the past 20 years of regulatory economics, one of the biggest lessons learned over this period is the importance of practice. Of course a less generous interpretation would be that electricity-sector reforms at their worst represent a sequence of fumbles.

Lessons from England and Wales

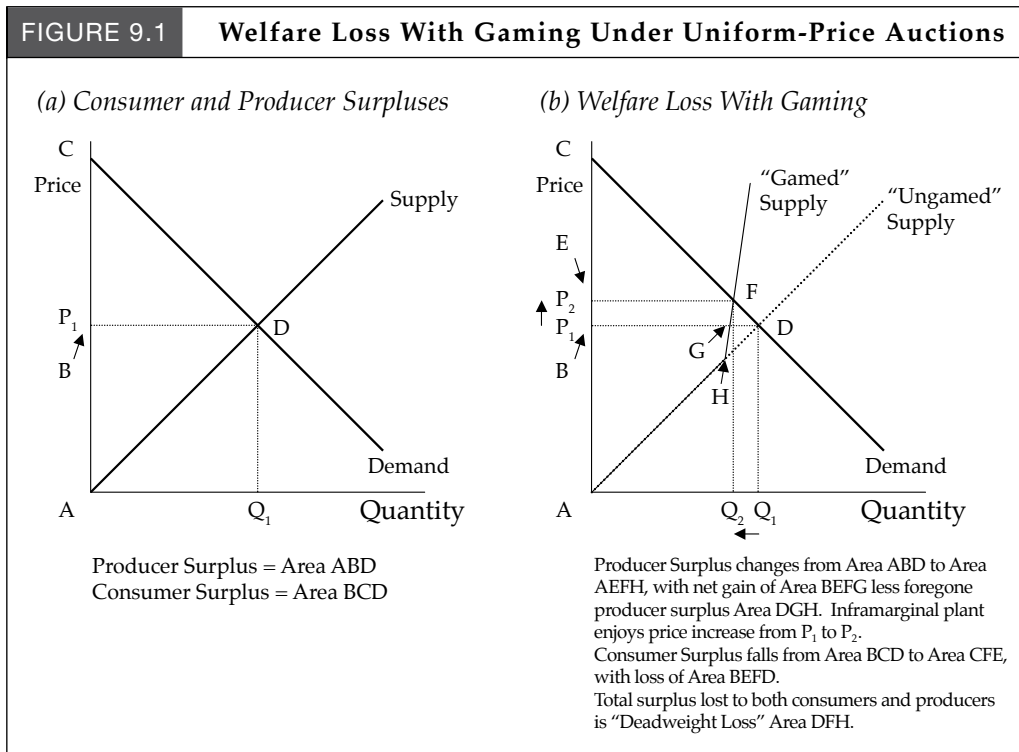
An important lesson can be taken from the reform experience in the England and Wales electricity system. As suggested in Chapter 2, a number of the features of the original England and Wales pool predisposed it to manipulation by generators, quite aside from any market power they possessed. Critically, the pool at first allowed no demand-side bids and hence no demand-side response to wholesale prices as they neared trading period determination, relying instead on system-operator demand forecasts (a fraught activity at the best of times) to determine which generators to dispatch. Generators were afforded considerable ability to revise their capacity commitments (although not their dispatch prices) up until the point of dispatch, which under market rules significantly affected the various pricing components that made up final prices. With the system operator responsible for maintaining system security, its degrees of freedom were limited by last-minute generator withdrawals of capacity commitments, instead allowing generators a degree of freedom to play off dispatch prices against prices for reserve capacity. A good way to allow market rules to be played by generators is to write them in a way that backs the system operator and consumers against the wall, while leaving generators with flexibility and discretion. The highly decentralised approach replacing the pool in England and Wales, NETA, represents a rewrite of market rules that simultaneously gives greater flexibility to consumers through demand-side contracting and power-exchange trading, and shifts the onus for maintaining system balance from the system operator more towards generators and purchasers. The scope for market participants under NETA to game the rules should now be reduced, or at least be much more balanced, than under the pool.⁴

Problems with Uniform Price Auctions

A concern with the England and Wales pool leading to other changes under NETA, and one which was raised following the Californian electricity reform debacle, relates to the nature of the auction rules implemented for setting electricity prices. In each case generators were dispatched via a centralised auction with “uniform pricing”. Under this approach all dispatched generators are paid the “market clearing” price, i.e. that which

⁴ Indeed, Zhou *et al.* (2003) report evidence from the first year of NETA operation that finds no abuse of market power or significant gaming of procedural rules, both of which plagued the pool of England and Wales.

equates demand with offered supply. In this regard it mimics the typical operation of any market, since the price at which goods or services are traded in “equilibrium” is set by the “marginal” supplier and consumer, meaning some consumers pay less than what they would be prepared to in order to consume the relevant good or service, and some suppliers are paid more than they need to be in order to attract their supply. Respectively consumers and producers enjoy “consumer surplus” and “producer surplus”, represented by the shaded areas in Figure 9.1(a).



Source: Richard Meade.

A criticism of uniform-price auctions is that they afford generators with multiple plants, especially those with differing technologies and hence multiple plant cost structures, the incentive to increase offer prices on the plant they own which they expect to be the “marginal” or “price-setting” plant in order to increase the profits they enjoy from their “infra-marginal” plant that will be dispatched earlier in the “merit order”.⁵ By

⁵ As noted in Klemperer (2002), uniform-price auctions are also vulnerable to demand-side collusion (tacit or explicit) to drive prices downwards, and the electricity regulator in England and Wales believed the pool fell prey to such collusion once demand-side bidding had been introduced. Evans and Counsell (2003) question whether purchaser gaming of the real-time and day-ahead markets in California was due to the use of uniform-price auctions in both.

skewing upwards the market clearing price, such generators seek to increase producer surplus, which consequently reduces consumer surplus and gives rise to a loss in combined surplus – a “deadweight” or welfare loss – as indicated in Figure 9.1(b).

Calls for Pay-as-Bid Auctions

It is not surprising that some have seen this risk in uniform-price auctions as sufficient reason to call for alternatives, notably “discriminatory” or “pay-as-bid” auctions. Under this alternative, generators are paid the prices at which they offer each unit of their generation for dispatch, with only the marginal plant receiving the market price. In this case all producer surplus is extracted, apparently to the benefit of consumers – thereby mitigating the incentive to raise prices so returns on infra-marginal plant can be increased.⁶ The subtle trap with concluding that this represents a net gain over uniform-price auctions is that it ignores the profound effect a discriminatory auction has on participants’ incentives and bidding strategies. To avoid the “winner’s curse” associated with bidding at less than the market-clearing price, under discriminatory auctions generators have an incentive to second-guess what the market clearing price will be and raise the price on all their plant to ensure they receive no less than that price (a strategy favouring larger operators with diverse plant and the resources to invest in estimating the likely market-clearing price).

It is therefore a mistake to assume that generators will offer plant in a discriminatory auction based on marginal supply costs, as they are more inclined to do under uniform pricing. With a change in rules, there is a change in bidding strategy. The net result is that discriminatory auctions can in fact increase market prices over uniform-price auctions, and shift generators’ attention from cost-based bids to second-guessing competitors’ bids (driven by strategy and informational costs more than production costs). The jury remains out on whether NETA’s use of discriminatory auctions in its balancing market has resulted in higher balancing prices than would be achieved under uniform pricing. The consequence of any mis-step in this direction, however, should be diminished relative to the pool since the balancing market represents only 2% of total electricity traded, whereas the pool priced all traded electricity (although much of that was hedged). Electricity auctions are repeated at different network nodes repeatedly (in New Zealand 48 times per day) so the necessity for effective auction rules is plain.

As noted by Klemperer (2002), any repeated auction is vulnerable to the risk that auction participants discover the bidding strategies of their rivals and peers and implicitly or explicitly use this information to collude (on either side of the market) in order to

⁶ This is the diametric opposite of how a perfectly-price discriminating monopolist would seek to extract all available consumer surplus from consumers by charging each consumer the price he or she is willing to pay.

manipulate prices.⁷ He suggests this is best solved by improved auction design rather than legal intervention. Coordinated actions are facilitated by transparent information flows, a stable environment, reasonably similar costs and, in the case of electricity, known hedge arrangements. The volatility and uncertainty of water inflows, and uncertainty about gas supplies, affect different generators differently at different times, rendering cooperation more unlikely in New Zealand. Uncertainty in this country is intensified by the large electricity demand of one participant – the aluminium producer, NZAS – and by the presence of a methanol producer that has historically consumed approximately 40% of the production of natural gas in New Zealand. While it may be seen as a longer term risk, the withdrawal of either of these firms would materially affect the financial performance of generators and other participants in the electricity sector.

Changing Issues

Gaming is thus a potentially potent issue, and one which requires ongoing attention. Compliance with market rules requires monitoring, and transparent and even-handed enforcement – an overlap with questions of governance. More fundamentally, market rules themselves require ongoing evaluation to ensure they are performing as intended, and that they are evolving adequately in line with external changes such as in industry composition (e.g. number of players) and structure (e.g. degree of vertical integration). In this regard the possible need for changes to the NZEM rules was flagged by the MSC in 2001, with the Committee observing that both market governance and rules were drafted in the context of generators and retailers competing on opposite sides of the market but that this situation had dramatically changed with the vertical integration of generation and retailing in 1999. As at June 2001 net generators constituted 76% of votes on the NZEM Rules Committee, with net purchasers the other 24%. As such, the potential for net-generator domination of future rule changes could not be precluded. The import of any such domination should not be overstated, however, since the vertical integration of generation and retailing, often involving finely balanced portfolios of generation and demand, means that either group of participants has relatively balanced interests. Hence any move by the new Electricity Commission (which assumed responsibility for NZEM governance on 1 March 2004) to include greater demand-side influence on market rule-making based on such considerations may be misplaced.⁸

⁷ Debate in New Zealand over how soon to release bid and offer information reflects the necessary balancing of market-power detection and other information gains against the competitive costs of facilitating strategic behaviour. Strategic behaviour may be enhanced because the revelation of individual bids or offers inform other generators of decisions taken and offer the possibility of inducing coordinated action in which cooperating players observe that others are not cheating on (implicitly) agreed strategies.

⁸ Evidence by Mansur (2003) from PJM in the US, which also has vertically integrated firms, supports this view, with prices at competitive levels except for firms that are large net sellers (who withhold output relative to competitive levels).

Gaming of a Higher Order

An exception to this caveat might relate to those few, larger electricity users who choose not to hedge their exposure to wholesale spot prices (in which case any exposure to gaming is a risk they bear voluntarily, perhaps because it is not important enough for them to do otherwise) because they regard the prices of available hedges unattractive, and decide not to create their own self-generation (instead relying on demand management). Various alternatives to market transacting are a real prospect when such users are in a position to game the system, whether at the level of market rules, market-rule setting, governance, regulation or policy-setting, or law-making. It has to be recognised that market transacting has costs and benefits that market participants will weigh against those of the available alternatives. For larger electricity users these can often favour lobbying for regulatory change – irrespective of the effects on other users – rather than playing within the letter and spirit of existing rules.⁹ Accordingly it is imperative in any discussion of gaming and its real or perceived evils that any solutions mooted do not simply shift the problems of gaming to different and potentially less-transparent and clearly rule-based arenas. The more decentralised the control of the electricity market, the less incentive there will be for such high-level gaming.

MARKET POWER

Horizontal and Vertical Variants

Gaming's big ugly step-sister is market power. Changing market rules (or higher-order forms of regulation) is relatively easy; changing the market-wide characteristics that contribute to or alleviate any adverse consequences of market power can require consideration of more fundamental and potentially obstinate problems. Not least among these is the number of firms in the sector, itself a reflection of the costs of available production technologies and the size of the market. From such considerations is derived the definition of **horizontal market power**, referring to the ability of one or more firms to consistently or deterministically raise prices beyond competitive levels because they control a significant proportion of capacity and are not subject to the threat of timely entry by competitors. Also relevant is **vertical market power**, whereby a generator integrated vertically with transmission, distribution and/or retailing uses control over one or more industry levels to restrict competition at other stages (e.g. by restricting network access to other suppliers), with the effect that customers face higher than competitive prices.¹⁰ Apart from the vertical integration of generation and retailing since 1999, for which considerations of vertical market power might remain

⁹ The literature identifies “concentrated” interests as being more effectual than “diffuse” interests (e.g. households) in influencing policy that enhances their own objectives at the expense of others’ interests (see for example Magee, Brock and Young (1989)).

¹⁰ See Vogelsang (2003) for a summary of relevant access-pricing rules in the context of vertically integrated telecommunications.

relevant, it is horizontal market power that receives most attention in the New Zealand electricity sector – in generation, transmission and distribution.

Market Power in Generation

Clearly if the most efficient scale of generation, given available technologies, was such that only a single generation unit could most viably supply the entire market, then monopoly generation would be both natural and potentially “first-best” despite the welfare losses associated with monopoly. The challenge in such a case is to induce the monopolist to act in such a way as to reduce welfare losses while not creating additional and self-defeating new costs.¹¹ More typically in reformed electricity systems, in New Zealand and elsewhere, generation is dominated by a relatively small number of generators having a mixture of plant types and/or cost-structures. The Australian state of Victoria is an interesting exception, where single, large thermal generation units were each separately sold to different owners. With the incentives for such generators to game uniform-price auctions (as they have no infra-marginal plant from which to benefit from the usual games) having been reduced, it would be interesting to contrast the nature and extent of gaming in the Victorian Power Exchange prior to its integration into the Australian National Electricity Market (NEM). Gaming remains an issue for the NEM (see, e.g., Outhred (2000)), perhaps more a consequence of integrated generation units in New South Wales and elsewhere than because of gaming by Victorian generators.

Indeed, it should also be acknowledged – as the MSC does in NZEM (2001) – that market power can also be enjoyed on the demand side of the electricity market, with the balance of any market power in New Zealand ebbing and flowing with the relative scarcity or abundance of hydro reserves.¹² Also, the vertical integration of generation and retailing in New Zealand since 1999 – more so than that occurring (or sometimes even permitted) in other reformed systems – means that generators have reasonably well-committed output on relatively fixed prices, and therefore face little incentive to manipulate wholesale spot prices. Once again, the exposure to any market power may be borne in relatively greater measure by the few large electricity users that either do not hedge or periodically need to renew hedges for which the options at any time might be limited because generators are pre-committed to customers or because they need to manage their own risks (such as fuel supply in dry years).

¹¹ Including bankrupting the generator, which is possible if otherwise-efficient “marginal cost pricing” is enforced when the most efficient scale of production lies beyond total market size, implying that such prices will not cover average production costs. Subsidies might be used to maintain the monopolist’s viability with marginal cost pricing, but that also incurs costs such as the distortionary effects of redistributive taxation.

¹² It would be difficult to sustain the argument that daily average main-centre wholesale electricity prices in the NZEM as low as \$0.01/MWh (arising in March 2004 when hydro reserves were 134% of average) reflected generator market power (or, indeed, production costs); but it might instead be thought to suggest demand-side advantage.

Market Arrangements to Mitigate Market Power

Authors such as Stoft (2002) and Zhou *et al.* (2003) suggest that generator incentives to exploit any market power in wholesale spot markets can be mitigated by using long-term contracts to commit generators to supply at fixed prices. While this reduces the importance of the spot market as a mechanism for profitable manipulation, it simultaneously shifts the problem of ensuring electricity prices are set competitively into potentially inferior realms (e.g. bilateral contracts not subject to market rules), and can reduce the liquidity of the wholesale market with the effect that wholesale prices are more sensitive to any remaining manipulative behaviour. An alternative solution described by Counsell and Evans (2003) might be to implement a “day-ahead” forward electricity market which is sufficiently short-term that it will be both relatively “deep” and transparent, leaving the real-time market for top-ups when demand varies from loads contracted day-ahead (such as the scheme implemented in PJM). Yet another method of reducing incentives to exploit market power involves the use of wholesale electricity price caps, but this requires alternative means to balance supply and demand when price rises are genuinely required, and seriously distorts the price signals required to elicit generation investment in liberalised electricity systems (see Chapter 10 and Meade (2005a)).

Vertical Integration and Hedging

The extent of generator vertical integration in New Zealand may seem to intensify an issue of market power also arising in less integrated industries, that of contract market illiquidity. Vertical integration does not adversely affect the ability to commit to long-term arrangements for supply: it is simply that most of such supply is committed through contracts written by generators’ own retail arms, rather than through middlemen retailers. Arguably, vertical integration enables better risk management, in part because generators can offer a wide range of contracts, some of which – household supply contracts – are variable and transferable. There should remain the same or better availability of non-spot-price supply for larger final-demand customers than if vertical integration had not occurred. Evidence on the extent and availability of these sorts of arrangements is hard to come by because each company jealously guards their fixed-price contract position, in part because knowledge of another’s hedge book reveals the vulnerability of that company to fuel-supply and price positions that might be exploited by competitors in certain situations. It is known that contracts range from fixed-price Contracts For Differences (CFDs), through household supply contracts, and contracts that share the risk of the spot price with customers, to those in which customers carry 100% of the risk. One of the four largest generators in New Zealand, Contact Energy, has publicly stated that approximately 85% of its average generation is hedged in some way. Generators have a demand for hedges in order to manage financial returns during times of lower prices, but they cannot be expected to be 100% hedged because in years where fuel supply is particularly limited for them – it may or may not be limited for others – they may have to buy on the spot market to meet their commitments at a hedge of 85% of average capacity let alone 100%.¹³

¹³ Their risk is more complex than this because it also depends upon the location of generation and hedges and the performance of the grid.

Further it should be noted that 100% hedging for all parties is impossible because some parties have to manage the intrinsic risk of demand and supply in the market. The more exposed parties are to the spot price, the stronger the incentive to plan other response measures to water and other fuel-supply shocks. It is to be expected that those better able to institute such responses will be those that choose to pay less for hedge contracts and are therefore relatively more exposed to risk.

Spot Market "Thinness"

With an already small spot electricity market, the depth of competition at nodes for future delivery of electricity becomes even more "thin"¹⁴ at a quickly increasing rate: hedge contracts of differing durations and locations are less homogeneous and hence less susceptible to competitive trading than spot electricity delivery at any node. Depending upon competition among the vertically integrated generators, it is possible that generators will enjoy some discretion over, even market power for, delivery of electricity at any given node at any given future date. Even in the centralised Australian national electricity market this remains an ongoing issue, with electricity futures markets of any depth slow to develop,¹⁵ although under the highly decentralised NETA active financial forward markets have emerged.¹⁶ What matters in an industry dominated by vertically integrated firms is the competition among them for customers: the shape and quantity of contracts (hedges) will reflect the generators' demand for hedge positions and the vigour of competition between them for customers.

Forced Hedging and De-Integration

In New Zealand the issue of thin hedge and other long-term contract markets was in the 1990s resolved by forcing the then-state-owned monopoly or duopoly generators to offer a fixed proportion of capacity via long-term contracts. This is once again being considered via the Electricity and Gas Industries Bill 2003, enacted in October 2004, among other things empowering the new Electricity Commission to require generators to offer a minimum proportion of their output via supply and other hedge contracts. Such measures, however, now arise in a vastly different context. Generation is now vertically integrated, with most generators having relatively low excess capacity or demand. Forcing generators to offer long-term contracts to parties other than their own customers might require them to access the wholesale market to meet their existing

¹⁴ In the financial market sense of having few buyers and sellers seeking to trade at each node for future delivery. This is to be contrasted with nodal instead of more aggregated (e.g. zonal) electricity pricing, which might suggest thin trading at each of the numerous nodes. However, the interconnected nature of electricity networks combined with Kirchhoff's laws means prices across nodes should be highly correlated (but for significant transmission constraints), a conclusion supported in the NZEM by Evans, Guthrie and Videbeck. (2003a).

¹⁵ Council of Australian Governments (2002).

¹⁶ Zhou *et al.* (2003) note that the OM London Exchange established the UK Power Exchange and an electricity futures market with the advent of NETA, followed soon after with a spot market. Two other independent exchanges also commenced operations, with the UK Automated Power Exchange offering a spot market and the International Petroleum Exchange a futures market.

customer requirements – increasing the exposure of those customers to any surges in wholesale prices such as during winter crises. Alternatively, it might force generators to at least partially de-integrate to ensure they are not over-committed.

The comparative advantage of generators vertically integrated with retailing in managing the risk of wholesale electricity price movements was introduced in Chapter 3. As discussed in Meade (2001), each provides a natural form of “self-hedge” to the other. Any policy or regulation that discourages such integration does so at the expense of this efficient means of risk management, begging the question as to what alternative measures might be required or even available to ensure customers are not exposed to dramatic increases in wholesale electricity prices (such as in winter crises). The difficulties that arise from inferior forms of retailing risk management could be observed in the 2001 winter power crisis (see Chapter 6) – even more so in the Californian power crisis (see Chapter 4) – with retailer bankruptcy either occurring or imminent. If gentailers were to de-integrate, then the need for mechanisms to contain flow-on financial distress and to ensure that retail customers continue to be supplied becomes all the greater.

A further complication is that any enforced offering of long-term contracts affects the operational policies and risk profiles of privately owned generators – risking the withholding or exit of capital from the industry should this interference prove excessive, or even the failure of these generators if they are unable to rebalance their commitments in an orderly manner (e.g. if they are caught by a winter crisis while still overcommitted). Greater long-term contracting is likely to benefit a few larger customers who reportedly experience difficulties in securing hedge contracts at prices they find attractive, and perhaps benefits new non-integrated retailers who might take advantage of customer sell-downs by over-committed integrated gentailers¹⁷ (possibly to the detriment of the smaller customers currently integrated into generation).

Importance of Transmission Constraints

More critical for the vulnerability of an electricity system to the effects of any generator-related market power, however, is the potential bottleneck represented by transmission constraints. It is because of such constraints that the standard measures of market power are inadequate and likely to be misleading.¹⁸ In short, where transmission capacity is scarce relative to likely demands, there is not only the potential for the electricity market to become fractionated or “regionalised” into smaller sub-markets with fewer

¹⁷ Any new non-integrated retailers would be mindful of the lessons of 1999 when integration restrictions on generators were lifted with the final break-up of ECNZ, resulting in the rapid retail dominance of integrated gentailers. Their survival will be dependent on the continuation of any policy of forcing generators to offer a certain proportion of their capacity via long-term contracts, exposing them to no small risk of regulatory u-turns.

¹⁸ The “textbook” measure of market power is the Herfindahl-Hirschmann Index (HHI), and this is discussed in detail in the section in this chapter on testing for market power. In any case, Arnold *et al.* (2003) note that many New Zealand industries are highly concentrated simply because of the size of the national economy.

generators available to vie for existing demands, but also the capacity for generators (and possibly even consumers) to use such constraints as points of leverage about which to gain advantage. In short, transmission constraints affect market power in generation and consumption; and participants can attempt to bring about transmission constraints in order to create it.¹⁹ Compounding these problems is the fact that grid operation is directed towards grid security and not towards mitigating the costs of market power borne by grid users: in effect, some grid users can have interests conflicting with those of other grid users who might be prepared to trade short-term supply security (both their own and that of others) to relieve the costs they bear of market power arising because of grid constraints.

Various authors have investigated the effects of transmission constraints and expansions on horizontal market power. Surveying multiple papers, and based on his own analysis, Leautier (2001) cites a consensus that generators are indeed able to exercise market power when transmission is congested, and that “rents” from congestion pass from grid owners to generators in consequence.²⁰

Indeed, Leautier argues that generators benefit from a reduction in grid capacity, and concurs with authors such as Borenstein, Bushnell and Stoft (1999) and Borenstein, Bushnell and Knittel (1999) who find that even small increases in grid capacity can result in significant reductions in generator market power and increases in consumer welfare. These results can arise even where little power actually flows over new grid capacity – with just the threat of competitive entry by other generators sufficient to constrain dominant generators within a transmission region. This conclusion warns against evaluating grid-investment proposals simply in terms of their anticipated throughput. To achieve the full benefits of generator competition, transmission capacity must be such that generators prefer to compete over a larger market than exercise market power in a constrained residual market. Other means to achieve the same or at least some of these results is to increase the price-responsiveness of electricity demand (i.e. flatter demand curves – the perennial and potentially two-edged goal – see Chapter 7) and/or increased generation. In the latter case the location of generation relative to demand is

¹⁹ Cardell *et al.* (1997) describe how market power in electricity networks need not involve firms restricting output to increase prices, but can extend to firms increasing output to invoke grid constraints and thereby “constraining off” a disproportionately greater share of competing generation.

²⁰ The “rents” referred to are the financial surpluses accruing to the grid owner as a consequence of the price separation that occurs between network nodes where electricity is injected and nodes where it is consumed, because of transmission constraints. A consequence of grid congestion is that cheaper generation in an exporting region upstream of the constraint becomes “constrained off” in favour of more expensive generation (if available) in the importing region downstream of the constraint. While some cheaper generation will still be supplied to the importing region from the exporting region (unless the constraint is complete), exporting generators receive the lower price while all of the demand met in the importing region faces the higher marginal price resulting from the constraint. In consequence, a surplus accrues to the grid owner. In New Zealand this rent is rebated by Transpower to distributors via lower grid fees, so Leautier’s analysis suggests it is distributors who would ultimately bear the consequences of any generator market power expropriating those rents.

critical, and the significantly higher fixed costs of new generation can militate against this approach in favour of grid expansion.

Is Market Power all Bad? – Static versus Dynamic Efficiency

Before shifting attention to market-power issues in transmission and distribution, some final thoughts regarding generator market power are warranted. The MSC has expressed the view that the NZEM was in 2001 tending towards oligopoly, with the result that generator market power should be expected to be exercised from time to time, and one market participant argued that this should be expected with an efficient vertically integrated generator requiring a customer base of at least 300,000 customers (in a total market of 1.5 million residential, 130,000 commercial and 100,000 industrial customers). The tests from the NZEM's perspective as to whether such market power was unacceptable related to whether such market power was transitory or prolonged, and the extent to which it was predictable.

The exercise of some market power *per se* was not proscribed under the NZEM because it can in fact be “dynamically efficient” – providing necessary pricing signals to encourage competitive entry and new investment, and thereby maximising consumer welfare over time – even if short-term prices can be apparently excessive.²¹ In supporting this view, the MSC noted that New Zealand electricity consumers are relatively immune to wholesale price surges during episodes of possible market power, and that NZEM wholesale prices were typically less than the long-run marginal cost of new generation (the level that prices should tend towards in a competitive market) – as supported by the analysis in Chapter 3. Indeed, perfect competition is not achievable for any part of the electricity system – retailing being the closest, but not serious, exception – given the sector's economies of scale, large and “sunk” fixed-costs, long-lived assets at risk of stranding, and only limited opportunities for bypass. As stated by Borenstein, Bushnell and Knittel (1999), in assessing the efficiency of any reformed industry it is not appropriate to contrast arrangements with the ideal of perfect competition, but rather with achievable alternative arrangements of varying degrees of imperfection. The costs of any market power in each case need to be weighed against the costs of market intervention.

²¹ Evans *et al.* (2003c) note the usual economic definitions of allocative and productive efficiency – respectively referring to the allocation of scarce resources to competing uses and the use of production processes minimising production costs, and also that of dynamic efficiency, referring to the efficiency of the framework for future decision-making. They note that the two former efficiency definitions relate to static measures of efficiency which can result in tradeoffs against dynamic efficiency. For example, in a statically efficient industry the operation of competition can be such that prices are driven to levels sufficiently low that no firm has incentive to innovate: “[i]n other words, under monopoly innovation occurs but at a lower pace than is socially optimal, whereas under [the ideal of] perfect competition there is none at all”. Such tradeoffs suggest rationales for the creation of monopoly rights such as trademarks and patent protections, assisting as they do the process of innovation that over time should be expected to benefit consumers. These authors conclude that the focus of public policy concerned with welfare maximisation should be on dynamic rather than static efficiency.

Market Power in Transmission

Transmission continues to be regarded as one of the more intractable examples of market power, both in the New Zealand electricity sector and overseas.²² Whereas the re-evaluation of electricity-sector thinking that spawned contemporary electricity reforms has recognised the potential for generation to be structured in a competitive fashion (however imperfectly), transmission continues to be regarded at best as a sleeping dog in need of a muzzle. Such a characterisation stems from transmission being considered a “natural monopoly” (as opposed to the legal or statutory monopoly created by, e.g., state ownership of all generation), for which the efficient scale of production is such that only one firm can feasibly service available demand. As for monopoly generation, monopoly transmission suggests an ability to restrict output to raise prices, or simply to raise prices and allow consumers to respond as best they can to reduce demand and mitigate some of the impact of higher prices. In an interconnected grid the ability to withdraw capacity can be as simple as flicking a switch, or as subtle as imposing unnecessarily stringent grid-security standards, resulting in grid congestion and constraints giving rise to congestion rentals enjoyed by the grid operator in the absence of other arrangements (such as their rebating to grid-connected companies via reduced grid charges, as is done in New Zealand, in order to render the grid owner financially neutral with respect to congestion charges).

It is not entirely accurate, however, to characterise transmission in such plain terms. While it is often argued that it is not economic to replicate the national grid, this does not mean transmission is immune from competitive forces. Just as generation must to some extent compete with alternative energy sources (if not among generators), transmission is vulnerable to bypass in discrete areas – whether by actual or threatened replication of discrete transmission lines and equipment (e.g. by distribution companies), or by situating new generation sufficiently close to load that it can directly connect with distribution companies (e.g. “distributed generation” embedded in distribution networks) – should transmission charges sufficiently increase. Indeed, electricity transmission competes with gas transmission pipelines (either for final consumption, or to locate gas-fired generation closer to load). Since such alternatives are typically costly and slow to implement (although gas pipelines enjoy resource consent advantages over transmission lines), the extent to which any threat or action is credible is constrained.²³

²² Here we concentrate on stand-alone transmission instead of transmission vertically integrated with generation and/or distribution, since electricity reform in New Zealand and typically elsewhere involves the separation of transmission from other market components. Leaving such “bottleneck” assets integrated with competitive activities in deregulated industries is more common in telecommunications, for which different regulatory issues arise. Structural separation involves a trade-off of economies of scale and scope – where integration allows for certain benefits not otherwise available – against the perceived benefits of market power reduction and competition enhancement.

²³ The main operator of New Zealand’s inter-island ferry, Tranz Rail, similarly relies on the ongoing threat of building its own southern ferry terminal to constrain charges on the locally owned terminal it currently uses at Picton. Planning consents and designs have been obtained, which maintain the threat’s credibility and simultaneously develop the option of carrying it out.

This affords transmission significant latitude in exercising any market power it might have, if there are no other constraints.

To the extent that the grid operator is not subject to market-based or other constraints on its use of any market power it possesses, the exercise of such market power has significant implications for the overall electricity system.²⁴ As discussed above, grid investment and operation are critical determinants of the overall competitive topology of an electricity sector. An unconstrained monopoly grid operator might wish to reduce or degrade capacity, or defer investment, to increase any congestion rents it receives. Alternatively, it might use its dominant position to impose unnecessarily stringent operating quality standards that constrain or deter bypass options. Furthermore, where a grid operator also has an interest in generation (i.e. is vertically integrated in the traditional mode), it can restrict economic access to competing generators wishing to wheel power to consumers across the grid (an issue resolved by separating generation from transmission, although at the cost of economies of scale and scope in coordination and investment that an integrated operator can enjoy). While any monopoly in transmission is not necessarily absolute, it can clearly be important.

Incentives for Efficient Grid Investment

An important issue in addressing transmission market power is creating appropriate incentives for either the incumbent grid owner or other potential grid investors to undertake efficient grid investments as and when they are required. In New Zealand an important step in at least providing the appropriate signals for new grid investment has been the adoption of nodal pricing, with differences in prices at nodes around the grid signalling the economic cost of transmission losses and congestion. However, grid owners are typically occupied by engineering issues such as operational security as much as they are with the economic costs of congestion.²⁵ In New Zealand, Transpower operates to the commonly used “N-1” grid security standard – meaning that “the lights should stay on” if any one major component in the network should fail. This is not the same thing as operating the grid to ensure the economic costs of losses and congestion are minimised, which would require an assessment of the relative costs and benefits to every grid user – over their respective operational lives – of supply security and price separation arising from losses and

²⁴ It should be noted that while Transpower owns the grid it operates it as a contestable service provider to the NZEM.

²⁵ Indeed, to the extent the grid owner benefits from congestion rents (Transpower does not) it should be more than happy with this focus: keep the lights on but make sure the present value of grid-connection fees, usage charges and congestion rents are maximised while minimising operating costs and the costs of investment. In reality the potential for such gains can instead substitute inefficiency, managerial slack and lacklustre profitability for outright profit maximisation, simultaneously making it harder to detect monopoly behaviour and reducing the risk of regulatory intervention.

BOX 9.1

NZEM: One Market or Many?

Determining the degree of market segmentation in the New Zealand Electricity Market (NZEM) is made particularly important by the difficulty in detecting abuses of market power (see Box 9.2). Existing empirical approaches used for market power analysis, like simulation and bidding analysis, rely on the accurate measurement of the marginal cost of generation. Unfortunately, calculating the marginal cost is extremely difficult in the NZEM because of the high proportion of hydro-electric generation. This inability to detect non-competitive behaviour makes it all the more important that the market is conducive to competition. Given the number of firms in a pool market, competition is maximised if there are no transmission constraints or other phenomena that segment the market. This ensures that every firm competes with every other firm, which lessens the chances that market power can be exercised. Conversely, if the market becomes segmented, decreased competition may result, owing to the diminished market contestability and the consequent increase in concentration of ownership and control.²⁶

By design, the price at every node in a perfectly integrated pool with no losses or constraints would be equal. The existence of constraints and losses will cause the market to segment and prices at different nodes to separate, hence the extent of integration is indicated by the extent to which prices at different nodes change together (i.e. if the market were integrated one would expect prices at different nodes to be strongly positively correlated, and lower correlations to be found if the market were segmented). Evans, Guthrie and Videbeck (2003a) use this insight, together with a statistical technique called factor analysis, to examine the degree of market integration present in the NZEM. The study looks at seven nodes throughout the NZEM and finds that all prices were frequently driven by a single factor, strongly suggesting that prices are highly correlated and that the market is usually integrated (notwithstanding evidence that the NZEM does segment from time to time). When such segmentation occurs, it is generally along North-South lines with the precise location of the split varying with the time of day. Such market segmentation usually occurs during periods of stress, such as peak periods or droughts. However, the study also suggests that the overall economic significance of such segmentation occurrences is small compared with the actual price, implying that firms in the NZEM are usually forced to compete with all other firms, an outcome which makes it difficult for firms to exercise unilateral market power.

²⁶ Even a segmented market may have sufficient competition amongst generators to achieve competitive outcomes; conversely even a fully integrated market can have market power issues (such as might arise from coordination). Nonetheless, an integrated market is always more conducive to competition, as a constrained solution cannot be more competitive than the associated unconstrained one.

congestion.²⁷ Clearly the informational requirements this imposes on a grid operator would in general be prohibitive, which argues for a market-based mechanism to allow the required trade-offs to be made by all market participants simultaneously, or at least some mechanism whereby the trade-offs are internalised by the parties making them (both discussed below) as opposed to the grid operator: it might be the “N-1” security rule of thumb, but it may not.

A difficulty with grid expansions undertaken by parties other than the existing grid operator is that they need not be efficient. As noted above, generators can prefer congestion as it enables the limitation of power flows from competing generators. The physics of electricity networks means it is possible to actually decrease transmission capacity by installing weak transmission capacity across some part of the network.²⁸ As such, it is important that inefficient investments of that type be prevented, or preferably that generator incentive for such investments be curtailed. Another difficulty is that any party investing in an efficient grid expansion cannot control the benefits from that investment, as other grid users will also enjoy the reduced congestion costs. Such “free-riding” can arise to the extent that the very constraints relieved by the new investment are re-introduced by other grid users increasing their throughput over the grid, meaning overall welfare is increased but the investing party might be left with insufficient net benefit to justify their investment.²⁹

A possible solution to either of these complications involves the use of tradable financial instruments such as transmission congestion contracts (TCCs) or financial transmission rights (FTRs).³⁰ Defining a hedge over nodal price differences that measure the cost of grid congestion, such instruments protect their owners against price separation across network nodes.³¹ If grid expansions are undertaken by parties other than the grid owner, then by offering such parties an FTR or TCC they are at least partially compensated for any nodal price separation arising from the reintroduction of congestion by other parties free-riding on the extra grid capacity. Alternatively they can be forced to accept such a contract to ensure they bear at least some of the cost of any inefficient grid expansion. Indeed, as surveyed and discussed in Evans and Meade (2001), FTRs can act either to discourage or encourage the use of market power by generators (or consumers), depending on the circumstances. For example, generators (or consumers) already enjoying market power who then acquire FTRs can find themselves with an

²⁷ An example of such tradeoffs being made is when Transpower relaxes its grid-security standard to alleviate tight supply conditions during winter demand peaks.

²⁸ Hogan (1999) gives the simple but illustrative example of a low-rated line being installed in parallel with an existing one-line network, reducing the overall flows possible since the maximum flow then possible is that across the weaker line.

²⁹ For a general discussion of network externalities see, for example, Liebowitz and Margolis (1994).

³⁰ An alternative, physical solution might be to separate AC networks into smaller AC sub-networks interconnected with DC connections – see Chapter 10.

³¹ A discussion of TCCs and FTRs can be found in Hogan (1999), or Stoft (2002), with an analysis of the FTRs proposed by Transpower given in Evans and Meade (2001).

additional means to exploit that power.³² Although they have limitations, an advantage of such instruments is that they create property rights whose value reflects the costs of grid congestion, and therefore represent a market-based means of signalling the need for, and providing incentives to encourage, grid expansions where they are most required (in economic rather than engineering terms).

Market Power in Distribution

If market power is gaming's big ugly step-sister, distribution is transmission's irksome little brother. Like transmission, distribution (i.e. local lines operators) exhibits features of natural monopoly – with typically prohibitive replication costs, limited competition and possibilities of bypass from either adjoining network operators or self-generation; and with opportunities for strategic network access pricing to foreclose competition where distribution is combined with retailing or generation. At a more functional level distribution operators can foreclose competition by other retailers by not facilitating customer changeovers, imposing prohibitive (or stalling on posting) conditions which restrict competitor access through their networks, or using monopoly rents from distribution to cross-subsidise retail customers at risk of switching to competitors.³³ In New Zealand a number of these issues have been resolved by imposing prohibitions on lines owners also owning competitive activities such as retailing. There are also limitations on lines operators' involvement in generation, although recent reforms have allowed for greater involvement in distributed generation, particularly renewables-based generation.

Market Power in Retailing?

It seems perverse to be discussing market power in retailing given that the thrust of electricity-sector reforms in New Zealand and elsewhere are intended to facilitate competition in sub-sectors now regarded as amenable to competition, typically taken to mean generation and retailing. While there are economies of scale in generation that can limit the number of competing generators possible in any given market, such barriers to competitive entry are not intrinsic to energy retailing – which is no more or less complicated than many other forms of commodity trading for which it would not normally be suggested that market power can arise.³⁴ Certainly market power enjoyed by retailers to the benefit of electricity consumers would not normally hit the headlines or perturb regulators and politicians.

³² For example, a generator in an importing region who already benefits from congesting transmission to block competing generation from exporting regions would derive additional benefit from owning an FTR that hedges against price separation between the exporting and importing regions. Consumers in an exporting region face a similar incentive – the obvious example being South Island consumers, who benefit from an improved supply/demand balance when the HVDC link between the North and South Islands is constrained.

³³ See, for example, Reichmann (2000).

³⁴ Indeed, as discussed in Chapter 5, early evidence in Boshier and Gordon (1996) on the experience of energy retailers prior to vertical integration showed little or no margin being enjoyed, in no small part because they all faced common wholesale supply costs. Even with vertical integration, 2004 analysis by the Ministry of Economic Development suggested any increasing trend in retail margins was now broken.

For completeness, however, it must be acknowledged that market power issues can arise in retailing for possibly two reasons. The first, being artificial (and in reforming industries only transitory), relates to the presence of statutory franchise areas in which retail competition is precluded by law. The second, discussed earlier, is that the gaming of market rules is not the exclusive preserve of generators. With uniform-price auctions, for example, it is possible for demand-side collusion to reduce wholesale electricity prices, as was found by the England and Wales regulator to have occurred before the pool was replaced by NETA, or for day-ahead and real-time markets to be gamed by purchasers as was suggested during the California power crises.³⁵ While such manipulative behaviour benefits consumers in the short-run, in dynamic-efficiency terms it may reduce welfare by discouraging or at least deferring any required investment in new generation.

More so in other reforming countries where generators face limitations on their involvement in retailing,³⁶ the widespread integration of New Zealand generation and retailing might now be regarded as a manifestation of market power in retailing, if only by association. Indeed, the extent of generator and retailer integration in New Zealand is such that it can be argued that stand-alone energy retailing is not a viable business model (if it was even before vertical integration), not least because of generators' comparative advantage in managing the risks of changing wholesale electricity prices and transaction-cost advantages in delivering energy. With generators effectively hedging a significant share of their output by owning customer bases on relatively fixed price contracts (or at least prices slow to adjust to overall wholesale price levels), they have little electricity to offer competing retail-specific firms through the spot market or via long-term contracts – and such competitors would be vulnerable to any significant price movements in either. This is not to say that retailing is not competitive, since most consumers in New Zealand have access to at least two “gentailers” from which to purchase electricity, but the regionalisation of generation and load resulting from vertical integration once again highlights the importance of transmission constraints across regions in defining the scope and likely course of effective retail-level competition.

Testing for Market Power

Before turning to questions of regulation, it is worth quickly discussing testing for market power. As with any test, failing to find evidence of market power is not evidence that it does not exist. Furthermore, tests that do identify market power might be mis-specified or poorly applied. False negatives are a risk, but so too are false positives: the former can result in undesirable conduct going unchecked, while the latter can give rise to inappropriate interventions with associated costs and distortions. In either case it is important to recognise the trade-offs between static and dynamic efficiency – any useful test for market power should consider forward-looking inter-temporal effects as much as static phenomena.

³⁵ See Michaels (2003) and response by Counsell and Evans (2003).

³⁶ Indeed, generators in England and Wales enjoyed increased access to regional electricity companies (RECs) partly by historical accident, as regulator-enforced generation sell-downs to encourage greater generator competition permitted REC acquisitions of generation, thereby conceding the principle.

A “textbook” approach to indentifying market power would focus on the extent to which prices diverge from marginal production costs, since the economic model of competition predicts that they should converge (certainly in the long run). The difficulty faced in implementing such measures is that while prices are observable, production costs are not (often even to the firm itself). Static measures such as the Herfindahl-Hirschmann Index (HHI) of market share concentration are more easily calculated, even though they bravely rely on market concentration correlating with excessive pricing and cannot capture the subtleties of market-participant behaviour (let alone transmission congestion). At the economic returns level, the profits – or more properly the cash flows – of firms suspected of having market power might be examined to gauge whether they are enjoying returns greater than those justified in risk-return terms.³⁷ Like industry concentration measures, these too are not especially reliable: highly competitive industries can include firms that, temporarily at least, enjoy periods of profitability greater than that required by investors to compensate for risk; and the assessment is only meaningful over the life of the firm’s operations, during which time significant “unders” and “overs” should be expected.

A more sophisticated approach to measuring market power – once again bedevilled by the problems of accurately estimating production costs but enjoying the benefits of being prospective and able to accommodate behavioural and strategic interactions – involves game-theoretic simulation models. Finding increasing application in electricity-industry research and evaluation, they attempt to model any divergence between prices and production costs over some forecast horizon based on assumed market-participant behaviour, industry structure, fuel costs, demand growth, location, etc. While conceptually superior to static measures, they too are vulnerable to mis-specification (not least in the New Zealand context because marginal production costs of electricity can vary considerably with the changing scarcity value of water). Typically they are unable to replicate the numerous complexities of even an existing electricity system – importantly, the complex dynamic optimisation represented by any electricity operation – let alone accurately foretell changes in industry structure, demand growth, weather patterns, fuel costs, or industry-participant strategies. Most of these influences will evolve with varying degrees of unpredictability, and might also involve elements of “learning” which a modeller will struggle to accommodate. A survey of this and other methods is given in Evans, Guthrie and Videbeck (2003b). They conclude that measuring market power in electricity markets remains a fraught exercise because the marginal cost of water is both hard to measure and inherently volatile, and also because of the oligopoly structure of generation with its attendant game-theoretic considerations.

³⁷ In other words, whether such firms are earning a rate of return commensurate with the riskiness of their activities when compared with firms of similar risk, based on normative economic models of return such as the capital asset pricing model, and assuming that risk and return are the relevant objects of investor choice (*a la* Markowitz portfolio theory).

BOX 9.2

Some Approaches to Measuring Market Power ...

The difficulty in detecting non-competitive behaviour in electricity markets is often underestimated. For example, to many commentators, the sight of markedly higher wholesale electricity spot prices implies that prices are not competitive and that generators must be abusing market power. Some even see it as conclusive proof that deregulation has failed. The reasoning behind this is incorrect: although high prices are a recognised symptom of market power, their mere existence does not establish that market power is being exercised. Indeed, high prices may be indicative of a well-performing competitive market distributing a scarce resource efficiently and thus providing a reliable signal for current management and future investment. Even the high profit of an individual generator is not proof of its abuse of market power – high profits could result from a number of other factors, including superior generation efficiency (something a competitive market seeks to promote, not deter), temporary profits because of transitory circumstances, and profits that are required to meet the fixed cost of generation plant. The challenge is to distinguish between high prices and/or profits that are caused by the abuse of market power and those relating to normal market operation: it is not normal to observe zero profits in any market, particularly those that have only a few large firms and sunk costs, which is the case for electricity worldwide.

A number of empirical approaches, including direct and bidding analysis, have been developed to measure the unilateral exercise of market power, or more generally any inefficiencies, in electricity markets. It is important to note that both these approaches do not directly investigate the abuse of market power. Market power can be viewed on a continuum from perfect competition (unattainable ideal), to tolerable levels of unilateral market power (which are present in most industries), to the abuse of market power (which is to be avoided). When exactly the unilateral exercise of market power becomes an abuse of market power is a matter for continued debate. Indeed it is often contingent on the finding of intent.

Direct analysis (Wolfram (1999a), Borenstein *et al.* (2002), Joskow and Kahn (2002)) attempts to find the marginal cost of production of the price-setting generator for each trading period by building a hypothetical competitive market. It then compares these simulated “perfectly competitive” market prices (the theoretical ideal price) with the observed actual market prices. The more actual market prices exceed the estimated competitive prices, the more this points to market inefficiencies and the potential exercise of market power.

Bidding analysis (Wolfram (1998), Joskow and Kahn (2002)) takes a similar approach to that of direct analysis, except that it focuses on individual generators’ pricing/generation decisions. It does this by estimating the supply curve of

box continues ...

BOX 9.2 CONT'D

... Some Approaches to Measuring Market Power

individual generators to see whether or not generators offer electricity at prices that exceed marginal cost or, equivalently, whether they do not offer in all the electricity that they could profitably generate.

Unfortunately the suitability of both direct and bidding analysis is questionable in any market because of the major difficulties surrounding the measurement of the marginal cost of reservoir generation, which includes the hydro-electric generation that provides approximately 60-70% of New Zealand's generation capacity; it is also relevant to gas-turbine generation (which contributes another 20%) when reserves are limited (see Box 3.2). In addition, direct analysis reduces the market into a single location – a simplification that could underestimate the simulated competitive price by ignoring inter-nodal constraints and transmission losses (see Box 9.1). Such uncertainty about the accuracy of the marginal cost estimates raises concerns that these approaches make it easy to misinterpret benign market events as the unilateral exercise of market power.

Source: Based on Videbeck (2004).

It is also useful to consider the anecdotal measure of market power receiving most attention in the public domain, namely episodes of dramatic increases in wholesale electricity prices. This has been especially contentious since the advent of the NZEM in October 1996 – particularly when wholesale prices rose significantly during the 2001 winter electricity crisis, when a winter crisis appeared imminent in early 2003 but failed to materialise, and when the HVDC link between the North and South Islands is sometimes lost owing to planned or unforeseen outages (as discussed in Chapter 6). In all such events commentators are quick to decry major price increases as a sign of market failure and/or market power abuse by generators, questioning how such high prices can be justified on grounds of production cost.³⁸ As noted by the MSC in NZEM (2001), such price surges are explicable and not inherently unreasonable. When short-term supply and demand – both relatively price-inelastic – are in close balance, for example because hydro reserves are scarce while demands are seasonally rising, even a small disturbance to that balance can result in markedly higher prices. This is not just an artefact of the NZEM pricing and dispatch model, but a reflection of the underlying economic fundamentals that to maintain balance between supply and demand it can be necessary to significantly increase prices (e.g. to induce interruptible load). The only reason a high market price results is because there are consumers willing to pay it.

³⁸ Curiously these cost-based arguments were not repeated when wholesale electricity prices fell almost to zero in March 2004 as a result of a hydro reserves being 134% of average – see “Megawatts Megacheap After Floods”, *New Zealand Herald*, 12 March 2004.

It might be argued that, in situations such as winter crises, generators unnecessarily withhold capacity in order to exacerbate this effect. However, the MSC has noted the “value to waiting” accruing to generators with scarce hydro (or other fuel) reserves in a period of tight supply and strong demand. In such cases, generators must manage their fuel stocks to optimally outlast the crisis period. They would receive little thanks if they committed all their reserves to early demands only to find they could not service later ones, in which case even higher wholesale prices should be expected. This value to waiting derives from the generators’ ability to better gauge hydro inflow, demand (weather-related and otherwise) and other uncertainties – and is an increasing function of such uncertainties. In the longer term, electricity prices should be expected to tend towards the long-run marginal costs of new generation; and to the extent that such prices exceed those levels – and the NZEM experience to date is that typically they do not – this would provide a greater indication of market power or some other form of failure.³⁹

It is instructive to note that fresh vegetable prices soared in the lower North Island following summer storms and widespread flooding in February 2004. In some cases vegetable prices rose by 200%, which too might be said to represent an inappropriate divergence of prices from production costs.⁴⁰ The chief executive of the New Zealand Consumers’ Institute was reported to have said that nothing could be done about the situation, and that “supply and demand is a basic economic principle and, of course, the consumer is going to suffer”.⁴¹ Should wholesale power price rises be regarded any differently, particularly when most electricity users are insulated from their effects?

REGULATION

Nature and Motivation

In plain terms regulation involves the control of some sphere of activity. As such it can encompass decentralised self-regulation as well as the centralised imposition of controls by an external party or parties. In the current context it refers to how the behaviour of electricity industry participants is controlled, whether to positive ends or to constrain undesirable behaviours. While it can encompass regulation defined

³⁹ This discussion highlights an important issue, namely the extent to which spot electricity prices are arguably “overworked” in the absence of liquid forward electricity, water, gas and other electricity fuel markets. Should those other markets be in place, forward prices would more naturally indicate anticipated future supply conditions, but in their absence current spot prices are the best available guide.

⁴⁰ Don’t even try to do the maths for a car park behind Harrods in London being offered for £100,000 (*The Dominion Post*, 26 February 2004), or the New Zealand embassy in Tokyo selling its tennis court for more than NZ \$300 million.

⁴¹ “Storms Send Vege Prices Rocketing”, *The Dominion Post*, 26 February 2004.

by market participants in the form of, for example, self-determined market rules,⁴² more commonly it refers to monitoring and control mechanisms imposed by a central regulatory agency to restrain or penalise industry conduct or performance deemed to be undesirable.

As noted by Steiner (2001), regulation in the electricity sector and elsewhere is typically motivated by concerns arising from the presence of natural monopolies, externalities and “public goods”. It is intended to substitute for competition where such competition does not otherwise arise. Natural monopoly issues as they arise in transmission and distribution have been discussed earlier in this chapter. So too has the issue of externalities, meaning the effects experienced by some parties as a consequence of the actions of others, in the context of network interdependencies also characterising transmission, and, to a lesser extent, distribution. Public-good issues (my consumption of the good does not preclude yours), non-excludability (everyone can consume the good), and impossibility of rejection (consumers can’t opt out of consuming the good) also apply to grids and networks.⁴³ On the face of it transmission and distribution are obvious targets for regulation.

Purpose

Having said this, important questions remain. What is the purpose of regulation? More specifically, what is the evil to be avoided? More tellingly, are the costs of regulation – the direct costs of its imposition as well as the fundamentally more important costs of the economic distortions they can create – more or less than the costs they seek to reduce? And is the process of regulation, as well as the method, likely to be effective or counter-productive?

As to the first two of these questions, the answer is typically the avoidance of the distortions and welfare losses associated with the exercise of market power. In generation this is taken to refer to gaming (which we have distinguished from market power *per se*), and at worst it includes collusion. In addition, regulators may consider outcome-based measures such as electricity prices or profits (or increases in either) as inappropriate in some sense. In transmission and distribution it not only refers to excessive prices or profits (or increases therein) but also to the use of pricing or other devices to limit competition across grids or local networks. In retailing it less commonly refers to price gouging (except where franchise areas are still in place) or

⁴² Prior to the Electricity Commission taking responsibility for NZEM governance on 1 March 2004, the NZEM was remarkable for having industry-determined market rules, as well as voluntary agreement by NZEM participants to subject the enforcement of market rules to a market surveillance committee comprised of independent, non-industry members – see Arnold and Evans (2001).

⁴³ This grid characteristic, and that of externalities, is at least partially or imperfectly resolvable by the creation of transmission property rights such as TCCs or FTRs, or through separation of AC networks into smaller AC sub-networks interconnected via DC links. The problem with public goods is that everybody wants them (or cannot be excluded from consuming them), but it is difficult to price them and elicit payment for them. Creating private property rights over public goods, where feasible, is the natural remedy – the “missing market” justification for deeming goods “public” simply begs the question.

market power exercised by consumers (which is typically seen as a lesser evil than that exercised by generators). In New Zealand it increasingly refers to actions (or inactions) by “gentailers” that some may regard as structural obstacles to entry by competing retailers, and also as having undue scope to influence electricity prices available to larger customers (through either the spot market or long-term contracts).

Some Theories of Regulation

A review of the theories of regulation is well beyond the scope of this work, but a few broad summaries are presented for context.⁴⁴ Dnes *et al.* (1998) characterise regulatory theories as falling into three camps: the “public interest” approach of Demsetz, the “private interest” approach of Weyman-Jones *et al.*, and the “mixed” view of Posner *et al.* The former follows traditional welfare economics and sees regulatory intervention by an impartial (and wise) government as a means to maximise social welfare in the face of natural monopoly. The second sees regulation as a means to balance competing private interests (e.g. as between a private monopolist and others), giving rise to the “regulatory capture” theory of Stigler *et al.* in which vote-maximising governments allow regulation (or even legislation) to be swayed by lobbies and other interest groups of varying shades. The final view suggests regulation should be seen as benefiting some at the expense of others, representing a mechanism of redistribution. Evans (1998) adds to the redistributive view by noting how regulation is often a mechanism for government to direct industries towards social ends, such as “universal service” in telephony.

Applying the “event-study” methodology from financial economics⁴⁵ to assess the impact on regional electricity companies (RECs) of regulatory interventions in the England and Wales electricity system between 1990 and 1995, Dnes *et al.* (1998) find an overall pattern of positive abnormal returns to RECs from regulatory announcement. They hesitate to regard this as regulatory capture; rather they attribute it to settings that were more favourable than expected. As noted in Chapter 4, REC regulation in the earlier period of the England and Wales reforms was regarded as possibly being too tentative, which is consistent with these findings, and was followed by a period of more aggressive regulated price reductions (for both distribution and, where still subject to franchise area monopolies, retailing). Interestingly, these researchers document adverse REC share price reactions in response to controversial regulatory interventions, indicating the potential for regulation to adversely affect the value of distribution investments whether intentionally or not.

⁴⁴ Appendix 9.1 provides a comparison of the leading regulatory alternatives, and discusses their respective merits and shortcomings.

⁴⁵ Event-studies examine the share price reaction of companies to the announcement of “events” of interest to gauge whether shareholders in such companies regard the events as adding to or detracting from the long-term value of their investments. The reactions are measured by “abnormal” returns – positive or negative – calculated by subtracting from observed price movements an allowance for risk-adjusted share price movements occurring at the same time. In this way the company-specific impact of the event can be distinguished from other relevant market-wide events.

Crew and Kleindorfer (2002) ascribe to the redistributive/regulatory capture view of regulation, with a monopolist's excess profits being reallocated by some process to others, noting that the impetus for deregulation has been in part born of economists and wider society becoming "more sceptical about the Nirvana view of government". While suggesting this motivates a shift away from the public-interest approach, they note this does not mean that deregulation (or reforms tilted in favour of market mechanisms and less government involvement) will be free of private-interest considerations – what might be termed "reform capture". Deregulation, they argue, will remain redistributive and hence the subject of ongoing private-interest influence, with producers seeking reform gains at the expense of consumers, and large consumers seeking to gain at the expense of the small. Such cynical characterisations bear scrutiny given the recent Californian reform experience (e.g. utilities being compensated via electricity prices for stranded costs in a supposedly deregulated context). In any case it should be clear that regulation is commonly regarded as something other than a pure process motivated simply by maximising overall welfare. It arises in a political context that has the potential to create significant economic distortions if it is poorly motivated, designed and implemented.

Regulatory Approaches

As mentioned above, regulation can range from rules self-imposed by industry (which might be competitive or anti-competitive in effect) through to those imposed by some external – usually government – agency (which similarly can be of varying competitive effect).⁴⁶ Focusing on the latter, Armstrong *et al.* (1996) suggest four possible approaches: (1) the regulator determining how a regulated entity (e.g. grid operator) will set its supply price, terms and conditions; (2) the regulator offering the entity a range of regulatory schemes from which it chooses one; (3) the entity being subjected to some overall regulatory constraint (such as capped revenue growth) but otherwise being allowed to set its price, terms and conditions; and (4) the entity being subject only to general competition law (i.e. no industry-specific legislation).

The latter is an example of "light-handed" regulation that has characterised the approach in New Zealand for most of the past two decades – since the advent of the Commerce Act 1986. Evans (1998) characterises this approach as one in which government establishes a property rights and competition law framework, but otherwise relies on self-regulation by industry on the strength of the threat of competitive entry to rectify any incumbents' misbehaviour. As a last resort government retains the ability to intervene more heavily should self-regulation be seen to be inadequate – but by keeping this power in reserve it reduces any distortion created by explicit regulation, albeit with some loss of regulatory

⁴⁶ As noted in Chapter 4, US rate-of-return regulation in the early 1900s can be regarded as an attempt to constrain competition rather than abuse of market power. Various industries often call for regulation (such as entry standards for medical practitioners) which on the face of it appear well motivated by concerns for (e.g.) public safety or the needs for quality standards – but which in effect raise entry barriers that stifle competition and/or increase the market power of those satisfying the regulations (and for these and other reasons can even be self-defeating).

credibility. Evans, too, lays out a succession of regulatory options, from government recognition of self-regulation by industry and “heavy-handed” regulation of private operators through to direct government provision (and hence ownership of the means of production, often in the form of state-owned monopolies). While Vogelsang (2002) describes New Zealand’s approach of the past twenty years as representing “total deregulation” at the “most extreme” end of the regulatory scale, in reality deregulation has been mixed in character, with aspects of all four approaches evident throughout its course. Indeed, more recent initiatives see it moving squarely in the direction of heavy-handed regulation combined with a high level of state ownership (and with increased vertical integration since 1999).

As noted in Chapter 5, light-handed regulation of transmission and distribution in New Zealand has been based around mandated disclosures of network operators’ returns and “optimised” assets only, calculated using the so-called optimised deprival value (ODV) methodology. Where network operator returns are revealed to exceed a “fair” return based on the returns expected of businesses with similar risk characteristics, it was intended under the light-handed approach that pressure from consumers and others, backed by the threat of activating price control provisions latent in the Commerce Act 1986, would be sufficient to deter over-pricing. In reality the regime shared some of the failings of more explicit rate-of-return regulation – with some constrained incentives for cost efficiencies, and generally an inability to reveal excessive pricing and/or inefficient operations.

OWNERSHIP REFORM – THE NEGLECTED REGULATORY COMPONENT?

State Ownership as a Defence against Market Power

Electricity reformers in New Zealand and elsewhere have long been aware of the potential efficacy of ownership as a means of reducing market power or mitigating its effects. For many years state ownership of monopolies has been regarded as a suitable hedge against price gouging, with “society” apparently reaping any of the ill-gotten benefits, particularly where state ownership was seen as permitting objectives other than profit-making. Increasingly it is recognised that this model instead includes incentives for waste, conflicting objectives, undue influence by particular political interests, and income redistribution from consumers to taxpayers in ways that distort consumption, investment and employment patterns (relative to desirable and achievable alternatives). It also presents an obstacle to industry innovation by deterring the entry of new operators, thereby leaving taxpayers as owners with the risks of any new investment and changes in technology.

Profit Motive Aids Regulation

This is not the place to review the often-times controversial issue of government ownership versus ownership by the public by means of holdings of (listed) equity. Nevertheless, the efficacy of regulation and, most would argue, the performance of the industry is significantly

affected by ownership and so it behoves some discussion.⁴⁷ Protagonists in any debate will generally agree that, in an economy enforcing property rights, publicly held corporations are more single-minded in their pursuit of profit over time than are government-owned entities. Willig (1993) argues that for this reason the objective of publicly held firms is better defined and known and hence the response of the firm to regulation is better understood by any regulator. As a consequence, more effective regulation can be designed for publicly held firms than for government-owned firms. In addition, competition among and for publicly held firms is on a different plane from that of government-owned entities: the ability to compete for ownership is one material dimension of competition that is relevant for performance and is missing in government-held entities.⁴⁸ The ownership by the public of shares in a government-controlled entity is a sort of halfway house that affects a firm's choice of and focus on objectives, and increases the extent of information disclosure and monitoring of its activities.

Ownership Reforms to Date

In the context of the contemporary reforms, ongoing state ownership of most generation and all of transmission in New Zealand has been a political default rather than deliberate policy instrument. Ownership reform at the community and even private level, namely that of combined distributor/retailers, was recognised as being potentially inimical to retail-level competition and private investment in generation. It was for this reason that government imposed ownership restrictions in 1999 preventing lines owners from also owning competitive activities such as retailing (and all but a small amount of generation). By such ownership and legal-form separations (i.e. the separation of transmission from generation), New Zealand has adopted some of the more potent means of eliminating or at least mitigating various manifestations of market power. Indeed, it has done so at the cost of economies of scale and scope that continued integration can bring – and at the risk of creating property-right insecurities that prejudice long-term investment returns. It has judged that the competitive gains outweigh these costs.

As identified earlier, the vertical integration of generation and retailing occurring since 1999 potentially represents an obstacle to further competitive entry by retail-specific firms, but any move to impose requirements on generators to offer portions of their capacity via long-term contracts may – for better or worse – put retail business back in play. More problematical, however, is the relative entrenchment in lines-company ownership that has resulted from the reforms. Given local authority ownership of lines companies for many decades, it was perhaps inevitable that parochial interests would present an obstacle to rationalisation in a sector that remains over-populated despite having halved in number since the reforms began

⁴⁷ The recent comprehensive OECD (2003) review of privatisation reports that “[o]ne of the most important policy objectives of privatisation is to improve the efficiency and performance of companies. Despite the difficulties with data and methodologies there is overwhelming support for the notion that privatisation brings about a significant increase in the profitability, real output, and efficiency of privatised companies. The results on improved efficiency are particularly robust when the firm operates in a competitive market, and that deregulation speeds up convergence to private sector levels”.

⁴⁸ For commentary on these issues and Willig's (1993) proposition see Evans (1999).

in 1987.⁴⁹ Following the ownership reforms imposed with the 1999 separation of distribution and retailing, 27 out of 28 lines operators have some degree of community- or customer-trust and/or local-authority ownership – 20 are wholly trust-owned, one is a customer cooperative, and public ownership arises in just two companies.⁵⁰ On the enforced split of lines and energy in 1999, most retail (energy) companies were sold and the lines element of the business retained in some form of trust or local government ownership.

Community or Consumer Ownership of Distribution

Community ownership of local lines businesses replicates the central-government ownership of monopolies and thereby provides a measure of protection against monopoly pricing. If the lines company overcharges its customers, to some extent the customers will enjoy the benefits from those excess profits in other ways. Indeed, because the interests of communities that own local lines companies should be more closely aligned with their representatives than central government's will be with those of all electricity users, local ownership represents a potential efficiency gain over central-government ownership.

Cooperative and consumer-trust ownership – where distribution company profit payouts are rebated or otherwise largely distributed directly to electricity customers – may represent a relatively more efficient form of ownership in the face of monopoly profits.⁵¹ In these cases there should be a material correlation between excess prices borne from monopoly lines pricing and compensatory rebates to mitigate their effects, and those with the greatest interest in efficient investments have incentives to involve themselves in the investment process.⁵² In all other cases of community ownership no such correlation can be assumed, and hence the mitigating effects of local/community ownership are likely to be highly attenuated, to the point of being ineffective,⁵³ unless it is to use lines company profits as alternatives to local

⁴⁹ New Zealand has 28 lines operators in a country the size of the United Kingdom (which has 12), but with only 7% of the population. Similarly, the Australian state of Victoria has just five distribution companies, a fraction of the number pre-reform. Based on operating cost data from the 1980s cited in Evans (1998), and operating data in PricewaterhouseCoopers (2003), only four distribution companies out of 60 (i.e. 7%) were of sufficient scale to enjoy lowest-possible operating costs before the reforms; in 2003 that figure had risen to only five out of 28 (i.e. 18%). While such an analysis can obscure very real reasons for differences in lines-company configurations, it can still be suggested that in many cases operating efficiencies in distribution remain to be achieved.

⁵⁰ Section 38 of the Electricity Industry Reform Act 1998 defines customer trusts as trusts whose income beneficiaries substantially comprise persons identified by reference to various measures of electricity usage, and community trusts as those whose income beneficiaries substantially comprise persons identified with a particular locale.

⁵¹ In this regard the extension of the option for lines businesses to be cooperatively owned under the Electricity Industry Reform Amendment Act 2001 is to be welcomed.

⁵² Questions of governance become especially important. If cooperative or customer-trust governance can be hijacked by interest groups, then distribution rules can be distorted or investments undertaken in the interests of some when others are more warranted. In this regard the Electricity Amendment Act 2001's provisions for improving trust governance are both long overdue and a step in the right direction. Another possibility is to allow for a significant level (i.e. around one-third to one-half) of private ownership of lines businesses, as a means of imposing capital-market-governance disciplines on their management. While this compromises the anti-market-power hedge created through exclusive customer ownership, it does so to the benefit of improved governance. An additional measure could be to outsource physical network management as a means to secure operational efficiencies as well as to simplify performance measurement and contracting.

⁵³ If you use a lot of electricity, then you'd better swim at a local aquatic centre or play on a local sports team.

authority rates. It is perhaps for this reason that political attention continues to be paid to lines company pricing through the Ministry of Economic Development and New Zealand's price-regulatory body, the Commerce Commission, despite the fact that the communities they are apparently inclined to overcharge are their owners.

The purpose and effect of such regulation is quite unclear since it seeks to do what the ownership structure – in many instances – is designed to do. And where ownership is not designed to mitigate market power, it is attempting to regulate in the presence of multiple objectives, in which case Willig's theorem applies (i.e. profit-motivated firms are easier to regulate than other organisations because their objective functions are more easily specified). In New Zealand the value of community investments in lines companies faces the prospect of erosion by unnecessary regulation, or even increased risk of bankruptcy (not least because trusts are constrained in their ability to raise new equity as required). In that case electricity consumers not only fail to enjoy the mitigating effects of ownership on monopoly, but the value of their community asset is potentially reduced by regulation. Presumably it is for these reasons that the majority of cooperative distribution companies in the USA and Canada are exempt from such regulation.⁵⁴ Meade (2005b) argues that the regulation of customer-owned monopolies is inferior to unregulated customer ownership, and that even unregulated non-customer ownership is possibly also superior.

Ownership of Transpower can be Bettered

Finally, similar reasoning suggests that the current ownership structure of Transpower is not as efficient as it might be. At present it is 100% state-owned, and required to earn a commercial rate of return on its network ODV subject to efficiency and other objectives. Both of these features represent a far from necessary or sufficient solution to the problem of monopoly transmission. Transpower's pricing has been subject to the oversight of the Commerce Commission, despite the company's absence of a profit-maximising objective, and with the recent transfer of Transpower's pricing and investment policies to the new Electricity Commission – effectively a government bureaucracy more removed from the costs and benefits of transmission mis-pricing and investment than industry is – this state of affairs is not improved. Other models merit consideration.

US Models of Grid Ownership

In the US, transmission grids have typically been owned by private utilities and vertically integrated with generation and distribution/retailing. Rate-of-return regulation, and increasingly incentive regulation, has been used to protect consumers (however successfully). Interconnections between grids traditionally arose voluntarily (i.e. to wheel wholesale electricity between states), but federal regulators in 2000 sought to encourage more open and non-discriminatory arrangements. As discussed

⁵⁴ An indication of the position of cooperative distribution companies in the USA is given by Burr (2004).

by Tomain (2003), this involved the mandating of regional transmission organisations (RTOs), which could take the form of non-profit independent system operators (ISOs), or for-profit independent transmission companies (Transcos). The former, run by non-owners, are predicted to price reasonably and maintain short-term reliability (the PJM interconnection follows this model). The latter, being owner-operated, are predicted to be superior in terms of investment and long-term reliability, and in terms of planning, innovation and maintenance. Importantly, each can accommodate consumer protections in the context of private grid ownership.

England and Wales Model of Grid Ownership

As discussed in Chapter 4, in England and Wales the national grid company was privatised after initially being owned by the regional distribution companies, and was subjected to price caps to guard against monopoly abuses. In fact the privatised grid company is subject to price caps on both its network revenues (Transmission Asset and Owner, or TO, price control) and balancing services revenues (System Operator, or SO, price control). In setting price caps (using RPI-X) the electricity and gas regulator, Ofgem, estimates the revenue required for an efficient transmission business, taking into account allowances for operating expenditure, capital expenditure, financing costs (based on an allowed return on a regulatory asset value – compare this with rate-of-return regulation), and taxation. Caps are reviewed five-yearly, but provision is made for adjustments before cap reviews, via so-called “income adjusting event” provisions under the SO price control and via an “annual correction factor” under the TO price control for unplanned output variations. The model is one that accords with the Willig test: a private firm regulated by a standalone regulator, providing good information disclosure, some incentive for cost-efficient operation, and an objective function that the regulator can assume with some confidence.

Such price controls are estimated to have resulted in £1.25 billion being transferred annually from gas and electricity businesses to their customers, while network investment has exceeded £30 billion under the regime.⁵⁵ Issues have arisen with the need to prematurely consider cap reviews to accommodate unanticipated grid investments and so facilitate investments in renewable generation, but without mitigating incentives for efficiencies or encouraging gaming of review periods. Concerns have also been raised that the periodicity of reviews favours the grid operator achieving efficiency gains early in the price-control period, since later gains are enjoyed only until they are passed to consumers via revised price controls. This can also encourage gaming of reviews by deferring the realisation of efficiency gains. Another concern is that the regime has weaker incentives for capital efficiencies than for operating efficiencies (i.e. has a bias towards grid capital expenditures). With private ownership of the England and Wales grid, concerns about monopoly pricing have been addressed by imposing price controls that are intended to allow the grid owner/operator operational independence while encouraging efficient operation and investment. The approach appears to have

⁵⁵ Ofgem (2004a).

achieved broadly satisfactory results in line with the stated intentions, but it is not without difficulties. It carries within itself an ongoing tension between the regulator and its better-informed grid owner/operator counterpart, and so provides incentives for regulatory gaming. This is inevitable in price regulation.

Other Grid Ownership Models

As in England and Wales, in Victoria the state transmission grid has also been privatised. Unregulated “entrepreneurial” or “merchant” inter-state grid connections are also now part of the new National Electricity Market. In Germany, shareholder-owned companies now own the six national grid utilities that had previously been in local ownership. In instituting these reforms, the associated taxpayers have enjoyed significant privatisation proceeds while also being protected against monopoly pricing via regulated transmission price reductions. At the same time they have been relieved of the risks of future grid investments. New Zealand’s solution is far from this.

“Club” Ownership of Transpower Shelved Despite Promise

Leaving aside privatisation, New Zealand shelved an alternative ownership reform opportunity for transmission that has the potential to both materially diminish concerns about monopoly pricing and enhance incentives for desirable grid investment. As long ago as 1989 it had been proposed that transmission be owned by a “club” of generators and distributors, a proposal that lapsed with distributor opposition to having to buy the grid assets and political sensitivity to being seen to privatise the grid (even if it was then to local-government-owned distribution parties).

For the reasons cited above regarding cooperative and customer ownership of distribution, there are arguably significant natural advantages to distribution companies owning transmission. This is even more so if distribution companies are in turn cooperatively or customer-trust owned. Most obvious is the ability to mitigate any effects of monopoly pricing in transmission, thus reducing the need for inherently problematical regulation. Those who might be gouged are those who share the benefits of any gouging and, as long as governance and distribution rules are appropriately provided for, these two influences should be largely off-setting and pricing policy issues relating to common cost allocations most naturally resolved.⁵⁶ Additionally, with an amended version of the “club” as discussed in Chapter 10, those bearing the costs of grid congestion are also those in the best position to devise and implement suitable grid investments. Such advantages need to be weighed, however, against the governance gains, clearer objectives and greater capital access available through listed public ownership of regulated transmission.

⁵⁶ It must be acknowledged that resolving common cost allocations is no small matter. The point being made is that these allocations can be determined administratively by a party not most exposed to the consequences of any errors, or more directly by those with the best information and incentives to ensure an appropriate outcome. It is suggested that distributor-ownership of transmission moves us closer to the latter.

Models Compared

In both the cooperative and the publicly-held-but-regulated firms we have not specified, but we presume, a Transco model wherein the grid owner and system operator are imbedded in the same entity as they have been, for all intents and purposes, in the NZEM (where they are owned by Transpower). The alternative approach is to have an independent system operator (ISO) separate from the grid that manages security and dispatch of energy and is held in a way that it does not profit from the performance of the grid or dispatch. Independence provides for contestability of this function, but the services of the grid require the coordination of grid performance and dispatch of generation – coordination that is arguably more effective in the Transco model. Where coordination of dispatch extends beyond one grid to encompass grids of other owners, this argument for superior coordination of the Transco model is reduced. It may also be less persuasive when all generation is forced to be placed through the pool, as in the hitherto version of the NZEM. In the Transco model one entity, the grid owner, is responsible for the totality of transport services related to the grid: these, again arguably, are the services that generators and demanders seek, and performance can be achieved by the incentives of a publicly held firm subject to regulation or the cooperative model.⁵⁷

Together with greater distribution-company rationalisation, the issues around ownership, governance and consequent regulatory refinements could be said to be the most significant piece of unfinished business in New Zealand's electricity reforms.

SOME REFLECTIONS ON THE NEW ZEALAND ELECTRICITY REFORMS

Market Power and Gaming neither Universal nor Damning

New Zealand is not alone in facing issues of gaming and market power in its reformed electricity sector, since the economics of electricity provision suggest that some measure of oligopoly or even monopoly is to be expected. While gaming is susceptible to being remedied by changes to market rules and other arrangements, a degree of market power in generation (and sometimes in demand) is to be expected despite significant steps having been taken to engender competition through successive generation break-up and the implementation of a wholesale market. At present the exercise of market power appears to take the usual forms observed elsewhere. But this exercise is transitory and not systematic to any significant degree – as evidenced by the fact that wholesale electricity prices have been typically less than the level required to induce entry by new generation, although the not insignificant entry costs of new generation create a margin above wholesale prices that could be sustained for a time before new entry becomes viable. Expressions of market power (to the extent they have already arisen) are not automatically signs of reform failure or welfare loss: they may be signals

⁵⁷ See Henney (2002) for a critique of the ISO approach.

of temporary situations and must be compared to an appropriate counterfactual (e.g. return to state-owned monopoly or some other form of central planning), and continuing private-sector generation investments (see Chapter 10) suggest they are not in themselves dynamically inefficient.

Privatisation Feasible but Unpalatable

Until generation break-up and the advent of the wholesale electricity market – along with separation of transmission and generation being preconditions for market power to be tamed if not eliminated in generation – it was not desirable, let alone politically feasible, for state-owned generation to be privatised. In this regard the sale of Contact to private investors in 1999 represents “one against the game”. While more widespread privatisation of generation is not currently to be anticipated (privatisation is the policy that dare not speak its name), at least there are now few inherent policy obstacles to this should it be desired.

Transmission Issues Remain

The beast of monopoly transmission is not yet tamed, despite the recent imposition of price caps on transmission and its pricing and investment policies being assumed by a government regulator. Even if these measures prove to be effective, they are likely to quell any appetite for private-sector ownership of transmission and investment. They represent a potentially inferior solution to either the well-specified regulatory model suggested by Willig’s proposition or the “club” model (in fact, a revised “club” model – see Chapter 10), long-since shelved. By deterring private ownership of transmission, they imply ongoing taxpayer investment and risk-bearing that might otherwise be burdens falling more directly on those enjoying their benefits.

The importance of transmission capacity in defining or limiting generator and transmission market power provides a useful counterpoint to current government policy favouring investment in distributed (particularly renewable) generation. Representing a reversion towards an industry architecture pre-dating New Zealand’s transmission grid, it is intended to take the pressure off the need for grid expansions by allowing local communities to generate their own power and bypass the grid by wheeling it directly through local lines networks. Owing to neglect of transmission investment, what it may result in is a further regionalisation of the electricity system – at the cost of nationwide competition. At the same time shifting the burden of determining transmission investment policy to the new Electricity Commission has the capacity to make or break the future competitive topology of the industry, while attenuating the ability of those bearing the costs of this to materially involve themselves in the solution process (see Chapter 10 for more). And at a more subtle level it represents a reversion to central planning for determining the generation mix, with fashionable energy sources receiving preference over the more obvious – New Zealand has enough coal to produce electricity for centuries – and ignores the

possibility that technology gains will render currently inappropriate generation types at least as efficacious as others.⁵⁸

Limitations of ODV Regulation

New Zealand's light-handed regulation of distribution companies based on information disclosures and the ODV methodology – combined with obstacles to ownership reform discussed earlier – has either delivered limited efficiency gains, or has resulted in consumers possibly benefiting little where such gains have been achieved. Bertram and Twaddle (2003) argue that the four major lines companies at the forefront of industry rationalisation – United Networks, Vector, Powerco, and Orion – indeed secured significant unit-cost reductions over 1992-2002, while all other companies achieved only modest unit-cost savings. On the other hand, these authors argue that all lines companies experienced increasing average revenue: this suggests widening price-cost margins over this period, a measure indicative of market-power exploitation. They further found that lines businesses enjoyed excess profits compared with those justified by their weighted-average cost of capital.⁵⁹

While the adoption of ODV methodology removed the incentive to “gold plate” under traditional cost-plus regulation and did not pass on the costs of stranded investments to consumers, at the same time it did not spur lines owners to efficiency gains or encourage investments (particularly those at risk of becoming stranded). Perversely, where lines operators had high prices and returns, the ODV methodology was indifferent to more normal returns being achieved by either lowered prices or increased costs. Conversely, where efficient operators enjoyed high returns despite low prices, it suggested they should lower prices or not bother to secure further efficiencies. The approach was relatively free from political interference and risk, and arguably was superior to traditional rate-of-return and formal incentive regulation, but, in common with any price-regulation scheme, offered weak incentives to motivate lines operators or reward their customers.⁶⁰

⁵⁸ Recent reports indicate the potential for coal to be used to produce hydrogen for fuel-cells, producing water as their only waste product. Technologies are also now emerging for scrubbing carbon from carbon oxides, implying that coal may one day be regarded as both an environmentally acceptable and a renewable energy source. Over very long timeframes coal is already a renewable energy source (cf the “carbon cycle”); with new technologies this may be the case on a more useful time-scale.

⁵⁹ One caveat regarding this conclusion is that the excess returns were based on accounting asset revaluations having been taken to profit. While increased asset values, ODV in particular, could be taken to justify higher future lines charges and profits under the ODV methodology, these were not associated with actual current increases in charges. In other words, the measured excess returns are possibly more an accounting artefact than actual, and with the recent shift to incentive-based regulation based on CPI-X price caps that potential must now be constrained.

⁶⁰ The exception to the latter, as discussed earlier, being where trust- or cooperative-owned lines companies rebated profits to their beneficiaries or customers respectively.

Had more widespread rationalisation of distribution companies arisen, and efficiencies been achieved and shared with customers, this might have obviated much of the perceived need to move from the ODV regime to price caps, but this is doubtful. In New Zealand, distribution reform was (and remains) potentially constrained by parochial and diffuse ownership – as it was in the US, where vertically integrated utilities with stranded assets represented an obstacle to radical sector reform (i.e. requiring compromises of the sort that were so telling in California); but as it was not in England and Wales, and in Victoria, where government ownership of distribution provided it a degree of freedom to rationalise distribution as it saw fit. Ironically, government has been willing to implement reforms that touch on local ownership of distribution as if it were equivalent to central government ownership (e.g. the 1992 and 1998 reforms), but it has not been willing to address questions of Transpower’s ownership.

Over-Regulation of Distribution

With determination of distribution company ownership at the time being left to local interests, it was perhaps inevitable that distribution reforms would be difficult. That communities continue to think community-trust ownership is somehow an efficient means of mitigating market-power concerns, or a necessary means to preserve local lines assets in their control, suggests a possible misunderstanding of both the risks and the opportunities. Under current structures neither goal is well achieved. With the introduction of price caps on lines operators, these operators potentially get medicine they don’t need (because more efficient ownership would suffice), face an unnecessarily increased risk of bankruptcy (should caps prove too tight), and suffer side-effects from their ownership interest (fewer community swimming pools because of reduced lines-company profits) which must be traded against any lines pricing benefits they enjoy. The longer-term effects of price controls on network investment remain to be seen.

Distribution Regulation in Context

Finally it is worth placing New Zealand’s fixation with taming local-monopoly lines businesses in context. Not only do distribution costs represent a fraction of domestic power bills, but, as indicated in Chapter 7, those power bills represent around only 3-5% of average weekly household expenditures. Most New Zealanders spend more on takeaways each week than they do on network charges. More to the point, however, no-one seems to level the criticisms aimed at distributors (and telephone network operators) at providers of other utilities that are clearly at least as “essential” to health – namely water reticulation and sewerage.⁶¹

In New Zealand both are typically provided as local-authority monopolies, without clear financial reporting, performance monitoring or often-times even separate pricing

⁶¹ Admittedly the potential for bypassing either is higher than for electricity distribution (you can buy bottled water or get into composting), but all share the bugbear of high fixed- and low variable-charges, which are apparently so burdensome on household budgets.

(they are commonly included in local-authority rates). Water reticulation, in particular, is often subject to supply security issues – with many communities often facing supply shortages in the face of droughts, and it is not uncommon for water supplies to be cut because of pollution (e.g. sewage spills after heavy rains, toxic algae, or infestation by other pathogens). Where moves have been made to increase efficiencies in this area – such as Auckland contracting out management of water supply to a private operator and/or with water meters being introduced – these steps have often been decried as merely presaging the unspeakable privatisation. Given local-body politics, it is perhaps unavoidable that implicit and unregulated price and quality gouging by inefficient monopolies which are hard to monitor (let alone control) will be preferred to the perceived perils of competition and efficiency gains achievable by introducing private ownership and competitive disciplines. Other countries or states reforming their electricity systems have not been so constrained – or their reform imperatives have been sufficient to overcome such objections.

APPENDIX 9.1 – COMPARING REGULATORY ALTERNATIVES

TYPES OF REGULATION*Rate-of-Return Regulation*

A full survey of this area is beyond the scope of this work, so a brief summary is instead presented. Small (1999) presents a taxonomy, beginning with the traditional “rate of return” or “cost of service” regulation most commonly applied to integrated utilities in the US throughout most of the twentieth century. Under this approach a monopolist is permitted to earn only a “fair” rate of return on its assets – particularly relevant where the monopolist is privately owned, but also finding application to state-owned monopolies – which reflects not just the prices it charges on its outputs but also its costs of production, over both of which the monopolist retains discretion. A natural criticism of this approach is that the monopolist can be assured of returns on assets that are uneconomic (indeed, can result in “gold-plating” or ill-considered investments), paid for by consumers (who ultimately bear the financial risks of investment and supply), and faces little incentive to reduce costs (a formula for managerial slackness). This is clearly untenable when there are no barriers to entry, since competing suppliers could then undercut the regulated party. Where such natural or artificial barriers exist, however, the monopolist is constrained by (aside from rate-of-return regulation) only consumer or government pressure, where costs are revealed to be excessive, and the ability of consumers to reduce their demand if prices are too high (which ability, by presumption, is limited). The rate-of-return approach has been praised as involving close cooperation between the regulator and the monopolist, given the information requirements it entails for measuring and monitoring asset base and returns, but also criticised for the risk of “regulatory capture” of the rate-setting process by a monopolist typically better-resourced than other interest groups to influence regulator decisions.

Incentive Regulation

The weaknesses of the rate-of-return approach have resulted in a major shift in approach over the past two decades. So-called “incentive regulation” has become the regulatory method of choice since its introduction in 1980s privatisations in the United Kingdom. While “first-best” regulatory approaches seeking to induce a monopolist to act in a more socially desirable manner have been attractive in principle (although subject to distortionary costs of their own), their chief limitation arose from the informational asymmetry between regulator and monopolist. It is hard enough for a firm to accurately estimate its own costs of production, let alone for a regulator (reliant on the monopolist for accurate and unbiased revelation of its costs) to do so. Incentive regulation tries to mitigate such difficulties by allowing the regulated firm to make its own pricing decisions subject to certain overall constraints (such as price or revenue

growth sometimes based on assumptions as to future demand growth, production costs and investments) – which leave it with considerable scope to increase profitability by reducing costs. Vogelsang (2002) points out that, by so doing, the regulator reduces its vulnerability to informational asymmetries and instead relies on the firm's superior knowledge of its costs and desire for profit, and shifts attention away from behaviour to outcomes.

Incentive regulation schemes typically take the form of imposed caps on price or revenue growth, known as RPI-X (United Kingdom) or CPI-X (elsewhere). RPI or CPI refers to the movement in some general price index and X represents a measure of required efficiency gain. Thus if X is 2%, for example, then prices or revenues of the monopolist will be permitted to grow at a rate that is 2% less than general price inflation for some specified period, or in other words fall in real terms by 2%.⁶² While there is some theoretical basis for determining an appropriate value of X, it is decidedly thin; and in reality X is either set by negotiation (such as during the British privatisations), or on the basis of simple empirics, or according to some hypothetical model of what costs ought to be (echoing the engineering model of old), or arbitrarily (i.e. at the regulator's discretion, subject to pressure from political and other interest groups).⁶³ Another complication of such an approach is that revenue or price rises permitted under CPI-X regulation become a self-fulfilling prophecy, with regulated firms increasing their revenues or prices by the allowed amount even where they might otherwise not have intended to raise them (at all or by that much).

Implementing incentive regulation requires determining the period over which it is to be implemented, adhering to the scheme and credibly amending it if changes are required, and maintaining quality and investment. For the monopolist to have strong incentives to reduce costs, it is desirable for any price or revenue caps to be set for a relatively long period (commonly five to ten years) before review, with monopolists facing incentives to appear more "costly" the closer they are to a cap review in the hope of this resulting in looser caps.⁶⁴ The difficulty is that monopolists might in fact secure significant cost efficiencies or otherwise increased profits in such a period – from their own efforts or simply due to external circumstances – which can prove to be politically intolerable. The consequences of setting an inappropriate value for X become exponentially greater as the review period lengthens. The temptation in such circumstances is for the regulator to prematurely intervene, with potentially significant

⁶² This is only approximately true, since price growth is measured multiplicatively, not additively.

⁶³ The theory for setting X is presented in Bernstein and Sappington (1999), based mostly on identities and with the key "idea" being that super-profits under competition would over time disappear. Imposing CPI-X in a non-competitive environment is then hoped to replicate outcomes over time more closely reflecting those expected under competition. It is this analysis that underpins the total factor productivity analysis methodology recently applied in setting price caps for New Zealand lines companies and Transpower – see Meyrick and Associates (2003).

⁶⁴ Small (1999) suggests this problem might be mitigated by having random cap review periods, but Pint (1992) instead argues for fixed review periods based on average rather than terminal-period costs.

value consequences to the monopolist and corresponding disincentives to make large or long-term investments on which returns are then at risk of expropriation. It must be acknowledged that the risk of long review periods is also to the monopolist, with overly tight caps over long review periods having the potential to cause bankruptcy.

Adhering to the scheme is important to the regulator for its own purposes, if not for the monopolist's shareholders. Any early cap reviews can encourage the monopolist to "call the regulator's bluff" by seeking early reviews, if that suits its interests (e.g. it has been unable to secure cost reductions and sufficiently increased profits because the cap is uncomfortably tight). Alternatively, a regulator's failure to tightly monitor and enforce caps can encourage the monopolist to breach them in the hope the regulator will not take corrective action, leading to windfall profits.⁶⁵ A complication arises when circumstances (not foreseen at the time caps are set) give rise to legitimate grounds for review. This is potentially the case currently in the UK, where government policies to encourage investments in renewable generation require grid investments not anticipated when transmission price caps were set some years previously (and these caps are not due for review for years to come).⁶⁶ If the relevant caps are reviewed early, there is scope for the regime's credibility to be undermined (not least because there is little science to determining what circumstances were not foreseen or relevant, or even how to properly take them into account), or for the monopolist to extract benefits from an early review that are additional to those strictly relating to the changed circumstances.

Approaches Compared

An obvious point of distinction between rate-of-return and incentive regulation is that the focus is less on required investments and allowable shareholder returns, and more on cost efficiencies and price reductions enjoyed by customers. Indeed, by setting a positive value of X it is intended that consumers benefit from real price reductions while the monopolist retains the incentive and capacity to enjoy increased profits through cost reductions. Furthermore, while rate-of-return regulation can be said to encourage gold-plating and unnecessarily high quality levels, under incentive regulation quality can be compromised in lieu of cost reductions as a means to increase profits, requiring simultaneous contracting for desired quality standards.

Another key contrast between rate-of-return and incentive regulation is that the regulated firm shares investment and supply risks with consumers, instead of consumers shouldering those risks as they do under rate-of-return regulation. A higher

⁶⁵ The Commerce Commission faced its first real credibility test following its move from light-handed regulator to distribution company price-capper. With CPI-X control thresholds for lines companies promulgated in December 2003 – the X for Hawke's Bay operator Unison being set at 0% – Unison in January 2004 announced a price rise of 9% (well ahead of current inflation) and signalled that more rises are required to fund required investments. For its part the Commission has signalled that it will be taking any such breaches seriously. Game on!

⁶⁶ See Ofgem (2003b).

rate of return is thus warranted under incentive regulation to recognise this extra risk. Moreover, whereas rate-of-return regulation requires barriers to entry to be effective, incentive regulation is consistent with competitive entry.

As pointed out by Small (1999), it is an oversimplification to suggest that incentive regulation remedies the problem of rate-of-return regulation favouring investors by shifting the risks of inefficiency and poor investments to consumers, and that it is inherently superior as a means of regulation. Much depends on how each method is implemented over time,⁶⁷ and under price-cap regulation for short periods the two methods in effect converge.

Hybrid Models

Hybrid forms of regulation are possible, such as thresholds being set for combinations of each method to be applied. While seeking to achieve the best of both worlds, this approach tends to suffer from both of their failings. In certain circumstances it is possible to shift attention from regulating the monopolist, and instead to seek to capture the benefits of competition by selling the right to be the monopolist. Such “franchise bidding” has been applied in various countries to “build-own-operate” and “build-own-operate-transfer” schemes for discrete roading and other infrastructure investments, under which the monopoly rights to a project for a specified period are tendered. The expectation of such schemes is that competitive bidding for the monopoly rights will see the value of any monopoly pricing being captured by the state through the bidding process, as a means of redistributing the welfare losses arising from monopoly operation.

New Zealand’s light-handed approach of the 1990s can be viewed as incentive regulation where the review period is arbitrarily long and dependent upon general assessment of the performance of the industry. Viewed this way, it can be expected that productivity growth and quality provision can be expected to be at least that of more explicit RPI-X incentive regulation – which most deem to perform better than the vanilla rate-of-return regulation.

COMMON REGULATORY PROBLEMS

Cross-Subsidy

Irrespective of the choice of rate-of-return regulation (whether based on an historical-cost or a replacement (ODV) rate base) or incentive regulation, or indeed other forms of regulation, some issues are common. First is that of pricing multiple product or service areas where considerable scope can remain for the monopolist to raise prices in

⁶⁷ Indeed, Evans and Guthrie (2003) show that policies directed towards encouraging competition while subjecting incumbent firms to incentive regulation increases their risk of asset stranding – a problem not arising under rate-of-return regulation – and therefore requires a higher regulatory rate of return.

product areas (for example, where market power is enjoyed) in order to subsidise other product areas that are vulnerable to competition. Alternatively, where common costs require allocation across various product areas of customer classes, the monopolist has discretion to determine allocations any number of ways, some of which are more efficient than others. Both rate-of-return and incentive regulation can in fact be applied at the individual product or service level, but the informational requirements of this are high, reintroducing problems of informational asymmetry and regulatory capture that are otherwise mitigated, at least in principle, by incentive regulation. Additionally this approach effectively also shifts an important aspect of the monopolist's business decision-making to the regulator, in effect nationalising its operations to some extent while leaving the risks of the regulator's decisions with the monopolist's owners. Similar issues arise in respect of investment decisions, discussed further in Chapter 10.

Service Obligations

Another shared issue confronting regulators in the reformed electricity industry context is that of service obligations. Historically monopoly and/or vertically integrated firms in the electricity industry have carried service obligations – such as the obligation to supply energy to any customer in a franchise area – as a *quid pro quo* for avoiding break-up. Regulating a firm with a requirement to supply has quite different implications from regulating a firm with discretion to invest: in general, discretion to invest means that regulation has to be doubly careful that investment is not impaired. In a reformed electricity sector it is typically no longer possible to impose a requirement for supply security, as no one competing generator – or even transmission where it no longer controls generation – is capable of assuming that obligation.⁶⁸ As argued by Crew and Kleindorfer (2002), imposing service obligations on incumbent utilities in a reforming electricity sector that seeks the entry of new competitors which need not share that burden, or do so unequally, remains one of the greatest ongoing challenges to reformed sectors. An alternative view, explored in Chapter 10, is that expectations of service obligations in a deregulated electricity sector are misplaced, as market participants ought to determine the level of supply security they are willing to pay for.

Degeneration to de facto Government Control

Neither regulatory approach addresses fundamental issues of industry structure or offers a road-map for determining optimal investments (although each will affect investment incentives). These remain issues of broader institutional arrangements and regulation that take their influences from high-level policy goals of encouraging competition, market-based solutions and private-sector involvement. To the extent that they do not, but instead reflect a return to the highly centralised “command and

⁶⁸ Alternatives include charging the system operator or some other body to contract for reserve generation and/or interruptible load over and above that required for short-term grid security (i.e. ancillary services) – for example, funded by a levy on electricity prices. As discussed in Chapter 6, New Zealand's new Electricity Commission has been charged with this responsibility.

control” approach more typical before worldwide electricity reforms began, they risk regulation collapsing to a *de facto* form of government control, albeit with greater and more mobile (in the sense that their investment can stop and they can be sold) private-sector interests at stake.

Redefining the “Game”

Finally, as referred to earlier, regulation does not eliminate gaming or market power, or even necessarily diminish the welfare costs they can bring. Instead it transforms the issues from one arena to another, and/or transforms their form. Gaming a regulator – such as playing regulatory “chicken” or “stares” – can be just as (or even more) productive as gaming voluntary market rules.⁶⁹ Also, politicians and regulators are potentially more susceptible to capture by powerful industry interests than market-rule-making processes, because there is greater scope for them to be influenced behind closed doors (and because their objectives and own interests are likely to be more diffuse). A perpetual shortcoming of regulation remains that it can too easily degenerate into controlling undesirable behaviour instead of predisposing industry participants to strive towards desirable ends – a combination of stick and muzzle instead of carrot and stick. And to end on a different metaphor, regulation is a sword that has two sharp edges.

⁶⁹ Soccer players, for example, game the regulator any time they milk a penalty from the referee.

