Weak Regulation, Rising Margins, and Asset Revaluations

New Zealand's Failing Experiment in Electricity Reform

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1 Introduction

Reform of the New Zealand electricity sector began in 1986, as part of a wave of neoliberal policy changes pushed through by the Fourth Labour Government (1984–2000). In that year, two major pieces of legislation—the State-Owned Enterprises Act 1986 (SOE Act) and the Commerce Act 1986—transformed the institutional and policy environment within which electricity, along with other publicly owned essential services, was produced and delivered.

The SOE Act changed the primary objective of these enterprises from social service to profit: state-owned enterprises (SOEs) were to be "as profitable and efficient as comparable businesses that are not owned by the Crown." SOEs were transformed from government departments to corporations, with management systems modeled on the private sector.

Meantime, the Commerce Act 1986 brought fundamental changes in regulatory philosophy. The stated purpose of the Act was "to promote competition in markets for the long-term benefit of consumers within New Zealand," but this left open the issue of what was to be done in markets where competition was weak or absent (Stevens, 2003, pp. 93–98). There were no provisions to outlaw price gouging or profiteering at consumers' expense. The presumption was that promotion of competition would generally suffice to restrain the use of market power by large firms to transfer wealth from consumers to themselves. If abuse of market power was suspected, Part 4 of the Act empowered the Minister of Commerce to instruct the Commerce Commission to inquire into particular industries and, if appropriate, recommend price regulation. If the Commission judged regulation to be warranted, a ministerial decision was still required before the Commission could proceed. Decisions on whether and how to regulate prices and profits were thus removed from the judicial to the political sphere. The common-law right of consumers, faced with high prices for essential services, to seek redress through the courts was extinguished (Taggart, 2008).

Electricity policy-making since 1986 has involved ongoing tension between those who saw privatization under generic competition law as the logical destination for policy, and those who retained the idea of electricity as an essential public service for the price and quality of which the state remained responsible, implying ongoing state participation and/or regulation. Successive changes to the structure and regulation of the electricity sector over two and a half decades have not resolved these tensions.

Several key features of the New Zealand experiment made it unusually neoliberal in its approach, compared with most other countries' approach to electricity restructuring:

• First, New Zealand shared with Germany the absence of a specialist regulator to oversee the early stages of reform. When eventually forced to establish an Electricity Commission in 2003, New Zealand policy makers gave it a minimal mandate, with its price-regulating power narrowly confined to transmission grid pricing and a governance-focused agenda. As described later, the Commission was abolished after only 6 years, to be replaced by a more generator-friendly Electricity Authority.

• Second, an antiregulatory mindset applied broadly to all facets of the electricity industry reform process. "Light-handed regulation" was interpreted as a reduction not only in regulatory intervention, but in regulatory capacity as well,[1] so that the rare government interventions in the face of anticompetitive market outcomes have been poorly designed, and have come too late to prevent large wealth transfers from being banked by key private-sector players.

• Third, there was no official enthusiasm in New Zealand for the institutional innovations that many other countries adopted to widen the range of electricity market participation. No feed-in tariff has yet been tried, nor any serious restriction on the power of incumbent large vertically integrated generator-retailers (gentailers) to foreclose wholesale market entry by independents, using tactics which in other jurisdictions would arguably be in breach of antitrust law. Smart metering is yet to arrive as of 2012 (Concept Consulting Group Ltd, 2008; Parliamentary Commissioner for the Environment, 2009). The demand side of the market remains undeveloped, and the ripple-control peak-shaving technology that was universal in 1986 has been largely eliminated under commercial incentives, moving the market away from real-time pricing.

• Fourth, the balance of representation and policy influence in relation to electricity matters has been loaded against small consumers and in favor of large industry and the big electricity suppliers. Over time the official stance has hardened against any protection for small consumers exposed to the exercise of market power by the generator-retailers. Terms like "fair" that at one stage were included in the government's objectives for the industry have disappeared from the policy lexicon, and small-consumer representation on governance bodies has been token or nonexistent.

Overall, therefore, the most interesting lessons from the New Zealand experiment have to do not with the technical engineering detail of the pool, the wholesale market, the system operator, or the grid, but rather with the outcomes in terms of prices, profits, asset valuations, investment timing, industry coordination in meeting demand forecasts, and entry by independent entrepreneurs at any level of the supply chain or on the demand side. These areas are accordingly the focus of this chapter.

A brief overview of the industry provides the background in Section 2. Section 3 summarizes the history of structural and regulatory change since 1986. Section 4 traces industry performance in terms of pricing, profitability, and investment outcomes. Section 5 concludes.

2 Background: System Description and History

New Zealand is an island nation of 4 million people with no interconnection to any other national electricity system. Matching generation, transmission, and distribution capacity to local requirements, both at the national aggregate level and locally, presents major engineering challenges in a long, thin country with rough topography, low population density, and

population clustered in a few major cities the largest of which, Auckland, is at the opposite end of the country from the largest hydroelectric resources in the south. Those challenges were successfully overcome in the course of the twentieth century by construction of a publicly owned integrated system with large generating stations located to take advantage of the country's natural resources—hydro, geothermal, coal and natural gas—and with the main load centers supplied over a nationwide transmission grid and local distribution networks.[2] Figure 21.1 shows the grid layout.[3]

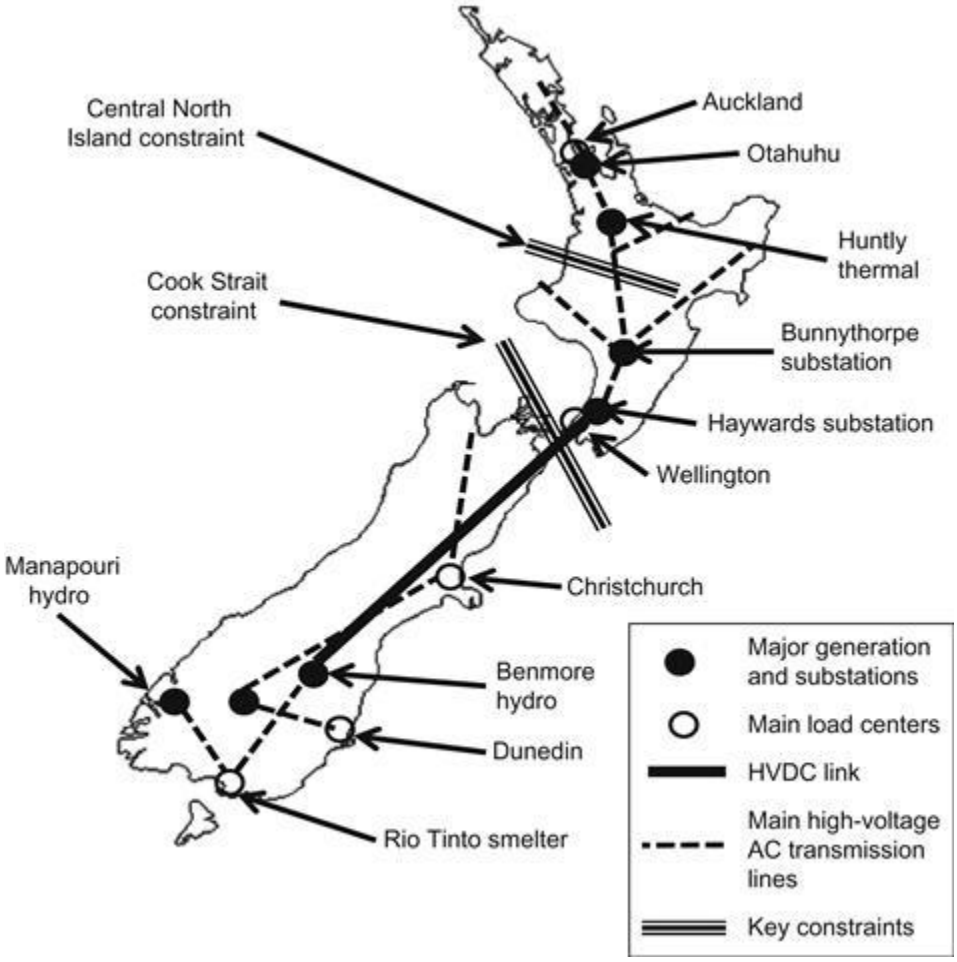

Figure 21.1 New Zealand electricity system.

Electricity demand is currently nearly 40,000 GWh per year, of which roughly two-thirds are used as an input by productive sectors (43% in industry, agriculture, forestry, and fishing; 24% in commerce and transport) and one-third is residential final consumption.[4] Installed generating capacity at December 2011 (Table 21.1) was 9751 MW, implying overall capacity utilization of less than 50%, which is to be expected in a system heavily reliant on renewable resources, such as wind and rain. Peak demand, also shown in Table 21.1, reached 6654 MW in 2011, equal to 68% of installed capacity (but far closer than this to actually available capacity at the time of the peak). Softer demand growth since the global financial crisis has cut previous projections of peak load by about 1000 MW for the next couple of decades (Transpower New Zealand Ltd, 2012, p. 33), implying that the system is currently carrying excess capacity relative to that needed to meet normal and projected demand.

Table 21.1 Trends in the New Zealand Electricity Sector 1980–2011

	Total Installed Generating Capacity	Peak Load, MW	Generation, GWh	Consumption, GWh	Total Sales Revenue $m	Average Price, c/kWh	Real Average Price, c/kWh at March 2011 Prices
1975	4784	3391		17,306	215.2	1.2	11.5
1980	6576	3677	22,700	19,415	744.2	3.8	17.0
1985	8038	4642	27,689	24,205	1393.8	5.8	14.3
1990	8001	5122	31,459	27,745	2267.6	8.2	13.8
1995	8061	5240	35,250	30,370	2748.7	9.1	13.8
2000	8323	5766	38,069	34,011	3189.4	9.4	13.4
2005	8851	6084	41,514	37,626	4981.1	13.2	16.7
2011	9751	6654	43,138	39,005	6357.7	16.3	17.2

Source: Capacity, generation, consumption, and average prices from Ministry of Economic Development *Energy Data File* (2012, Tables G.3a, G.2a, and I.1a)http://www.med.govt.nz/sectors-industries/energy/energy-modelling/publications/energy-data-file/new-zealand-energy-data-file-2012 (accessed 07.12), respectively. Total sales revenue calculated from sectoral data in the same sources; real average price derived using CPI for residential sales and PPI Inputs for commercial and industrial sales. Peak load 1975–1995 from Bertram (2006, Table 7.1) and 2000–2011 from http://www.ea.govt.nz/industry/monitoring/cds/centralised-dataset-web-interface/peak-electricity-demand-nationally/ (accessed 08.12)

Figure 21.2, charting the growth of generation capacity since 1945, shows that the pioneering construction and expansion phase of the industry's history had been completed when the Government embarked on increasingly radical restructuring experiments from 1986 onward. By then the system was engineered and operated to a very high standard, having overcome the recurrent supply shortfalls that had been the central challenge from the 1940s to the 1970s. By the late 1980s, there was ample generation capacity in hand, an expansion of the interisland HVDC link was underway, and sophisticated software programs had been developed for the merit-order scheduling of generation and frequency control. Thus when, during the 1990s, economic policy makers disrupted the established ownership, governance, and objectives of the industry, often displaying scant regard for engineering subtleties, they were fortunate to be operating on a patient in robust physical health, with a strong core of technically skilled employees who were able to maintain supply quality in the face of the often-perverse incentives thrown up by market institutions in a deregulated policy environment.

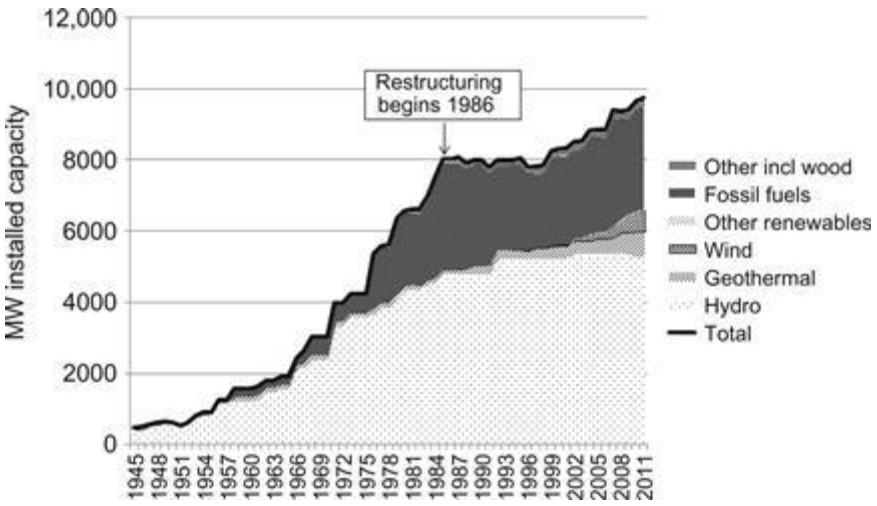

Figure 21.2 Installed generating capacity in the New Zealand electricity system, 1945–2011. Source: 1945–1975 data assembled from annual reports of the New Zealand Electricity Department (NZED); 1975–2011 from Ministry of Economic Development *Energy Data File* (2012, p. 112, Table G.3a).

Figure 21.3 shows generation by fuel type, and total electricity demand, which is less than total generation due to line losses in transmission and distribution. The New Zealand electricity system has always been primarily renewables based, but a large tranche of fossil-fueled capacity was added in the 1970s.

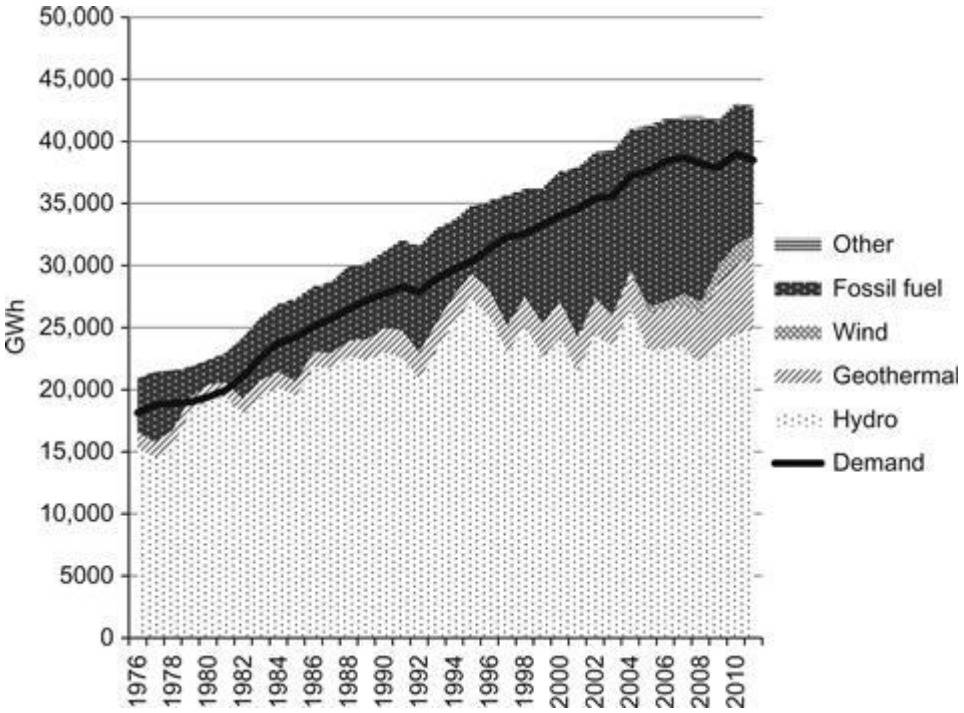

Figure 21.3 Generation by fuel type, 1976–2011. Source: Ministry of Economic Development *Energy Data File* (2012, p. 110, Table G.2c).

The availability of low-priced gas from the Maui field raised nonrenewables to over a third of generation by the late 1990s, part of a 30-year trend seen in Figure 21.4. The trend then reversed, bringing the renewables share back up to 77% in 2011. Depletion of the Maui gasfield

raised the operating cost of thermal plant after 2005 and this, combined with the beginning of carbon pricing policies and generators' preemptive occupation of the best windfarm sites, has contributed to a rapid decline in the share of nonrenewables in the past 5 years. The system is now on track back towards the 90% renewables share last seen in the 1970s (Bertram and Clover, 2009), even in the absence of Government policy support.[5]

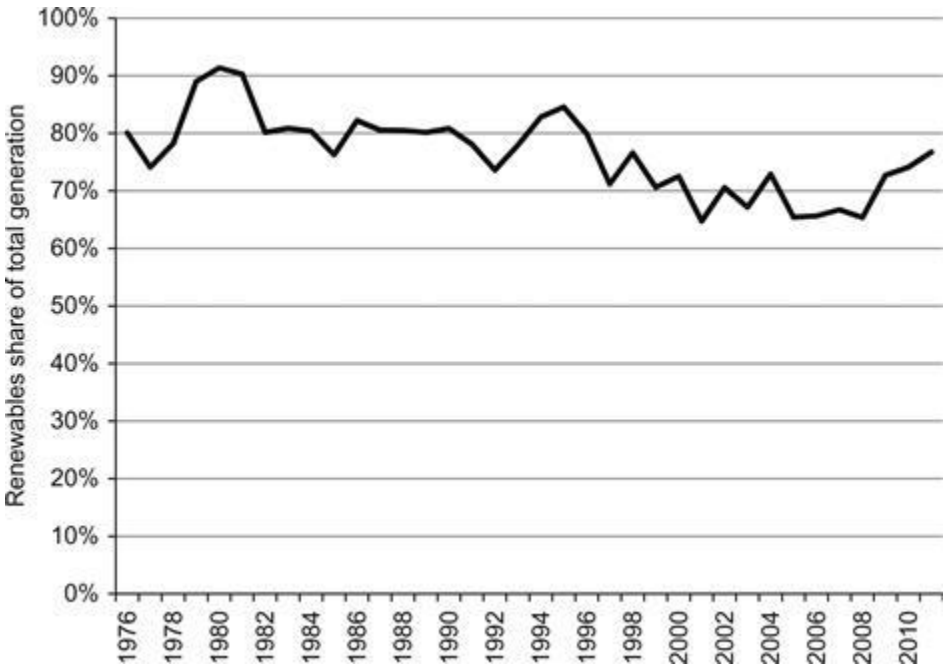

Figure 21.4 Share of renewables in total electricity generation, 1976–2011. Source: Calculated from Ministry of Economic Development *Energy Data File* 2012, p. 110, Table G.2c).

Comparison of Figure 21.3 with Figure 21.2 shows a mismatch between trends in consumption and trends in capacity over the reform period. Consumption rose steadily throughout the 1980s and 1990s while capacity stagnated; then capacity grew rapidly from 2000 to 2011 while consumption leveled off in response to rising electricity prices, the global financial crisis, and some gains in energy efficiency. The failure of capacity to track consumption is significant because one major argument advanced in the 1980s and 1990s in favor of corporatization, deregulation, and privatization was that commercial management guided by market signals would deliver investment in a more timely and orderly way than had been accomplished by the old government monopoly NZED. The reality has turned out to be, if anything, the reverse, an issue discussed in more detail later in this chapter.

Turning to the institutional setup prior to the onset of reform, at the time when New Zealand embarked on restructuring of its electricity sector in the mid-1980s the industry had a simple structure that had been built up pragmatically over the preceding 80 years to fit the geographical, physical, and social realities of the country.[6] Supply was entirely in public hands, and operated according to politically determined rules for pricing and investment. Large generating stations and the national high-voltage transmission grid were owned and operated by a government department, NZED. Local-area distribution networks, electricity retailing, and appliance sales and servicing were controlled by a special class of local Electricity Supply Authorities (ESAs), called Electric Power Boards in rural and small town areas, and Municipal Electricity Authorities in the main centers.

At both wholesale and retail levels of the industry, prices were set by administrative procedures designed to recover costs on a nonprofit basis, with prices to residential consumers held below those paid by industrial and commercial users. Electricity was, in short, an essential service made available at cost. At all levels the industry's operations were transparently accounted for by the annual publication of detailed statistics relating to its operations, revenues, costs, and sales volumes.[7] Downward pressure on prices at wholesale level was provided by the accountability of the responsible Minister to Parliament, and at retail level by the requirement for Electric Power Board members and city councils to face the local electorate in local-body elections.

These arrangements displayed the familiar advantages and disadvantages of public ownership. Prices were set in advance for long periods by administrative decision—the Bulk Supply Tariff (BST) at wholesale level and retail prices at local level as a markup on the BST to cover distribution costs. Investment decisions were taken on the basis of engineering considerations subject to political constraints, and hence were somewhat isolated from commercial market disciplines. The planning agency responsible for forecasting demand and advising on the commissioning of new capacity investments—the Committee to Review Power Requirements—was subject to a degree of capture by engineers and the heavy construction sector, and was risk-averse in the sense of trying to establish and maintain a substantial margin of excess generating capacity so as to minimize the prospect of power blackouts. Management of lake levels by NZED was similarly risk-averse, aimed to keep the system secure against the risk of dry years when meeting winter demand would stretch the system to its limits. ESAs similarly gave high priority to supply security, investing in excess capacity and employing enough staff to ensure in-house capability to handle emergencies.

The industry in that old form was exposed to three lines of criticism, which in the 1980s developed into a political platform for change.

• First, administrative decision-making was only as good as the people holding responsible posts, and could potentially be subject both to political influence from above and to "capture." During the 1970s, the ambitions of engineers in NZED and the Ministry of Works to sustain a rapid hydroelectric construction program, combined with the wish of government energy planners to use the newly discovered Maui natural gas reserves for electricity generation, made the growth of future electricity demand a political issue. Increasingly strong criticisms of the escalating cost of new hydro plants, and of the Government's promotion of electricity-intensive large industries to ensure a market for expanded generation, meant that NZED became politically exposed going into the 1980s as the legitimacy of its demand forecasts was eroded.

• Second, the allocation of supply costs across different categories of consumer at retail level had arbitrary elements that were subject to political challenge. ESAs purchased power in bulk at a uniform wholesale price, the BST, and then distributed it at different retail prices to commercial, small-industrial, and residential consumers. Residential customers dominated the local-body electorate and probably had higher demand elasticity than commercial users; these two factors combined to produce a pricing structure under which residential pricing was significantly cheaper, leading commercial and small-industrial sector organizations to lobby for tariff rebalancing in their favor. Because such rebalancing was politically difficult so long as ESAs were elected bodies, a constituency developed in favor of abolishing electoral accountability in favor of a governance structure more susceptible to commercial pressures.

• Third, and crucial, was the rise of neoliberal ideology in New Zealand policy circles during the 1980s, inspired by overseas discussion of deregulation and the privatization policies of the Thatcher government in the United Kingdom. Led by the New Zealand Treasury, neoliberal thinking supported corporatization and if possible privatization of state-owned operations, minimal regulation, and heavy reliance upon market forces to guide investment, pricing, and industrial structure. The average cost-pricing model of the BST was rejected in favor of supposedly more "efficient" pricing procedures focusing on the margin of supply in both short and long runs, and competitive market forces were promoted as the alternative to central planning as the means to direct investment in new capacity. The promise was that a market-driven alternative to the NZED/ESA organizational structure would deliver electricity as reliably, but at lower cost to the economy (and to consumers).

The next section covers the institutional detail of the industry restructuring program.

3 Industry Restructuring Since 1986

3.1 Supply-Side Structure

The history of the New Zealand electricity reforms is extremely complex and only a quick overview of major trends will be given here.[8] The evolving structure of the industry is set out in Figure 21.5. Initially generation and transmission were combined in the state monopoly, NZED, while distribution lines and retail were combined in the hands of local electric supply authorities. NZED was corporatized in 1987, becoming the Electricity Corporation of New Zealand, ECNZ, then split into separate generation and grid companies in 1994 after a period of uncertainty during which privatization of the generation assets and club ownership of the grid operator Transpower were unsuccessfully pursued. ECNZ was split into two supposedly competing generators in 1996 by the creation of Contact Energy. Contact was privatized in 1999 at the same time as the remaining ECNZ generation assets were broken up among three new SOEs and a small group of independent private companies. In 2012, legislation was passed allowing part-privatization of the three generation SOEs by selling up to 49% stakes to private investors; this sell down of the government stake is intended to be complete by 2014.

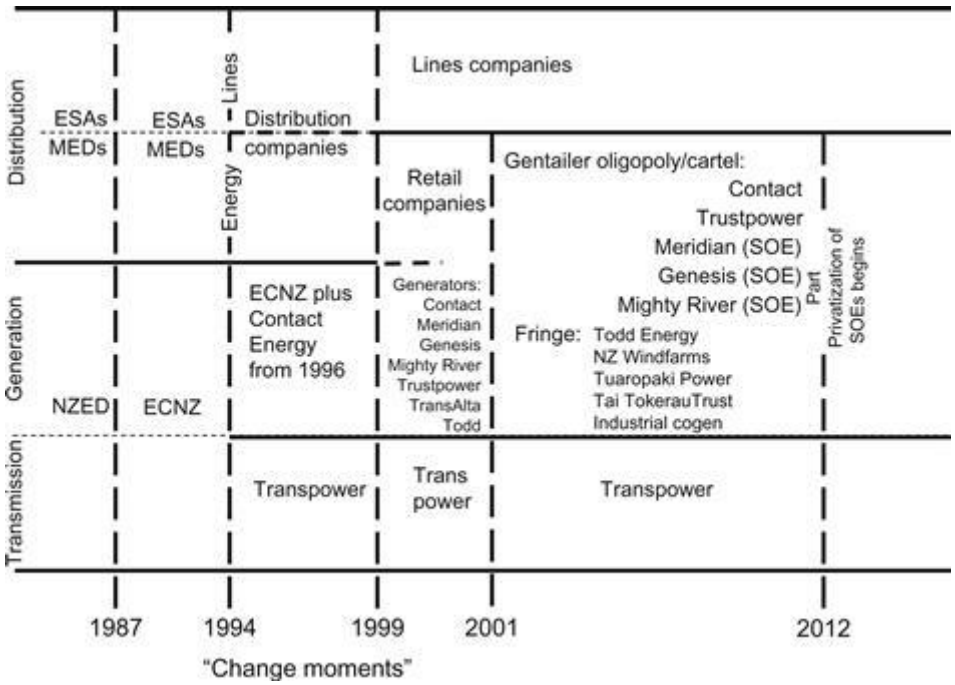

Figure 21.5 Evolving industry structure.

Meanwhile, the ESAs and Municipal Electricity Departments that operated retail distribution were converted into commercial companies in 1993–1994, lost their local-monopoly franchises, and were required to ring-fence their lines businesses which were made subject to "light-handed regulation" through information disclosure. The Electricity Industry Reform Act 1998 forced breakup of these companies, requiring ownership separation of distribution networks from energy (generation and retailing). An intensive period of takeovers and mergers followed as industry players jockeyed for position. By 2000, there were six large vertically integrated players in generation and energy retailing—three private and three state-owned—plus a tiny fringe. The elimination of OnEnergy in 2001, a victim of imbalance between its large retail customer base and its tiny generation portfolio (Bertram, 2006, pp. 218–219), and a shuffling of retail portfolios among the remaining gentailers, produced a cartel of five large operators controlling around 95% of generation and a similar share of the retail market, with a very limited set of small independents occupying the fringe. The dominance of the five-gentailer group over the past decade has remained unchallenged.

3.2 Regulatory Arrangements: Generation and Retail

The successive restructurings summarized above have been motivated by the desire to bring market forces to play at all levels to the greatest extent possible, starting with abandonment at the outset of the previous social contract under which electricity was publicly supplied at cost and treated as an essential service. Once profit-maximization replaced social service as the industry objective, policy makers aimed to create competitive markets in generation and retail—the former by separating generation from involvement with lines networks and breaking-up ECNZ, the latter by abolishing the franchise areas which had given distributors a local monopoly. Since the commercialization of generation in 1987, of retail in 1993–1994, and ownership separation in 1999, these two "energy" levels of the industry have been left free of so-called "heavy-handed regulation" of their prices and profitability.

The only regulatory intervention the gentailers have faced over the past decade has related to industry governance. The engineering imperatives of coordinating dispatch and delivery of generated electricity have had to be matched by institutional arrangements for the operation of a pool which sets a spot price, the provision of ancillary services such as voltage support for frequency control, the maintenance of quality standards of supply, and some measures to reduce the uncertainty surrounding investment decision-making and to improve coordination among nominally competing parties in a market effectively foreclosed to large new independent entry.[9]

Until 1999 ECNZ's dominance, and state ownership of all major generation, enabled these issues to be handled within firm by management, but thereafter some more formal arrangements were required. After a ministerial inquiry in 2000 an Electricity Governance Establishment Committee was set up, within which the industry was invited to develop its own set of rules and institutions for self-governance, with Government standing aside but available to become involved if agreement could not be reached. After several years of fruitless negotiations, the Government was forced to establish, for the first time, a specialist electricity-sector regulator, the Electricity Commission, in 2003.[10]

The Electricity Commission was tasked with implementing and overseeing the rules, already largely developed by industry players themselves, covering the New Zealand Electricity Market (NZEM), the Metering and Reconciliation Information Agreement (MARIA), and the Multilateral Agreement on Common Quality Standards (MACQS). It was responsible for managing the supply into the market of reserve energy from a 155 MW generation plant at Whirinaki installed by the Government in the wake of the 2001 dry year crisis.[11] The Commission had no brief to oversee pricing[12]; this area was covered—if at all—by New Zealand's generic competition law, the Commerce Act 1986, under which the Commerce Commission (a general-purpose regulator under the Act) would be responsible for undertaking any pricing inquiries and possible direct regulation that the Minister of Commerce might consider desirable. No such political decision to consider or introduce price regulation of generation or retail has been forthcoming to date.[13]

Most importantly, the Commission was mandated to facilitate efficient new investment. Investment in new generation was to be coordinated by indicative planning, comprising economic modeling and publication of demand projections and of a "statement of opportunities" to indicate when and where new capacity would be required, leaving it up to the gentailers to decide where and when to actually undertake the investments. Investment by the monopoly grid operator was, however, to be directly regulated, with all significant Transpower investment projects requiring approval by the Commission, subject to a rigorously specified cost–benefit procedure, the "Grid Investment Test."

The Commission's first 3 years were dominated by an acrimonious dispute over Transpower's desire to build a new 400 MW transmission line across the Waikato region from Whakamaru to Auckland. Transpower's plans were judged incompatible with the legally specified Grid Investment Test. After repeated unsuccessful attempts to persuade the Commission, Transpower called on political support from its owner, the Government, which dismissed the Commission Chair, Roy Hemmingway.[14] A chastened Commission, headed by a political appointee installed to replace Mr. Hemmingway, proceeded to approve the project.[15]

After this defeat the Commission survived only another 2 years, facing growing opposition within the industry. The price at which Whirinaki reserve power was to be dispatched was a

major bone of contention with the large gentailers, and a 2009 ministerial inquiry concluded that the existence of a reserve generator was deterring new investment and thereby reducing rather than improving system security (Electricity Technical Advisory Group, 2009, vol. 1, pp. 16–22; Office of the Minister of Energy and Resources, 2009, paragraph 88). The Commission's analyses and modeling occasionally ruffled feathers as well, uncovering preliminary evidence of excessive retail margins being charged by the gentailers. Following an election win by the conservative National Party at the end of 2008, a new ministerial inquiry recommended abolition of the Commission and a return to more business-friendly approach (Office of the Minister of Energy and Resources, 2009). The Electricity Act 2010 provided for the termination of the Whirinaki contract, some shuffling of generation assets between two SOEs (South Island-based Meridian Energy and North-Island-based Genesis Energy), and the replacement of the Electricity Commission by a new Electricity Authority with the general objective of "promot[ing] competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers."[16]

Included in the functions of the new Authority alongside monitoring the market, maintaining registers, and implementing an industry code of conduct, was "to promote to consumers the benefits of comparing and switching retailers."[17] Together with asset switching between two of the gentailers, this was intended to revive some appearance at least of competition in the retail market by raising the rate at which consumers were switching from one retailer to another. In association with a consumer watchdog organization, the Consumer Institute, the Authority set up a "Powerswitch" web site[18] on which consumers could compare retail prices in their locality. The gentailers contributed to the impression of competitive activity by diversifying the brand names under which they sold electricity at retail. These activities, plus an intensive advertising campaign entitled "What's my Number?" (Electricity Authority, 2012), succeeded in raising the rate of customer churn amongst retailers, at the cost of a very large deadweight burden of information-gathering, calculation, and anxiety borne by individual consumers and voluntary budget advisory services; the Authority nevertheless judged its efforts a success. It is not yet clear whether increased customer switching has had any effect on the rate of increase of retail prices over the long run, but it may have had at least a temporary effect similar to the initial impact of the Electricity Industry Reform Act in 1998–2000 (Figure 21.6).[19]

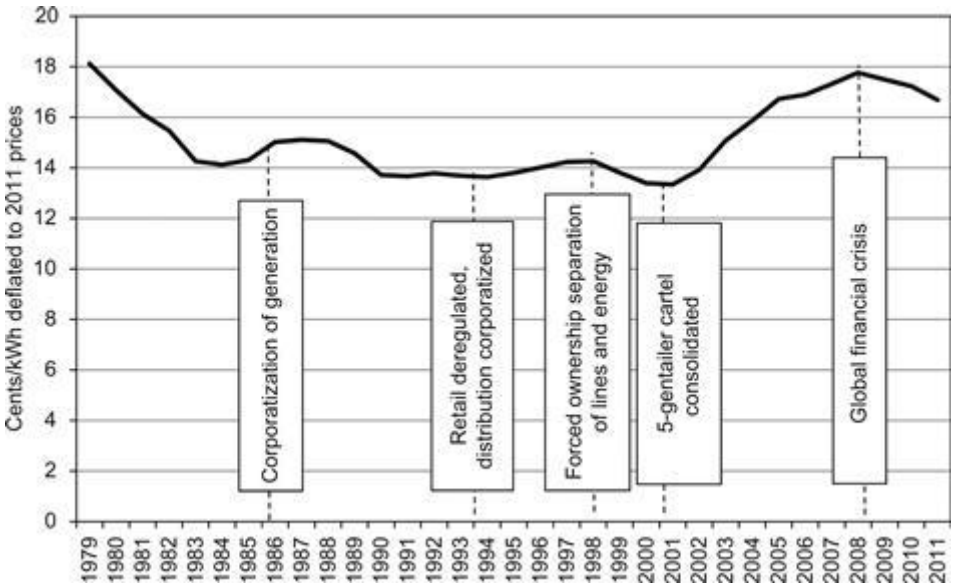

Figure 21.6 Average real electricity price 1979–2011, 2011 cents per kWh. Source: As for Table 21.1; author's calculations.

3.3 Lines Regulation

The ongoing nonregulation of generation and retail pricing and profitability (in the name of promoting, and relying on, market competition and efficiency) was from the outset separate from the regulatory treatment of transmission and distribution lines, whose natural-monopoly character made some sort of regulation inescapable, but for the first decade of corporatization, 1994–2003, policy makers relied on information disclosure alone as a means of disciplining market behavior.

Lines businesses were required to disclose financial, and some physical, information for publication in the official *New Zealand Gazette*; but the government department responsible for overseeing the information disclosure process (the Ministry of Commerce) did not maintain a public registry of disclosed information, nor undertake analysis of financial disclosures. As lines companies became increasingly bold in their asset revaluations, price-cost markups, and creative accounting, government's ability and will to regulate declined steadily through the 1990s. The official electricity sector statistics shrank rapidly in coverage and accuracy after 1989, and were phased out entirely in 1994.

By 2000, the lines companies were carrying on their books some $2 billion of asset revaluations that their auditors had signed off without challenge from government—effectively a wealth transfer from electricity consumers, underpinned by increased prices and margins—and had become the object of widespread public disquiet about their apparent profiteering at consumers' expense. A ministerial inquiry largely exonerated the companies, even going so far as to deny that capital gains captured by natural monopolists should be treated as income for regulatory purposes (Caygill, 2000). Nevertheless, some regulatory intervention was judged politically unavoidable, and amendments to the Commerce Act were passed requiring the Commerce Commission to inquire into the need for regulation. In due course, after a 3-year process of deliberation and ministerial approval, the Commission introduced a version of CPI-X price regulation (prices allowed to rise by X% less than the Consumer Price Index), based on thresholds that accepted as a fait accompli the asset revaluations and high-priced takeovers of the preceding decade, with the accumulated revaluations reclassified as historic cost (Bertram and Twaddle, 2005, p. 298).

Subsequently, two detailed empirical studies utilizing disclosed information (Bertram and Twaddle, 2005; Nillesen and Pollitt, 2011) have traced large increases in price-cost margins, and in asset values, in the late 1990s, as the new company managements drove costs down and (to a lesser extent) prices up. Figure 21.7 charts the revaluation boom which doubled the book value of distribution lines assets 1994–1999 before the Government referred lines pricing to the Commerce Commission. After regulation began in 2003, steady annual revaluations were still allowed to reflect the increasing replacement cost of assets. Of the 2011 regulatory asset base of around $8 billion, nearly half consisted of revaluations (basically bare wealth transfers) as distinct from net actual investment. Around $2 billion of those revaluations represent the initial wealth transfer from consumers—the rate shock attributable to the reform process—as valuations rose from historic cost to Optimized Deprival Value (ODV) or more during the unregulated 1994–2003 period.

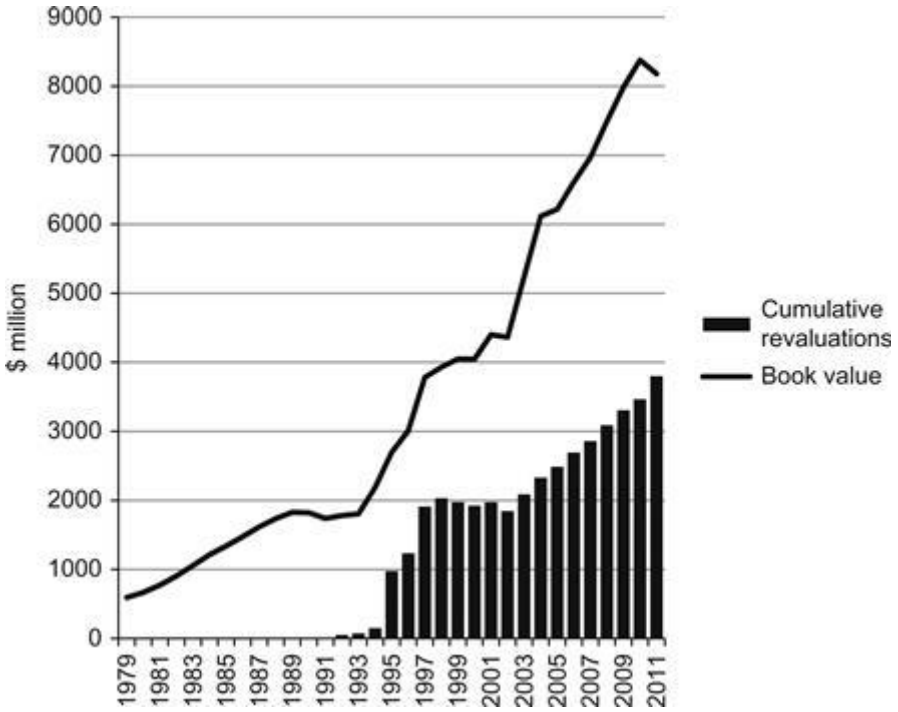

Figure 21.7 Distribution networks book value of fixed assets. Source: 1979–1993 from annual electricity statistics; 1994–2002 assembled from individual company disclosure statements; 2003–2011 from Commerce Commission disclosure data at http://www.comcom.govt.nz/information-disclosure/.

The next section turns to the outcomes of industry restructuring and the evolving regulatory regime since 1986, asking whether there is clear evidence of improved performance emerging from two decades of neoliberal "reform."

4 Outcomes Over the Reform Period

This section summarizes the trends in prices, costs, margins, profits, asset values, and investment performance over the 25-year period 1987–2012. At aggregate level, Figure 21.6 showed that the real price of delivered electricity was falling prior to reform, stabilized over the first decade of restructuring, fell briefly during a competitive interlude 1998–2001, and then climbed steadily from 2001 to 2009. In the last 2 years of the chart, it is evident that the global financial crisis, emerging excess generation capacity, and some pro-competitive regulatory activism have curbed the industry's rate of price inflation to below the economy-wide inflation rate.

Figure 21.8 shows real price trends by end-use sector, with the overall average from Figure 21.6 overlaid. It is apparent that the flat trend of prices overall through the 1990s (Figure 21.6) did not hold for all end users. Residential prices began to rise in 1990 and over the following two decades they increased 3% per year ahead of the inflation rate. The only time when competitive market pressures seriously checked the trend was 1998–2001, when a scramble for retail-market shares was underway following the ownership separation of lines and energy businesses. Once the *de facto* cartel of five vertically integrated gentailers consolidated in 2001, price rises for residential consumers accelerated to a steady 5% per year above the general inflation rate until the global financial crisis struck.

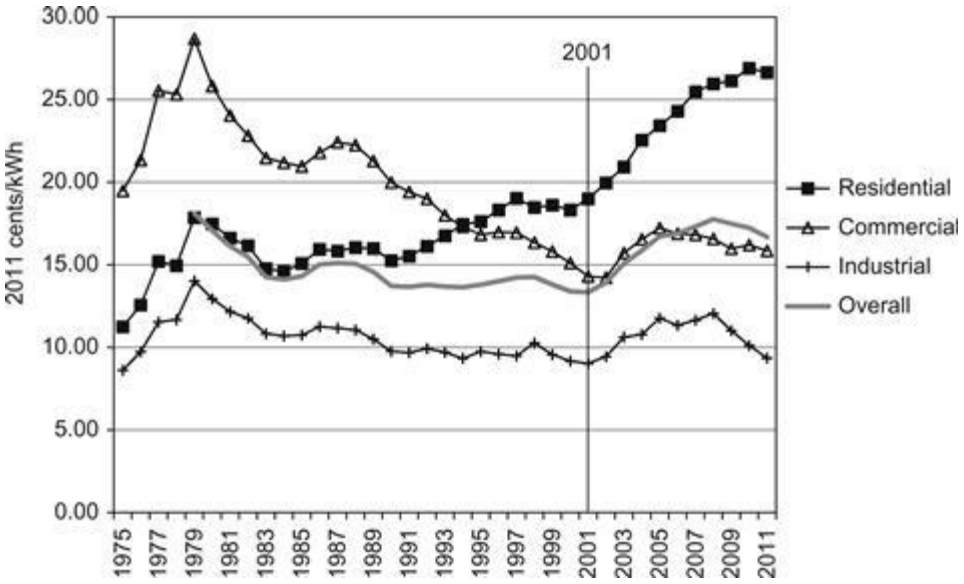

Figure 21.8 Real electricity price by end-use sector, 1979–2011. Source: Prices and volumes from *Energy Data File* (2012, Tables I.1a and G.5a). Deflated by the author using CPI for residential and Producer Price Index (PPI) (Inputs) for commercial and industrial, but using CPI for years before the PPI series begins.

Commercial prices fell steeply in real terms through the 1990s, offsetting the residential price hikes. However, after the gentailer cartel consolidated in 2001, they too turned up sharply until 2008. Industrial prices stayed much more constant in real terms throughout, but with a period of real price hikes 2001–2008. The average industrial price is held down by the heavy weight of the Rio Tinto aluminum smelter at Bluff (Figure 21.1) which uses around 17% of New Zealand's total electricity at a very low contract price.

The key to the divergent trends pitting households against business has been the lobbying and bargaining power exercised by the industrial and commercial sectors to keep their costs down, and to the almost complete loss by residential consumers of any effective voice in policy or regulatory arrangements. In government, both main political parties have allowed the large electricity suppliers to set retail prices without regulatory intervention.

How did the New Zealand price trends in Figure 21.8 compare with those elsewhere in the world? Using International Energy Agency data, Figure 21.9 shows the path of residential prices in New Zealand compared with a number of the other countries covered in this book. Figure 21.10 carries out the same exercise for industrial electricity. Both charts are constructed to show trends before and since the restructuring of the New Zealand industry began in 1986. New Zealand is clearly an extreme outlier in terms of the extent to which residential prices have been driven up ahead of the inflation rate in the reform era, whereas other countries in this book have held residential prices stable or reduced them over the same period. In contrast, industrial electricity prices in New Zealand have roughly tracked those in neighboring Australia.

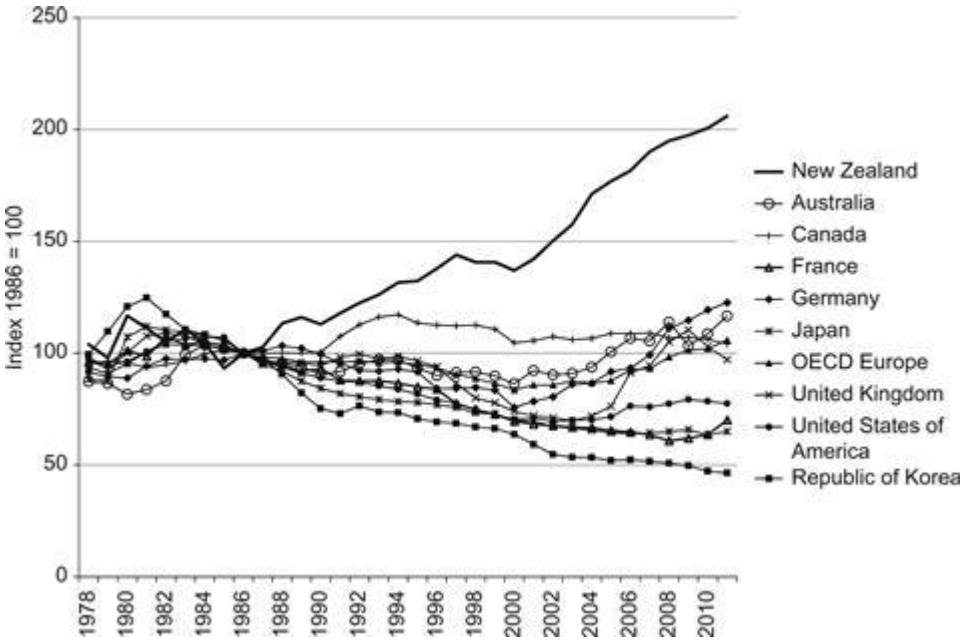

Figure 21.9 Real electricity price to residential consumers: New Zealand compared with some other countries covered in this book. Source: International Energy Agency, *Energy Prices and Taxes* online database (accessed July 2012).

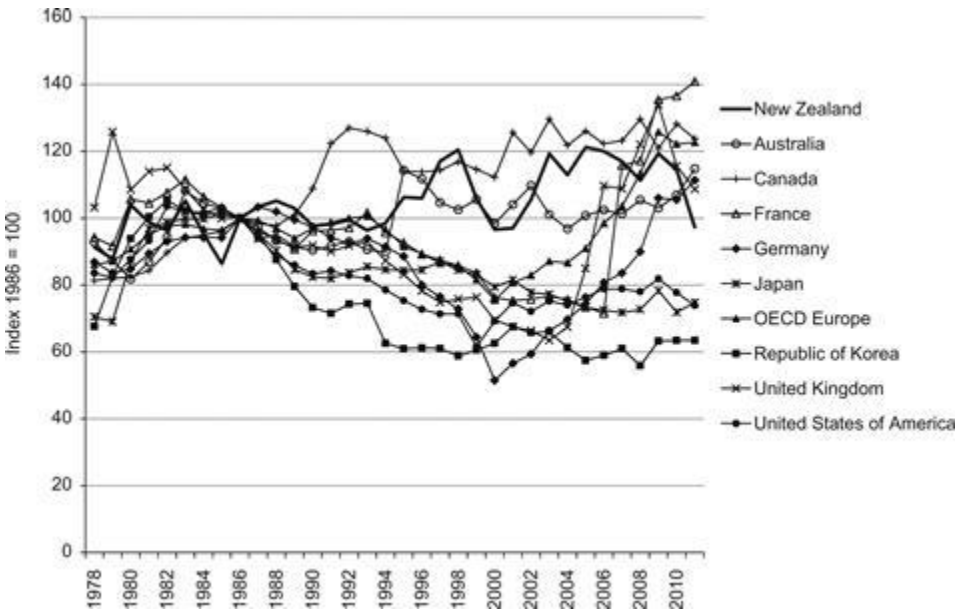

Figure 21.10 Real electricity price to industrial consumers: New Zealand compared with some other countries covered in this book. Source: International Energy Agency, *Energy Prices and Taxes* online database (accessed July 2012).

A profitability analysis of the three SOE gentailers (Meridian, Genesis, and Mighty River) conducted for the Treasury by Ernst and Young in 2011 estimated that "economic profit" (the companies' return over and above their cost of capital) had totaled some $3.8 billion over the 10 years (Ernst and Young, 2011; Treasury, 2011, p. 39, Table 8) on total revenues of $42 billion. Their "invested capital" was stated to have risen from $4 billion in 2002 to nearly $12 billion in 2011 (Treasury, 2011, p. 38, Table 8); but the great bulk of this increase—$6.2 billion, according to the companies' annual reports—was asset revaluations, with less than $2 billion

representing the historic cost of net actual investment. The revaluations were so-called "fair value" exercises which wrote up the book value of assets to reflect the present value of expected cashflows, and in this sense they provide a gauge of the actual and anticipated profitability of the vertically integrated state-owned businesses.

Analysis of the annual financial reports of all five large gentailers, and of their predecessor ECNZ, enables construction of Figure 21.11, which compares the recorded book value of fixed assets with the cumulative revaluations taken to book over the years. It can be seen that by 2011 roughly half of the total book value was revaluations. The revaluation process got under way in 1999, when generation assets transferred from ECNZ to their new owners were marked up by $1.5 billion; but the really big surge came after 2001 as the cartel consolidated and was able to exercise its market power to generate increasing cashflows that could be capitalized into "fair value" entries on their balance sheets.

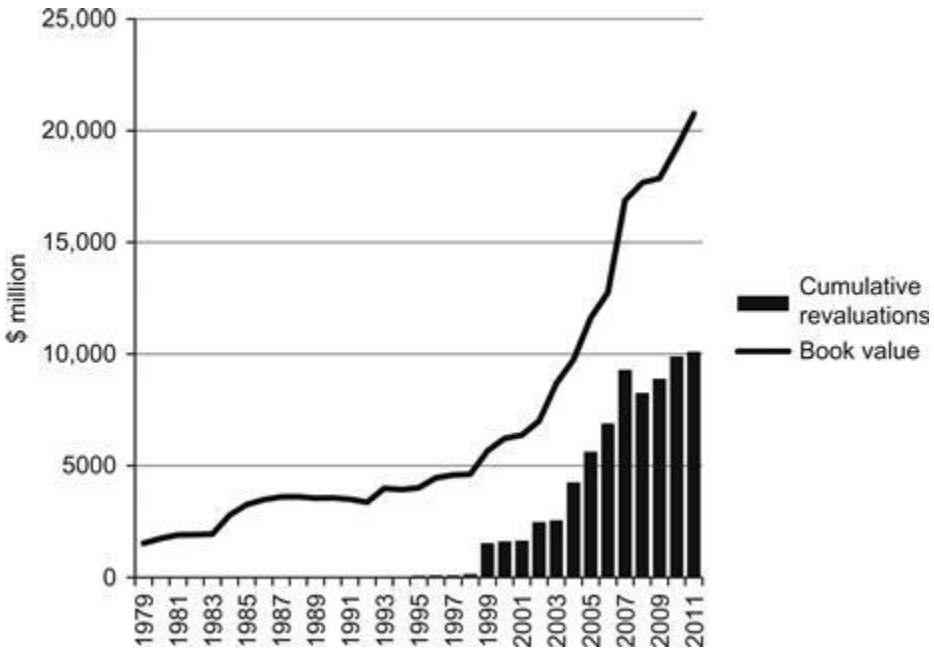

Figure 21.11 Gentailers' book value of fixed assets decomposed between net capital expenditure and revaluations. Source: 1979–1993 from annual electricity statistics; 1994–2011 collated by the author from company annual reports.

In interpreting Figure 21.11, two peculiar features of the New Zealand regulatory environment need to be borne in mind. First, there is no capital gains tax in New Zealand, so that revaluations are in effect untaxed income, which under New Zealand's generally accepted accounting practice (GAAP) does not have to be entered in the profit and loss account. Second, as noted earlier, there is no law prohibiting the taking of excess profits. As a Commerce Commission report noted in 2009:

The exercise of market power to earn market power rents is not by itself a contravention of the Commerce Act, but is a lawful, rational exploitation of the ability and incentives available to the generators

(Commerce Commission, 2009, p. 6, paragraph v.)

Under new financial reporting standards introduced about 2007, and used by all the gentailers from 2008 on, company accounts now show, in addition to the book value of fixed assets including revaluations, a figure for the value that would have appeared under historic-cost accounting conventions of the sort that apply in, for example, the United States of America. Table 21.2 assembles, from the five large gentailers' accounts, comparative data on the two measures for the years 2008–2012. If one imagines a hypothetical regulator controlling retail prices on the basis of a historic-cost regulatory asset base, it is immediately apparent that such a regulator would have disallowed a substantial proportion of the price increases charged by these companies over the past decade.

Table 21.2

"Fair Value" Book Value of Generation Fixed Assets Compared with Historic Cost

	2008	2009	2010	2011	2012
"Fair value" at which generation fixed assets are carried					
Contact	4.1	4.1	3.7*	4.1*	4.2
Genesis	1.5	1.5	1.4	2.5	2.5
Meridian	6.0	5.9	7.7	7.3	7.3
Mighty River	3.0	3.5	4.1	4.4	4.5
Trustpower	2.0	2.3	2.3	2.4	2.5
Total	16.5	17.2	19.2	20.8	21.0
Book value if a historic cost basis were used					
Contact	1.6	1.6	1.6*	1.6*	1.6*
Genesis	1.2	1.2	0.9	1.7	1.6
Meridian	2.3	2.2	2.9	2.9	2.7
Mighty River	1.2	1.5	1.7	1.7	1.7
Trustpower	1.1	1.2	1.2	1.2	1.2
Total	7.4	7.7	8.3	9.1	8.9

Contact Energy in its 2010 *Annual Report*, p. 60 announced a voluntary switch to historic cost and an end to "fair value" adjustments. In constructing this table, the 2009 revaluation reserve has been carried forward to make up for the removal of any corresponding item in Contact's financial statements.

Source: Company Annual Reports, collated by the author.

To capture as cash the capital gains embodied in "fair value" revaluations, either the companies must make return-of-capital distributions to their owners or the assets must be on-sold to a third party at a price that includes the revaluations. The New Zealand Treasury, hungry for revenue from SOEs, has encouraged and benefited from the sequence of ownership changes forced on the industry by restructuring policies. When in 1996 the first split of ECNZ took place with the

creation of Contact Energy, the new company raised debt finance to pay out ECNZ in cash, enabling ECNZ to pay its owners cash dividends totaling $3 billion over 2 years (Figure 21.12). The divestment of the remaining ECNZ assets to new state-owned companies in 1999 produced another $2.5 billion. The Treasury in 2012 hoped that the pending sale of 49% of the three generator SOEs could produce another $5–6 billion in cash.

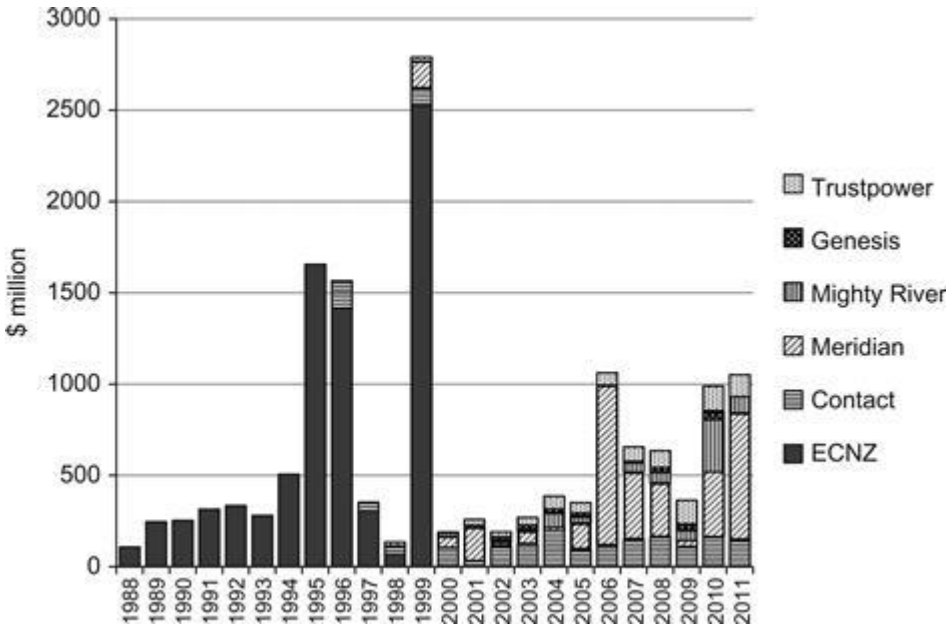

Figure 21.12 Distributions to owners by the large generator-retailers, 1988–2011. Source: Collated by the author from annual reports.

The circular process of revaluing assets, declaring higher capital charges to service the resulting higher book values, then raising prices to recover those charges before proceeding to the next "fair value" exercise, slowed down after 2008—more because of macroeconomic conditions affecting the market than due to any regulatory restraint.

To look more closely at cost/price trends in the four levels of the industry (generation, transmission, distribution lines, and retail), a first step is to decompose total electricity sales revenue between lines charges and energy charges. Figure 21.13 carries out this exercise by assembling scattered data published in official statistics, company annual financial statements, and information disclosure documents. The solid bars at the bottom of this chart represent lines charges for transmission (black) and distribution lines (gray), while the hatched bars at the top represent energy charges. For the first half of the 1990s, official statistics permit a further breakdown between wholesale and retail charges for both lines and energy, with the retail margin derived as a residual from total sales after subtracting transmission, distribution lines charges, and ECNZ's wholesale energy sales revenue.

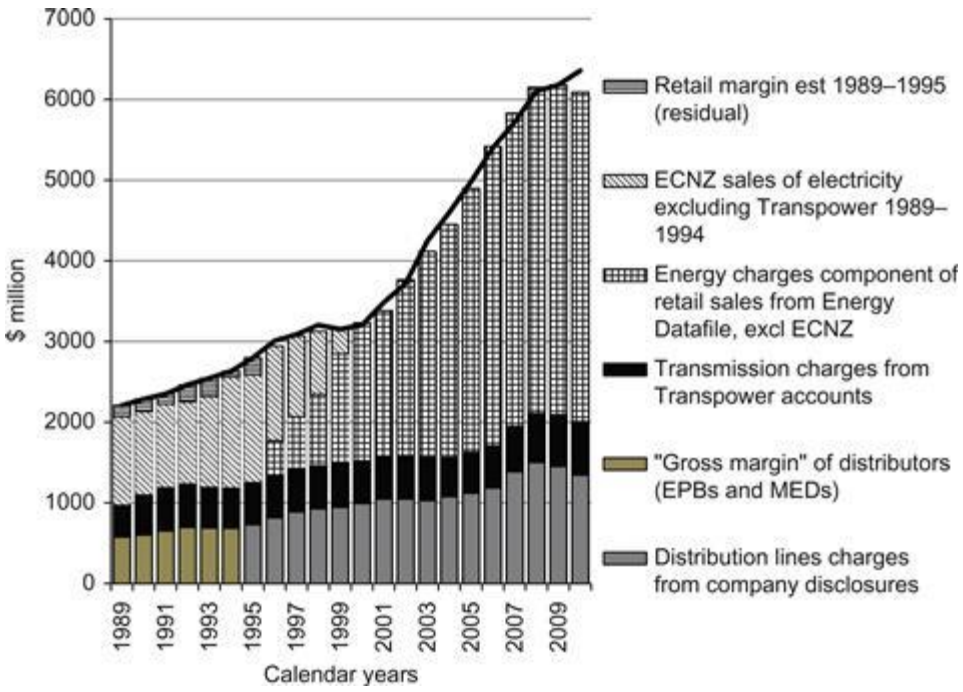

Figure 21.13 Decomposition of total sales revenue, 1989–2010. Source: Compiled by the author from electricity statistics, company annual reports, information disclosures, and *Energy Data File* various issues

It is not possible to disaggregate the "energy" charges in Figure 21.13 for years since 1997 because the vertically integrated gentailers combine their generation and retail businesses into a single set of annual financial statements, with only limited segmental reporting of revenues and costs.

It is obvious, however, from inspection of Figure 21.13 that trends in total sales revenue have been driven more by energy charges than by lines charges. The 1998–2000 dip in total revenue and its very rapid rise 2001–2009 were due primarily to developments in the pricing of energy. In 2009–2010, when average overall prices softened (Figure 21.7 above) it was distribution lines, rather than energy revenues, that took the hit. Transmission charges, apart from their sharp increase 1989–1991 (when ECNZ restructured to load costs onto its transmission subsidiary and thereby improve the privatization prospects of the generation operation) have remained constant in nominal terms, and declined in real terms, over the two decades.

Using the Producer Price Index (Inputs) to deflate the figures, and dividing by annual final sales volume, Figure 21.14 shows the breakdown of the average real price using the same data as Figure 21.13. The relative constancy of distribution lines charges and the decline in transmission charges are clear, as is the sharp increase in energy charges after 2000.

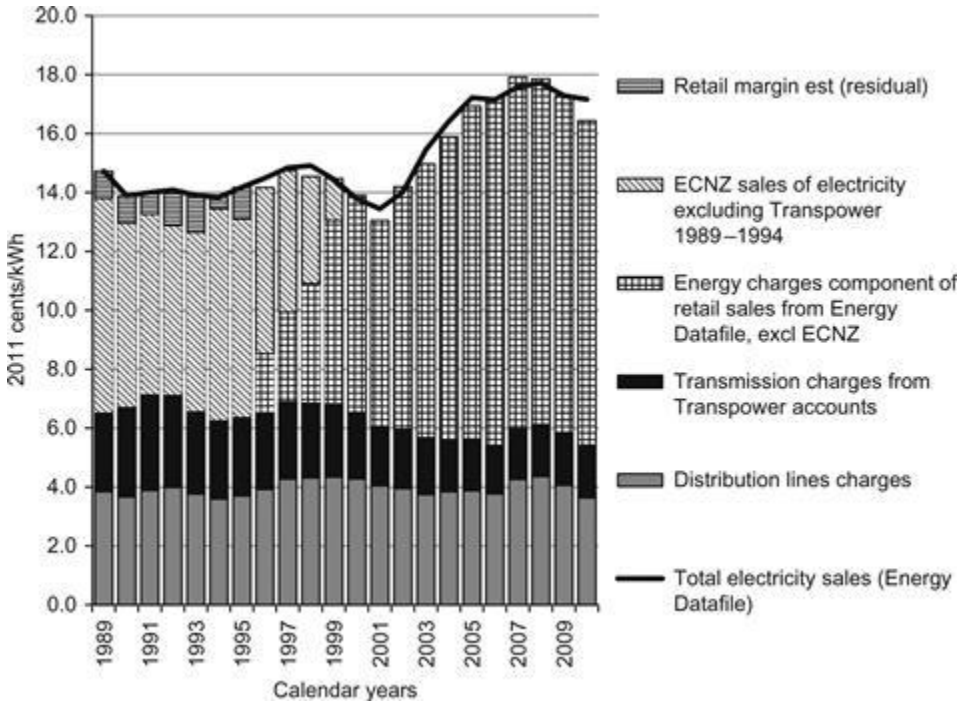

Figure 21.14 Decomposition of the real average price of electricity, 2011 cents/kWh. Source: As for Figure 21.13, deflated using the PPI (Inputs) published by Statistics New Zealand.

Recently, data have become available for the segmental breakdown of the gentailers' aggregated sales revenues between the cost of wholesale electricity generated and purchased, and the retail margin (covering charges for various market services, metering, consultants, industry governance levies, advertising, plus the gross profit margin secured). This new data makes it possible to compare, in Figure 21.15, the breakdown of final price paid by all consumers on average in 1990 and 2010.

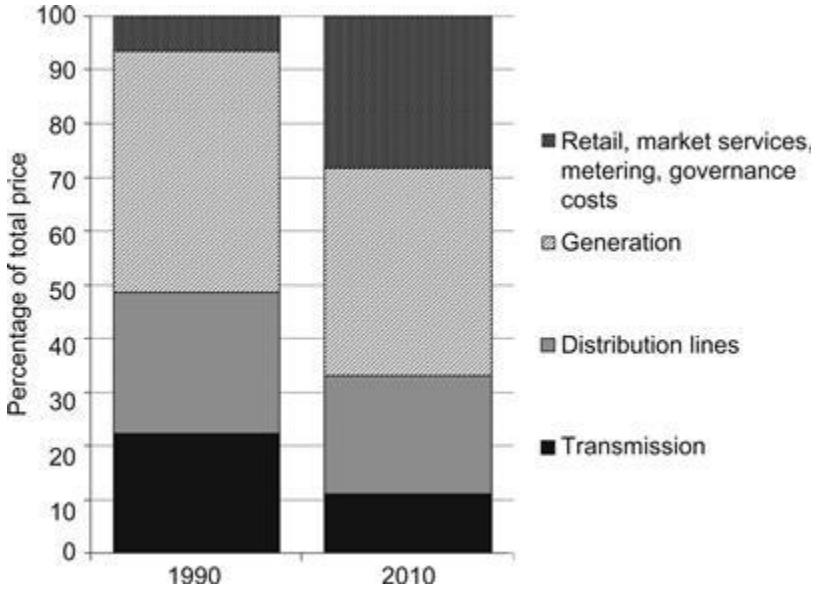

Figure 21.15 Proportional breakdown of final electricity price amongst the four components, 1990 and 2010. Source: 1990 from the data used to construct Figure 21.12. 2010 based on a

chart in Electricity Authority (n.d, p. 1), with the four sectors aggregated using sectoral consumption weights from *Ministry of Economic Development* (2011, p. 118, Table G.6a).

The striking feature in Figure 21.15 is the enormous increase in the proportion of the final price that is absorbed by the retail segment of the industry. Under the old industry structure, with retailing undertaken by ESA distributors on a nonprofit basis, retailing absorbed 7% or less of the consumer dollar. By 2010, after two decades of restructuring supposedly for the benefit of consumers, these charges had risen to 28% of the bill. In real 2011 dollar terms, retail and other minor charges cost the consumer 0.9 cents/kWh in 1990; by 2010 this had risen to 4.2 cents. For residential consumers, the increase was far greater than this, taking retail charges from under a cent to around 8 cents/kWh.

An important component of the price of electrical energy is the wholesale price emerging from the operation of New Zealand's pool.[20] The wholesale market is an energy-only market which clears every half hour at the price offered by the marginal tranche of generation. A typical diagrammatic cross section of the cost and demand structure is Figure 21.16,[21] which shows clearly the large component of generation capacity available at very low short-run cost, and the steeply rising segment at the right-hand end of the supply curve as successive tranches of thermal plant (and of hydro generation with high opportunity cost of water) are called upon.

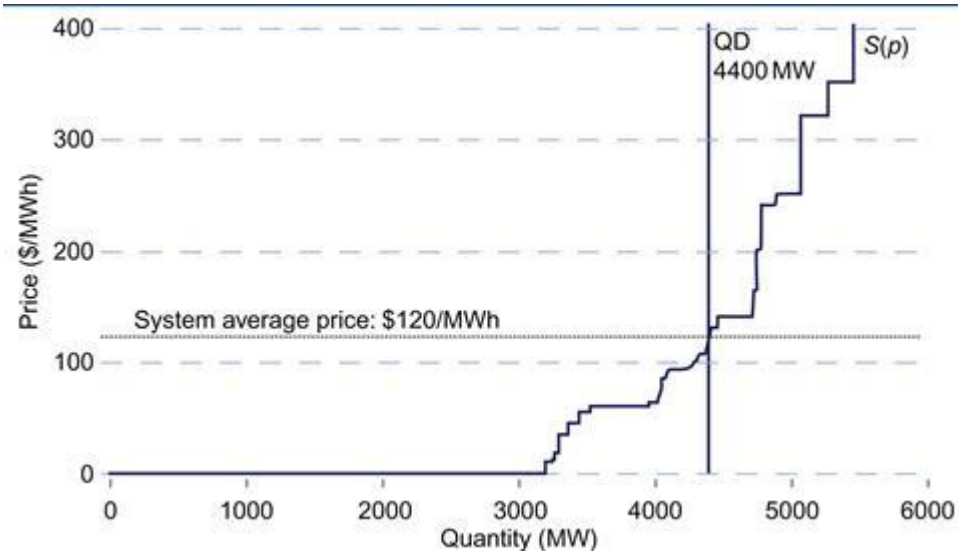

Figure 21.16 Aggregate offer curve for all generators in a half-hour period, with total market demand at 4400 MW. Source: McRae and Wolak (2009, p. 36, Figure 3.4).

It is obvious from the diagram that a large part of the total revenue secured in any period is rent on low-operating-cost fixed assets. Since the market is energy-only, incumbent generators are expected to utilize this large producer surplus to fund new capacity, and the availability of such large rents has allowed the system to function without separate arrangements to incentivize investment like capacity rights. There is no reason, however, to believe that the total rents bear anything other than an arbitrary relation to the actual financing needs of generation. There is, on the contrary, much reason to see them as pure wealth transfers from consumers, positively related to the spot price.

Acknowledgment that the spot price might be subject to the exercise of market power led the Commerce Commission, in 2005, to initiate an inquiry into the issue of whether market power

was being exercised in the wholesale market and, if so, whether this involved anticompetitive behavior as defined under New Zealand competition law. The resulting quantitative study of the wholesale market (McRae and Wolak, 2009; Wolak, 2009) found strong evidence that at times of relative shortage of supply, the spot price had been driven well above a hypothetical competitive level (the "counterfactual price" in Figure 21.17).

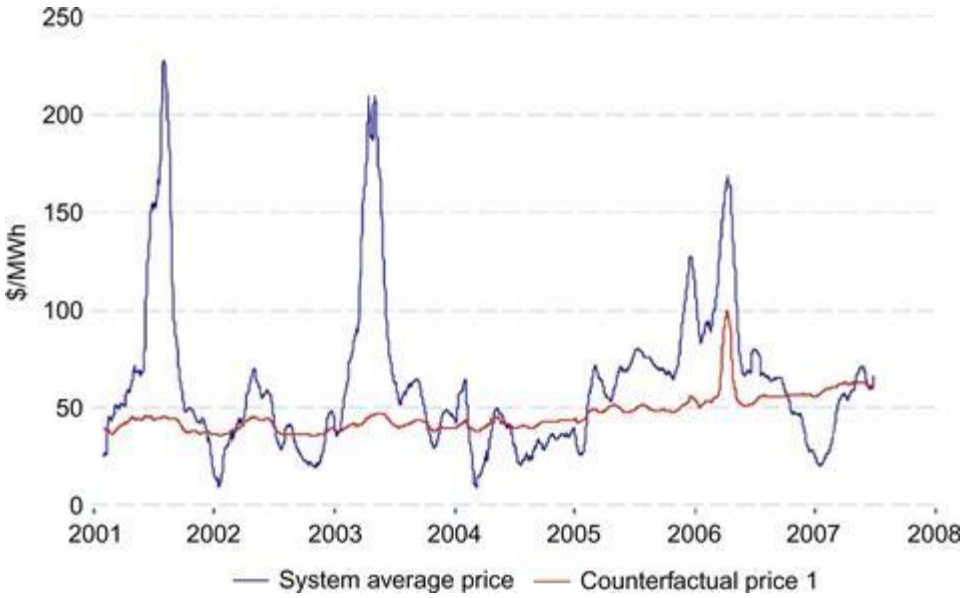

Figure 21.17 Deviation of actual wholesale spot price from hypothetical competitive price, 2001–2007. Source: Wolak (2009, p. 201, Figure 5.13).

Based on this modeling work, Wolak estimated market power rents, shown in dark shading in Figure 21.18, at $4.3 billion over the period—18% of the total wholesale market revenues received by all generators over the entire period (Commerce Commission, 2009, p. 6, paragraph ii). A later, independent, study using a different methodology (agent-based modeling) found monopolistic rents on the same scale as Wolak, but with a different distribution of rents across seasons and years (Browne et al., 2012).

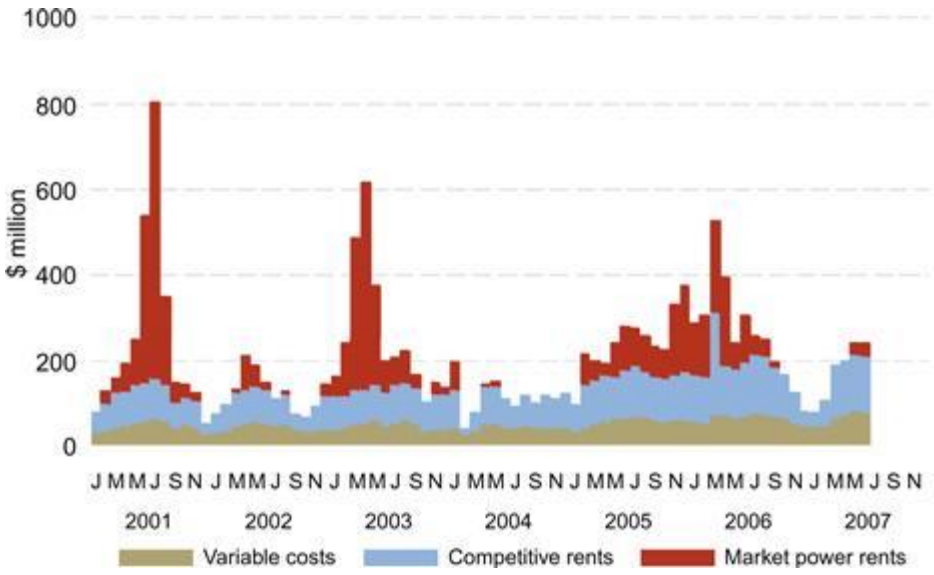

Figure 21.18 Wolak estimates of "market-power rents". Source: Wolak (2009, p. 200, Figure 5.11).

Because it found no evidence that the market power identified by Wolak had been "exercised for any anticompetitive purpose," the Commission ended its investigations with no further action being taken, but it did comment that

there are serious systemic issues arising out of the current market structure, market design, and market rules that provide the generators with the ability and incentive to exercise market power under certain periodic and recurring conditions

(Commerce Commission, 2009, p. 6, paragraph v.)

The Commission pointed also to the inadequacy of information available, even a decade and a half after the New Zealand Government had adopted a light-handed regulatory stance built around the idea of information disclosure as the key restraint on monopolistic conduct:

[U]nlike the situation in many other jurisdictions, the regulatory bodies monitoring the electricity industry in New Zealand have not historically collected, and still do not collect, all of the information typically required by a competition authority to fully assess competition in the wholesale and retail markets

(Commerce Commission, 2009, p. 8, paragraph xvii).

Turning to investment, Figure 21.19 shows the trends in depreciation and gross fixed capital formation for the sector "electricity, gas, and water" in the New Zealand national accounts. Within that sector, electricity accounts for 85% or more of total sales and value added,[23] which means it is the dominant influence on the aggregate figures.

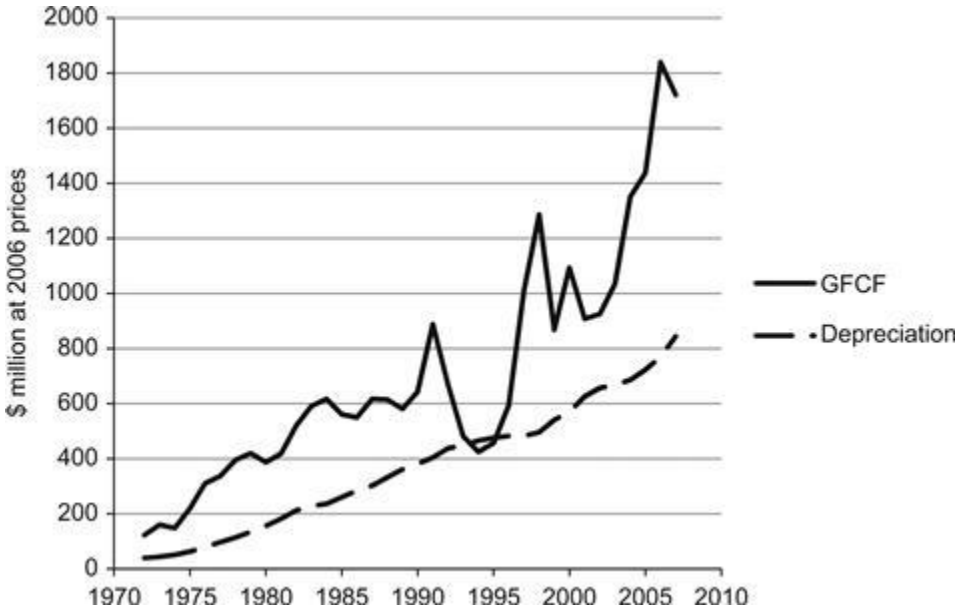

Figure 21.19 Investment performance of "electricity, gas, and water" sector, 1972–2007.[22] Source: National accounts published by Statistics New Zealand. The published sectoral data ends at 2007.

The uncertainty and disruption caused by restructuring of the electricity sector had a major impact on maintenance spending and investment in new capacity, both in the generation fleet and in the transmission grid. As was seen in Figure 21.2, over the first 15 years of "reform" from 1986 to 2000 generation capacity remained flat with no net gain from investment, as commercial decisions eliminated over 600 MW of reserve high-operating-cost thermal plant whose disappearance fully offset what new investment was undertaken in lower cost thermal baseload units (Bertram, 2006, p. 225, Table 7.5). This profit-motivated scrapping of inherited reserve plant had the effect of narrowing the safety margins in a system that was heavily dependent upon hydroflows. In due course a dry winter in 2001 brought a supply crisis, high prices, and blackouts, spurring a resumption of new construction.

The 1990s swing to negative net investment in Figure 21.19 amounted to an "investment strike" not only by the newly corporatized generation sector—resulting in a 15%-point increase in capacity utilization as the margin of excess generation capacity was stripped back—but also by the state-owned grid operator Transpower, as it struggled to meet stringent financial performance requirements—high capital charges on revalued grid assets—imposed by Government as its shareholder. The grid was allowed to run down for a decade and a half while large cash dividends were extracted by the New Zealand Treasury. The grid assets inevitably deteriorated and eventually key components began to fail, a process dramatically illustrated by a blackout of much of Auckland in June 2006, and by the 2007 reduction in the capacity of the interisland high-voltage DC link which is a key part of the grid backbone.[24]

The HVDC link had been installed in the 1960s, and upgraded in 1987–1992 by addition of a new thyristor converter alongside the original mercury valves, plus the laying of three new undersea cables. Pole 1 of the system continued to operate with the original 1960-vintage equipment until 2007, leaving the link increasingly vulnerable to failure as Pole 2 also began to age. The coldest day of the 2006 winter, June 19, brought a grid emergency and blackouts in the North Island due to a sudden outage on the HVDC; and in September 2007, Pole 1 finally had to be taken out of service. The next year it was reactivated for a while using old equipment salvaged from Denmark, but the link effectively was reduced to a single pole, meaning that normal industry standards of grid security were not met, and wear and tear on the operational pole increased sharply. In 2008, planning finally commenced on a new pole for the HVDC; work began in 2010, and the new pole is finally due for commissioning in 2013, restoring an (n–1) level of security.

Figure 21.20 shows the grid's book value since Transpower was established in 1987. The steep increase from 1990 to 1993 reflects a combination of asset revaluation (to ODV) and heavy expenditure on the interisland link. Thereafter until 2006, the book value drifted steadily down as depreciation outran new investment spending. A major downward revaluation was taken to book in 1998. Only after 2006 did the value of assets begin to increase as investment in replacement and extension of grid assets was resumed. Short-term thinking and Treasury's hunger for revenue eventually had their consequences in the 2006 Auckland blackout and 2007 HVDC downgrade.

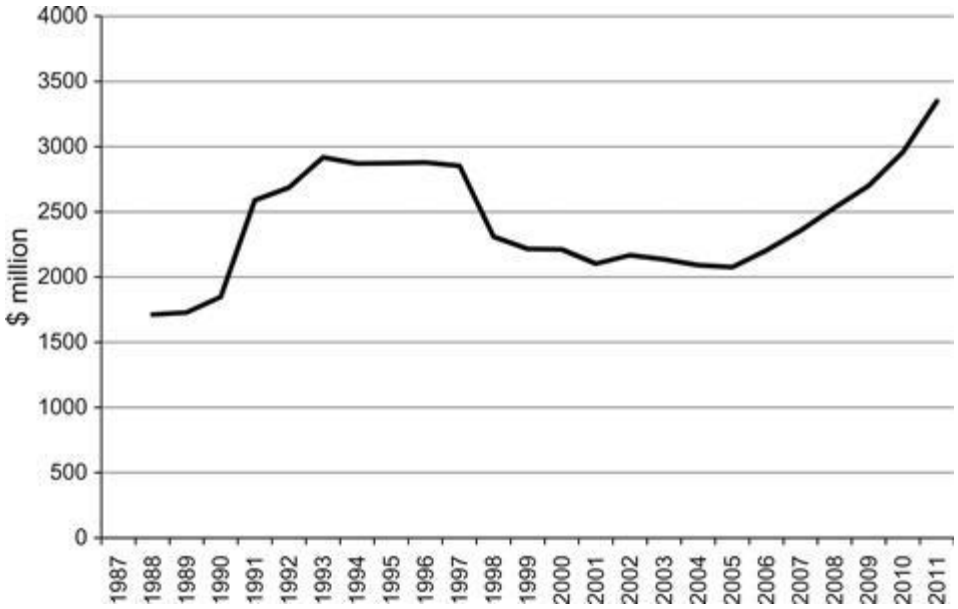

Figure 21.20 Transpower fixed assets book value 1987–2010. Source: Transpower NZ Ltd *Annual Reports.*

The proposition that market mechanisms would coordinate investment more efficiently than central planning had done prior to 1987 receives no support from Figures 21.19 and 21.20.

5 Conclusion

At the beginning of the restructuring process, the 1989 Electricity Industry Task Force report recommended privatization of ECNZ with some limited spin-off of its assets, removal of retail franchises, separation of lines and energy, corporatization and privatization of distribution, light-handed regulation of lines, and no regulation of retail prices (Bertram, 2006, p. 209, Box 7.1). While not all details have matched the Taskforce blueprint, the general outline of the New Zealand restructuring program has remained generally consistent with its general strategic thrust.

The absence of a fully resourced specialist regulator has proved a significant drawback. The regulatory arrangements covering prices, costs, and profitability in the electricity sector have undergone repeated adjustments without as yet settling into a sustainable long-term shape.

Unresolved issues lie in wait as the state-owned generators are put through part-privatization over the coming years. The tax treatment of windfall profits on sunk-cost renewables as the carbon price rises is one of these. Another is the long-term exemption of hydrogenerators from any charge on the water they use. A third is the rise in energy poverty among low-income households faced with rising retail prices. A fourth is the reemergence of surplus generation capacity, on a scale potentially greater than that of the 1980s which was used to justify industry restructuring in the first place.

In terms of the international reform agenda reviewed in this book, New Zealand can point to success in maintaining supply through a period of drastic upheaval in the industry structure; a mixed record on operating costs (which were reduced in the lines sector but have risen sharply in vertically integrated generation and retail); progress towards a 90% renewables share (based

on resource endowments rather than policy); but little progress to date on smart metering, demand-side participation in the market, freedom of entry for independent generation, or planning for major future market development like the pending arrival of electric vehicles. Much remains to be done.

References

1. Bertram, G., 1988. Rents in the New Zealand energy sector, in Royal Commission on Social Policy. The April Report, vol. IV. Government Printer, Wellington, pp. 293–325.

2. Bertram G. Restructuring of the New Zealand electricity sector, 1984–2005. In: Sioshansi FP, Pfaffenberger W, eds. *International Experience in Restructured Electricity Markets: What Works, What Does Not, and Why?* Amsterdam: Elsevier; 2006.

3. Bertram G, Clover D. Kicking the fossil fuel habit: New Zealand's case. In: Sioshansi FP, ed. *Electricity Generation in a Carbon Constrained World*. Amsterdam: Elsevier; 2009; (Chapter 14).

4. Bertram G, Twaddle D. Price-cost margins and profit rates in New Zealand electricity distribution networks since 1994: the cost of light handed regulation. *J Regul Econ.* 2005;27(3):281–307.

5. Browne O, Poletti S, Young D. Simulating market power in the New Zealand electricity market. *New Zealand Econ Pap.* 2012;46(1):35–50 (53–55, April 2012).

6. Caygill, D., 2000. Report of the Ministerial Inquiry into the Electricity Industry.

7. Commerce Commission, 2009. Investigation Report: Commerce Act 1986 s.27, s.30 and s.36 Electricity Investigation. <http://www.comcom.govt.nz/investigation-reports/> (accessed 03.13).

8. Concept Consulting Group Ltd, 2008. Smart Metering in New Zealand: a Report Prepared for the Parliamentary Commissioner for the Environment. <http://www.pce.parliament.nz/assets/Uploads/Reports/pdf/Concept_Smart_Metering.pdf/> (accessed 03.13).

9. Contact Energy Ltd, 2010. Annual Report 2010. <http://www.contactenergy.co.nz/web/shared/annualreports?vert=in#a2010/> (accessed 03.13).

10. Crown Ownership Monitoring Unit, 2011. 2011 Annual Portfolio Report. New Zealand Treasury, Wellington. <http://www.comu.govt.nz/resources/pdfs/apr-11.pdf/> (accessed 08.11.).

11. Electricity Authority, n.d. Comparing Prices Paid by Other Consumers: Fact Sheet 3. <http://www.ea.govt.nz/document/16851/download/consumer/factsheets/ (accessed 08.12.).

12. Electricity Authority, 2012. What's my Number? A Changing Landscape for New Zealand Electricity Consumers. <http://www.ea.govt.nz/document/16344/download/about-us/documents-publications/> (both accessed 03.13).

13. Electricity Technical Advisory Group, 2009. Improving Electricity Market Performance: A Preliminary Report to the Ministerial Review of Electricity Market Performance, 2 vols. <http://www.med.govt.nz/sectors-industries/energy/pdf-docs-library/electricity-market/implementing-the-electricity-market-review-recommendations/background-papers-on-2009-review/improving-electricity-market-performance-volume-one-discussion-document-1152-kb-pdf.pdf/> and <http://www.med.govt.nz/sectors-industries/energy/pdf-docs-library/electricity-market/implementing-the-electricity-market-review-recommendations/background-papers-on-2009-review/improving-electricity-market-performance-volume-two-appendices-2252-kb-pdf.pdf/> (both accessed 08.12.).

14. Ernst, Young. *SOE Profit Analysis* Wellington: Treasury; 2011; Available from: <http://www.comu.govt.nz/resources/pdfs/ey-soe-epa-nov11.pdf/> (accessed 03.13).

15. Evans LT, Meade RB. *Alternating Currents or Counter Revolution? Contemporary Electricity Reform in New Zealand* Wellington: Victoria University Press; 2005.

16. Martin J. *People, Politics and Power Stations: Electric Power Generation in New Zealand 1880–1998* Wellington: Electricity Corporation and Bridget Williams Books; 1998.

17. McRae, S.D., Wolak, F.A., 2009. How Do Firms Exercise Unilateral Market Power? Evidence From a Grid-based Wholesale Electricity Market, EUI Working Paper RSCAS 2009/36.
<http://cadmus.eui.eu/bitstream/handle/1814/12098/RSCAS_2009_36.pdf?sequence=1/> (accessed 03.13).

18. Ministry of Economic Development, 2011. Energy Data File 2011. Wellington.

19. Ministry of Economic Development, 2012. Energy Data File 2012. Wellington.

20. Murray K, Scott G, Stevenson T. *Determining Outcomes or Facilitating Effective Market Processes: A Review of Regulation and Governance of the Electricity Sector* Wellington: LECG; 2009.

21. Nillesen PHL, Pollitt MG. Ownership unbundling in electricity distribution: empirical evidence from New Zealand. *Rev Ind Org.* 2011;38(1):64–66 January 2011.

22. Office of the Minister of Energy and Resources, 2009. Ministerial Review of the Electricity Market, Cabinet Paper. <http://www.med.govt.nz/sectors-industries/energy/pdf-docs-library/electricity-market/implementing-the-electricity-market-review-recommendations/background-papers-on-2009-review/Elec.0025%20-%20Electricity%20Market%20Review%20-%20Cabinet%20Paper.pdf/> (accessed 08.12.).

23. Parliamentary Commissioner for the Environment, 2009. Smart electricity meters: how households and the environment can benefit. <http://www.pce.parliament.nz/publications/all-publications/smart-electricity-meters-how-households-and-the-environment-can-benefit/>.

24. Stevens L. The goals of the commerce act. In: Berry MN, Evans LT, eds. *Competition Law at the Turn of the Century: A New Zealand Perspective*. Wellington: Victoria University Press; 2003.

25. Taggart M. Common law price control, state-owned enterprises and the level playing field. In: Pearson L, Harlow C, Taggart M, eds. *Administrative Law in a Changing State: Essays in Honour of Mark Aronson*. Portland OR: Hart Publishing; 2008.

26. Transpower New Zealand Ltd, 2012. Annual Planning Report, Incorporating the Grid Reliability Report and the Grid Economic Investment Report. <http://www.transpower.co.nz/f5620,69352750/APR2012CompleteFINAL.pdf/> (accessed 07.12.).

27. Wolak, F., 2009. An assessment of the performance of the New Zealand wholesale electricity market. Report for Commerce Commission. Wellington. <http://www.comcom.govt.nz/assets/Imported-from-old-site/BusinessCompetition/Publications/Electricityreport/ContentFiles/Documents/comcom-wolakreportassessmentofthenzelectricitymarketperformancept1.pdf/> and <http://www.comcom.govt.nz/assets/Imported-from-old-site/BusinessCompetition/Publications/Electricityreport/ContentFiles/Documents/comcom-wolakreportassessmentofthenzelectricitymarketperformancept2.pdf/> (accessed 03.13).

[22]Official national accounts data at sector level are currently not available for years after 2007.

[1]A 2009 consultants' review of electricity regulation noted that "New Zealand has no consistent or coherent measure of electricity sector performance against which to measure the results of policy changes. None of the many regulatory agencies which routinely comment on the electricity sector has developed, or report[s] in a structured way, indicators of electricity sector performance." (Murray et al., 2009, p. 1.).

[2]The history of the building of the national system is set out in Martin (1998).

[3]Detailed maps of the transmission system are available online at: http://www.transpower.co.nz/maps-diagrams#cs-91581. An online map of distribution networks and their associated grid exit points is at: http://www.electricity.org.nz/Site/Map/default.aspx. Both sites accessed July 2012.

[4]Ministry of Economic Development, *Energy Data File* June (2012, pp. 105–106) http://www.med.govt.nz/sectors-industries/energy/energy-modelling/publications/energy-data-file/new-zealand-energy-data-file-2012 (accessed 07.12).

[5]The Labour administration which was defeated in 2008 had adopted an explicit 90% target (http://www.beehive.govt.nz/release/90-renewable-energy-target-achievable). The new National administration initially backed away from the target, but later included it as a general aspiration in its 2011 Energy Strategy (http://www.eeca.govt.nz/sites/all/files/nz-energy-strategy-2011.pdf, p. 6). There are no explicit policies directed to achieving the aspiration, however.

[6]The history of the industry is described in detail in Martin (1998).

[7]Statistics appeared annually under the cumbersome title *Statistics in relation to the electric power industry in New Zealand*. The minister's annual reports to Parliament can be found in the *Appendices to the Journal of the House of Representatives.*

[8]More detailed descriptions are provided in Bertram (2006), Evans and Meade (2005), Nillesen and Pollitt (2011), and on the Electricity Authority web site at: http://www.ea.govt.nz/about-us/structure/background-to-governance-and-regulation/. A detailed and accessible description of the generation system and the operation of the New Zealand pool and wholesale market is in Wolak (2009, Section 2 and Appendix 1).

[9]Foreclosure is a consequence of vertical integration of generation with retail, which forces any potential entrant to begin operations in two industries simultaneously if it is to escape the sort of fatal imbalance that destroyed TransAlta/OnEnergy in 2001. That company's failure to secure sufficient generation capacity out of the breakup of the old ECNZ portfolio left it overweight in retail and dependent on the spot market for wholesale supply during the 2001 dry winter; bankruptcy was the outcome.

[10]A comprehensive overview of the Commission's activities, including a concise summary of the industry's officially perceived failings as of 2009, is in Office the Auditor-General, *Electricity Commission: Review of the First Five Years*, June 2009, online at: http://www.oag.govt.nz/2009/electricity-commission/docs/electricity-commission.pdf.

[11]The new plant was commissioned in 2004, on the same site as had previously been occupied by a similar dry-year reserve plant decommissioned by Contact Energy in 2001. After the Electricity Commission was abolished the plant was sold in 2011 to Contact Energy for $33 million, less than one quarter of its original cost of $150 million.

[12]Apart from approving the grid pricing methodology for Transpower.

[13]"Threshold" price regulation of lines networks by the Commerce Commission came into effect in 2003 and is discussed further below.

[14]A detailed insider account of these events was provided by Mr. Hemmingway in a sworn affidavit dated December 2007 for a High Court case in which local interests sought to overturn the Commission's eventual decision in favor of the Waikato line. The judgment in the case, which refused judicial review, is *New Era Energy Inc. v Electricity Commission* (2010) NZRMA 63 [HC].

[15]de Lacy, H., 2010. The Waikato Pylon War. *Energy New Zealand* 4(5) September–October, http://www.contrafedpublishing.co.nz/Energy+NZ/Vol.4+No.5+September-October+2010/The+Waikato+pylon+war.html.

[16]Electricity Industry Act 2010, Section 15.

[17]Electricity Industry Act 2010, Section 16(1)(i).

[18]http://www.powerswitch.org.nz/powerswitch.

[19]In both 1998–2000 and 2009–2012, there were downward pressures on price from surplus generation capacity in periods of economic recession, which makes it difficult to identify any separate effect from customer churn.

[20]It is unclear how the wholesale price enters into the operating costs reported by gentailers in their annual financial statements and shown in Figure 21.15. The transfer of electricity from wholesale to retail divisions of each company is an internal transaction, while electricity acquired from other generators is subject to complex contracting and hedging arrangements.

[21]The basic shape of the short-run marginal supply curve has remained unchanged since the 1980s; see Bertram (1988) for a very similar diagram.

[23]This figure comes from the 1996 input–output matrices published by Statistics New Zealand.

[24]A useful overview of the HVDC is at http://en.wikipedia.org/wiki/HVDC_Inter-Island (accessed 07.12).