Asia Pacific Viewpoint, Vol. 42, No. 1, April 2001
ISSN: 1360-7456, pp115–131

Energy

Geoff Bertram

Abstract: *The 1990s was a decade in which radical institutional restructuring was imposed from above on an energy economy which was in a stage of stable maturity following half a century of rapid development. The key plank in the reforms was the withdrawal of the state from ownership of energy production where possible (natural gas and parts of electricity), and from any non-commercial philosophy in relation to the electricity and coal enterprises which remained state-owned. Regulation of natural monopoly elements (pipelines, transmission and distribution lines, processing plants) was virtually eliminated under the rubric of 'light-handed regulation', and the scheduling of electricity generators was moved from a planned to a market system. Underlying real trends in energy intensity, production and use were unaffected by the reforms, and the expected efficiency gains which had motivated reform were not in evidence by the end of the decade.*

Keywords: *energy, restructuring, reforms, electricity, 'light-handed regulation'*

Photo: M.J. Crozier

The Clyde Dam, Clutha River.

Author: Geoff Bertram, School of Economics and Finance, Victoria University of Wellington, PO Box 600, Wellington, New Zealand. E-mail: Geoff.Bertram@vuw.ac.nz

The half-century to 1990 witnessed radical changes in energy supply and use in New Zealand: installation of the electricity grid and Cook Strait cable; completion of a system of forty large state-owned electricity generation plants; massive development of the roading network with the rise of the private automobile; development of the Marsden Point oil refinery, the Kapuni and Maui natural gas fields, and the high-pressure gas transmission network throughout the North Island; virtual extinction of the old coal-gas manufacturing industry; the Think Big programme of energy-intensive or energy-related large projects in the 1980s.

By the beginning of the 1990s these developments were complete and the energy industries had reached maturity. With infrastructure in place and sectoral patterns of energy use established, trends in production and use held steady throughout the 1990s with no significant breaks.

Institutionally, however, this was a decade of upheaval. The energy sectors were at the heart of the process of deregulation, corporatisation, privatisation, and restructuring that began in New Zealand in the mid-1980s. Changes to the institutional superstructure of the electricity, gas, and coal industries were far-reaching and had every appearance of radicalism – effectively a gigantic experiment in the application of markets in place of planning, in the course of which public ownership and control of several of the economy's commanding heights was either abolished, or so stripped of social content as to make public enterprise indistinguishable from private.

This superstructural revolution was imposed from above. Reform was not an adaptive response to any urgent problem in the production of energy services, and the reform process left untouched the long-run issues of energy policy – greenhouse gas abatement, energy intensity, transition to renewable and small-scale energy technologies and rapid depletion of the Maui gasfield.

Rather, reform was driven by the wider process of the turnover of New Zealand's political and economic elite following Labour's 1984 election victory. The consensus built up in the half-century since the Depression, to which all political parties had paid faithful lip service, and which had dictated the role and shape of government within New Zealand society, was abruptly swept aside as a new generation of officials, managers, entrepreneurs and consultants seized control of the levers of power and pushed the old guard aside.

A doctrinaire belief in private markets, combined with an equally doctrinaire rejection of state activism and regulatory intervention, provided legitimacy for the newly ascendant elite's campaign to eliminate the institutional bastions of the post-war consensus. In energy the immediate victims were those government entities associated with the previous era of large-scale planned development under state auspices – the Ministries of Energy, Works and Development, Trade and Industry; NZ Electricity Division; NZ Energy Research and Development Council; Liquid Fuels Trust Board. All were gone or restructured by 1990, leaving energy policy as a sideline activity of the new Ministry of Commerce, which shared with the Treasury a crusading enthusiasm for privatisation, markets, and 'light-handed regulation'.

OWNERSHIP, CONTROL AND STRUCTURE

Until the late 1980s the dominant players in three of the four key energy supply sectors were either state-owned (Electricity Division, Natural Gas Corporation, State Coal) or part of local government (Electricity Supply Authorities and Municipal Electricity Departments).

The 1984–90 Labour government embarked on a programme of first corporatising, and then (when possible) privatising, all activities of central government that could be construed as commercial. Corporatisation swept through the government's energy supply operations, largely eliminating the previous public-service culture, and with it the concept that market failures could best be corrected by public ownership and control.

Electricity

Electricity was the reformers' prime target. A government task force in 1989 produced a manifesto for privatisation, separation of transmission from generation, establishment of a wholesale market to facilitate competitive new entry, and light-handed regulation of natural monopoly activities. Implementing this package and coping with its disruptive consequences preoccupied official attention for the following decade.

Changing company names were kaleidoscopic. Electricity Division became the Electricity Corporation of New Zealand in 1987. ECNZ's grid subsidiary Transpower was incorporated in 1988 and, following the failure of an attempted experiment with 'club ownership', was separated as a stand-alone state-owned enterprise in 1994. Roughly one-third of ECNZ's generating capacity was then spun off in 1995 to a new entity, Contact Energy, which was privatised in 1999 with a 40 per cent cornerstone shareholding going to a US firm, Edison Mission Energy. At the same time, the remainder of ECNZ was split into three new companies in April 1999: Mighty River Power controlling the Waikato River hydro stations, Genesis Power the Huntly thermal station, and Meridian all the South Island hydro resources that had not been passed to Contact, plus a single wind turbine in Wellington.

All of these entities except Contact remained in state ownership at the end of the 1990s due to a public and political backlash against electricity privatisation, which blocked the ambitions of ideologically-driven ministers and officials. The theoretical rationale for continued public ownership was, however, virtually extinguished by government's unwillingness to promote the public interest through its ownership of the dominant firms. The most dramatic manifestation of this ideological repositioning in electricity was the replacement of systematic planning of hydro lake storage by a market mechanism, discussed further below.

Similarly sweeping change affected electricity distribution networks, which had mainly been constructed and operated by community-based organisations ('supply authorities'). Over the period 1989–93 these were forced by legislation to corporatise. Their previous franchise monopolies over local retail territories were abolished, opening the way for the entry of independent

retailers wheeling electricity over the existing networks. In 1998 further legislation compelled the network owners to divest their own retailing activities in the name of competitive neutrality among retailers.

Gas

Natural gas was the second energy sector whose superstructure was transformed by the market reform process. Wholesale price regulation of natural gas was ended in 1992. The commanding heights of gas transmission and wholesale supply were privatised in great haste and secrecy in 1989, when NGC was sold to Fletcher Challenge and the Crown's Maui gas contract rights were divided up among the three biggest gas purchasers (NGC, ECNZ and Methanex). NGC's monopoly position enabled it over the subsequent decade to extract high profits and erect barriers to entry by competitors. Attempts by gas users, distributors, and producers to circumvent NGC's pipeline monopoly by securing open-access rights to transport independently-sourced gas on the transmission system were stalled by the dominant firm for most of the decade, while pipeline tariffs and access terms were structured to favour NGC's retail affiliates against potential competitors (Bertram et al. 1998; Bertram 1999). Only gradually and over the long run were third parties able partially to erode NGC's dominance.

Overshadowing all else in the gas sector is the thirty-year Maui Contract, due to expire in 2009. The Contract is between the Crown as buyer and the developers of the gasfield (the Maui Mining Companies). It sets the benchmark price of wholesale gas in the New Zealand market, effectively excludes independent gas from the main transmission pipeline north out of Taranaki, and imposes 'take or pay' obligations on the Crown which have driven government to promote large-scale projects (ammonia-urea at Kapuni, methanol and synfuels plants near Waitara, electricity generation) to use up gas within the contract time frame, with little regard for sustainability or efficient use.

Coal

Coal, the third major sector, was dominated by State Coal, with private mines operating as fringe suppliers. (The most significant private coal mining operation, in the Waikato, was affiliated with the New Zealand Dairy Group's factories which in the 1980s were still major coal users; most have since switched to natural gas.)

The state operation was corporatised and would probably have been privatised had there been a willing buyer. Its commercial viability, in the face of static local demand and competition from natural gas, was rescued by a major export drive which underwrote new mining development (Table 1).

Oil

The fourth main energy sector, oil, was already privately controlled by four major transnationals (Mobil, Shell, BP and Caltex). Policy changes in this

Table 1. Coal Production and Use, Thousand Tonnes, Annual Averages

Period	Production	Local Use	Exports	% Exported
1980–84	2,220	2,032	188	8.4
1985–89	2,204	1,835	370	16.8
1990–94	2,937	2,228	709	24.1
1995–99	3,469	2,150	1,318	38.0

Source: Energy Data File, July 2000 p. 31.

sector comprised removal of price controls and licensing requirements, withdrawal of government from involvement in the Marsden Point refinery, removal of import restrictions on refined products, and abandonment of incentives to promote CNG as an alternative fuel for motor vehicles. By the end of the 1990s CNG had almost completely vanished from service station forecourts, eliminating one of the two main direct competing motor-vehicle fuels (the other is LPG). The four major companies' tight control of the refinery, the port installations, the coastal tanker trade, and service station sites, sufficed to restrict independent new entry to a tiny fringe leaving prices in the local market under the control of a de facto cartel.

'LIGHT-HANDED REGULATION'

A common thread through all the energy-sector reforms has been a lack of official concern over monopolistic profit-taking, and only ineffectual attempts to confront other monopolistic practices. Energy supply remains dominated by large enterprises, with natural monopolies in the areas of processing and transportation and with major barriers to entry in energy production and trading. Monopolistic behaviour is rife both in the extraction of profits from energy consumers and in the blocking of new energy technologies. So-called 'light-handed regulation' in New Zealand has equated to what in any other OECD economy would be considered non-regulation. There is no industry regulator similar to the UK's Ofgas and Offer, nor any generic regulator like Australia's ACCC with a brief to oversee terms and conditions for access to monopoly facilities. Legal restraint on monopoly, up to 2000,[1] consisted only of the Commerce Act 1986, which places no prohibition on monopoly profits and has thereby deprived consumers of recourse to the courts to defend themselves against price gouging (see the 1996 Privy Council decision in *Telecom v Clear Communications*, and the 1999 Court of Appeal decision in *Vector Ltd v Transpower, CA32/99* p. 28 para 13).

Deregulation has been a central plank in the new official ideology. Given the pervasive imperfections in energy markets, political credibility was maintained by inventing and promoting a system of 'light-handed regulation' which was claimed to be an effective substitute for the usual regulatory mechanisms. Government, having forced new ownership and governance structures into place, declared that it would hold back from intervening in ongoing business

decisions. Instead it would require large firms with monopoly positions to disclose information about their businesses, with the explicit expectation that transparency would motivate firms to self-regulate and that this would be sufficient protection for the consuming public.

Experience under the new regime quickly confirmed its instability. Self-regulation which reduces profits could be an attractive option for business only if a credible threat of government intervention is the alternative. Firms' incentives are continually to test the government's resolve to act by pushing the limits. Light-handed regulation therefore has an inherent tendency to slide either into *de facto* real regulation (if government credibility is established by intervention), or into non-regulation if government backs off. The New Zealand Government backed off from successive tests of its resolve, with the result that by 2000 the energy sectors were unregulated. As discussed below, this had major implications for the economic effects of the reforms.

REAL TRENDS

This section briefly reviews the main trends in energy supply and use. The outstanding feature of the 1990s was the absence of any break in established trends. The economy's energy intensity remained on its long-established rising path, in contrast to the OECD-wide downward trend (Table 2, Figure 1).

The composition of primary energy supply by fuel type barely changed, apart from a continued trend from gas to oil fuel, attributable partly to falling oil prices, within the two-thirds market share of fossil fuels (Table 3).

Energy consumption patterns showed steady 2 per cent annual growth with only very gradually shifting shares (falling coal and gas, rising oil) (Table 4).

Sectoral energy consumption is shown in Table 5. Transport is the largest component of consumer energy use, accounting for just under 40 per cent of total 2000 consumption and for 70 per cent of the increase in consumption 1990–2000.

Table 2. Primary Energy Intensity 1960–1999: New Zealand and OECD Tonnes of Oil Equivalent per US $million of GDP (1990 Purchasing-power-parity prices), Five-year Averages.

	NZ	OECD
1960–64	193.8	
1965–69	210.4	
1970–74	220.1	357.6
1975–79	239.4	341.9
1980–84	230.4	304.6
1985–89	260.6	284.9
1990–94	302.9	271.5
1995–99	292.6	269.2

Sources: International Energy Agency, Energy Balances of OECD Countries, 1994–95, pp. 10–12 and 154–156; International Energy Agency Key World Energy Statistics from the IEA: 1999 Edition pp. 48–49 and 54–55; Ministry of Commerce Energy Data File, July 2000.

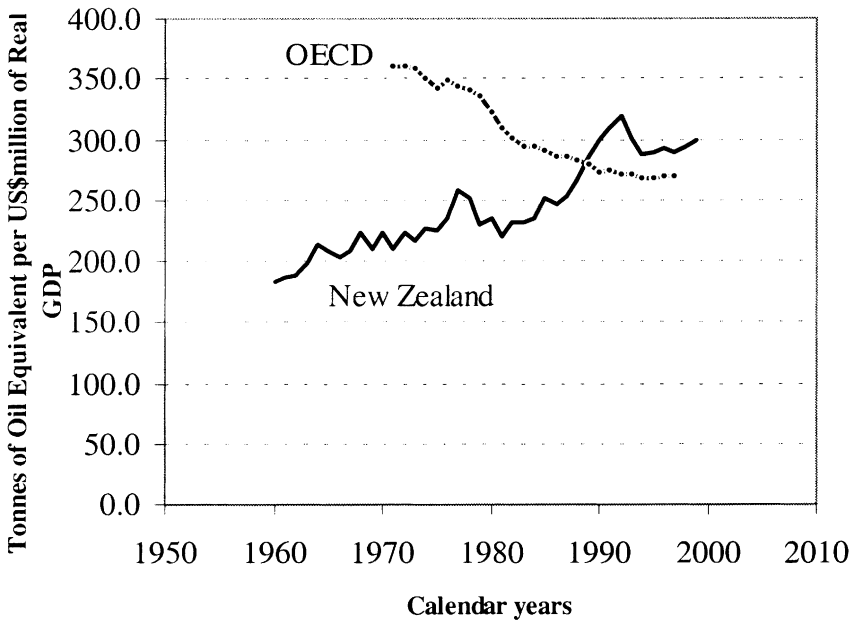

Figure 1. Primary Energy Intensity of GDP: New Zealand and OECD Total Compared

The rising transport share of energy consumption is partly reflective of cyclical trends as the economy recovered from the recession of the early 1990s, but was driven also by falling oil prices which encouraged expansion and use of the private vehicle fleet. The availability of imported Japanese used vehicles contributed to rapid fleet expansion. As Table 6 shows, the mix of transport fuels shifted radically towards diesel and away from alternative fuels such as CNG and LPG, as the diesel price fell and policy support for alternative fuels was withdrawn. One consequence of this was that when world oil prices again rose sharply in 2000, the ability of vehicle owners to switch back to CNG and LPG was limited both by the lack of distribution infrastructure and by the disappearance from the vehicle fleet of the dual-fuel equipment that had been widespread at the beginning of the decade.

PRICES

In view of New Zealand's extreme radicalism in restructuring its energy sectors in pursuit of 'economic efficiency', one of the most significant trends of the 1990s was energy prices. A recent review of these through the decade 1990–99 in *Energy Data File* (July 2000 pp. 119–139) shows no payoff from all the supply-side changes that had been forced through. In real terms, overall energy prices for industry in 1999 were 3.7 per cent below 1990 levels, compared with price drops of 11.2 per cent in the UK, 20.3 per cent in the USA, and 6.2 per cent for the OECD as a whole. For households, the overall cost of energy fell 4.6 per cent compared with 0.2 per cent in the UK, 19.8 per

Table 3. New Zealand Primary Energy Supply by Fuel Petajoules (PJ)

March years	Oil	LPG	Gas	Coal	Wood	Other Renewable	Total
1990	147.2	5.5	186.3	52.5	25.8	162.2	579.5
1991	157.2	5.7	181.7	49.4	27.4	172.7	594.1
1992	163.0	6.2	199.3	48.3	26.1	174.3	617.2
1993	161.3	6.6	212.8	49.6	27.5	172.7	630.5
1994	169.3	7.0	203.6	54.3	27.5	182.0	643.7
1995	195.9	7.0	185.1	44.6	31.1	192.5	656.1
1996	202.3	7.1	181.4	44.8	31.5	198.7	665.8
1997	223.1	7.0	216.7	48.3	31.1	183.6	709.7
1998	221.9	6.6	202.4	47.1	32.1	192.8	702.9
1999	237.0	6.0	209.2	49.6	35.0	206.8	743.5
2000	248.1	5.9	224.9	57.7	35.3	206.1	777.9

Percentage Shares

March Years	Oil	LPG	Gas	Coal	Wood	Other Renewable	Total
1990	25.4	0.9	32.1	9.1	4.5	28.0	100.0
1991	26.5	1.0	30.6	8.3	4.6	29.1	100.0
1992	26.4	1.0	32.3	7.8	4.2	28.2	100.0
1993	25.6	1.0	33.8	7.9	4.4	27.4	100.0
1994	26.3	1.1	31.6	8.4	4.3	28.3	100.0
1995	29.9	1.1	28.2	6.8	4.7	29.3	100.0
1996	30.4	1.1	27.2	6.7	4.7	29.8	100.0
1997	31.4	1.0	30.5	6.8	4.4	25.9	100.0
1998	31.6	0.9	28.8	6.7	4.6	27.4	100.0
1999	31.9	0.8	28.1	6.7	4.7	27.8	100.0
2000	31.9	0.8	28.9	7.4	4.5	26.5	100.0

Sources: Energy Data File, January 1995 pp. 60, 62, 65, 68; January 1996 p. 28; January 1998 p. 20; January 1999 p. 20; July 2000 pp. 20, 2.

cent in the USA, and 8.6 per cent across the OECD. The modest real price reductions in New Zealand were attributable not to reform but to the falling world oil price during the decade.

The two most-restructured sectors, electricity and natural gas, exhibited no real price reductions whatever. The real national average electricity price was constant at 9–10 cents per kWh throughout the decade; prices to commercial customers were cut, but at the expense of households, whose real electricity price rose 20 per cent compared with the pre-reform era (Table 7). Meantime natural gas prices rose 10 per cent for industry and 42 per cent for households.

In both electricity and gas, the main force driving prices was the exercise of monopoly power by network owners, following the ending of price regulation. This meant that the efficiency gains resulting from restructuring were captured as monopoly profit, not passed through to energy users. For the economy as a

Table 4. New Zealand Consumer Energy by Fuel PJ

March years	Oil	Coal	Gas	Electricity	Wood	Other Renewable	Total
1990	159.3	44.9	40.7	98.5	25.8	11.8	381.0
1991	164.8	43.6	39.6	100.6	27.4	11.6	387.6
1992	168.3	38.5	44.1	104.8	26.1	11.6	393.4
1993	178.8	43.3	40.2	101.4	27.5	13.4	404.6
1994	182.5	47.5	41.1	105.2	27.5	13.6	417.4
1995	192.8	34.7	41.1	111.4	27.4	13.5	420.8
1996	201.3	38.1	37.2	114.7	27.6	14.0	432.8
1997	205.5	36.3	39.8	118.6	27.5	13.6	441.5
1998	211.2	29.7	35.6	120.1	27.6	13.6	437.9
1999	214.5	39.2	36.1	121.7	28.7	14.2	454.3
2000	220.7	39.6	39.9	125.2	28.9	14.9	469.3
				Percentage Shares			
March Years	Oil	Coal	Gas	Electricity	Wood	Other Renewable	Total
1990	41.8	11.8	10.7	25.9	6.8	3.1	100.0
1991	42.5	11.2	10.2	26.0	7.1	3.0	100.0
1992	42.8	9.8	11.2	26.6	6.6	2.9	100.0
1993	44.2	10.7	9.9	25.1	6.8	3.3	100.0
1994	43.7	11.4	9.8	25.2	6.6	3.3	100.0
1995	45.8	8.2	9.8	26.5	6.5	3.2	100.0
1996	46.5	8.8	8.6	26.5	6.4	3.2	100.0
1997	46.6	8.2	9.0	26.9	6.2	3.1	100.0
1998	48.2	6.8	8.1	27.4	6.3	3.1	100.0
1999	47.2	8.6	7.9	26.8	6.3	3.1	100.0
2000	47.0	8.4	8.5	26.7	6.2	3.2	100.0

Sources: as for Table 3.

whole, therefore, there was no payoff from the energy reforms in terms of reduced input costs for other sectors. Rather the effect of reform was to redistribute income and wealth towards the owners of electricity and gas supply operations, in particular the natural monopoly networks.

GEOGRAPHY

In terms of geographical patterns of energy production, the 1990s saw confirmation of two shifts that had been foreshadowed for several decades. First was the building by private-sector firms of two large new gas-fired electricity generating plants in Auckland (Southdown and Otahuhu B), partly filling the gap left by abandonment in the late 1970s of the ambitious government plans at that time to build a series of large thermal stations to burn Maui gas. Nevertheless Auckland remains geographically distant from the major electricity generation resources of New Zealand, and heavily dependent

Table 5. Sectoral Energy Consumption PJ

	Agriculture	Industry	Commercial	Residential	Transport	Total
1990	17.5	143.3	35.1	50.5	126.3	372.7
1991	18.4	146.7	38.1	53.1	131.4	387.7
1992	18.0	148.5	34.8	51.4	132.6	385.3
1993	20.6	149.0	37.2	53.5	139.2	399.5
1994	20.2	152.3	37.4	52.3	146.3	408.5
1995	21.6	150.0	38.9	52.9	153.7	417.1
1996	22.6	145.4	38.0	54.9	163.9	424.8
1997	17.9	149.7	39.7	56.6	165.2	429.1
1998	19.7	143.8	37.5	56.5	172.0	429.4
1999	20.0	147.1	38.6	57.6	172.6	435.9
2000	20.0	149.4	39.8	58.8	175.3	443.3
			Percent			
	Agriculture	Industry	Commercial	Residential	Transport	Total
1990	4.7	38.4	9.4	13.5	33.9	100.0
1991	4.7	37.8	9.8	13.7	33.9	100.0
1992	4.7	38.5	9.0	13.3	34.4	100.0
1993	5.2	37.3	9.3	13.4	34.8	100.0
1994	4.9	37.3	9.2	12.8	35.8	100.0
1995	5.2	36.0	9.3	12.7	36.8	100.0
1996	5.3	34.2	8.9	12.9	38.6	100.0
1997	4.2	34.9	9.2	13.2	38.5	100.0
1998	4.6	33.5	8.7	13.1	40.1	100.0
1999	4.6	33.8	8.9	13.2	39.6	100.0
2000	4.5	33.7	9.0	13.3	39.6	100.0

Sources as for Tables 3 and 4.

Table 6. Transport Fuel Breakdown

	Gasoline		Diesel		Other	
	PJ	%	PJ	%	PJ	%
1989	83.7	64.0	25.5	19.5	3.9	16.4
1990	83.6	66.2	22.8	18.1	3.0	15.8
1991	85.9	65.4	24.0	18.3	2.6	16.4
1992	86.6	65.3	26.5	20.0	2.6	14.7
1993	87.6	62.9	31.0	22.3	2.4	14.8
1994	89.3	61.0	35.8	24.5	2.2	14.5
1995	91.9	59.8	39.9	26.0	1.7	14.2
1996	94.4	57.6	48.3	29.4	1.3	13.0
1997	96.1	58.1	50.2	30.4	1.0	11.5
1998	97.9	56.9	55.5	32.2	0.7	10.9
1999	100.0	58.0	56.3	32.6	0.4	9.4
2000	101.1	57.7	61.0	34.8	0.4	7.5

Table 7. Real Energy Prices, 1985–89 = 100

	1985–89	1990–94	1995–99
Residential electricity	100	105	120
Residential gas	100	109	142
Industrial electricity	100	95	96
Industrial gas	100	100	110
Commercial electricity	100	87	75
National average electricity	100	97	99

Source: Energy Data File, July 2000 pp. 121 and 127.

for energy on the long-distance transmission infrastructure provided by the Transpower grid and the NGC North gas pipeline. Either or both of these could become a strategic bottleneck within the next decade if Auckland's energy demand continues to rise.

Second was the confirmation that New Zealand still has prospects for ongoing discoveries of new oil and gas reserves to carry it beyond the exhaustion of the huge offshore Maui gas field (now projected for about 2010 but likely to be somewhat after that in fact). A medium-sized gas discovery near Wairoa in 1997 ended Taranaki's monopoly as the country's only proven hydrocarbon producer, and raised interesting problems for the gas transmission network which, having been built to carry gas outwards from Taranaki to the East Coast, now faced the prospect of gas flowing in the reverse direction from east to west. The last year of the decade then brought important new discoveries of both onshore oil (near Hawera) and offshore gas (Pohokura, north of Waitara) in the Taranaki area.

THE ELECTRICITY MARKET

Until reform, New Zealand's electricity system was operated using an integrated planning model which had as its key objective the optimal utilisation of the country's hydroelectric resources. Thermal generating stations were operated in such a way as to enable ECNZ planners to maintain storage levels in the various hydro reservoirs at levels designed to avoid either wasteful spillage or interruption of supply due to low lake levels. Decisions on which stations to run, day by day, were taken administratively on the basis of criteria which included these non-commercial objectives as well as the raw financial costs of operating different stations.

The victory of market ideology in the late 1980s spelt the end of formal planning within the electricity system. In its place, decisions on where and when electricity was to be generated passed to an auctioneer (EMCO) collecting competing bids from corporate managements freed from social obligations. Given the smallness of New Zealand and the fact that most top management personnel in the new companies knew each other well enough to make tacit collusion a viable backstop to the market, a residual 'social' component in decision making remained through the 1990s. Thus informally,

the old system remained alive in spirit through the continuity of key personnel, especially the generation of engineers who had occupied senior management positions in ECNZ and who moved on to control its successor companies except for Contact.

The reformers' bold conjecture that a market mechanism could yield distinctively better resource allocation than planned management of an integrated system has not (yet) been borne out by experience. The early stages of the transition from plan to market witnessed New Zealand's first nationwide supply failure for many years, as hydro storage levels fell to critical levels during the winter of 1992 causing widespread power cuts. Anecdotal evidence indicated that the new commercially-oriented management of ECNZ had allowed lake levels to run down during the summer beyond the limits set by the old planning model, possibly because of a desire to boost financial results for the corporation's year ending in March 1992. An official inquiry claimed to have found no evidence for this, but did criticise ECNZ for the late starting-up of its thermal stations and its failure to give early warning of the impending crisis (Electricity Shortage Review Committee, 1992). The committee strongly recommended that ECNZ should increase its margins of prudence when making decisions on the use of scarce water.[2]

The market model also failed its first test as a superior means of allocating scarce investment resources. In the 1980s the old NZED had been roundly criticised for its over-investment in large-scale generation projects, leading to an overhang of surplus capacity. This was portrayed by market advocates as evidence of the inherent wastefulness of a socially-oriented planning process. Decisions by new entrants in the 1990s, however, quickly demonstrated that wasteful over-investment in electricity generation was by no means prevented by market disciplines. As had occurred in the UK following deregulation, New Zealand witnessed a competitive rush to build new generating plant, with a string of separate projects constructed to serve a volume of market demand sufficient to justify only one or two of them. The market mechanism proved incapable of coordinating these private investment decisions, and the electricity surplus that had emerged by 2000 was greater than the much-debated surplus created in the early 1980s by NZED's Upper Waitaki, Huntly and Tongariro schemes.

Between 1997 and 2000 new electricity supply projects added approximately 10,000 GWh of annual baseload capacity to a system facing actual annual demand of only 36,675 GWh in the 1999 year, and with annual growth of less than 800 GWh per year. The overhang of dry-year surplus capacity as of 2000 is about 7,000 GWh (20 per cent of demand).

At the technical operational level, the attempt by government to establish a workable new structure for the electricity industry consumed enormous resources of time and money through the decade (Martin 1998 Chapter 16). The 1989 Electricity Task Force was followed in 1990–91 by detailed proposals for an electricity pool, plus a highly complex and theoretically sophisticated model for pricing of transmission services (ECNZ, 1991). Much of the new thinking came from overseas consultants and involved the

transplanting to New Zealand of ideas developed in the context of regulatory reforms in the USA and UK. A series of mini-task-forces under government auspices, but effectively dominated by ECNZ and a tight clique of 'insider' vested interests, pushed through the design for a new wholesale market system (WEMS, 1992; WEMDG, 1994). The new pool, modelled largely on the now-abandoned UK model, was started up in 1996 and has been in operation for four years. In New Zealand as in the UK, pool rules and prices were manipulated from the outset by large supply-side interests. Although the pool was successful in enabling coordinated dispatch of generating capacity to continue following the breakup of ECNZ, the new system brought no obvious gains for either consumers or the economy at large. Nothing in the design or operation of the pool contributed to improving economy-wide energy efficiency, and the wholesale market structure in its first incarnation assisted rather than hindered the establishment of barriers against the entry of small-scale distributed generation.

Price volatility has been a feature of the new electricity wholesale market. In 1998 and 1999 prices were driven very low as the owners of combined-cycle gas turbine generating plants competed to burn surplus prepaid gas while water was spilled from hydro reservoirs. The artificially-depressed price contributed to an unfavourable environment for adoption of novel renewables-based generation technologies such as wind power. In the other direction, the 'market' pricing system has provided opportunities for short-term exploitation of monopoly power during times of shortage, seen most dramatically in the ability of Contact Energy to secure extremely large payments for backup power supplied to Meridian for the Comalco aluminium smelter during a shutdown of the Manapouri power station in May 2000.

GREENHOUSE GAS EMISSIONS

Greenhouse gas emissions from the energy sector increased through the 1990s, led by transport and electricity generation. Table 8 shows emissions from energy and other sectors. Energy use accounted for 36 per cent of total emissions during the decade, with a rising trend. Table 9 shows that domestic transport was the dominant force driving up emissions.

New Zealand was one of the industrialised countries which became parties to the 1992 Framework Convention on Climate Change, and subsequently undertook an obligation under the 1997 Kyoto Protocol of December 1997 to reduce its emissions of carbon dioxide and other 'greenhouse gases' to the 1990 level by 2008–12. Discussions over which policy instruments (if any) ought to be used to reduce greenhouse gas emissions proceeded throughout the 1990s, with no decisions reached by the end of the decade. Apart from voluntary (mostly no-regrets) abatement programmes by a few large industrial firms, New Zealand energy users faced no incentives to change their behaviour, and emission levels rose accordingly. A major official study (Working Group on CO_2 Policy, 1996) toyed with highly sophisticated economic instruments for trading-off emissions against 'carbon sinks' such as

Table 8. New Zealand Emissions of Three Major Greenhouse Gases, Measured in Million Tonnes of CO_2 Equivalent

	Energy-related Emissions:				Non-energy Emissions	Total Emissions	Estimated Sinks	Estimated Net Emissions
	CO_2	CH_4	N_2O	Total				
1990	23.1	0.8	0.2	24.1	48.5	72.5	21.5	51.0
1991	23.5	0.7	0.2	24.4	47.8	72.2	20.5	51.7
1992	25.2	0.7	0.2	26.1	47.3	73.5	18.3	55.2
1993	24.5	0.7	0.2	25.4	47.6	73.0	16.2	56.8
1994	24.6	0.8	0.2	25.7	47.8	73.5	15.6	57.9
1995	24.6	0.9	0.2	25.7	47.8	73.6	16.2	57.4
1996	25.6	1.2	0.2	27.0	47.5	74.6	16.5	58.0
1997	27.7	1.0	0.2	28.9	46.9	75.8	18.2	57.7
1998	26.2	1.1	0.2	27.5	46.9	74.4	20.9	53.5
1999	27.5	1.1	0.2	28.9	na	na	na	na

Source: Derived from tables in Chapter 9 pp. 91–94 of Ministry of Economic Development 2000, converted to CO_2-equivalents using the 100-year global warming potential parameters from Table 8.1 p. 87 of Ibid.

Table 9. Carbon Dioxide Emissions from Energy Use, by Sector: Million Tonnes of CO_2

Year	Domestic Transport	Electricity Generation	Other Energy	Total
1990	8.7	3.5	10.8	23.1
1991	8.7	3.9	10.8	23.5
1992	9.1	5.1	11.0	25.2
1993	9.6	4.1	10.8	24.5
1994	10.3	3.3	11.1	24.6
1995	11.0	3.0	10.6	24.6
1996	11.1	3.7	10.8	25.6
1997	11.4	5.7	10.6	27.7
1998	11.6	4.0	10.6	26.2
1999	11.6	5.4	10.5	27.5

Source: Ministry of Economic Development, 2000.

forestry, but no action resulted despite the enthusiasm of the then Minister for the Environment, Simon Upton, for a tradeable permit scheme.[3]

Various economy-wide modeling studies have produced divergent predictions on how difficult it would be for New Zealand to reduce its emissions. Some of these (e.g. Bertram et al., 1993) concluded that quite a large amount of abatement ought to be achievable at little or no cost to the economy as a whole, although energy-intensive sectors such as iron and steel would clearly bear heavy costs. Others (Tasman Institute, 1992; Brown et al., 1998 pp. 69 and 72) projected modest abatement costs of the order of 0–1 per cent of GDP. The official government view, heavily influenced by intensive lobbying from large industrial interests, had by 1999 hardened against any early action on greenhouse gases, buttressed by claims by government

(Ministry for the Environment et al., 1999 p. 9) that 'the cost of substantially reducing emissions in New Zealand … is high at the margin'. This position was reviewed following the change of government in 1999, but no new policy initiatives had emerged by late 2000.

CONCLUSION

The New Zealand energy sectors had, by the beginning of the 1990s, settled into a pattern reflective of the country's basic resource endowment combined with the political economy of the mixed capitalist economy consolidated in mid-century. A major trend of the century had been towards centralisation and large scale, and away from local provision. Municipal gasworks and small coal producers gave way in the North Island to natural gas transported over trunk pipelines from the country's sole proven hydrocarbon province, Taranaki; and in the South Island to LPG shipped in from the same central source. Larger-scale coal mining had long been concentrated in the hands of State Coal. Local electricity generation plants were largely displaced by the nationwide state-owned system of giant generating stations linked to a transmission grid.

Energy supply thus became a visible commanding height of the economy with large organisations controlled by the state. The neo-liberal frontal assault on state control that drove New Zealand's political economy during the 1980s and 1990s developed naturally into an attempt to force through a revolutionary transformation of those organisations into corporate form, with their profit-earning potential being shifted into the hands of private business. The resulting institutional upheaval was sustainable because the underlying productive base of energy supply had reached maturity and adequate infrastructure was in place. Consequently, no critical issues of resource allocation had to be confronted during the 1990s, and the new corporatised institutions had the chance to find their feet in a stable production environment.

Looming on the horizon, however, are more difficult issues which will test the new system in the coming decade. Small-scale decentralised electricity technology threatens to make large centralised supply networks obsolete (except for those using low-cost renewable resources such as hydro), leaving some of the 'reformed' commanding heights in danger of being stranded. Adoption of serious policy measures to reduce greenhouse gas emissions would kill off several of the biggest customers of the large gas and coal producers. More gas discoveries on the east coast of the North Island (let alone in the South Island) could force re-configuration or bypass of the Taranaki-centred NGC pipeline network. Emergence of capacity constraints on both electricity transmission and gas pipeline facilities will present the problem of how to coordinate essential new infrastructural investment in a climate of oligopolistic strategic conflict with no regulator.

Measured against this agenda, the 1990s were a backward-looking decade, during which policymakers and entrepreneurs focused on dismantling the old regime and distributing the resulting spoils. Forward vision was myopic and peripheral. Policy attention and resources were diverted away from actions to

confront the new millennium – research and development of new energy technologies, removal of institutional barriers to local and demand-side energy initiatives, pricing of environmental externalities, design of effective regulatory institutions able to withstand capture by large vested interests. Ready or not, New Zealand must soon confront these challenges.

NOTES

1 A Ministerial Inquiry into the electricity industry headed by former Labour Cabinet Minister David Caygill recommended some strengthening of the Commerce Commission's regulatory role vis-à-vis electricity lines charges, and government decisions implementing this were announced in October 2000. For details see *www.electricityinquiry.govt.nz* and *www.med.govt.nz*.

2 The lack of a nationwide perspective on hydro storage came into focus again in 2000 when low winter rainfall in the North Island left storage levels in Lake Taupo well below normal at the beginning of spring. By that stage the responsibility for utilisation of Lake Taupo had passed into the hands of the regionally-based Mighty River Power but inflows to the lake from the Tongariro scheme were managed by its competitor Genesis Power. Other storage reservoirs elsewhere in the country were controlled by competitors.

3 Major policy statements in 1994 and 1999 affirmed the government's commitment to emission abatement targets but contained no substantive measures other than exhortation and minor expenditure on the promotion of energy efficiency. See Ministry for the Environment 1998 pp. 5.49–5.53, and Ministry for the Environment et al. 1999.

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