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Achieving policy goals for the electricity industry

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Executive summary

This report returns to a framework for evaluating significant policy changes in the electricity industry we originally published in 2009.[1] It asks whether the outcomes expected from the reforms since that report are being achieved. In addition to assessing outcomes under the current arrangements, we use the same evaluation method to consider recent proposals to change core aspects of the wholesale market by establishing a new Crown entity, NZ Power; this entity would buy all generation output and be the single supplier of electricity to electricity retailers.

In our 2009 report we identified five public policy goals that seem enduring for policy-makers across countries and time:

- security of supply
- efficient operation of the wholesale and retail sectors
- efficient use of, and investment in, long-life assets
- meeting community or social minimums
- integrating environmental objectives into all facets of sector decision-making.

Assessed against these enduring policy goals, there is still work to be done in the sector. Two issues in particular stand out:

- Increases in retail electricity prices over the past decade have not been well explained nor justified. The relationship between costs, wholesale electricity prices, and retail prices is not well understood and retail margins earned by vertically integrated generator/retailers remain opaque.
- Current arrangements do not bear down on the problem of "fuel poverty" or "energy hardship". Recent studies have identified a significant portion of New Zealand households would need to spend more than 10% of their income to heat their homes if they only used traditional electric resistive heaving (for example, bar heaters). A softening of electricity prices is unlikely on its own to substantially alleviate fuel poverty, as arises from a combination of factors including access to energy efficient appliances, household size and composition, state of housing stock, location, fewer individuals living in institutions, reduced use of solid fuels, and income levels.

While there is work to be done in these and other areas there have just as clearly been a number of key achievements over the past 2 decades:

- Security of supply has improved under market arrangements. No blackouts have occurred as a result of a failure in the market since it was introduced and under current arrangements the market is more resilient in dry years than it has been in the past.

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[1] Minister of Energy and Resources, Media release *Ministerial Review of Electricity Market* 1 April 2009 http://www.beehive.govt.nz/release/ministerial-review-electricity-market. The report is available at: http://www.businessnz.org.nz/file/1622/Regulation%20and%20governance%20of%20electricity%20sector%20-%20160209.pdf

- Investment in generation has provided secure supply. The market has provided the incentives and timing signals for new generation capacity so that supply is expected to meet demand with an acceptable reserve margin for several years.
- The number of trading periods in which any one generator has the ability and incentive to unilaterally raise wholesale prices ('net pivotal') has reduced significantly as a result of the physical and contractual asset swaps imposed by the Government as part of the 2010 reforms and with the development of the contracts markets that has occurred since the 2010 reforms.
- Commonly accepted indicators of retail competition show marked improvements in retail competition since 2009, and increased competition will place increased downward pressure on retail prices.
- 1182 MW of new generation has been commissioned since Genesis commissioned its 400 MW gas fired combined cycle plant in 2007. Of the capacity commissioned in this period, 857 MW is renewable, 302 MW is peaking plant (that is, runs infrequently and supports security of supply) and 23 MW is non-renewable.
- Substantial investment has been made in transmission and distribution, in part to address past legacies where investment did not keep ahead of requirements.

External reviewers support our finding that the continuing evolution of the electricity market based on experience is addressing many of the challenges that have pre-occupied the sector and the Government. The International Energy Agency (IEA) recently acknowledged New Zealand's sector achievements following the introduction of the Electricity Industry Act 2010:[2]

> *New Zealand's strong commitment to liberalised energy markets has delivered a relatively high level of energy security and economic prosperity for consumers. Since the previous IEA review in 2006, the government has built on the success of existing policy mechanisms and implemented a number of far-reaching changes in the electricity sector and environmental policy.*

The Green Party of Aotearoa New Zealand[3] (Greens) and the New Zealand Labour Party[4] (Labour) have proposed two similar alternatives to how core parts of the electricity sector should be organised and governed. Both proposals would establish a single buyer called 'NZ Power'. From the information provided with the proposals, we identify the key changes that would be made to the existing arrangements to establish NZ Power and assess the outcomes that can be expected from those changes against the five enduring public policy goals – security of supply, efficient investment and operation of the sector, meeting community minimums and integrating environmental objectives.

We conclude that the alternative proposals do not appear targeted to the problems we identify in our review of the current arrangements. The proposals would replace the wholesale electricity market with the objective of reducing retail electricity prices. Wholesale

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2 International Energy Agency *Energy Policies in IEA Countries - New Zealand 2010 Review* July 2011 version. See http://www.iea.org/publications/freepublications/publication/name,25165,en.html

3 See http://www.greens.org.nz/energy

4 See http://www.labour.org.nz/nz-power

electricity prices comprise less than one-third of the retail electricity price, with lines charges, metering, retail cost to serve, margins and GST making up about two-thirds or more of the retail price. To achieve meaningful reductions to retail electricity prices through wholesale electricity market changes would require very large reductions in the wholesale electricity price.

The primary driver for lower wholesale electricity prices under the alternative proposals is that a single buyer would compensate generators for fixed costs at a fair return on historic costs, and pay for the operating costs of the generation plant. These purchasing arrangements are unlikely to lead to lower wholesale electricity costs in the short-term and would lead to higher costs over time.

Measured in today's dollars, the historic cost of much of the hydro generation plant exceed current values and hence a fair return on historic costs would not reduce prices. Over the life of these assets, valuations have been made at various dates which may be lower than historic cost or current values (such as when assets were transferred from a government department to a state-owned enterprise). Selecting and imposing one of these valuations on the current owners of the assets is not supported by economic arguments, and would likely be viewed as capricious by investors in long-life assets, undermining confidence in other sectors important to the Government's objectives.

It is for these reasons that the experience to date in New Zealand, and elsewhere in the world, is for Government's to adopt the most recent valuations as historic cost when regulating a move from current valuation methods to historic cost methods. As a result, there is no change in prices from the change in valuation method.

We doubt new generation plant would cost less to construct under a single buyer model than would be the case under current arrangements. The proposed arrangements would not lower the construction cost of plant, but may reduce the effort to find the least cost source of generation. Investors are focused now on the engineering and commercial analysis of new plant and take the risk of those decisions – experience elsewhere and New Zealand's own history suggests that consumers and taxpayers pay for the mistakes of government controlled procurement in the electricity sector such as was the case with Whirinaki and Clyde Dam.

The proposed arrangements would have the government effectively underwriting security of supply and its agency controlling hydro storage; the implication is that the government would step in if new investment is not forthcoming. This underwrite would take electricity planning and expenditure back to a time when bureaucrats made inefficient investments in terms of the timing and location of generation, and the dictates of security ran roughshod over the environmental impacts – by contrast, the current arrangements are delivering new generation investment without risk to taxpayers.

It is not clear how the proposals would result in more retail competition. If all retailers are able to access a comparable homogeneous product from NZ Power, then the emphasis for retailing would shift from service innovation and differentiation in managing price and volume risk, to achieving economics of scale. Price and volume risk would sit with NZ Power. Smaller new entrant retailers, and retailers wishing to provide niche services to customers, would suffer from having to spread fixed costs over a small customer base. The result would be consolidation to fewer, larger, retailers and less innovation. This is perhaps why no country has managed to implement retail competition under a single-buyer wholesale model.

There is no doubt that further work is needed to ensure all consumers benefit from competition in electricity supply. However, the proposals to remove the wholesale electricity market and replace it with a single buyer are not targeted at the problem areas. There is a very real risk that the proposals would result in higher electricity prices and less secure electricity by undoing the achievements that have been made and repeating past mistakes.

1. A proposal to alter direction

1.1 Introduction

New Zealand's electricity sector arrangements benefit from years of learning both in our own economy and from overseas experience. The workings of the electricity sector are of vital interest to governments everywhere particularly when the system comes under stress. In New Zealand, stresses have come in the form of dry hydro years and the vulnerability of a small economy with no interconnection to other electricity systems, and more recently from price increases to consumers. Over the past decade domestic electricity prices have risen faster than CPI while commercial electricity price increases have been more subdued. Concerns about these price increases have, at least at the time of drafting, displaced 'dry year' as the focus of attention.

The Green Party of Aotearoa New Zealand[5] (Greens) and the New Zealand Labour Party[6] (Labour) have proposed two similar alternatives to how core parts of the electricity sector should be organised and governed. These proposals would both see the establishment of a Crown entity that would be a single buyer called NZ Power. These proposals have attracted articulate and passionate commentary by supporters and opponents alike.[7]

Others suggest mildly that the proposals could be made to work.[8] But almost any proposal could be made to work in some sense. The more important questions for policy-makers are what are the problems the policy intends to solve, will the policy change solve those problems, what other costs and benefits might flow from the proposed change, and are there better tools available to solve the identified problems? This paper is intended to inform those discussions.

Supporters and opponents of the proposal to establish NZ Power recognise that the current arrangements will continue to evolve; the industry is not at some sort of endpoint. The debate is whether adopting the proposed alternatives would set us on a better path of evolution leading to improved outcomes compared with the current path.

1.2 A brief history of policy direction in the electricity sector

The current industry arrangements have emerged from transformational changes in technology, business processes and sector regulation. To provide context to discuss the policy settings that would change under the proposal to establish NZ Power, and those that

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5 See http://www.greens.org.nz/energy

6 See http://www.labour.org.nz/nz-power

7 See for example, Professor Geoff Bertram, 'Tighter reign urged on asset revaluations', Dominion Post 29 April 2013; Dr Brent Layton 'The Economics of Electricity' 4 June 2013, Professor Lew Evans 'Single buyer generates instability' Dominion Post 25 June 2013.

8 John Small, 'Power Struggles', Dominion Post 9 May 2013.

would not, the following points summarises some key forks in the evolutionary path of the New Zealand electricity sector:

(a) From the passage of the 1903 Water Power Act until 1986, generation of electricity for sale to the public was primarily the preserve of the government – with some limited exceptions; private investment in electricity generation capacity was not feasible (because of legislative and access barriers) for most of the last century.

(b) From the 1920s to 1993, electricity distribution and retailing was the preserve of legislated local monopolies, with a key focus through to the 1950s on electricity reticulation to ensure as many consumers as feasible had access to electricity.

(c) From the 1940s to the late 1970s, the government's primary objective as owner of generation plant was increasing capacity, with installed capacity more than doubling every decade - rising from 299 MW in 1940 to 590 MW in 1950, 1,509 MW by 1960, and 3,680 MW by 1970.

(d) From the mid 1980s, policy shifted to organising electricity generation, networks and retailing into corporate entities, with decisions subject to commercial disciplines and profits subject to corporate income tax (from 1987); ECNZ was formed out of the Ministry of Energy in 1987, and power boards were corporatised from 1992.

(e) The Commerce Act 1986 was introduced to promote competition in markets for the long-term benefit of consumers within New Zealand. It saw the establishment of an independent Commerce Commission. The Commission is responsible for price control, and its power were expanded to include price control of electricity distribution businesses and Transpower in 2008 (Part 4 of the Commerce Act).

(f) Opening of a competitive wholesale electricity market in 1996, in a format that requires generators to offer on a half-hour by half-hour basis, purchasers to buy on the same basis, and centralised dispatch to find the least cost operation of available generation plant taking account of transmission and security limits.

(g) Allowing and fostering competition in generation and retail by removing legislative franchise areas (1993), separation of Transpower (1994), the emergence of independent retailer Trustpower through the sale of its lines business (1994), the tender of gas contracts allowing an independently owned power plant Taranaki Combined Cycle (1998), the creation of Contact Energy (as an SOE in 1996 and privatised in 1999), and break-up of ECNZ into 3 SOE generator/retailers (1999) and requiring distributors to separate lines fromenergy businesses (1999) leading to a high degree of vertical integration between generation and retailing.

(h) Following a Ministerial review in 2009, 29 measures to improve the performance of the electricity market, its institutions and its governance were introduced. Most of these measures are covered by the Electricity Industry Act 2010 and were implemented by the Electricity Authority (Authority) established by the Act.

(i) The Authority is an independent Crown entity under the Crown Entities Act. It was established on 1 November 2010 with a statutory objective to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.[9]

[9] Electricity Industry Act 2010, section 15.

(j) The current roll out of advance metering, the emergence of more cost reflective tariffs and the availability of home energy management systems, provide potential for greater engagement by consumers and, as a result, much greater demand-side management down to the household level.

1.3 Proposal would change the wholesale market

The NZ Power proposal would revisit the design of (f), the wholesale electricity market rules, and the role and functions of the independent regulator (i). The wholesale market rules were developed initially through consultation with industry participants and consumer groups, and have since experienced several phases of governance. The wholesale electricity market:

- was initially established and governed under a private multilateral agreement (1996 – 2003) operating under generic competition, contract and securities law
- for a seven-year term, the wholesale market was operated and governed by the Electricity Commission under direction by the Minister of Energy (2003 – 2010)[10]
- is now governed by an independent regulator, the Authority, operating to a statutory objective.

For its first year, the Authority focused on seven steps stipulated in the Electricity Industry 2010 Act that were expected to lead to a more competitive market and a more secure system. These steps were required to be addressed before the Authority would become independent of Ministerial direction. Those steps were completed by December 2011 and the Authority is two years into a programme of work to advance its statutory objective. The Authority's work programme illustrates that there is still a great deal of refinement and evolution that can take place with the market.[11]

The Authority states that its focus or strategic directions for market development are to:[12]

> *develop a workably competitive electricity market by reducing barriers to entry, expansion and exit of parties in electricity markets, facilitating consumer participation, providing efficient price signals and promoting flexibility and resilience into the market and market systems. These strategic directions mean that the Authority will prefer initiatives that provide price and non-price information to assist efficient investment decisions by the electricity industry and consumers, confirm that consumers have a greater role in the electricity market than being passive recipients of electricity services and help industry participants and consumers to respond efficiently to changing market circumstances.*

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10 Few changes were made to the wholesale market rules during the seven-year period the market was governed by the former Electricity Commission; the Commission was required to advance a 30 page Government Policy Statement (this statement did not propose changes to the wholesale market design, but focused the efforts of the Commission elsewhere).

11 The Authority's work programme is available at http://www.ea.govt.nz/about-us/documents-publications/work-programme/

12 Electricity Authority, 'Strategic directions for market development', July 2013, page 2.

2. Evaluating a change in direction

2.1 The NZ Power proposal

As with any policy proposal developed from the opposition benches (without the support of advice from government departments) detail is lacking from the NZ Power proposal around operating arrangements. Even so it is possible to set out the key elements of the proposals and to compare them with current arrangements. We summarise our understanding of the proposals in Appendix 1. In Table 1 we set out five distinct and substantial proposed differences between current industry arrangements and NZ Power:

Table 1 Key differences between proposed arrangements and current arrangements.

Characteristic	Current arrangements	Proposed arrangements
Decision making	Investors decide type and timing of new generation and divestment based on business case. Least cost dispatch based on generator price offers, demand, and transmission limits; generator runs if profitable. System Operator makes short term security of supply decisions based on rules. An independent regulator sets and applies market rules (Code); dispatch is by separate independent system operator, and participants contract bilaterally.	Government agency decides on the need and type of new generation and divestment required to meet future demand. Also contracts with generators and retailers, determines dispatch, and sets the rules for industry. Least cost dispatch based on generator operating costs, demand, and transmission limits; agency may direct generator to run. System Operator discretion to manage short term security of supply situations.
Contractual arrangements	Generators receive marginal wholesale price adjusted for location. Retailers pay the marginal price at the consumers' location. Price and volume risk for generators and retailers managed through contracts negotiated bilaterally or through standard exchange traded contracts.	Government agency contracts with generators on basis of a fair return on historic assets and operational costs, including fuel costs, adjusted for location, and recovers these costs from retailers. Retailers pay average of the supply costs and bear the risk of the long term contracts entered into by the Government agency.
Retail prices	Retail tariffs are a product of retail competition.	Retail tariffs remain product of retail competition; purchase costs of retailers set by central single buyer through contracts based on average generation costs.
Water management	Each hydro generator determines optimal use of stored water and receives marginal price for electricity production	Government agency determines use of stored water based on its models; hydro generators not paid for calculated water value.
Investment in renewables	Renewables compete with non-renewables in the market.	Mandated renewables (Greens).

The documents accompanying the announcements of the proposal to establish NZ Power suggest a number of jurisdictions utilise a single buyer model or variants of it. In arriving at its list of examples, Labour appears to have relied (not unreasonably) upon a World Bank report.[13] Unfortunately, the World Bank document incorrectly characterises many markets. For example, the report characterises South Australia and the Philippines as operating single buyer arrangements.[14] However, wholesale prices in South Australia and the Philippines are determined under wholesale markets very similar to the New Zealand wholesale market.[15]

The Greens provide a list of countries which they understood to operate single buyer model.[16] A careful review of countries listed shows that a number have wholesale markets similar to New Zealand, while other examples are variants of vertically integrated national utilities with different degrees of contracting out (similar to the former ECNZ monopoly with generation and some retail functions delivered by the private sector under long-term contracts).[17] Only Brazil and Ontario have features similar to the NZ Power proposal and we refer to the experiences in these jurisdictions, where relevant to the discussion.

2.2 Approach to evaluating the proposals

All governments have a range of policy goals and policy makers are aware that a change in one area might have consequences for objectives in another area. The detail of how a particular policy goal is pursued may change over time. For example, the way New Zealand should respond to the threat of climate change has been reconsidered a number of times. Some of these considerations coincide with shifts in international research, while others result from internal changes in thinking about New Zealand's role and the importance different decision-makers place on the trade-offs between objectives. If decision-makers are to properly weigh, from their perspective, the advantages and disadvantages of a policy change, an evaluation approach is needed that accounts for the wider impacts of a policy change and not just its immediate effect.

In our 2009 report we presented a framework for evaluating significant policy changes in the electricity industry.[18] We began that report by looking back over three decades of electricity sector reform and experience worldwide to develop indicators of electricity sector performance against which the results of policy changes might be measured. We identified five policy goals that seemed enduring across countries and time:

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13 World Bank report, 'Electricity Auctions: an overview of efficient practices details' (2011), cited at page 10 of NZ Power: energising New Zealand policy document.

14 Ibid, figure 1, page xiii.

15 The authors have worked in both the Australian and Philippine markets for over a decade.

16 Footnote 14, Empowering New Zealand: green discussion paper.

17 For a detailed discussion of international experience with Single Buyer Models for Electricity, see Castalia *International Experience with Single Buyer Models for Electricity* Report to Contact Energy August 2013.

18 The report is available at: http://www.businessnz.org.nz/file/1622/Regulation%20and%20governance%20of%20electricity%20sector%20-%20160209.pdf

- security of supply – in the sense of supply meeting demand without involuntary cutting supply, or a heighten threat of cuts to supply
- efficient operation of the wholesale and retail sectors, with competition a primary tool for achieving efficiency
- efficient use of, and investment in, long life assets (including transmission and distribution), guided by economic regulation
- meeting community or social minimums, including universal access to electricity and support for those who can't pay (as opposed to won't pay)
- integrating environmental objectives while mitigating the impact on the industry of achieving these objectives, with a current focus on climate change.

Experience in New Zealand and elsewhere argues that enduring performance gains will be achieved in the electricity sector if the policy interventions provide a clear path to better outcomes across all of these goals. Undue focus on one or a few goals risk policy swings which undermine the confidence necessary to invest efficiently in the long-life assets of electricity production and delivery.

2.3 Assessing current and proposed arrangements

In the following sections we return to the five enduring policy goals. We first assess *current* market performance against these policy goals, as a means of providing an overview of the 'landscape'; that is, we highlight the problems and successes of the current market arrangements when assessed against each policy goal. We then apply the same approach to evaluating the NZ Power proposal for change. From this analysis we draw out the strengths and weaknesses of the proposals.

3. Assessing the current arrangements

3.1 The problems the wholesale market and accompanying regulation were expected to solve

As the brief history outlined in section 1.2 above illustrates, the creation of the wholesale market was one of a number of significant reforms to how the electricity sector is organised and governed. The wholesale market, and related measures to open the sector to private investment, was intended to solve several problems that had emerged under the arrangements that prevailed in the 1970s and 1980s including:

- considerable cost overruns from the construction of generation capacity, with these costs met either by consumers or by taxpayers[19]
- a lack of price signals and financial incentives for generators and consumers to increase/decrease generation/demand in response to low hydro inflows until the shortage actually existed, and as a result, recurring shortages[20]
- electricity pricing had become a political rather than an economic exercise[21]
- a desire to replace investment by the government with private investments.[22]

The wholesale market model which emerged from a consultative design in New Zealand is characterised as an "energy only" market. The market discovers a wholesale price for electricity produced (MWh) for each half-hour trading period. Very similar market designs operate in the eastern states of Australia, Singapore, the Philippines, and Texas.

Although energy only markets operate within detailed and extensive rules, the market design relies to a considerable extent on market prices as a coordinating mechanism for managing short-term supply and demand imbalances and for providing incentives for efficient investment to meet demand growth and to replace aging assets.

Alternative market designs considered at the time included providing for separate capacity payments to generators. Examples of wholesale markets with separate capacity payments

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19 See Galvin B, Secretary to the Treasury, Review of Electricity Planning and Electricity Generation Costs, (Treasury Paper to the Minister of Finance, Wellington, March 1985 [the McLaughlin Report].

20 Sir Ronald Davidson, The Electricity Shortage 1992: the Report of the Electricity Shortage Review Committee, 1992, page ix.

21 Prices were supressed for times and then hiked – prices increased 55% following the 1975 election for example (other significant price increases included, 1954 @ 46% and 1959 @ 42%).

22 Galvin B, Secretary to the Treasury ibid.

include Western Australia and the PJM market in the United States.[23] Wholesale prices in capacity markets are less volatile, but the trade-off is that the capacity payment shifts the risk of forecasting demand to consumers (with retailers over forecasting demand paying for more capacity than needed or being penalized if their demand is less than contracted capacity).[24]

3.2 Assessing performance against enduring policy goal

Although the wholesale market might have been designed to solve specific problems, its performance should be assessed against a range of policy goals as the market does not operate in isolation. In Table 2 below, we summarise our analysis of the performance of the market against the five enduring policy goals described above. This overview highlights:

- two immediate challenges for the sector
- a number of areas where substantial progress has been made on issues that have pre-occupied the sector and successive governments.

[23] PJM market originated as market for Pennsylvania, New Jersey and Maryland, but has expanded to cover all or part of 14 states, including Virginia. NZ Power: energising New Zealand policy document, page 10, refers to Virginia and California as examples of markets that price wholesale energy on the basis of historic costs plus fuel. However, PJM has operated a bid based market since 1997, and Virginia joined in 2005 – see http://www.pjm.com. In California wholesale prices are discovered in a commodity exchange operated by the Independent System Operator, with the highest offered priced generator required to run setting the price – see http://www.caiso.com

[24] Capacity market designs have also been subject to manipulation, see for example, CRA 'Capacity Market Gaming and Consistency Assessment', final report, 2013, prepared for Department of Energy and Climate Change, United Kingdom. The Minister of Energy in Western Australia has announced a review of the design of its wholesale market: http://www.mediastatements.wa.gov.au/pages/StatementDetails.aspx?listName=StatementsBarnett&StatId=7285

Table 2 Outcomes of the current sector arrangements under five public policy goals

Current arrangements	Security of supply	Efficient market transactions	Efficient investment	Meeting consumer social minimums	Environment
Decentralised decision making for investment and bids into wholesale market	Energy security relies on prices and commercial incentives. Diverse views and actions reduce error risk. System Operator responsible for real time security of supply.	Discovered prices tend to support efficient exchange by reflecting marginal cost of production; demand side increasingly involved.	Generation and consumption investments made by parties with the information, incentive and ability to manage the risks; network investment regulated.	Residential prices have risen faster than inflation. Recently retail competition has improved in all areas. Consumers unable to afford electricity (i.e. in fuel poverty) not well looked after.	Investment in renewables on a commercially sustainable basis. Can be influenced by the carbon price.
Generator receives marginal price. Risk managed through bilateral contracts	Cost of incremental supply and demand revealed; demand side increasingly responding to signal.	Prices signal marginal production cost, risk and economic benefits of demand response, helping identify opportunities for efficient exchange. Stress tests highlight certain risks.	Wholesale market price signals aligned with LRMC. Arrangements to manage risk through contracting improving. Investment occurs when economically efficient. Peaking capacity hard to justify.	Some consumers now seeing prices that vary with wholesale cost with advanced metering. Contracts for mass market consumers to manage risk relatively undeveloped.	Investment in renewables on a commercially sustainable basis. Investment in renewable distributed generation depends on arrangements with retailers and distributors in each specific geographical area.
Retail tariffs a based on outcomes of retail competition	Exposed retailer uncompetitive in dry year, hence incentive to contract with generators to manage wholesale risk. Contracts help underwrite investment in generation capacity and stabilise earnings.	Consumers face cost to serve, hence signals for efficient decisions. Competitive restraint on retail prices appears to be increasing.	Retailers that pay above market for wholesale energy uncompetitive, hence generators not guaranteed recovery of poor investment choices.	Few new entrant retailers with scale. EA targeting greater retail competition. Consumers face full cost to serve; support (e.g. low fixed user charge) may not be well targeted to consumers experiencing fuel poverty.	Investment in renewables on a commercially sustainable basis.
Actual hydro production paid marginal price	Places value (opportunity cost) on stored hydro so water used when most needed.	Discovers opportunity cost of stored hydro.	Receiving the marginal price is factored into the viability of hydro investments.	Consumers face economic cost of production i.e. return on and of capital and opportunity cost of using water in current periods.	Opportunity cost of hydro revealed; incentive for water rights to be applied to highest value use i.e. hydro generation under the status quo.
Renewables vs. non-renewables	Supply based on least cost supply and incentives to invest regardless of fuel type.	Market dispatch based on least cost supply and incentives to invest regardless of fuel type.	Investment in renewable and non-renewable generation face same investment hurdles.	Current system encourages least cost supply regardless of fuel type or SRMC or capital cost.	RMA and carbon cost guide impact of investment on environmental goals.

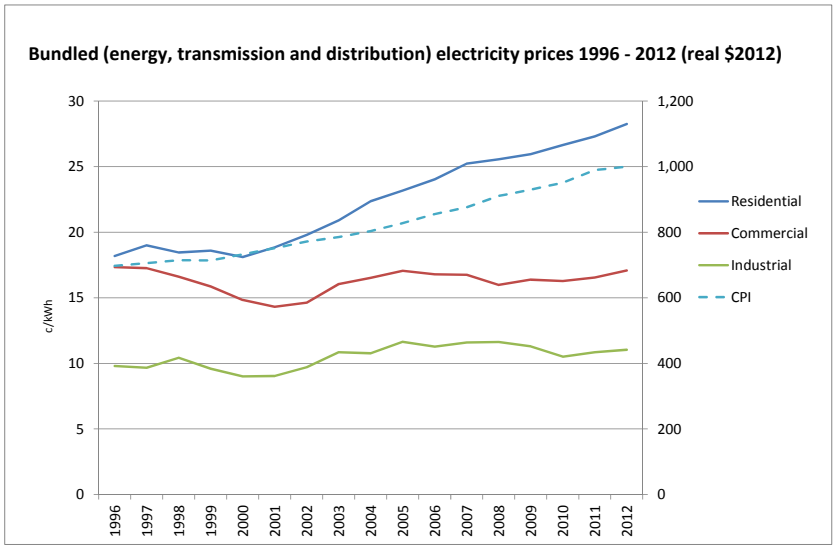
3.3 Apparent problems

Some key themes emerge from this summary. In terms of challenges facing the sector, two factors seem clamouring for attention.

3.3.1 Rising residential electricity prices

Residential retail electricity prices have risen faster than the rate of inflation, especially over the period 2001 to 2007, and significantly faster than electricity prices for commercial and industrial consumers.

Figure 1 Bundled electricity prices



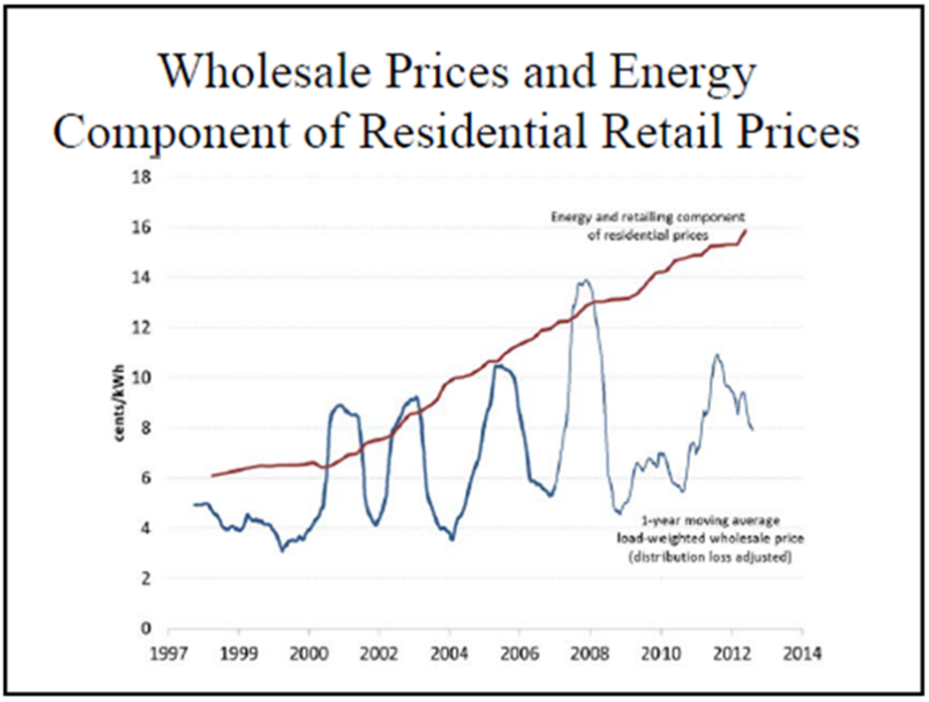
Source: Ministry of Business Innovation and Employment

A number of explanations for residential price rises have been offered by official and industry sources. These explanations include increases in distribution and transmission costs, a doubling of gas prices, an increase in the GST rate, an increase in the cost of building new power stations in the New Zealand and the trend away from commercial consumers subsidising mass market consumers.

There have undoubtedly been increases in these costs, but they do not fully explain the changes in retail prices or why residential prices have increased more rapidly than other retail electricity prices. If transmission and distribution charges and GST are backed out of the residential retail price, and the retail price net of these costs is mapped against the wholesale

spot prices, the margin taken on residential prices appears to have increased significantly as shown in Figure 2.[25]

Figure 2 Wholesale prices and energy component of retail prices



Source: Wolak 2013

The Electricity Authority has pointed out that New Zealand residential electricity prices were very low in real terms in the late 1970s and early 1980s and were subject to the price freeze in the early 1980s.[26] The Authority notes that the more rapid rise in New Zealand residential prices relative to overseas prices observed by several commentators means residential prices here are now 'middle of the OECD pack', and hence it is misleading to claim that prices are rising more quickly in New Zealand over time.[27] These explanations lead to further questions as to why most of the price adjustments occurred after 2001, and whether 'middle of the pack' is a satisfactory outcome after decades of reform.

There are other explanations for the price changes. Headline retail electricity tariffs may mask the number of consumers who pay lower prices by, for example, receiving prompt

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25 See Professor Frank Wolak (2013), 'Are the Electricity Supply Industry Challenges New Zealand Faces Any Different from those in other Hydro-Dominated Markets? Available at: http://www.iscr.org.nz/f895,23374/nz_iscr_presentation_wolak.pdf

26 Electricity Authority, Overview of EA progress, Presentation to Commerce Select Committee, 7 March 2013.

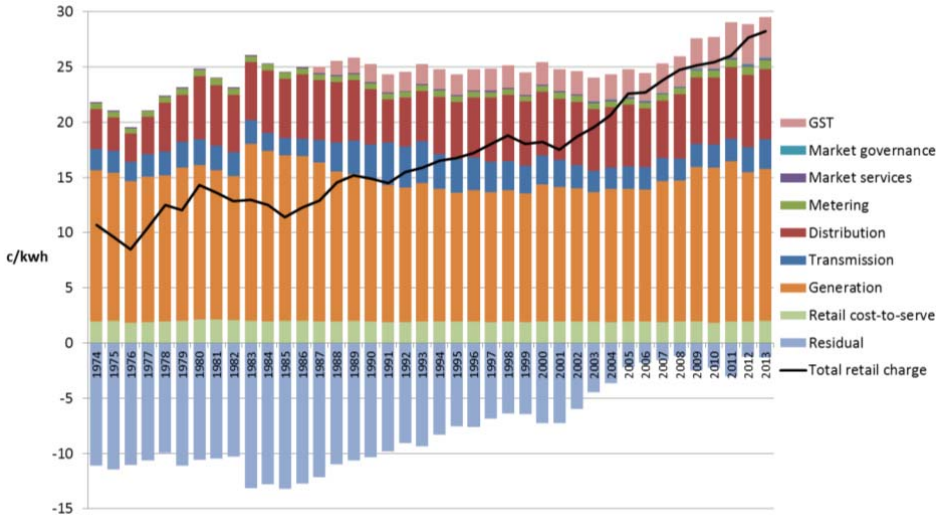
27 Electricity Authority, ibid.

payment discounts.[28] Retail margins may have increased due to the substantial wholesale price volatility in 2001, 2003, 2006 and 2008 or perhaps to reflect other costs or risk. The Authority has also recently published analysis showing the generation cost of meeting residential profiles is higher than the cost of meeting industrial load, because of the need to use more expensive peaking plant to meet peak demands.

Figure 3 below reproduces a chart recently published by the Authority showing bundled retail tariff and its estimates of the historical costs of the individual components of retail electricity charges over 30 years in 2013 dollars.[29] The Authority concludes from this analysis that prices for consumers were historically below cost and that:

> *Since 2005 average residential charges have remained close to the total estimated cost of supplying residential consumers based on historical costs. Increases in total residential charges over recent years appear to be matched by an equivalent increase in total underlying costs based on Authority modelling.*

Figure 3 residential cost breakdown based on estimated historical cost of generation



Source: Electricity Authority Real $2013

The release of the Authority's report has sparked further healthy debate.[30] However, importantly, from our perspective, the Authority's report *is not focused at measuring whether those retail prices are 'efficient' in an economic sense.*[31] That is, the report was never intended to answer

[28] The Authority advises that the Ministry of Business, Innovation and Employment (MBIE) is currently investigating the pricing data and that initial indications are that the published data may not fully account for residential customer discounting, Electricity Authority, *Analysis of historical electricity costs,* 21 January 2014, page ii.

[29] Electricity Authority *An analysis of historical electricity costs* Final report 21 January 2014.

[30] James Weir *Academic attacks electricity report Stuff website* 29 January 2014 (see http://www.stuff.co.nz/business/industries/9661789/Academic-attacks-electricity-report)

[31] Authority, *Analysis of historical electricity industry costs,* page ii.

whether residential consumers are currently paying too much for retail electricity – an objective of the market reforms is that consumers should pay only the efficient costs of electricity supply and should not pay the costs of past poor decisions (such as the historic cost of building Clyde dam).

This illustrates our overarching point that regardless of the explanations now available, the electricity industry has made a poor job of informing consumers why prices were increasing and demonstrating that the increases fairly reflect efficient costs rather than market power. Consumers remain suspicious of whether retail tariffs reflect fair and reasonable costs and whether the industry is competitive.

Steps to improve the ease of switching and to help consumers understand how to switch have increased switching activity but do not appear to be persuading consumers that this means electricity supply is competitive. The Electricity Authority actively monitors switching and the attitudes and experiences of residential customers and small and medium enterprises (SMEs) through surveys. The most recent survey reports:

> *Small to medium enterprises ranked electricity suppliers lowest for competitiveness when compared to telecommunications and banks. Less than a quarter (23%) ranked them as competitive compared to 45% for mobile, 37% for broadband and 32% for landline telecommunications industries: 25% thought banks were competitive.*
>
> *The outlook was more positive when the industries were compared for ease of switching* [32]

There have also been recent efforts to counter the perceived relatively weak bargaining power of consumers compared with large commercial users. Grey Power, for instance, recently announced a group buying deal with an electricity retailer. This is the first significant announcement of consumers finding a collective voice directly or indirectly in the sector.[33]

Looking forward, the Ministry of Business, Innovation & Employment (MBIE) expects lower demand growth and committed new generation capacity to put strong downward pressure on wholesale electricity prices for next the decade.[34] The owner of a controlling stake in one of the nation's five electricity generator/retailers, Infratil, notes *the future real retail price path for electricity (which) is about 2 cents/kWh lower than the average of the last five years.* On this basis, Infratil concludes: *the lower wholesale prices would reduce the average monthly household bill by $10 to $15, if distribution and transmission costs stop rising.*[35]

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32 Electricity Authority commissioned survey: UMR Research Shopping Around for Electricity Retailers A Quantitative Study among Small and Medium Enterprise Consumers January 2013 p. 20

33 Pulse Energy *Launching Grey Power Electricity* September 12 2013 See: http://www.pulseenergy.co.nz/customer-hub/community/news/launching-grey-power-electricity/

34 Ministry of Business, Innovation & Employment, 'New Zealand's Energy Outlook,' Electricity Insight, 2013, pages 7, 10.

35 Infratil Update September 2013

3.3.2 Fuel poverty

The current arrangements do not appear to bear down specifically on the problem of fuel poverty. The UK government defines fuel poverty, or energy hardship as the need to spend more than 10% of household income on household energy fuels[36] – hence, energy hardship may be influenced by energy prices, income levels, household size, housing insulation, energy efficient appliances, prohibitions on burning solid fuels, weather, if the house is large or small, and changes in community services (for instance, people remaining in their homes for longer rather than in aged care or other institutions). People living in cold or dam homes may exacerbate or contribute to medical conditions such as respiratory, arthritis or cardiovascular illness.

More recently the Hills report recommended to the UK Government a modified and more precise definition:[37]

> *Recommendation 2: The Government should adopt a new indicator of the extent of fuel poverty under which households are considered fuel poor if:*
>
> - *They have required fuel costs that are above the median level and*
> - *Were they to spend that amount they would be left with a residual income below the official poverty line.*
>
> *The government should count the number of individuals in this position as well as the number of households they live in.*

Modelling by Lloyd (2008) estimated that up to 23% of New Zealand households faced potential energy hardship (according to the UK definition of energy hardship), up from around 10% to 14% in 2001 if they only use traditional electric resistive heaving (for example, bar heaters).[38] The Growing Up in New Zealand study found that 21% of the most deprived quintile of households (about 4% of total households) reported they used no form of heating, and around 10% of these households reported that dampness was a constant problem.[39] Howden-Chapman at al (2011) [40] estimate up to quarter of New Zealand households are potentially in fuel poverty, existing houses are often poorly insulated and average outdoor temperatures are cold by international standards. Howden-Chapman at al's paper on research into the link between housing and fuel poverty in New Zealand reports *fuel poverty is thought to be a factor in NZ's high rate of excess winter mortality (16%, about 2600 deaths per year) and excess winter hospitalisations (8%).* McChesney finds that: *In the past 2 decades energy*

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36 DEFRA 2003, Department of Environment, Food and Rural Affairs, "The UK Fuel Hardship Strategy" 1st Annual Progress Report, 2003.

37 John Hills *Getting the measure of fuel poverty. Final report of the Fuel Poverty Review* A report commissioned by the UK Department of Energy and Climate Change March 2012

38 B. Lloyd (2008*) Fuel poverty in New Zealand.* A presentation at Community Energy Action conference in Christchurch, New Zealand, 2008 (unpublished; referenced in MSD and EECA, 2010).

39 The University of Auckland's Centre for Longitudinal Research - He Ara ki Mua, available at http://www.growingup.co.nz/index.shtml

40 Philippa Howden-Chapman, HelenViggers, Ralph Chapman, Kimberley O'Sullivan, Lucy TelfarBarnard, Bob Lloyd *Tackling cold housing and fuel poverty in New Zealand: A review of policies, research, and health impacts* September 2011

costs as a % of income have approximately doubled for low income households whole being little different for high income households[41].

The low fixed charge regulations were intended to benefit electricity users on low earnings and with low consumption.[42] *This policy is designed to help low power users and low income earners, including pensioners, to save on their power bills, and it's working.*[43] It does not target that group as there are many low users who are not low earners (e.g. dual fuel customers) and does not help low earners on high consumption.

The Electricity and Gas Complaints Commissioner Scheme provides a place for complaints with retailers to be resolved if the need arises but that does not help with affordability. Consumers may apply to Work and Income New Zealand for income assistance. Government policies have also supported housing insulation, including in HNZC houses, and there are initiatives to develop a warrant of fitness for state housing. However, from the studies we have reviewed, these measures do not appear to have made material inroads into the problem.

Any softening of wholesale prices (because of flat demand and increased generation capacity) that feeds through into lower retail prices would assist electricity affordability for households, but only marginally. However, the multi-dimensional causes for why some people live in homes that are cold and damp will not be alleviated by a change in electricity prices. An efficient and competitive electricity market is only a partial response to the problem of fuel poverty indicated in the Lloyd and Howden-Chapman et al's studies.

3.3.3 Addressing key issues that do not appear to being directly addressed

Our review suggests that:

- consumers are not convinced the industry is competitive and therefore that residential prices fairly reflect reasonable costs
- fuel poverty appears to be a significant problem for some New Zealand households.

These two key issues are not being directly addressed, perhaps because the solutions may involve multiple stakeholders (consumers, industry participants, regulators). We recommend a work programme targeted at these issues directly and comprising:

- a literature review to draw together whether these problems exist elsewhere and how they are being dealt with

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41 Ian McChesney *Achieving affordable warmth for all – the policy challenges* presentation to the Community energy Network Conference 20 September 2013.

42 The low fixed charge arrangements are established by the LFC Regulations (regulation 3) to

- ensure that electricity retailers offer a low fixed charge tariff option for delivered electricity to domestic users

- regulate electricity distributors so as to assist electricity retailers to deliver low fixed charge tariff options

43 Minister of Energy press release reported on Scoop independent news *Cheaper electricity bills from new regulation* Tuesday, 14 June 2005 http://www.scoop.co.nz/stories/PA0506/S00268/cheaper-electricity-bills-from-new-regulation.htm

- data collection to determine the true extent and nature of the problem here in New Zealand
- clarify problem from a public policy perspective and identify possible solutions.

3.4 Some challenges evident before the wholesale market was introduced have been addressed

A number of challenges which have pre-occupied the sector and the Government appear to be diminishing because of reform effort. The International Energy Agency (IEA) acknowledges New Zealand's sector achievements following the introduction of the Electricity Industry Act 2010:[44]

> *New Zealand's strong commitment to liberalised energy markets has delivered a relatively high level of energy security and economic prosperity for consumers. Since the previous IEA review in 2006, the government has built on the success of existing policy mechanisms and implemented a number of far-reaching changes in the electricity sector and environmental policy.*

The learning continues however. As discussed in section 1.3 the Electricity Authority has a work programme aimed at benefiting from the experience in the market and continuing to strive for a code that better satisfies its statutory objectives; this is a process of refinement though in total the extent of change is significant.

In the context of outcomes being achieved against public policy objectives our review supports a conclusion that substantial process has been made in at least seven areas each of which is discussed in this section.

3.4.1 Security of supply

Management of low hydro inflows has improved. For example, Figure 4 compares lake storage between two low inflow years 2008 and 2012. In the first six months of 2012 the South Island had the lowest hydro inflows on record. Despite these low inflows, lake levels were managed more prudently than the previous dry year, 2008.[45]

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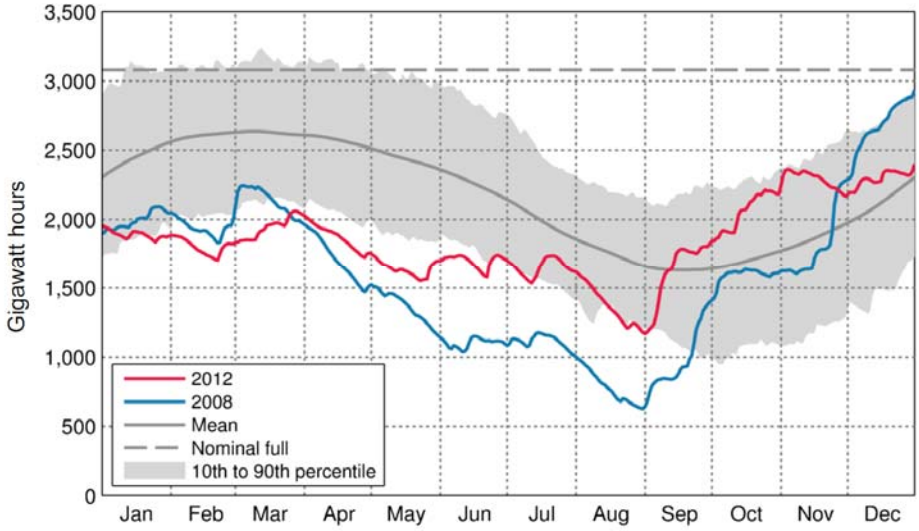
44 International Energy Agency *Energy Policies in IEA Countries - New Zealand 2010 Review* July 2011 version. See http://www.iea.org/publications/freepublications/publication/name,25165,en.html

45 Electricity Authority Briefing to the Incoming Minister: Hon Simon Bridges January 2013.

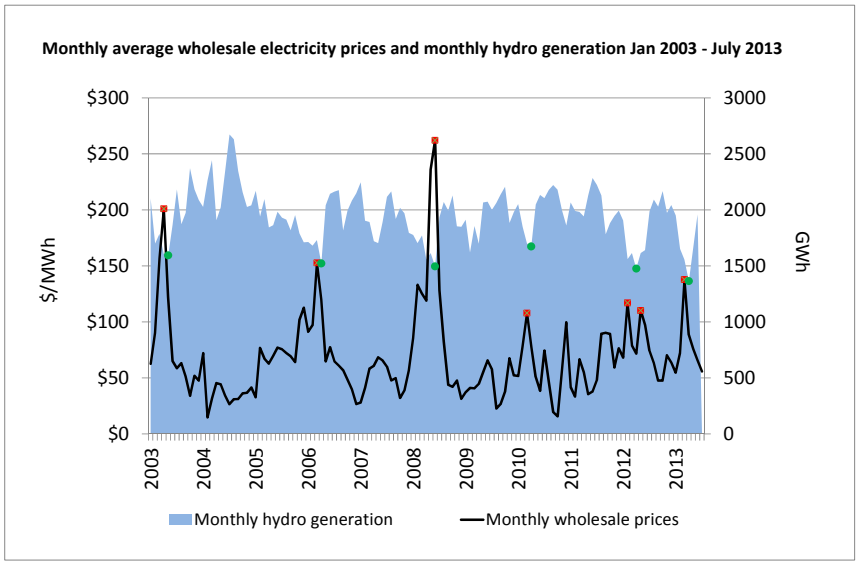
Figure 4 **Managing Low inflows – 2008 vs 2012**



Source: Electricity Authority

Figure 5 compares periods of low hydro generation with wholesale price outcomes over a 10 year period. The plot of monthly hydro generation shows 6 significant periods of low generation over the past decade (indicated by green dots) with the most recent drop being the most exteme for the series. The plot of monthly wholesale (spot) prices shows that peak prices (indicated by red dots) associated with low hydro generation have been less acute than the previous three years especially in 2013 when inflows are the lowest in the series.

Figure 5 Monthly hydro generation compared with monthly average wholesale electricity prices



Source: Sapere Research Group

3.4.2 Investment in generation

Since 2000, approximately $4 billion has been invested in 22 power station development projects in New Zealand.[46] These plants are fuelled by gas, biomass, wind, water and geothermal. They are located all around the country. Sufficient capacity has been brought forward so that there has been no forced curtailing of demand (as a result of energy shortages as distinct from transmission outages) since the inception of the wholesale market.

Importantly, the prospect of either a capacity or energy shortage has receded as the market has matured. The Ministry of Business, Innovation & Employment predicts that in its mixed scenario[47] no new investment in generation (other than that already committed) may be required until 2020, given the amount of new generation already under construction.[48] The System Operator reports on the energy margin security:[49]

> *NZ_WEM[50] and SI WEM are expected to remain within or above the energy security standards for the foreseeable future (2013 – 2020) even without additional generation investment over that which is currently committed (base case scenario).*

These results suggest that the fear that market prices would not bring forward generation as required has proved unfounded. The prices at which this investment is occurring appear reasonably efficient. As Figure 6 shows, hedge prices closely approximate the cost of the next cheapest generation; hence, hedge prices are signaling the wholesale cost of electricity to New Zealand.

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46 Infratil Update, September 2013, Issue No 38, p 13.

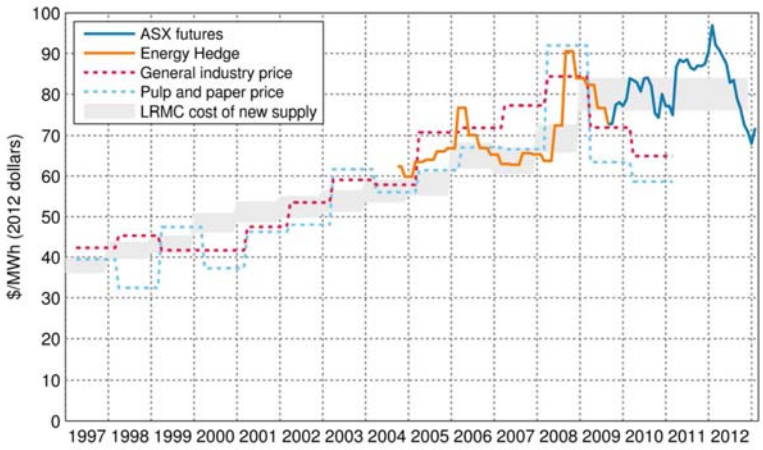
47 Ministry of Business, Innovation & Employment, 'New Zealand's Energy Outlook,' Electricity Insight, 2013, describes the mixed renewable scenario as resembling business as usual which includes no significant reductions in the cost of existing generation technology and an available energy supply similar to today's sources.

48 Ministry of Business, Innovation & Employment, 'New Zealand's Energy Outlook,' Electricity Insight, 2013, pages 7, 10.

49 System Operator report: security of supply annual assessment 2013 http://www.systemoperator.co.nz/f4571,80947535/SoS_Annual_Assessment_2013_PUBLISH.pdf

50 WEM – winter energy margin

Figure 6 LRMC versus forward hedge contracts[51]



Source: Electricity Authority *The Economics of Electricity*

3.4.3 Investment in renewable generation

Appendix 2 lists all of the new generation commissioned since the wholesale market was established in 1996. In the period since Genesis commissioned the modern 400 MW combined cycle gas plant at Huntly in 2007, 857 MW of renewable capacity has been added to the system and 302 MW of peaking capacity. Other small diesel and landfill plants commissioned total 23 MW. During this period there have also been expansions such as Ngawa geothermal (28 MW) and Poihipi geothermal (50MW). This pattern of investment does not suggest a problem with investment in renewable generation under current arrangements.

3.4.4 Investment in transmission

There has been significant policy convergence internationally on a number of key principles for regulating market activities, especially in industries with long-life assets. These principles include regulators withdrawing from direct controls on market conduct/outcomes, and strengthening the application of general competition policy and law. Economic regulation (price and services) of non-competitive parts of the sector should be undertaken by regulators that are independent of short-term political pressures which may be at odds with long-term objectives and prices set to allow a reasonable, risk adjusted, return on investment; interventions to achieve equity, distributional, or other social objectives should be undertaken by core Ministries accountable to elected Ministers.

Measured against this convergence, the regulatory regime for transmission investments in New Zealand is now relatively settled. A number of significant upgrades are completed or are underway. Figure 7 plots historical capital expenditure on transmission and forecast expenditure from 2005 to 2016.

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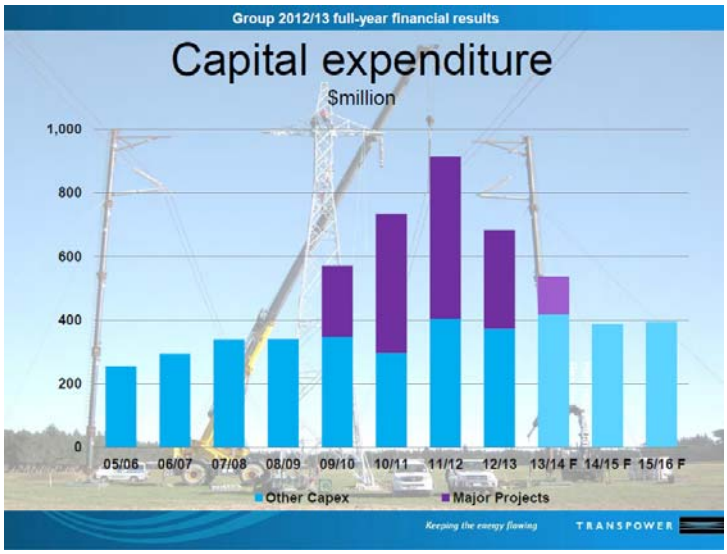
[51] Electricity Authority Stakeholder briefing 5 June 2013.

Figure 7 Total capital expenditure in transmission



Source: Transpower

3.4.5 Net pivotal situations less frequent

Wholesale electricity prices in energy only markets can be volatile, as prices rise or fall to balance supply and demand in each half-hour trading period. Because demand has historically been relatively unresponsive to price, especially in the short-term (under the prevailing retail tariffs, residential consumers do not see short-term variations in price), market commentators have remained concerned that generators would be able to exercise market power, at least during some trading periods.

In its 2009 Investigations Report, the Commerce Commission considered that each of the four largest retailer-generators - Contact, Genesis, Meridian and Mighty River Power - was likely to have held substantial market power on a recurring basis, particularly during dry years.[52] The Commission commented that this market power meant wholesale prices charged over the period 2001 to mid-2007 resulted in an extra $4.3 billion in earnings to all generators over those they would have earned under competitive conditions. In reaching this conclusion, the Commission relied on the work of Professor Frank Wolak of Stanford University.[53] Professor Wolak's report was subsequently heavily criticised for its application

[52] http://www.comcom.govt.nz/the-commission/media-centre/media-releases/detail/2009/commercecommissionfindsthatelectri

[53] Professor Wolak has since stated that this estimate of $4.3 billion was not his work and acknowledged that as generators were also retailers the figure could not be an estimate of additional earnings by generators – see pod cast of Professor Wolak's 30 July 2013 presentation at http://www.iscr.org.nz/n895.html

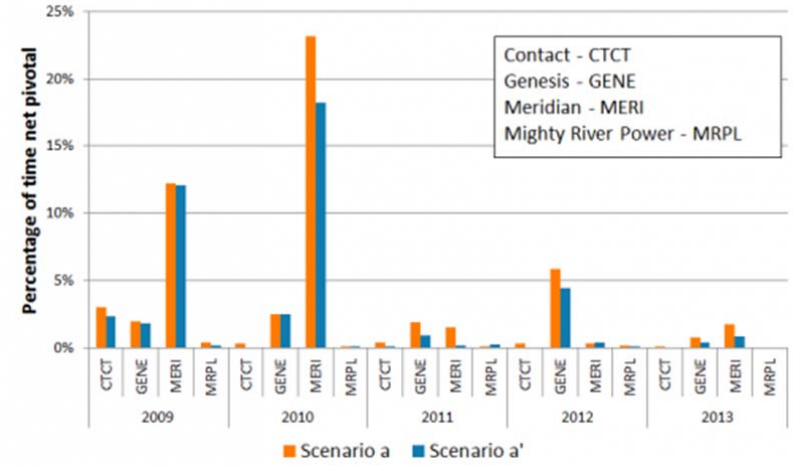
of methodologies, conceived in a thermal based system, to a hydro generation dominated system.[54]

The Electricity Authority has recently conducted work to understand whether more recent developments in the market, and especially whether hedge contracting, had altered the ability and incentives for generator-retailers to exercise market power and increase wholesale prices during certain periods.[55]

The Authority investigated (as Professor Wolak had done) the circumstances when at least some of the output of a specified generator is required to serve demand. A generator in this position has the ability to raise the spot price. However, it may not have the incentive to do so, if it also purchases from the spot market to meet its retail sales and hedge contracts. When the output required from a specified generator exceeds the quantity that generator purchases from the market, it has both the incentive and the ability to raise the spot market price. The Authority refers to a generator in this position as being *net pivotal*.

The Authority modeled each half-hour period over the period 2009 to 2013 – *scenario a* considered only the long term contract between Meridian and Genesis and Mighty River Power, whereas s*cenario a'* considers other hedge contracts. The results are presented in Figure 8 and show that there has been a significant reduction in the proportion of time generator-retailers were net pivotal.

Figure 8 Percentage of time generators are net pivotal



Source: Electricity Authority

Meridian's net pivotal ability reduces quite substantially from 2011 as a result of the physical and contractual asset swaps imposed by the Government following the Ministerial Review. The development of the contracts market has also reduced the incentive for generators to

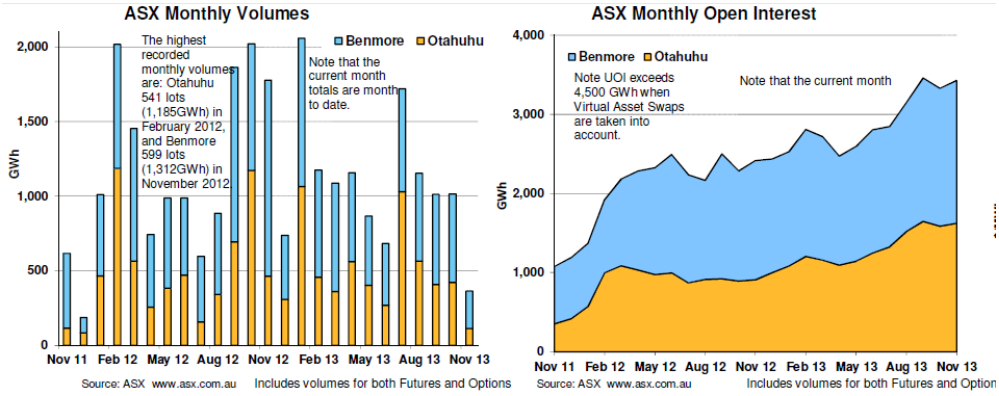
54 The New Zealand Treasury, in a Report on Regulation of the Electricity Market, 8 March 2012, dismissed the basic premise of the Wolak report on the basis that "two independent peer reviews of Professor Wolak's report identified significant flaws with his methodology that render the conclusions he reached worthless".

55 Electricity Authority, 'Information on the Market # 16 – The impact of hedge contracting on net pivotal ability' available at http://www.ea.govt.nz/industry/monitoring/i-on-the-market/number-16

exercise market power – the Authority observes that in 2013, for example, the additional hedge contracts sold by Meridian through the electricity futures market etc. reduced the proportion of time it was net pivotal from around 1.8% to less than 1%.

Market statistics suggest that the ASX market is continuing to grow in size, with unmatched open interest sitting at around 3,500GWh since September 2013 (see Figure 9). Trading in longer dated contracts in particular has strengthened. This trend is positive for retail competition as it increases the opportunity for retailers to manage exposure to price risk over the longer-term.

Figure 9 ASX electricity market hedges



Source: Electricity Authority

In addition to these structural and market changes, the Wholesale Advisory Group established by the Electricity Authority is investigating strengthening the integrity of the trading arrangements by introducing a code of conduct in relation to market trading.[56]

3.4.6 Retail competition

Since the introduction of the Act in 2010 the Authority has pressed on with a number of initiatives targeting increases in retail competition. The Authority regularly reports on improvements in retail competition. It reports on the following measures:

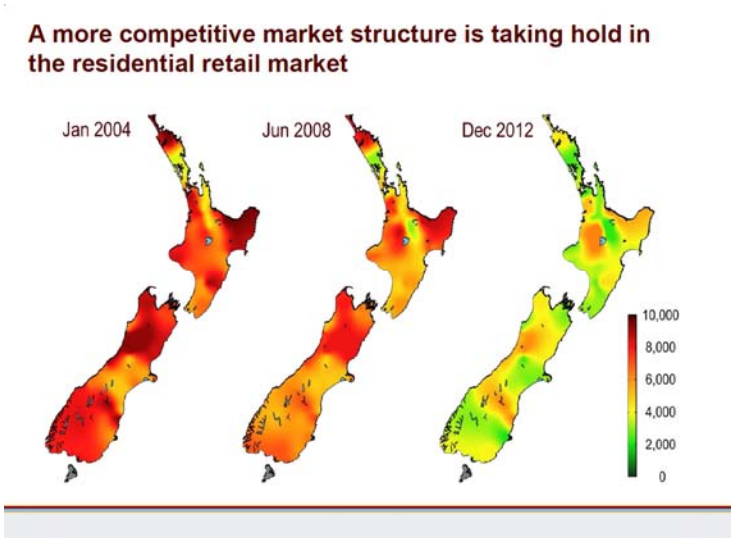
- The market share of the largest retailer(s) competing in the regions has reduced markedly since 2004, as shown in Figure 10.
- Consumer switching rates have increased substantially since 2008, see Figure 11.
- The frequency of approaches made to potential retail consumers as an indicator of competitive retail activity. As shown in Figure 12, approaches have risen from 58% in 2011 to 68% in 2013, with a 73% increase in the number of consumers approached 3 times in the period.

[56] http://www.ea.govt.nz/our-work/advisory-working-groups/wag/

The Authority has conducted a campaign to promote customer switching and publishes a review of the campaign. In its review of the 2012 campaign the Authority noted that during 2012, there were 24,209 additional switches over those recorded pre-What's My Number in 2010, with estimated average savings of $175 per switch and an estimated annual national savings of $4.24 million.[57] In 2012, VaasaETT a global energy think-tank based in Finland, conducted a study comparing 38 competitive electricity markets around the globe. It ranked the New Zealand electricity retail market as number two in the world when it comes to customer switching, second only to Victoria, Australia.

As the Authority acknowledges, high levels of switching may not necessarily be a measure of competitive rivalry; for example, low switching rates may indicate a highly competitive market if it results from retailers offering very similar pricing and services, removing the incentive for consumers to switch.

Figure 10 Trends in retail market concentration (Herfindahl-Hirschman Index[58])[59]



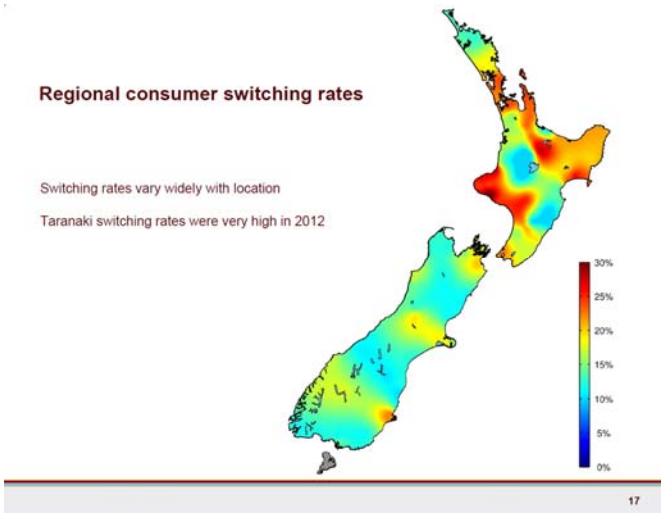
Source: Electricity Authority

[57] Electricity Authority What's my number Competition is key – a review of the 2012 campaign http://www.ea.govt.nz/consumer/csf/#review

[58] The Herfindahl–Hirschman Index (HHI) is a measurement of competitiveness measuring market concentration by using size and number of competing firms. On the HHI scale 10,000 is low competition and 0 is very competitive.

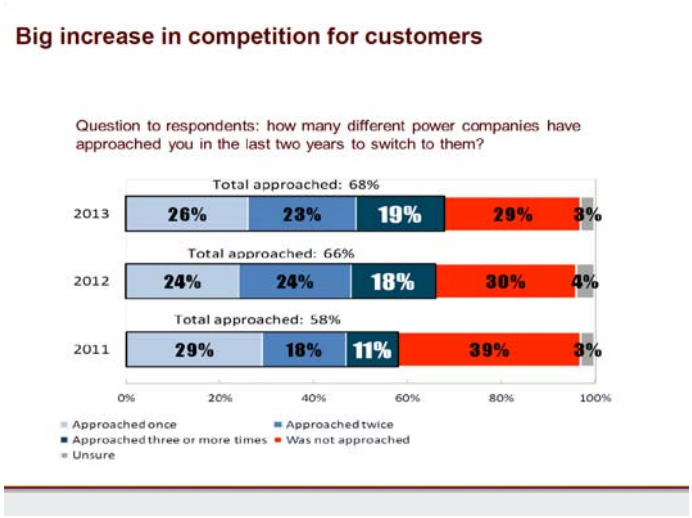
[59] Electricity Authority (2013b) *Overview of EA progress*. Presented to Commerce Select Committee 7 March 2013.

Figure 11 Regional consumer switching rates, 2012[60]



Source: Electricity Authority

Figure 12 Indicators of retailers making approaches to potential new electricity customers[61]



Source: Electricity Authority

60 ibid

61 Electricity Authority *Stakeholder briefing*. 5 June 2013

3.4.7 Integrating transmission, distribution, and generation investment and demand management

In markets, prices convey information about demand and about the cost of supply. By conveying information between suppliers and consumers, prices help solve the central problem of economics – how to ensure scarce resources are employed in their highest value use and used by those who value them the most. However, the experience and literature on electricity sector reforms suggest price signals alone will not achieve efficient investment outcomes in integrating transmission, distribution, and generation investment and demand management.[62] Coordination issues arise because of joint consumption / lumpy investments, spill-over effects (a decision by one participant affects others), and imperfectly defined and hence priced transmission and distribution services, and different regulatory regimes amongst asset owners.

Coordination remains important with the implementation of competitive wholesale markets, because transmission, distribution, and demand management are both complements and substitutes for generation:

- investment in electricity networks allows electricity to be transported from low to high value regions, but locating generation at load centres reduces the need for network investment (and vice versa)
- interconnection reduces the total generation capacity needed to reliably serve demand but demand interruption may substitute for transmission.

Considerable progress has been made in relation to the decision processes for transmission and distribution investment, and these processes have supported substantial investment upgrades (see section 3.4.4 Investment in transmission). The Authority and the industry are engaged on a comprehensive review of transmission pricing to assess whether improvements to the pricing methodology are feasible.[63]

Some challenges remain with coordination between distributors and generator/retailers around demand side management. The emergence of smart meters, access to more data and the possibilities that building management systems offer, means there is a greater potential for demand side management. A working group convened by the Electricity Networks Association has worked closely with retailers to develop a set of rational principles for managing potentially conflicting load control objectives. The principles recognise the fundamental concept that end user load belongs to consumers.[64]

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62 For a discussion of these issues, see Kieran Murray 'Efficient coordination of investment in regulated transmission and competitive generation markets', presentation to Association of Power Exchanges, Rio de Janeiro, October 2011

63 See http://www.ea.govt.nz/our-work/programmes/priority-projects/transmission-pricing-review/

64 ENA Newsletter October 2013

4. Assessing the proposed arrangements

In the previous chapter we assessed current industry arrangements against five enduring policy goals for the sector. We pointed to two key areas that continue to present challenges but we also identified several areas where the challenges are diminishing. In this section we ask whether the proposed alternative arrangements would address the remaining issues and whether they would create other issues that would need to be addressed in future.

4.1 Assessing proposed changes

In **Table 3** below, we summarise our analysis of the proposed changes to the wholesale market against the five enduring policy goals.

Table 3 Outcomes of the alternative proposal(s) under five public policy goals

Proposed arrangements	Security of supply	Efficient market transactions	Efficient investment	Meeting consumer social minimums	Environment
Central single buyer (SB) makes decisions on investment and dispatch	Prices and incentives 'lean against' security objectives. Central view replaces diverse views and actions. Conservative bias likely for load forecasting and outage planning.	Less information and incentives compared to private investors, leading to more errors and higher costs. Prices and incentives not aligned with efficient transactions.	Increased investment errors and costs due to poorer information and incentives. Required return for investors if contractual risk is lower than with current arrangements.	Higher burden on consumers if central decision making inefficient. Higher burden on taxpayers if under investments results in requirement for Government investment.	Favouring renewable generation over lower cost options gives more assurance of meeting environmental objectives but increases investment costs over current arrangements.
SB supply contracts based on a fair return on assets & production at cost	Undermines investor appetite for risk and economic return. Potential for new Government investment required if private investment incentives weak.	SB lacks the incentives to optimise investments in generation, fuel procurement and fuel use. Value of wholesale market price signals may be lost.	If investors cannot achieve their WACC the Government has to underwrite or make investment.	If Government has to invest consumers pay indirectly through taxes.	Undermines renewable energy goals by deterring hydro development and may incentivise transfer of existing hydro water rights to other uses.
SB contracts with retailers at average cost. Aim of lower retail tariffs.	Higher demand (because average costs < marginal costs) will lead to requirement for additional investment in generation and transmission.	Will reduce incentive to develop demand side management and innovation to reduce power use and, in turn power costs. Similarity in retail contracts will drive fewer larger retailers rather than more smaller retailers.	May strand some generation and energy efficiency investments and waste a lot of effort in many areas. Lower dividends for the Government on its ownership of generators and retailers.	Lower prices will lead to higher demand. Lower prices *per se* will only assist with fuel poverty at the margin. Otherwise NZ Power does not focus on the issue specifically.	Higher consumer demand may lead to greater need for investment additional generation some of which may be fossil fuelled power stations.
Arrangements for hydro catchments: $0/MWh for actual production	Shift away from marginal pricing will weaken efficient use of water especially stored water.	Shift away from marginal pricing will weaken efficient use of water especially stored water.	New hydro less competitive than today if unable to value stored water at opportunity cost.	If arrangements lead to higher costs rather than lower costs the scheme may be counterproductive.	Inhibits investment in hydro generation; water from existing hydro may transfer to uses which provide return on water.
Mandated renewables (GPA).	Greater requirement for ability to accommodate intermittent renewable generation.		May displace lower cost generation investments. May strand generation and energy efficiency investments.	May displace lower cost generation leading to higher wholesale and retail prices than would otherwise be the case over time.	Positive outcome may be undermined by inefficient investments and support for less economic intermittent generation.

4.2 Proposal does not appear to target problem areas

This analysis leads us to several key preliminary observations about the alternative proposals.

4.2.1 Price outcomes

A critical assumption in the alternative proposals is that delivered prices would be lower, providing a benefit to households of about $300 per year.[65] The average New Zealand household consumes about 8,000 kWh per annum,[66] suggesting a reduction of 3.8 cents per kWh on average.[67]

A reduction of 3.8 cents would amount to about 13% of the current average residential tariff of around 28.5 cents/kWh.[68] To achieve this price reduction, the policy change would replace the wholesale market. Other components of the retail price such as transmission and distribution charges, metering and so forth are not directly targeted by the proposals as announced. Wholesale energy costs currently range about 7 cents to 10 cents (see Figure 6).[69] That is, to deliver a saving of about $300 per annum to households the proposals would need to reduce the average wholesale price by about 40%.

The primary driver for the expected lower wholesale prices is that the Single Buyer would compensate generators for fixed costs at a fair return on historic costs, and pay for the operating costs of generation plant. The Single Buyer would charge retailers for the average cost it incurs. The price consumers pay would be set by competition between retailers, as under the current arrangements (though the proposal by the Greens would regulate the structure of the charges to provide for progressive pricing).

However, purchasing electricity at the historic cost of generation plant, plus operating costs, is unlikely to lead to lower wholesale costs in the short-term and would almost certainly lead to higher costs over time.

Change in valuation method in of itself does not change competitive prices

There is precedent in New Zealand, and in the international jurisdictions with which we often compare ourselves, for economic regulation to require a shift from revaluation to historic cost valuation methods – these changes have occurred in relation to transmission

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65 The proponents contemplate this reduction being achieved by different routes. The Greens would provide a "block" of low cost electricity for each household, whereas Labour anticipates a reduction in all retail electricity prices. The Greens estimate that saving per household at $300 per annum; Labour estimates a saving of $330 per annum.

66 Electricity Authority, *Electricity In New Zealand*, 2011, available at www.ea.govt.nz/dmsdocument/12292.

67 $300 / 8,000 = 3.75 cents.

68 Ministry of Business, Innovation & Employment. *Energy in New Zealand*. 3 October 2013.

69 The Electricity Authority in its recent publication, *Analysis of historical electricity costs,* proposes that the generation cost of meeting residential demand is higher than the average LRMC of new plant because of the need to maintain peak capacity.

and distribution investments, not generation investments. Examples include electricity transmission – both New Zealand[70] and Australia[71] have changed from an Optimised Depreciation Replacement Cost method (which requires regular revaluations) to an historic cost valuation of transmission assets for the purposes of setting prices. In both cases, a recent valuation was deemed to be the 'historic cost' of existing assets. The UK regulator adopted a similar approach by setting initial values to reflect market values.[72]

There are several reasons why regulators introducing regulation that requires assets to be valued at historic cost adopt a recent valuation as the 'historic cost' for existing assets:

- For long-life assets, the historic capital costs can be impossible to reconstruct as accurate records were not kept.
- Actual historic costs may be higher than current values. For example, some accounts place the cost of the Clyde Dam at $1,573 million in 1991 dollars.[73] This is more than the vesting value of all of Contact Energy's assets when it was formed as an SOE.[74]
- If historic costs are adjusted for inflation (a possibility suggested by Labour), the cost of many of the major hydro developments would greatly exceed current values.[75]
- Picking a valuation from some past date, such as a date when assets were vested from a government department to a state-owned enterprise, and deeming that value as the 'deemed' historic cost becomes a capricious exercise unsupported by any economic rationale – we are not aware of any democratically elected government that has introduced economic regulation in this manner because of the risk of destabilising investment in other long-life industries.
- Changing the value of an asset does not alter the fair return on that asset or the prices in a competitive market; an investor will consider the aggregate of cash and revaluation returns; if the valuation method precludes revaluations the fair return would be assessed against cash returns which reflect current prices.
- If historic values other than the most recent valuations are used then long-term contracts may have to be assessed as well, raising very problematic issues for the

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70 Rules relating to valuing the RAB can be found in Part 2, Subpart 2 of *Electricity Distribution Services Input Methodologies Determination 2012*, Commerce Commission, 15 November 2012

71 Rules relating to valuing the regulatory asset base are set out in Schedule 6.2 to Chapter 6 of *Economic Regulation of Distribution Services of the National Electricity Rules*.

72 The regulator in the UK (Ofgem) has taken a similar approach. The initial RAB values were set at the time of privatization by reference to the market values at the time (in the 1980s) of these businesses Ofgem, *RIIO-1 glossary of terms*. Ofgem uses the RAV, or regulated asset values, for the RAB. Found at https://www.ofgem.gov.uk/ofgem-publications/47151/riioed1sconglossary.pdf

73 Aynsley Kellow, '*Transforming Power, the Politics of Electricity Planning*', 1996

74 Geoff Bertram, Asset revaluation, price gouging, and barriers to entry: the state of play in electricity sector non-regulation, 24 May 2013.

75 The Electricity Authority calculated the historic costs in 2012 dollars of the following hydro developments would exceed current prices – Whakamaru, Ohakuri, Atiamuri, Roxburgh, Aratiatia, Benmore, Aviemore, Tongariro, Upper Waitaki, Clyde, source Electricity Authority, Overview of Progress: Presentation to Commerce Select Committee , 7 March 2013, slide 14. These estimates are provided in Appendix A to the Authority's report, *Analysis of historical electricity industry costs*.

Government if it intervenes to re-write long-term agreements against the wishes of the contracting parties.

In short, if New Zealand follows international norms in introducing regulated changes to valuation methods, there would be no change in prices as a result of the change in valuation method.

Costs higher in the medium to longer term

There are several reasons why the alternative arrangements would likely result in *higher* electricity costs over the medium to longer term:

- Currently, all electricity generators invest in developing generation projects, some of which may not proceed to consent; generators also undertake engineering and commercial analysis of upgrades to existing power stations and seek incremental improvement. It is hard to see why generators would continue to invest in developing options or upgrades under the Single Buyer arrangement; they would just make submissions to the Single Buyer's request for proposals. These incentive effects are why central agencies fund and carry out most of the investigation work for large civil works procurements, with tenders for the construction.
- A Single Buyer takes on the key risks of how much generation capacity is needed and when it is needed, and takes on price and volume risk in matching supply with demand in each trading period. In the current market, generators and retailers bear most of these risks. There is no reason why a Single Buyer would be better placed to manage these risks – it would not have better information, incentives or capability.
- The New Zealand historical experience provides many examples of overly optimistic central planning, the costs of which were borne by taxpayers (for example, the last major power station built by the government, Clyde Dam, or the more recent Whirinaki peaking plant). This experience is shared by taxpayers and consumers in other jurisdictions, for example Ontario consumers will pay about $1 billion to cancel two power stations contracted by its central buyer.[76]
- Hydro generators would face strong incentives to divert water to other economic uses. For instance, water that might otherwise have been available for hydro generation may become available for irrigation. This is because water used for irrigation would earn a return (e.g., through increased milk fat production) but water used for hydro generation would not necessarily achieve a return under a system where generators are paid SRMC. This would mean that, over time, less hydro generation resources would be available.

4.2.2 Retail competition

The NZ Power proposal suggests that retailers will benefit from lower costs as a result of buying closer to average costs rather than marginal costs. However, no further information is provided about the contract between NZ Power and the retailers. As the spot market would be abandoned, the retail contracts are likely be what are known as fixed price variable volume contracts; under this form of contract the retailer would be able to access supply and

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[76] http://www.auditor.on.ca/en/reports_en.htm

pay the Single Buyer's price regardless of how many customers the retailer acquires and whatever its real time demand is in any given hour. If that is the case, all retailers would pay the same price, as the retailers would have no price and volume risk and the product is the same for both retailers.

If we have characterised the proposal correctly, retailers would make money by competing to lower retail margins rather than by tailoring products to consumer needs. The best way to lower costs would be to become less creative (i.e. stifle innovation) and consolidate to achieve scale so fixed costs are spread over a greater customer base. The result would be fewer, larger, retailers and less innovation.

It is for these reasons that we can observe that no other market has successfully used a combination of a single buyer with retail competition.[77]

4.2.3 Fuel poverty

We identify fuel poverty as an issue where more could be done under current arrangements. The proposed alternative arrangements are targeted at retail electricity prices across the board. If the proposed arrangements do result in lower prices that would reduce the number of consumers facing fuel poverty but, like the current arrangements, it would not address the fuel poverty issue head on.

An analysis by McChesney (2013) suggests that the largest proportion of benefits from progressive pricing would go to households with the lowest and most even monthly electricity consumption, not necessarily those in fuel poverty. This is partly because low electricity requirements do not necessarily equate to low incomes: many of the lowest users such as dual fuel users are not necessarily in fuel poverty and some consumers in fuel poverty are not low users. A change in fuel prices would not address the capital requirements (poor insulation, inefficient appliances, housing not well matched to requirements, etc) that lead to people living in cold homes.

4.2.4 Lack of transparency

Current arrangements allow for generators and retailers to be integrated. The Electricity Market Review undertaken in 2006 by the Minister of Energy found that mandatory separation of retail and generation was unlikely to offer net benefits so no action was taken at that time. The Ministerial Review conducted in 2009 did not take any steps to disturb vertical generation either. Some of the major generator retailers provide separate information on the retail and generation arms of their business. However the nature of the information is inconsistent amongst the generator retailers; some provide very little information and the lack of transparency remains a source of suspicion over the business activities of generator retailers.[78]

A step that may be helpful could be to provide for greater transparency on the relative operation of generation versus retail arms of the energy companies. For example, a regime

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77 Castalia *International Experience with Single Buyer Models for Electricity* Report to Contact Energy August 2013.

78 Increased trading on the ASX electricity futures is, arguably, providing increased transparency on the wholesale cost of retail sales.

similar to the information disclosure regime for regulated business (e.g. lines companies and the grid owner) might provide a thorough and consistent understanding of how these companies make their money and where inefficiencies might lie. However, information disclosure of this nature is costly, both in terms of the resource costs involved and the potential adverse incentives to create information if it is subsequently required to be disclosed to competitors.

The underlying problem is part information disclosure part confidence that retail tariffs reflect the efficient cost of delivered energy. The solution should address this issue rather than intervene in other aspects of the industry without addressing this first. From a public policy point of view it is not possible to run centralised and decentralised arrangements in parallel to see which works the best. The best approach is to address the problems without undermining the parts of the sector that are working.

4.2.5 Vertical integration

The Greens proposal is for vertical integration to continue to be allowed and rely on other changes to encourage efficient retail operations and competition. The Labour proposal is for separation of retail and generation. The very fact that these two proposals are characterised as similar but that they disagree on this point indicates that the argument for separation is not clear cut.

It would not be a trivial step to require separation of generation and retail as it would be a major incursion into the activity of private companies and rip apart established risk management practices in the industry. Most reformed wholesale electricity markets have converged to several large integrated retailer generators, with a number of niche entities, suggesting there are real efficiencies in risk management and operating costs from integrated retailer generators, at least once firms become sizeable in terms of generation or retail.

Concerns about vertical integration should be addressed first through considering whether additional information disclosure is warranted. A debate on the merits of information disclosure would help clarify whether any aspect of vertical integration is a problem and whether providing greater transparency would address the perceived problems.

4.2.6 Environmental impacts

The environmental outcomes under the alternatives proposals are not necessarily an improvement on current arrangements. If the lower retail tariffs were delivered higher demand would create a requirement for greater generation some of which would be non-renewable (unless renewable generation was mandated). If renewable generation is mandated consumers would pay more for supply where lower cost non-renewable options are shut out.

4.2.7 Return to risk of outages

A 2006 Cabinet paper speculated that a Single Buyer would likely to lead to higher levels of security because this would be the primary focus of the Single Buyer. However, this is a narrow view of the incentives on a Single Buyer and inconsistent with international experience. A Single Buyer is also concerned with prices and likely faces a capital constraint. The result is that central procurement functions tend to under invest in generation capacity, and attract fewer investments, relative to market driven investments.

This has been the New Zealand experience – no forced shortage has occurred since the market was introduced and the capacity margin has expanded. It is also the experience internationally. As Professor Wolak observed, Brazil, Chile and other cost-based markets have faced several shortage periods when firm load had to be curtailed.[79]

4.3 Conclusion

It is easier to be confident of the expected outcomes and any failings of the current arrangements than with the proposed alternatives. The outcomes of the current arrangements are the result of two decades of learning and refinement. This experience, and the experience of other jurisdictions, provides insights into the likelihood of delivering on the alternative proposals and the impacts that would emerge. Previous periods of central procurement of electricity in New Zealand, and the outcomes from regimes that share some of the same characteristics with the alternative proposals, suggest there is a very real risk that the proposals would result in higher electricity prices and less secure electricity by undoing the achievements that have been made and repeating past mistakes.

[79] See Professor Frank Wolak (2013), 'Are the Electricity Supply Industry Challenges New Zealand Faces Any Different from those in other Hydro-Dominated Markets? Available at: http://www.iscr.org.nz/f895,23374/nz_iscr_presentation_wolak.pdf

Appendix 1 NZ Power proposal

Feature	Labour	Greens
Mechanism for establishing generation price	Long term contracts negotiated through open tender	Auction long term contracts with generators and use market power to negotiate much lower wholesale prices (Lowest price possible) Mandate to favour renewable generation (retain marginal wholesale price signal for new renewable generation)
Guidance for price determination	Fair return based on actual (historic) costs[80]	If generators hold prices high government able to use regulation to ensure fair prices
Other features		Will contract back-up from stations that might otherwise close and demand side response Remove perverse incentives to spill hydro
Dispatch	Dispatch from cost based offer curve and single buyer view of fuel and market conditions	System operator to tell generators which power stations to produce how much electricity The most expensive electricity (from gas and coal) will remain expensive. Electricity that is nearly free to produce will be much cheaper.
Agency	Single buyer - cover operating costs and trading	Single buyer - not for profit
Arrangement with retailers	Long term contracts with retailers. No clarity over the form the contracts will take.	
Mechanism for ensuring retail competition and accommodating new entrant retailers	Retailers separated from generators combined with other mechanisms listed here.	Weakened ability to share risk between wholesale and retail allowing more competition and fostering more innovation in retailing.
Expectations of retail prices	Prices of new generation averaged	Overall prices of electricity = average cost of production Progressive pricing: a low cost block per household then cost reflective thereafter Mandate to facilitate energy efficiency Eliminate low fixed charges

[80] We understand by this that generation will receive payment in two parts. One part would equate to a capacity payment based on historical cost as assessed by SB or prepayment for an agreed level of generation. The other part would be variable cost if dispatched, or dispatched above a predetermined amount, based on a cost assessed by SB

Appendix 2 Commissioned plant

Figure 13 Plant commissioned since the wholesale market established in 1996

Plant type	Generator	Plant Name	Commissioned	Capacity (MW)
Thermal	Mighty River Power	Southdown	Dec 1996	175
Other	Meridian Energy	Christchurch City Wastewater	Jan 1996	3.2
Cogeneration	Todd Energy	Bay Milk Edgecumbe	1996	10
Wind	Genesis Energy	Hau Nui	1996	8.45
Cogeneration	Todd Energy	Kiwi Dairy, Hawera (Whareroa)	1996	69.6
Geothermal	Mighty River Power	Rotokawa	Sep 1997	34
Cogeneration	Alinta Energy	Glenbrook	1997	112
Geothermal	Contact Energy	Poihipi Rd	1997	55
Thermal	Contact Energy	TCC - Taranaki Combined Cycle	Jul 1998	385
Geothermal	Top Energy	Ngawha	Jun 1998	25
Cogeneration	Bay of Plenty Energy	Kapuni	1998	25
Cogeneration	Carter Holt Harvey	Kinleith	1998	28
Wind	Trustpower	Tararua Stage 1	Mar 1999	31.7
Hydro	Contact Energy	Opuha	1999	7.5
Cogeneration	Contact Energy	Te Rapa	1999	44
Geothermal	Mighty River Power	Mokai I,II & III	Feb 2000	112
Thermal	Contact Energy	Otahuhu B	Jan 2000	380
Cogeneration	Meridian Energy	Blue Mountain Lumber	2000	1.4

Plant type	Generator	Plant Name	Commissioned	Capacity (MW)
Cogeneration	Mighty River Power	Watercare Mangere	Apr 2003	7
Wind	Meridian Energy	Christchurch Wind Turbine	2003	0.5
Thermal	Genesis Energy	Huntly p40	Jun 2004	48
Thermal	Contact Energy	Whirinaki	Jun 2004	155
Wind	Trustpower	Tararua Stage 2	May 2004	36.3
Wind	Meridian Energy	Te Apiti	Nov 2004	90.75
Other	WEL Networks	Horotiu Landfill	2004	0.9
Cogeneration	Meridian Energy	Auckland District Hospital	Apr 2005	3.6
Cogeneration	Pan Pac Forest Products	Pan Pac	2005	12.8
Wind	Meridian Energy	Southbridge Wind	2005	0.1
Thermal	Genesis Energy	Huntly e3p	2007	400
Wind	Meridian Energy	White Hill	Jun 2007	58
Wind	Trustpower	Tararua Stage 3	2007	93
Hydro	Trustpower	Deep Stream	Dec 2008	5
Geothermal	Geothermal Developments	Kawerau - KA24	Sep 2008	8.3
Geothermal	Mighty River Power	Kawerau Geothermal	2008	100
Hydro	Mighty River Power	Mangapehi	2008	1.6
Other	Mighty River Power	Tirohia Landfill	2008	1
Hydro	The Lines Company	Matawai	Aug 2009	2
Thermal	Todd Energy	Mangahewa	Feb 2009	9
Wind	Meridian Energy	West Wind	Oct 2009	143

Plant type	Generator	Plant Name	Commissioned	Capacity (MW)
Other	Mighty River Power	Hampton Downs Landfill	2009	4
Wind	Pioneer Generation	Horseshoe Bend Wind	2009	2.25
Wind	CBD Energy	Chathams Wind	2010	0.45
Hydro	MainPower	Cleardale	2010	0.9
Hydro	Pioneer Generation	Kowhai	2010	1.9
Geothermal	Mighty River Power	Nga Awa Purua	2010	140
Hydro	Talla Burn Generation	Talla Burn	2010	2.15
Geothermal	Contact Energy	Te Huka	2010	23
Wind	Meridian Energy	Weld Cone Wind	2010	0.75
Wind	Pioneer Generation	Mount Stuart	Nov 2011	7.65
Wind	Meridian Energy	Lulworth Wind	2011	1
Wind	Trustpower	Mahinerangi	2011	36
Thermal	Trustpower	Marsden Diesel	2011	9
Thermal	Contact Energy	Stratford Peaker	2011	200
Wind	New Zealand Wind Farms	Te Rere Hau	2011	48.5
Wind	Meridian Energy	Te Uku	2011	64.4
Geothermal	Norske Skog Tasman	Kawerau - TOPP 1	Dec 2012	25
Hydro	Kawatiri Energy	Rochfort	Jul 2013	4.2
Hydro	Westpower	Amethyst	Jun 2013	6
Geothermal	Mighty River Power	Ngatamariki	Mar 2013	82
Thermal	Todd Energy	McKee	2013	102