Understanding the key priorities for the New Zealand electricity industry

Addendum to main summary report

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sapere

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Glossary

Abbreviation	**Stands for**
DER	Distributed Energy Resources
MDAG	Market Development Advisory Group
GIC	Gas Industry Company
Code	Electricity Industry Participation Code
HVDC	High Voltage Direct Current
TPM	Transmission Pricing Methodology
LMP	Locational marginal pricing
BCG	Boston Consulting Group
HWC	Hot Water Control
EDB	Electricity Distribution Business
VoLL/	Value of Lost Load
CDF	Customer Damage Function
DLMP	Distribution Locational Marginal Pricing
IPAG	Innovation and Participation Advisory Group

Executive summary

This report should be read in conjunction with *Key priorities for the New Zealand electricity industry - information for ministers and ministerial review – 5 February 2025*.

The electricity industry faces a number of challenges which need addressing. Some of these challenges manifest through elevated wholesale market prices. However, as would be expected in a market, price is the symptom, not the cause.

All markets are designed for the context at the time. Therefore, as the context changes, markets may need to evolve. Some changes may be foreseeable, many are not. Issues that were not obvious or significant when the market was designed can manifest later. If markets don't evolve and adapt fast enough then they can become increasingly disrupted, which increases the risk of reactionary changes that are ill-informed.

Economy-wide decarbonisation will require growing and leveraging renewable electricity into transport and industrial heat, ensuring security and affordability

Change has come to the electricity system through newer technologies, such as wind and solar, but also increasingly through demand side technologies that allow broader carbon-intensive energy use (such as transport and industrial heat) to switch to generally renewable, but secure and reliable, electricity. The technologies involved in this opportunity include industrial electric boilers, heat pumps, and electric vehicles.

To a significant extent, decarbonisation of our *energy* system will rely on growing and then leveraging high proportions of renewable electricity into transport and industrial heat, while ensuring that it is secure and affordable. This includes the potentially significant 'self-supply' at a customer's premise (through rooftop solar and batteries), which is increasingly economic.

Broad system design and coordination questions need to be addressed early

At a broader level, the system will need to be able coordinate many thousands, and potentially hundreds of thousands, of energy resources distributed through the electricity system on the roofs and in the garages of residential customers, for example. As well as coordination, the system must provide prices that signal distributors' needs to invest efficiently in network capacity, but also to consumers who must invest efficiently in electric boilers, EVs, solar panels, batteries, smart appliances, and even newer technologies.

While these changes deep in the distribution network are at early stages today, these design questions need to be answered *before* the need arises.

Finally, for households and businesses to participate in this, they need to understand what choices are available to them, what the impact of these choices are, and trust that their best interests are being served.

Key strategic questions for the electricity industry relate to the gas market, security of supply in electricity, and the coordination of distribution networks and DER

However, markets are also subject to externalities, such as the electricity market's dependency on the gas market (and other fuel markets – water, coal, diesel). The best electricity market will still experience challenges if there are problems with these dependencies. This highlights that electricity is a system within a broader energy system. Legislative gaps and inconsistencies within and between parts of the energy system will undermine even good market design.

Government policy can both directly and indirectly affect uncertainty, risk, and price in the electricity system. Policy uncertainty about the role of gas in New Zealand's energy future negatively impacted investment in gas fields and development, which in turn affected electricity. This contributed to the failure of the gas market in 2024 when demand could not be satisfied at any price. Policy uncertainty about the viability and potential commitment to 100 per cent renewable electricity targets and the NZ Battery project negatively affected investment in security of supply assets and contributed to the erosion of security margins.

Therefore, we identify that the gas industry and security of supply in electricity, are key specific concerns for government. Given the potential significance of EDB investment in networks, customer investment in DER, and the absence of any meaningful coordination or efficient pricing in the distribution network, we add the coordination of networks and DER as a further key specific concern for government.

Energy system regulators need strong, independent governance and rigorous performance monitoring frameworks

However, recent history highlights more fundamental concerns. Energy systems are complex and interconnected which leads to risks that either overly simplistic solutions are developed, and/or that unintended consequences manifest. These risks are manageable if the capability to address the key concerns above – gas, security of supply, and the retail/distribution market - is available to the market design process. Our concern is that the mandate for these broad 'energy system' questions is fragmented across at least four regulators. Furthermore, across the breadth of these issues the best capability will not always be in these regulators. Drawing on the perspectives of the broadest set of stakeholders is necessary to consider consequences and innovative solutions.

Moreover, regulators need to develop robust, comprehensive approaches to prioritisation of effort that are deeply rooted in the long term interests of the economy and society. Legislative/regulatory action simply cannot be subject to political cycles, lobby groups and 'hot topics'; regulators need strong, independent governance and rigorous performance monitoring frameworks. These frameworks need to ensure the best interests of those who pay for the system: households, businesses and communities.

The biggest concern, though, for any government is the certainty of any policy choices over the life of assets being invested in by large market participants and residential consumers alike – lives of at least 20 years. Policy choices made today will not materially de-risk investments that have 20-year asset lives if they are subject to short term political cycles.

We note that these issues are also being experienced globally. Notwithstanding that, there is no reason that New Zealand couldn't be a world-leader, as it has before. To achieve this leadership, the significant prize of economic growth and decarbonisation by electrification must be grounded securely in stable policy frameworks, market design expertise and regulatory capability that will see New Zealand embark on its next 25 years of innovation in energy.

Key decisions that need to be made

Due to the breadth and complexity of the energy system there are some key policy decisions that are required to drive meaningful change**:**

1. How can durability be provided for these key strategic decisions over the long-term, despite political cycles?
2. If some political pressure can always be expected, how does this affect the design choices?
3. Who leads the market design for these key areas, and how are they to be held accountable**,** given:
    a. The risks associated with multiple regulators – risks of unintended consequences concentrated in areas of gaps;
    b. Some of the expertise needed for each area will be outside regulators;
    c. The need for wide engagement with stakeholders to illuminate unintended consequences and discover innovation.
4. Determine scopes for key strategic questions
    a. Gas market – can it function stably? Can it support flexible arrangements? If it can't function stably what happens to existing connections and wider infrastructure?
    b. Security of supply – how to provide assurance that consumer expectations are met and the industry and consumers have certainty that the system is secure?
    c. How to coordinate DER on distribution networks – wholesale and retail market design, who coordinates, and how does the customer participate?

1. Notes to slides

1.1 New Zealand's energy system – a basic overview of electricity system 'architecture'

Electricity and energy underpin almost all aspects of economic and societal activity.

Electricity systems have critical 'jobs' to do for the economy and society. These systems are also necessarily complex. Our conception of the electricity industry spans four broad components:

1. Supply of, and demand for, electricity (including fuels), which requires both 'baseload' power for energy, but also firm, reliable services for security of supply (reliability and resilience).
2. The provision of networks to transport power from where it is generated, to where it is needed.
3. The electricity, gas, coal and diesel markets where electricity is traded, and prices are discovered. This includes both wholesale and retail markets.
4. The mechanisms used to price networks.

The market was launched in 1996, and has undergone incremental change since. The design of the market strikes a careful balance between operational coordination (meeting demand and providing resilience) and enabling competition amongst investors to find the lowest cost and lowest risk future for the overall system, and therefore the customer.

1.1.1 Commentary

The unique characteristics of electricity, which set it apart from other networks (e.g. roading), require the very precise matching of supply and demand every instant. Equally, most of the assets in an electricity system are large, capital-intensive, and long-lived.

Given the capital-heavy nature of electricity systems, and the historical context of government-owned electricity assets, the key reason for moving to a market was to focus on building the right plant, in the right place, at the right time. The philosophy was that a transparent, 'real time' system price of electricity would allow investors to form expectations of future revenue streams, on which they would base decisions about building generation plant. These signals would also provide incentives for electricity consumption, although demand response was nascent at the time[1].

Electricity markets must be deliberately designed to cater for the hard engineering associated with operating the system (to keep the lights on), while providing the best incentives (through prices) for innovation and investment.

[1] We note that the world's most renowned market designers in the 1990s (Paul Joskow, William Hogan, Sally Hunt, James Bushnell, Dieter Helm) maintained that a responsive demand side was the ultimate solution to the most challenging problems associated with electricity markets (market power, valuing reliability, security of supply). However, only in the last few years has the communications and automation technology emerged that enables a responsive demand side without requiring significant active engagement from the consumer.

More specifically, electricity markets must ensure price incentives deliver four broad 'services:'

1. Having sufficient **resources** in the system to securely meet customer demand over time (consumption).
2. Having sufficient **capacity** in the system to securely meet customer demand at its highest point (peak demand).
3. Having sufficient available '**standby' resources** in the system to achieve (1) and (2) when supply resources become unexpectedly restricted. This has been an especially important service for New Zealand, given its >50 percent reliance on hydro with relatively low storage (by international standards).
4. Having sufficient available '**standby' resources** in the system to achieve (1) and (2) when a significant generation or transmission asset suddenly fails.

New Zealand's market, established in 1996, led the world. Its design maximised the extent to which prices could both be freely discovered through offers from suppliers and bids from customers, but also reflect the underlying value of electricity, and the resilience of electricity supply, at every point in time and every location on the grid. This was expected to deliver services (1) – (4) above.

Under this design, investors are correctly incentivised to procure fuel, and build new generation assets, at the time and the place which maximises their revenue (subject to grid capacity). The quid pro quo is that their revenue is at risk to the variation of wholesale (and potentially retail) prices through time. Contract (or hedge) markets are therefore critical for investors, sellers and purchasers of electricity to manage this risk and provide more secure arrangements to underpin short and long-term decisions. Contract markets were not a feature of the market design in 1996, but have been developed by the industry and regulator over the past 25 years.

The design of New Zealand's market strikes a careful balance between operational coordination (meeting demand and providing security and resilience) and enabling competition amongst investors to find the best trade-off between cost and risk for the future of the overall system, and therefore the customer.

The four services above are core components of any modern electricity industry. However, the nature of the generation and demand mix and dynamics at any point in time can result in the different services requiring different investment needs. For the first 20 years of the market, attention to security of supply (services (2) – (4)) focused on transmission capacity[2] and dry years.[3] The country had a surplus of peak capacity supporting service (2). This is no longer the case, as outlined in section 2 below.

While the core 'spot' market design is the same today as in 1996, significant parts of the wider design evolved through time—for example, the development of contract markets, the provision of information and risk assessments about hydro and other fuels, Code related to managing acutely low

[2] Transmission capacity into the country's largest urban centre (Auckland) and between the islands (the HVDC) was a significant focus for the period 2006-2013.

[3] The country faced extended periods of very low inflows, which got significant public and political attention, in 2001, 2003, and 2008. While there have been significant low inflow periods since 2008 (some record-breaking), new rules introduced by the new Electricity Authority in 2010 have resulted in more conservative reservoir management by major hydro operators. We note this change in reservoir manageemtn has (naturally) had a commensurate impact on wholesale prices.

hydro inflow events, transmission investment and pricing, and industry coordination of planned outages.

Critically, the governance of the industry has also changed through time. The core of the market design (which remains in place today) was designed under self-regulation. In 2003, a Crown entity (the Electricity Commission) became the regulator and had to give effect to government policy. In 2010, the Electricity Commission was replaced by the Electricity Authority, an independent Crown entity which is only required to have regard to the government's views. The majority of the significant changes and evolutions to the core electricity market were overseen by these two Crown entities. Meanwhile, the Commerce Commission oversaw the economic regulation of networks and the co-governance group, the Gas Industry Company (GIC) oversaw gas market rules.

1.2 Pressures on our energy system – the system is experiencing profound changes, most of them externally driven

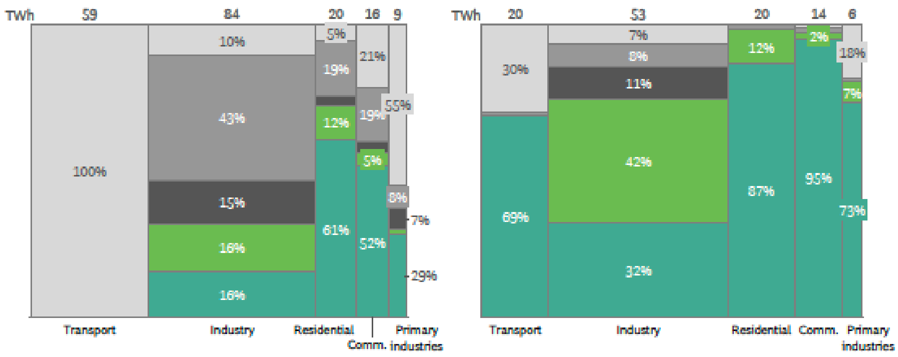
Our electricity system is not the same system it was in 1996. Variable renewables are now prevalent in the system, and the technology driving demand has changed materially. Together, these two changes mean that the best pathway for decarbonising the *energy* system is to electrify transport and process heat (giving rise to 20Mt of emissions today),[4] and meet the resulting demand by growing a highly renewable electricity system (responsible for around 4Mt of emissions today).[5]

Figure 1: Percentage of renewable electricity projected to account for energy demand in 2050

[4] BCG, The Future is Electric, page 9. BCG estimated that the total electrification potential (ground transport, low to medium temperature industrial heat, and space and water heating in buildings) in 2019 was 20.3Mt, or ~25 per cent of the total gross emissions in that year.

[5] MBIE, Energy sector greenhouse gas emissions.

Exhibit 4: Renewable electricity to account for 58% of energy demand in 2050



	2020	2050
Total energy demand	188 TWh	113 TWh
Renewable electricity	19%	58%
Biomass and other	9%	23%
Coal²	8%	5%
Gas²	23%	4%
Oil	41%	10%

1. Demand in TWh is energy consumed, not primary energy. 2. Coal and gas numbers include electricity generation, converted from primary energy to the actual TWh electricity consumed

Source: Climate Change Commission, BCG analysis

1.2.1 Commentary

While the four services above still remain, a new set of resources are now commercially attractive. The new resources are variable renewables (wind and solar), grid-scale batteries, and the technology that underpins significant flexibility in consumer demand (demand response). The significant economic advantage of grid-scale resources has been eroded by global reductions in the cost of distributed rooftop solar and batteries. Households and businesses are now part of the system's portfolio of 'supply resources'—a scenario that would have seemed far-fetched at the time of market design.

Our gas industry has provided fuels to both the broader energy users (for heat in industrial, commercial and residential settings) as well as electricity generation for decades. However, gas production and discovery has declined materially, and the gas market is a serious risk for the country's energy system—particular due to the sheer uncertainty and lack of information about remaining reserves and the end-of-life status of existing fields.[6]

Consumption technology has also changed, enabling the electrification of two significant forms of energy consumption—transport and process heat. Their underlying energy requirements have, in the past, been almost exclusively provided by fuels other than electricity, including natural gas for process heat in the North Island, thus offering a solution to gas supply issues.

The transition to electrified transport and process heat will impact electricity demand. Electric vehicles, while incredibly energy efficient, may require high levels of instantaneous demand from the system (relative to other consumer appliances). Businesses are moving away from coal and gas to electricity for process heat, either through industrial heat pumps or electrode boilers.

[6] We understand that gas fields become more unpredictable as they approach end of life, exacerbating the uncertainty.

Critically, both electric vehicle charging and electrified heat plant can be enabled to be 'smart,' and thus interact with the electricity system and market in much the same way as a generator.

1.3 These pressures are creating tension, illustrating decarbonisation-security-affordability issues through the lens of the trilemma

The World Energy Council energy trilemma highlights that the stability of energy systems worldwide can be characterised as requiring trade-offs between three 'limbs'—sustainability, affordability, and security.

The energy trilemma highlights that the tensions between sustainability (especially decarbonisation), cost, and security and reliability must be carefully balanced. Allowing any of the limbs of the trilemma to fall out of balance can then affect the other limbs.

The New Zealand electricity system is out of balance.

1.3.1 Commentary

Sustainability and decarbonisation in the electricity system is doing well, but security, reliability, and resilience are not. The risks associated with security, reliability and resilience manifest in electricity prices, in turn risking affordability. Uncertainty and risk both deter investors, affecting competition and the risk premia assessed by operators lifting prices. Critically, it also creates a risk that the significant decarbonisation opportunity that electrification offers will become unaffordable.

The erosion of security margins—particularly for the capacity required to meet the short periods of very high demand, and potentially the longer-term fuel required to support hydro during periods of low inflows—is creating market risks.

- In the **short-to-medium term**, these risks primarily relate to lack of confidence that fuels (principally gas) which provide secure capacity during peak demand periods, and support hydro when inflows are low, will either be unavailable or only available at very high prices. Hydro reservoir operators communicate this short-to-medium term risk to the market via their 'water values.'
- In the **long term**, these risks manifest as highly risk averse investment behaviour in security of supply. Uncertainty about gas availability, as well as the threat of significant government involvement in providing security of supply (the NZ Battery project), significantly increases the risk of committing capital to plant that provides a security of supply service.

Not encapsulated in the trilemma, as it affects all three, is certainty of policy direction over investment timeframes. In markets, uncertainty manifests as investment risk, and risk is commuted into a market price premium.

For the avoidance of doubt, there is no evidence of a fundamental problem with *how* prices are formed in the wholesale electricity market. The adverse price outcomes in the electricity market today are a function of:

1. increased risk through reduced security of supply
2. gas market uncertainty
3. policy uncertainty.

The New Zealand electricity system does not have a problem with the sustainability (decarbonisation) limb of the trilemma. Renewable energy for electricity generation in New Zealand is plentiful and economic without subsidy. Our open access market encourages a deep pipeline of potential projects. However, the imbalance of security/reliability and cost/price does potentially compromise the decarbonisation limb of the New Zealand economy: poor security and high cost in the electricity system will disincentivise broader decarbonisation. But, of course, it will also reduce public welfare, commerce, and industry, especially energy intensive industry.

1.4 These changes are seeing issues manifest across the system

The changes in the external environment, and their impact on investment and operation of the industry, are seeing a number of interconnected issues manifest across the system. These issues often highlight aspects of our market and governance design that need to be updated. Given the number of issues, prioritising which need to be updated first will be critical.

1.4.1 Commentary

Many of these issues are degrees removed from the explicit driving forces above, but they are nonetheless often interconnected (even when the cause-and-effect chain is hard to discern). Systems involving investors, operators, regulators and policymakers take time to adapt to a different reality. The analysis of whether market participants will naturally adapt, or whether policy and regulatory settings need to change, is a significant challenge for policymakers and regulators. At the very least, it requires foresight to anticipate potential changes, rather than waiting for the changes to manifest and then be forced into reactionary and rushed decision making.

The balance between anticipatory and reactive regulation needs to be carefully considered, and draw on the very best available expertise. The interconnection between issues—across consumers, fuel markets, technology, growth, regulation and governance, capital, price formation, to name a few—is a critical consideration in the sequencing of any changes to existing settings, and needs a wide range of stakeholder views to be present in the design process. This is especially true for issues that span the mandates of multiple regulators.

Finally, in a time of significant change, numerous 'solutions' to market design problems will be advocated by market participants and lobby groups. Fully assessing all these potential solutions would almost certainly exceed the resourcing available to any regulator. Prioritisation is absolutely essential for any regulator, and needs to be grounded in a comprehensive understanding of, and the evidence for, the problem being solved. Fundamental departures from the original design philosophy require close scrutiny.

2. Key priority areas for the review

2.1 Key area 1: Flexibility and security of supply

Firm and flexible resources—hydro, gas, coal, diesel and demand response—have underpinned security of supply in New Zealand since the market began in 1996.

The nature of security of supply—focused on weather-driven peak demand periods and/or low inflow years—results in significant revenue risk to an investor. Managing this risk requires well-functioning contract markets, both for the output of the resource, but also for any fuel that it is reliant on.

Robust, implementable and affordable solutions to replace gas and coal in providing security of supply services (including hydro firming in low inflow periods) have not been credibly identified.

2.1.1 Commentary

The contribution of variable renewable electricity (wind, solar) to decarbonisation goals will be maximised when they can be leveraged into process heat and transport via electrification. However, process heat and transport require a secure supply of electricity as much as the existing uses of electricity. Variable renewables cannot be relied on to meet demand securely at every point in time, and at every location (security of supply). To provide security of supply, 'firm' resources are required—resources that can be relied on to be available at particular points in time when the business-as-usual resources (typically variable renewables in NZ) are insufficient to meet demand. In particular, we need resources that can be available at the highest periods of demand, and possibly not required at any other time. Similarly, to deal with New Zealand's relatively low levels of hydro storage capacity, we need resources that may only be called on once every five to seven years, potentially for a number of months, when inflows are lower than normal.

These resources are referred to as 'flexible' resources, or flexibility. Flexible resources have the potential to manage both resource security and capacity, and also network security and capacity, by responding to the need for network power flows to remain within the secure capacity of the network.

Flexible resources can be provided by the supply side (e.g. gas, diesel, coal and hydro—subject to storage) or the demand side (e.g. industrial demand response, smart EV charging). Flexible resources on the supply side are highly reliant on firm and flexible upstream fuel arrangements, and on the demand side, are reliant on arrangements with customers to vary their demand at the right time and place. While demand side flexibility from an individual customer is typically 'energy limited,'[7] it is potentially ubiquitously available across all customers. Creating a firm, flexible demand side response aligned with system needs therefore requires market participants to aggregate these resources and deploy them optimally based on clear wholesale and network price signals (value stacking). The

[7] By 'energy limited,' we mean the response from any individual customer is often only available for a small number of hours, as it depends on the level of storage in a vehicle or stationary battery, or the thermal storage in a hot water cylinder.

market systems, technology and practices required to enable this are developing quickly, but more progress needs to be made.[8]

Global experience suggests there are multiple challenges encountered in electricity markets as they respond to increasing variable renewables, a primary one being that the economics of investing in firm and flexible resources—especially those that have relatively low (but vital) utilisation—tend to decline, and investment risk increases. Wholesale and hedge markets are critical to managing this investment risk: the spot market must signal the value of flexible resources correctly, and investors must be able to reduce cashflow volatility with hedge products. These hedge products themselves underpin investment and must also be priced correctly. Uncertainty about future market outcomes will manifest in wholesale prices (in New Zealand, mainly via hydro water values)[9] and hedge market prices,[10] as a 'price for risk.'

At the same time, consumer appetites for security of supply will inevitably increase as more of the economy (transport and process heat) is connected to the electricity supply chain. To underpin economic growth, a more concerted effort is needed to understand this changing appetite and what it means for the way the system manages security of supply. Inevitably, it will need more flexible resources to be brought into the market.

In New Zealand, investment in firm flexible resources that provide security of supply—both peak demand security, and dry year security—has been minimal, and has fallen behind growth in peak demand[11]. The gas situation has seen a contraction in the flexible fuel available to manage dry years. As a result, security and reliability have been eroding over some time.[12] While there are regulatory standards for security and reliability, they have not been regularly updated and there is no method to ensure standards are met.

For market regulation, this relies on competition and unfettered price signals to deal with market power and drive efficient investment, and a material and concerted regulatory focus on security of supply and the availability of flexible resources because there is no security standard that the market is required to meet.

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[8] Hot water control has been a feature of the New Zealand system since the 1960s, and today is estimated to be capable of providing a 600-700MW peak-period reduction in demand. However, until very recently, the control mechanisms have sat purely with distribution networks, and the resource has only been deployed for network needs. Significant progress is underway to increase retailers' and other flexibility aggregators' deployment of hot water control at times when the wholesale market sees value in its deployment.

[9] Understanding how water values are formed, and the market information they signal, is essential to understanding the nature of wholesale dynamics in New Zealand. The best paper we are aware of for this is E Grant Read's "An Economic Perspective on the New Zealand Electricity Market"; appended to Meridian's EPR submission; or available from Sapere on request.

[10] Traded for the next three to four years on a futures exchange, or over-the-counter.

[11] https://srgexpert.com/wp-content/uploads/2024/12/Confluence-of-factors-threatening-electricity-reliability-3-September-2024.pdf, Figure 3

[12] See Stevenson, Batstone, Murray (2024) "Responding to matters set out in Reviewing risk management options for electricity retailers – issues paper", Appendix A, in Contact Energy's submission to Electricity Authority Risk Management Review

2.1.2 Evidence

Sapere[13]

"New Zealand households and businesses were asked to reduce electricity use on a chilly morning in May 2024, as Transpower warned of a potential shortfall of electricity supply. The events of 10 May were not an isolated event. Peak supply capacity relative to peak demand had been tightening for nearly a decade, surfacing as a major concern during the load shedding events of 9 August 2021 as well as becoming increasingly urgent last year, and will be a concern for years to come.

This paper considers how the Electricity Authority (the Authority) came to misjudge the market.

We discuss five interweaved factors:

1. The Authority appeared to **lose focus on reliability** (security standards have not been updated for 12 years) as it prioritised a transition to a low-emissions sector and affordability.
2. **How the Authority weighs 'reliable supply' in its statutory objective is now unclear**, though the importance of reliability to consumers continues to increase. The Authority's statutory interpretation document, written in 2011, is stamped advising it has not been updated for legislative change or guidance provided by court decisions.
3. **Threats to electricity security from outside the electricity sector**, notably the troubled gas supply sector, seem to fall within a regulatory governance gap as the Authority remained largely on the sideline while gas supply for peak electricity generation dwindled.
4. The Authority has **muted its independent voice**. If an 'independent' regulator is not steadfast in pursuing its long-term objectives even when in conflict with short-term political aspirations, capital investment will be undermined.
5. **Prices** in the wholesale market have been **constrained by the Electricity Industry Participation Code (the Code) and its application below efficient levels when supply is scarce** relative to demand, damaging incentives to invest for reliable supply.

A legacy of significant hydro generation capacity and past investment in thermal generation plant allowed the electricity sector, including its regulator, to defer a stark choice between market design features to deliver reliable electricity (noting this choice is explicitly faced in other jurisdictions). This choice recognises that the electricity sector will

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[13] https://srgexpert.com/wp-content/uploads/2024/12/Confluence-of-factors-threatening-electricity-reliability-3-September-2024.pdf

always be the subject of intense political interest as its services are vital to households and businesses.

With the ever-pending threat of government intervention, an independent regulator focused on the long-term benefit to consumers faces a choice between two market design paths. It can govern and defend a market that:

Explicitly allows prices to clear the market at all times

This design involves:

- accepting spot prices will at times be higher than politically palatable
- fostering competitive entry to discipline price discovery rather than regulatory rules
- promoting contracts between consumers (and their retailer agents) for capacity/firm energy to protect consumers and investors against price volatility, and to pay for peak capacity.

OR

Explicitly constrains peak prices

This design involves:

- unambiguous constraints on peak prices
- consumers accepting a levy to pay for peak capacity which is not commercially viable due to the explicit price constraints
- defining credible criteria for the regulator to identify and compensate capacity made unviable by the price constraints, but needed to meet peak demand.

Mixing these two paradigms, by constraining prices (including non-explicit interventions) from clearing the market without a substitute mechanism to fund the missing capacity, is a recipe for electricity shortfalls and panicked and costly government intervention. We are currently on this path." (Executive summary)

Transpower[14]

"The reference case (which represents the resources available to the market) falls below the lower security standard by 2030 when considering only those new supply projects that are existing and committed." (Section 3.1.1)

[14] https://static.transpower.co.nz/public/bulk-upload/documents/2024%20SOSA%20-%20Final%20Report%20-%20Final%20Version.pdf

"The reference case falls below the lower security standard by 2027 when considering only existing and committed generation." (Section 3.2.1)

"The analysis assesses the energy and capacity margins against the three security standards using the supply pipeline based on information provided by market participants, and does not analyse or consider other aspects of future investment such as the availability of transmission and distribution network capacity; the deliverability of planned new-build generation; or the commercial viability or market incentives required for resources to be developed." (Section 1.0 Executive Summary)

MDAG[15]

MDAG also identified key concerns with security and reliability.

"7.18 Better short-term forecasting and related information is vital so market participants can better gauge what resources to make available and when (Option A1). Another key area is ensuring the value of reliability to consumers is properly reflected in spot price signals, so resource providers are rewarded appropriately for making supply available or reducing demand (Option A3). We also prefer the idea of a new ancillary service to reflect the changing risk profile on the system. Such a new service should harness the full range of potential resource providers including batteries and demand side flexibility, be co-optimised with the wider spot market and conform to causer-pays principles (Option A4). We propose that these three measures should be actioned without delay.

7.19 Looking further out, we think a formalised ahead market might be needed to help participants with their short-term planning, particularly for use of batteries and demand response (Option A6).89 A formalised ahead market could have major benefits but would be a significant change and takes some years to implement. In the meantime, voluntary use of short-term products (such as day ahead contracts) should be encouraged and supported (see measures to strengthen contract market in Chapter 8)."

2.2 Key area 2: Networks, distributed generation, and demand flexibility

Transmission and distribution businesses are expected to spend $85 billion over the next 25 years on maintaining and expanding their networks. This is nearly four times the anticipated investment in generation over the same period.

The scale of expected network investment in lines and consumer investment in solar, EVs, and smart technology—driven by the electrification of the economy and new technology that decentralises energy supply—highlights the urgent need for effective economic signalling and coordination. This signalling and coordination is essential to ensure efficient capital allocation, optimise network use, and

[15] https://www.ea.govt.nz/documents/1006/MDAG_-_Price_discovery_in_a_renewables-based_electricity_system_-_options_paper.pdf

avoid unnecessary infrastructure spend. This investment could be significantly reduced—by up to $14 billion per decade[16]—through enabling a smart, flexible system, especially in the distribution network.[17] This must be a priority for policy and regulation.

2.2.1 Commentary

Networks ensure that the balance of supply and demand can be achieved at every point in the country—all 2.2 million locations that consume or produce electricity. They consist of 12,000km of transmission networks, and 60,000km of distribution networks.

Significant capital is forecast to be spent on networks over the next 25 years—BCG estimate ~$25 billion for transmission and $60 billion for distribution.[18] This investment is somewhat driven by the needs outlined above—electrification of transport and process heat, and the construction of variable renewables to supply that electricity.

The majority of EVs and electrified process heat will be connected to the distribution network, rather than the transmission network. Some utility-scale solar and wind investment is occurring on distribution networks, and consumers are also investing significant capital in distributed (rooftop) solar PV[19] and batteries, which results in the potential for two-way flows on networks that were designed for one-way flows. However, as outlined above, these new forms of electricity consumption and storage come equipped with significant 'smarts,' allowing them to provide flexibility services to the electricity system—including being able to defer network investment by reducing network peaks, improving long-term affordability. The potential spend on smart technology by consumers is also significant and needs efficient signals. While no formal analysis of likely consumer investment in electrifying their homes and businesses has been conducted, one assessment put this at $150 billion over the next 20 years[20], surpassing the infrastructure investment required by the supply side as outlined above. Further, Reeve, Stevenson, and Comendant (2021) put the potential economic surplus from these investments at a PV of $4.8 billion.[21][22] 84 per cent of this surplus came from avoiding network investment.

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[16] BCG's five pathways to 2050 suggest the lowest cost pathway is a "smart system evolution" which would save $14.1 billion compared to the BAU/base case. See BCG, The Future is Electric, Exhibit 52, page 83.

[17] For a distillation of the primary reasons why, see FlexForum (2025, forthcoming),"Filling the holes in the flexibility value stack."

[18] BCG reported annual investment of $1 billion in transmission and $2.4 billion in distribution networks between now and 2050 to reach net zero. See BCG, The Future is Electric, page 61.

[19] Around 400MW of residential and commercial rooftop solar has been commissioned since 2013 (source: emi.ea.govt.nz). At an assumed average capital cost over the period of $2,500/kW, this is around $1B of investment by households and businesses, 25% of the total investment in generation over the same period.

[20] Batstone, S (2024), Flexibility panel discussion at Downstream 2024. The majority of the figure related to 3.2M light vehicles being replaced with EV equivalents at an assumed (real) cost of $35,000 per vehicle.

[21] Cost-benefit analysis of distributed energy resources in New Zealand – Reeve, Stevenson, and Comendant (July 2021).

[22] Reeve, Stevenson, and Comendant (2021) only derived the net marginal benefits and costs of contribution to the electricity system from DER, and so the total investment cost for consumers cannot be determined from that work.

The current wholesale market design has focused primarily on creating efficient signals for investment and operation of resources connected to the transmission grid, including the marginal costs of capacity limitations on the grid (through locational marginal pricing).[23]

While the Transmission Pricing Methodology (TPM) must ensure Transpower recovers its costs of owning and operating the grid, these costs must mostly be recovered in a way that doesn't affect the market marginal energy price except to signal the marginal cost of transmission.[24] This marginal cost of transmission is an important long run signal as it indicates the cost to consumers of local security of supply if they keep increasing peak demand. However, the current marginal cost of transmission is non-observable, requiring consumers and generators to predict transmission investment and how that investment cost will be allocated. In many ways, the problems of contracting for transmission and distribution investment are very similar to the problems of contracting for security of supply. We do not expand on this here, but encourage the reviewer to explore this area thoroughly.

Wholesale market design (including locational marginal pricing (LMP)) does not extend into the distribution network. Other than static (average) loss factors being applied to wholesale purchases and sales, the economic signalling of network needs is achieved purely through distribution pricing, with prices almost exclusively set once per year.

Network costs are almost exclusively capital costs, hence the signalling role of pricing is almost exclusively about future investment (rather than a balance between operating costs and future investment, as is the case for wholesale supply and demand).

Given the critical interface between pricing and investment, especially in the context of $60 billion of distribution investment expected to occur, we believe the separation of regulation of network pricing (the Electricity Authority) to the regulation of network investment (the Commerce Commission) is a significant risk to the economy. A simplified summary of the respective regulatory approaches is:

- Network pricing (Electricity Authority): The underlying philosophy adopted by the Electricity Authority is that 'cost-reflective' network pricing can provide the twin objectives of cost recovery and forward investment signalling. Distribution pricing has been on a slow journey to cost reflectivity (e.g. varying with time of day, which is now common across many distributors), with the regulator so far only asking for voluntary action. In the absence of strong regulation, each of the 29 EDBs in New Zealand have been able to progress their approaches to cost reflective pricing at their own pace, and in their own ways, notwithstanding the regulator periodically publishing 'scorecards' that rank EDB progress towards the 'cost-reflective' target at a very high level.
- Network investment – revenue and quality (Commerce Commission): For network regulation, the current approach—largely codified in Part 4 of the Commerce Act, and the associated input methodologies—assumes that investment drivers and outputs (capacity, resilience and quality) can be generalised across a large proportion of the 29 EDBs. While more tailored

[23] In 1996, New Zealand became the first country in the world to fully deploy wholesale locational marginal pricing across a transmission grid. A number of jurisdictions have followed suit since.
[24] Marginal transmission losses plus the marginal economic cost of redeploying grid resources to manage any constraint in the transmission grid.

options are available, these are so onerous that few take them up. Further, there is no mechanism in the default price path approach for investment approval to be linked to the EDBs use of cost-reflective pricing.

Given the potential scale of resources connected to the distribution network, the voluntary nature of compliance with cost-reflectivity (which may efficiently signal the network value of flexibility resources), combined with the absence of considering pricing in the revenue-setting, risks inefficient allocation of capital. While the desired outcome may not be to perfectly replicate the wholesale-grid model of locational marginal pricing in the distribution network, some form of dynamic locational pricing on the distribution network seems essentially if the long-term benefits to consumers are to be maximised[25]. This, in turn, requires some form of resource coordination based on economic signalling and economic reward.

[25] See eg FlexForum (2025, forthcoming), "*How to find and fill holes in the value stack*" and https://flexforum.nz/cash-is-king/ ; Market Development Advisory Group (2023), "*Pricing in a high renewables market: recommendations paper*", Recommendation 5: Price-driven secure distribution dispatch; Batstone and Reeve (2018), "*The rise of the machines: What could it look like?*", Presentation to IPAG; Batstone, Reeve and Stevenson (2017) "*An exploration of locational marginal pricing at the distribution level in the New Zealand context*".

2.2.2 Evidence

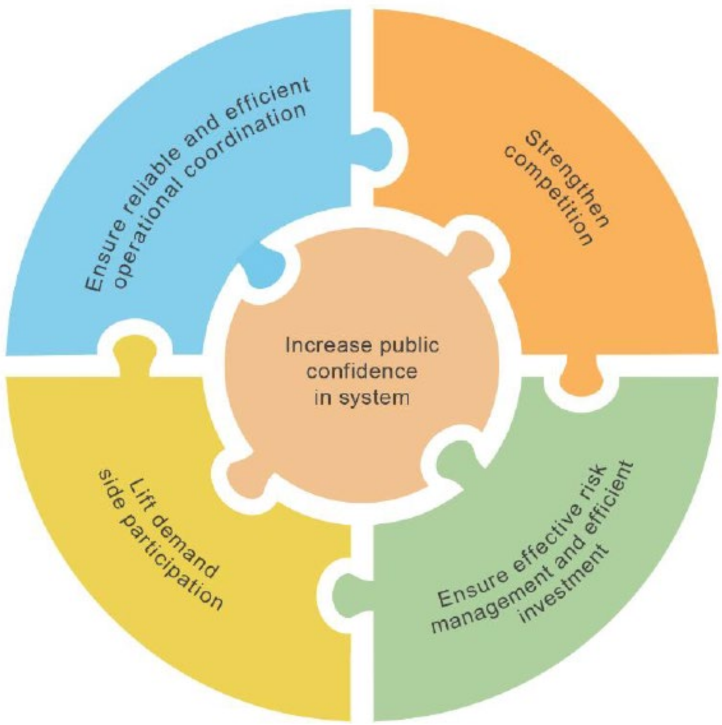
MDAG[26]

"7.7 Returning to operational decision-making, we have not identified any alternative to a spot market to efficiently coordinate decisions across many thousands of participants/devices such as:

a) When to charge and discharge batteries (including those in electric vehicles);
b) When to use/save other types of stored energy such as water in hydro reservoirs; and
c) When consumers should best utilise any flexibility they have over their usage."

Lifting demand side participation was also one of MDAG's five key areas for future action."

Figure 1: Five key areas for future action



Source: MDAG – Price discovery in a renewables-based electricity system options paper

[26] https://www.ea.govt.nz/documents/1006/MDAG_-_Price_discovery_in_a_renewables-based_electricity_system_-_options_paper.pdf

IPAG[27]

"We need a flexibility services market, with technical participation rules.

Which comes first?

- Most consumers will spend money on DER technology when the benefits are certain and they have choice and control.
- Technology uptake will be inhibited until there is a level-playing field for DER.
- Distributors will need to impose limits or minimum standards for DER technology that is coordinated to ensure the reliability of the power system.
- Regulators will not be able to ease hard rules on the electricity industry, which may include flexibility traders, unless consumer benefits are certain and the system is reliable. (Slide 23)

BCG[28]

BCG identified the potential inefficiencies of not coordinating network and flexible resources.

"A smarter, more flexible electricity system will save ~$10 billion on an NPV basis to 2050. Our roadmap highlights the need for 2 GW of demand flexibility in 2030 and 5.8 GW of demand flexibility in 2050. As electrification and the level of intermittency increases on the system, networks and power flows will become increasingly complex and multi-directional, and demand side and storage flexibility will become much more valuable. To deliver this, the electricity system will need to become much smarter.

The electricity system of the future will be able optimise millions of energy resources and appliances in real-time by leveraging smart system enablers like full network visibility (down to the household), automation, AI, Internet of Things, smart communications, and platforms. However, as we transition to this state, which could take at least two decades, it is important to consider how markets, regulations, policies and standards will need to evolve." (Recommendation theme 4)

2.3 Key area 3: Consumer engagement

As consumers gain more options to engage with the market through self-supply and flexibility services, clear and coordinated price signals are essential to drive efficient investment while balancing complexity, consumer preferences, and value sharing. However, getting efficient consumer participation (investment and consumption choices), and ensuring electricity affordability, requires consumer trust, including trust in their agents and industry interfaces.

[27] https://www.ea.govt.nz/documents/525/IPAG_advice_on_creating_equal_access_to_electricity_networks.pdf
[28] https://web-assets.bcg.com/b3/79/19665b7f40c8ba52d5b372cf7e6c/the-future-is-electric-full-report-october-2022.pdf

2.3.1 Commentary

Electricity affordability for consumers is politically 'hot' but does not lend itself easily to quantification. In essence, the market design set itself the goal of delivering a secure and reliable supply at lowest cost. This also corresponds well to the market regulator's statutory objective. However, given the capital-intensive nature of traditional electricity supply investment, achieving this goal has accepted that investment will be delivered by large entities that can achieve economies of scale, whilst relying significantly on competition in wholesale and retail markets to discipline prices. More recently, wholesale market conduct monitoring has become an increasing feature of the regulator's activity, with new Code that provides the regulator with the ability to test whether prices are in line with productive and dynamic efficiency (and act/discipline market participants if not). Thus, consumer 'trust' in the electricity market will partly be based on perceptions of the effectiveness of competition and the regulation and governance of participant behaviour.

For much of the market's 25-year history, consumer choice has been limited to being able to change their own consumption (through short or long-term action e.g. efficiency) or choose a different retailer. Today though, consumers are increasingly investing in technology that can provide some degree of 'self-supply' (solar and batteries) and/or respond to wholesale and network prices from the electricity market (using smart EV charging, appliances such as hot water control, solar, or batteries to provide flexibility services). Done well, this will increase consumer agency, where consumers can choose among different ways to reduce the cost of their desired consumption, or potentially even benefit from revenue streams that derive from wholesale and network 'markets'[29]. These options for engagement need to be made easy and routine, but this, in turn, should reduce consumer mistrust of the market and industry.

This does not mean that all consumers must choose to engage with the market in this way for trust to be increased. It merely requires that there is agency – i.e., that choices are readily available. The desire to actually engage is primarily a function of every consumer's individual preference.

For this to happen at any reasonable scale, these responsive resources must be coordinated. Unless there are reliable economic indicators (essentially prices) produced from this coordination, investment will be inefficient, and consumers adversely affected. While correct economic signals are necessary, undue complexity in pricing or operating conditions can also be barriers to efficient investment. Hence there is a balance to be struck, and the trade-offs inherent need to consider consumer preferences, the potential role of technology, and transparency regarding the value that is being created and shared between the customer and the market (or market agent).

[29] See FlexForum (2025, forthcoming), "*How to find and fill holes in the value stack*", and https://flexforum.nz/cash-is-king/

2.3.2 Evidence

MDAG[30]

MDAG identified the importance of trust in the electricity market as a key component of allowing unfettered price discovery. This requires political trust which itself requires public trust.

> "5.49 Public information is also essential. It must be neutral, clear, timely and relevant for consumers, lifting public understanding of what to expect from our electricity system (in both quality and price) and opportunities for consumers to get better value."

MDAG considered increasing public confidence in the system as a key area for future action (Figure 5).

Transpower[31]

In *Whakamana te Mauri Hiko,* Transpower identifies the importance of coordinating networks and flexible resources. However, the importance of the customer is also identified.

> "Simple and profitable consumer participation: it should be easy for consumers or prosumers (consumers who also produce energy) who own DER to engage in the market and find the highest value uses for their DER, potentially across different market platforms." (Section 5 - Options for New Zealand DER markets)

2.4 Key area 4: Strategic assumptions and design

Excessive uncertainty in the electricity and gas markets, often driven by inconsistent government policies and a lack of coordinated market design, creates unmanageable investment risks that flow through to higher prices and supply insecurity. To address this, strategic decisions must be informed by broad industry expertise, independent from vested interests and political cycles. However, setting stable platforms for strategic decision making requires enduring, good, government policy.

2.4.1 Commentary

While uncertainty is inherent in any modern market, undue uncertainty that causes significant investment risk can have acute impacts, especially where this risk is largely unhedgeable or uninsurable. Uncertainty has been caused by strong government support of single solutions, assumptions about outcomes, and lack of market design/evolution in some areas. Uncertainty has had many undesirable impacts on the gas and electricity industries, and this in turn has created uncertainty about the availability of the fuels we rely on to provide security of supply.

Ultimately, these unmanageable risks to investors flow through to prices, as investors and operators express their concerns about the future through risk premia.

[30] https://www.ea.govt.nz/documents/1006/MDAG_-_Price_discovery_in_a_renewables-based_electricity_system_-_options_paper.pdf

[31] https://static.transpower.co.nz/public/publications/resources/TP%20Whakamana%20i%20Te%20Mauri%20Hiko.pdf?VersionId=FljQmfxCk6MZ9mIvpNws63xFEBXwhX7f

Significant strategic questions remain over the future of the gas market, and the nature of future government involvement in investment or even the normal operation of the electricity market, e.g. during periods of very high wholesale prices. All strategic choices about the future of the electricity industry require assumptions to be tested about the answers to these strategic questions. Assumptions must be clear about whether the gas market can recover, whether a government considers itself the investor of last resort in electricity, or whether regulators canbe insulated from political concerns about prices. Different assumptions are likely to lead to different design choices.

Addressing these strategic questions in a way that serves the long-term interests of the economy and society has a number of fundamental requirements.

Firstly, each strategic question requires a mix of deep industry expertise, but also strong regulation to avoid the strategic direction of the industry being unduly driven by the unavoidable vested interests of industry participants or lobby groups. No strategic design project in electricity should be done using only the expertise available to one or two organisations and developed in isolation of the industry and independent advice.

Secondly, electricity is so interconnected that strategic design decisions need to be coordinated across many complex aspects (retail, wholesale, contracts, networks, investment, operations, upstream fuels—especially gas). This leads to two potential problems:

1. Solutions that don't address the underlying complexity of the problem or need.
2. Solutions with unintended consequences, especially in interconnected areas.

This makes it essential to get as many perspectives as possible on the identified issues, options and solutions, which will greatly increase the likelihood of identifying unintended consequences.

The industry has a good track record here where good processes have been able to avoid vested interest, apply relevant expertise, and engage a wide range of views. Such successes include the original market design, rules of the New Zealand Electricity Market, the Multilateral Agreement on Common Quality Standards, and the Metering and Reconciliation Industry Agreement, all of which remain core components of the current Code. The process followed by the independent Market Development Advisory Group over the past few years is also an exemplar in this respect.

Finally, the solution to each strategic question, and all regulators, must also be independent of politics to avoid policies, driven by the political cycle, that exacerbate uncertainty. This is a current concern.[32]

Given that the quality and performance of governance and regulation is a key driver of societal and political trust in the industry, and the long-term interests of the country, the fundamental assumption about the most effective level of regulatory design, effort and capability needs to be revisited regularly. This includes the powers, mandates, governance, funding, and capability of policy and regulatory institutions requiring careful design and close monitoring of performance.

[32] One week of high prices, which the Authority has yet to conclude were or were not consistent with efficient market outcomes, has driven an Electricity Taskforce, urgent projects, and significant variation from MDAG's market reform recommendations. It is difficult to come to any other conclusion than the reaction to one week of highly publicised prices was political (see evidence below).

There should be no overlapping functions, ideally addressed by having a regulator that covers the entire scope of the market, fuels and monopoly elements. If this is deemed undesirable, the interfaces between regulators needs constant independent monitoring and performance reviews.

International good practice strongly suggests that rule making is separated from decision making, and suggests high quality independent monitoring/oversight with strong independent expert and consumer input.

Prioritisation of effort is a critical capability. It is inevitable that there are insufficient resources to solve every problem the industry faces. Faced with ongoing pressure to address topical issues, regulatory efforts can get swayed by lesser issues, unclear priorities, or rushed long-term solutions often in the form of 'band-aids.'

Key strategic questions that would add valuable certainty to the industry

Security of supply

1. Can the gas market recover?
2. If it can recover, do the practicalities and economics support using gas for flexible supply in electricity over the medium term?
3. If it can't recover, what is the best transition for existing customers and assets (e.g. distribution pipelines)?
4. What are the other resources (supply or demand side) that could be used for flexible, secure supply (known technology that works today)? How do their practicalities and economics compare to gas?
5. If technology delivers low emissions, flexible peak supply/demand response in the long-term, how does that change the economics and practicality above?
6. What is the VoLL/CDF for consumers? What is the best function for assessing reliability benefit? How does VoLL/CDF change with electrification?
7. Can we ever guarantee that politics and regulators won't influence and therefore impair efficient price discovery at the limits of secure supply (i.e. can a one-part energy only market really work)?
8. If so, and if we can rely on MDAG's recommendations for longer-term security of supply, is there a short-term security of supply deficit that needs a special mechanism? How do we ensure an interim mechanism doesn't become permanent?
9. Even if we are confident that market mechanisms can deliver security of supply, do we need a last resort back up mechanism to ensure it (especially after significant electrification)?

Networks, distributed energy resources, distributed generation, and demand response

1. Is it still tolerable to separate regulation of network pricing from network investment? Should these areas be combined into a single regulatory entity, to maximise the chance that EDBs use pricing as a tool to optimise investment?

2. Do we need dynamic and locational wholesale market signals on the distribution grid? If so, should this replicate the wholesale electricity market design (i.e. LMP) at distribution level (i.e. DLMP), or are there other options?
3. Should we instead focus on network pricing that conveys both the long run marginal cost of capacity and the operating and locational costs?
4. Do we need to signal the value of quality (i.e. voltage)?
5. Should operating signals be provided purely through control systems and pricing focus only on long-run marginal?
6. Who coordinates the above and who has that role?
7. How does the interface with consumers work?
8. Can the answers to these design questions be implemented, let alone debated and made, before we have full knowledge about the technologies and resources that will be connected to the distribution network?
9. What is required, and of whom, to make the decisions and design choices above?

Consumer engagement

1. Can we make price the primary mechanism to engage with consumers or do we rely on agents? Will consumers trust these agents?
2. Is it sufficient for consumers to have choice or does there need to be competition between agents?
3. Which parties have the right incentives to be good agents for the consumer?
4. Who represents the bargaining power of mass-market consumers?
5. Even with good agents, is there a need for independent, trusted information and data for consumers about total energy consumption and choices?

2.4.2 Evidence

MDAG[33]

Uncertainty adds the perception of risk to markets and risk lifts prices. Uncertainty can also deter investment even if underlying fundamentals suggest investment should go ahead. MDAG identified this.

> "12.21 While green peakers should be treated as one possible solution, the underlying point is that there could well be a need for investment in additional flexible resources (such as OCGTs) at some point in the transition. In principle, such investment ought to be forthcoming if it is genuinely required because of the drivers and incentives on investors discussed in Chapter 8. However, parties contemplating investments in flexibility

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33 https://www.ea.govt.nz/documents/1006/MDAG_-_Price_discovery_in_a_renewables-based_electricity_system_-_options_paper.pdf

resources arguably face some risks that investors in renewables do not face. These risks stem from two areas where there is currently significant policy uncertainty:

a) The scale, location, and timing of any capacity developed under the auspices of the New Zealand Battery Project (NZBP). If a large-scale NZBP option were to proceed, it seems likely that it would be ready from early/mid-2030s at the earliest. However, some additional flexibility might be needed before then – especially if the renewable share is close to 100% by the end of this decade.

b) Whether any additional policy instruments (beyond the emission trading scheme) will be enacted to further restrict fossil-fuel use for power generation. Additional restrictions could accelerate or deter new flexibility investments, depending on the form of any instruments and how they affect different fossil fuels.

12.22 Any flexibility solutions that are directly affected by the above factors may not proceed until the uncertainties are resolved, because investors may be concerned about the potential for adverse impacts or even economic stranding. The significant impact that uncertainty can have on the timing of irreversible investments has been examined extensively in the economic literature[152]. The Government is working on a New Zealand Energy Strategy that may help to clarify some of the uncertainties. This work is due to be completed in 2024. However, if any aspects can be accelerated, that could help to facilitate an orderly transition."

[152] For example see 'Irreversibility, Uncertainty, and Cyclical Investment', Ben S. Bernanke, The Quarterly Journal of Economics, Vol. 98, No. 1 (Feb., 1983)."

It could be argued that the uncertainty around NZBP has been resolved. However, any investor will be concerned about the resurgence of NZBP under a change of government. Factors leading to the failure of the gas market definitely meets the criteria of further restricting fossil-fuel use for power generation.

MDAG also had concerns about governance in the Future Security and Reliability project.[34]

"The Authority should strengthen governance of the FSR project by:

- Incorporating the set of Guiding Principles in Appendix E into the terms of reference for the FSR project;
- Incorporating into the terms of reference for the FSR Common Quality Technical Group the tasks of helping to:
  - Identify and address key economic and technical trade-offs;
  - Oversee that application of the guiding principles;
  - Examine issues where Transpower (or the Authority) may be perceived as having potential conflicts of interest – such as the best division of

[34] https://www.ea.govt.nz/documents/4335/Appendix_A2_-_Final_recommendations_report.pdf

responsibility between national and 'local' system operation, or the merits of an independent system operator model; and

  - Support periodic stakeholder engagement.

- Adding a person with strong experience in economic and technical trade-offs." (Recommendation 14)

Read et. al

In a presentation to IAEE in 2007, Grant Read and CRA identified *the* critical question of electricity market design.

After outlining political and practical realities, Read et. al conclude:

> "The existence of government makes the threat/promise of intervention unavoidable"
>
> According to Read et al, "under such threat the regulator **must either**:
>
> - allow market prices to clear, explicitly acknowledging risk of short-run price "gaming"
> - rely on competitive entry to discipline price discovery in the long run
> - convince consumers that they must contract for capacity/firm energy
>
> **or**:
>
> - credibly and robustly define criteria for intervention
> - compensate value removed from the market across all plant types, by a capacity market mechanism.
>
> **Mixing these two paradigms may spell disaster**" [emphasis added].

Sapere[35]

Based on Read et al, Reeve and Murray conclude:

> "What is needed is the honest conversation. If the electricity regulator cannot realistically resist these government threats, or New Zealand cannot accept a market that requires faith in long-term competition above short-term volatility, then there is only one conclusion that can be reached about the one-part (energy only) market." (Section 6.5)

On an assessment of DER potential for Transpower, Reeve, Comendant, and Stevenson[36] mused that the ultimate design for the distribution/retail market could be as significant as the original wholesale market design. They noted:

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[35] https://srgexpert.com/wp-content/uploads/2024/12/Confluence-of-factors-threatening-electricity-reliability-3-September-2024.pdf

[36] https://static.transpower.co.nz/public/uncontrolled_docs/Distributed%20Energy%20Resources%20-%20Understanding%20the%20potential%20-%20main%20report%20-%20final_0.pdf?VersionId=HZUkiRMgp_krcHqKKkBcaremfLVmrygl

"**5.2 Factors for change**

Using the 1990's development of the electricity market as a blueprint, the authors note some key factors for successful change:

Industry leadership With dominant resources and motivated for change ECNZ underpinned the WEMDG study and Transpower provided significant technical development into nodal pricing. Mistrust of ECNZ led to the Government inspired WEMS study. The two studies lead to a very well-designed wholesale market.

Broad support While individual motivations were quite different, the New Zealand Electricity Market was broadly supported by most stakeholders.

Stakeholder engagement While not perfect, the combination of WEMDG and WEMS involved stakeholders in the design process."

This led to questions that still seem relevant today.

5.3 Major questions

Where does the industry leadership come from for DER integration into the current system and arrangements, where the problem is economically and technically complex, and the solution could be a world first?

Is there broad enough support for a difficult transition and, if not, how can that be secured?

What is the process to involve an even more diverse set of stakeholders than in 1996, which now needs to include innovators, aggregators, and technology developers?"

Although, the authors of this paper would also note the subsequent fora for building leadership and stakeholder engagement through FlexForum and the Framework.

All but one of the market trading conduct reports over July, August, and September conclude that prices over this period were consistent with prevailing conditions affecting supply and demand. The one exception (report of 4 August 2024) [37] concludes:

"14. Ongoing work in trading conduct

14.1. Though fuel supply limitations will often cause prices to increase, the high wholesale prices seen this week are of major concern to the Authority. We will be closely analysing recent offer behaviour to ensure it is consistent with supply and demand conditions and have requested additional information from participants regarding their offers from 1 July 2024 onwards.

14.2. Further analysis is being done on the trading periods in Table 1 as indicated."

This one week of high prices, which the Authority has yet to conclude were or were not consistent with efficient market outcomes, has driven an Electricity Taskforce, urgent projects, and significant

[37] https://www.ea.govt.nz/documents/5449/Trading_conduct_-_4_August_2024.pdf

variation from MDAG's market reform recommendations. It is difficult to come to any other conclusion than the reaction to one week of highly publicised prices was political.

Much of the public debate was focused on the closures of major users over the week in question. However, the problem for major users was not one week of high prices but continued uncertainty about a market that continues to suffer the consequences of eroded security of supply.

BCG[38]

While BCG's *The Future is Electric* report was of the view that the one part (energy) market could still work, it also identified the key criteria for this assumption.

> "In practice, however, market uncertainty can create a significant barrier for generators seeking to maintain flexible assets and develop new ones. This is compounded by political realities – the political palatability of sustained periods of elevated wholesale market prices, or more frequent blackouts, may be in stark contrast to the economic value ascribed to these outcomes by the wholesale power market." (Recommendation theme 3)

IPAG[39]

IPAG identified key problems for DER/flexibility services. Many of the problems speak to the need for the design of coordination right down to the LV level.

> "Problem statements:
>
> 1. Key network information is not collected and/or made available to flexibility traders
> 2. Providers and procurers of flexibility services provided by DER can't see flexibility "market" information
> 3. Technical specifications are not consistent or in some cases adhered to
> 4. Transaction costs for facilitating flexibility services trade are high
> 5. Distribution pricing does not signal the cost of flexibility services to network operation (congestion and voltage excursions for example) or its value to distributors
> 6. Distributors are not confident flexibility services can assist with service quality or is viable as a network alternative
> 7. Part 4 Incentives appear to be poorly understood
> 8. Distributors' DER investments are treated as regulated capital, but the planning and operating services provided are contestable
> 9. Distributors may misallocate costs and revenues

[38] https://web-assets.bcg.com/b3/79/19665b7f40c8ba52d5b372cf7e6c/the-future-is-electric-full-report-october-2022.pdf

[39] https://www.ea.govt.nz/documents/525/IPAG_advice_on_creating_equal_access_to_electricity_networks.pdf

10. Distributors may favour in-house or related-party solutions
11. Distributors may favour network solutions
12. Distributors may restrict technologies or network users
13. Security and reliability at risk if flexibility services use by transmission and distribution in conflict." (Slide 14)

IPAG also warned:

> "Delaying action will create significant costs to consumers, particularly from uncoordinated or constrained investment in DER." (Slide 31)

Gas Industry Company (GIC)[40]

The gas market has failed and may not be recoverable. External factors significantly contributed to the failure of the gas market. However, this raises questions about whether the GIC had adequate authority, scope, and tools to regulate the industry and provide a trusted independent voice to the government. This may manifest most acutely for consumers through unreasonably high disconnection costs as gas market participants seek to recover the loss of value in their networks.

A review of the GIC's governance in 2019 concluded:

> "If the Electricity Price Review (EPR) considers further the case for a joint electricity and gas regulator, we suggest other factors besides regulatory consistency and economies of scale are also considered including:
>
> ...
>
> c) what other problems confront each sector, and to what extent can they be solved by a joint regulator;..."

Given the failure of the gas market and the criticality of gas supply currently to security of supply in electricity, the problems confronting each sector have changed considerably since the TDB review and warrants reconsidering the joint governance issue.

Accountability

While it was prepared in response to the Electricity Pricing Review, the advice provided by Jack Hodder QC for Trustpower[41] is still relevant.

(Attachment 4)

Memorandum: ELECTRICITY PRICE REVIEW (EPR) - OPTIONS PAPER (FEBRUARY 2019) - MERITS APPEALS AGAINST ELECTRICITY DECISIONS

"In summary, it is my view that:

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[40] Gas Industry Governance - Incentives, Regulation and Outcomes – TDB Advisory.
[41] https://www.mbie.govt.nz/dmsdocument/4926-trustpower-submission-electricity-price-review-options-paper-pdf

a) there is a strong public interest in economic/market regulatory decisions that are high quality: impartial, fully informed and fully defensible on logical grounds;
b) the human factors involved means that there Is an inherent risk of errors or reduced quality in any major decision, including on economic/market regulation;
c) an independent "second look" -relevantly by the courts - is an established and generally well regarded means of reducing such risks and reinforcing high quality in relation to such decisions;
d) the EPR paper does not suggest removal of judicial review rights, but a judicial "second look" by means of modern judicial review Is of uncertain scope: the boundaries have expanded in modern times, albeit inconsistently. And the same is true of appeals on "questions of law";
e) such uncertain boundaries undermine the purpose of the independent second look, and favour the availability of a merits appeal:
f) concerns about costs and delays (and gaming by major players) can be reduced by a range of design features in a merits appeal regime for the electricity"

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