Strengthening the Security and Reliability Council

Report prepared for Mercury Energy Ltd

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1. Introduction

Mercury asked us to consider potential deficiencies in the current industry arrangements that might lead to an erosion of security of energy supply. We identified that an independent entity, which is adequately resourced, and which has a singular focus on reliability, security, and resilience, is a feature of many electricity industry jurisdictions for good reason.

We noted that such an entity should also be independent of the industry regulator, as those regulators themselves need to be monitored for how their decisions impact reliability, security, and resilience. The singular focus is necessary, not only because of the importance of security of supply, but because the topic is highly technical and complex. Not only is expertise required, but also experience. The entity cannot rely on Transpower for such expertise or experience as Transpower is the primary entity that is being monitored.

To maintain independence, such an entity should not make changes to the Electricity Industry Participation Code (the Code), but provide a publicly independent voice on all levels of security of the electric power system, including monitoring long and short-term planning and operations. While the entity should not make Code changes, it could be consulted on proposed changes that affect security. Although our consideration was focused on transmission and the wholesale market, the entity would ideally provide oversight over the whole electric power system including distribution and distribution-level resources. We note that such an entity should also be empowered to consider the upstream sources of electricity supply to the extent that they affect reliability, security, and resilience, most notably gas and coal markets and supply chains.[1]

We identified that the Security and Reliability Council (SRC) was intended to provide at least some of this role, but has become more of an advisory group to the Authority only. However, we identified that, within the current arrangements, the SRC could be structured to provide the role.

In this report, we begin with our assessment of reduced security and the reasons for that, and then recommend how an independent, adequately resourced SRC could be established under the current arrangements. To establish our identification of the problem and the solution, we look in-depth at the reduction in North Island winter capacity and the lack of focus on security standards. However, we note that concerns could also be raised on the winter energy margin and the South Island capacity margin.

[1] Upstream in this context would include all upstream sources of supply regardless of where they supply, e.g. distributed generation. It would also include demand to the extent that demand could cause an upstream impact, e.g. through harmonics, power factor, or voltage, etc.

2. Peak capacity is now a problem for reliable supply

2.1 Peak capacity was not a concern for the first 15 years of New Zealand's electricity market

Generating capacity available to meet peak demand is referred to as 'firm capacity,' as it is capacity that must be available during periods of low wind, solar and/or hydro generation. Maintaining sufficient firm capacity to balance supply and demand under peak demand conditions is a central focus of electricity market design globally. As electricity demand varies widely over the hours of the year, sufficient generation capacity must be built to balance supply and demand reliably under peak demand conditions.

On a chilly morning in May of this year, Transpower advised there was a risk that the wholesale electricity market could fail the next day to fulfil its primary purpose of reliably matching supply to demand, and requested consumers to conserve electricity the next morning.[2] This request likely came as an unpleasant surprise to many consumers, but it should not have been a surprise to those monitoring the electricity sector. Peak 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, and becoming increasingly urgent last year. It will be a concern for years to come.

Peak capacity was not a concern two decades ago

Designers of the New Zealand electricity market did not need to be concerned about peak demand for the first decade and a half of the New Zealand wholesale electricity market, from 1996 to about 2015. Peak demand was not a concern because we had 3,000MW of highly flexible hydro generation capacity (able to supply nearly half the system peak demand in the late 2000's), plus a decent amount of gas and coal-fired generation. These legacy assets meant that when the task of scheduling generation plant to meet demand shifted to the market in 1996,[3] there was sufficient generation capacity within the system to meet peak demand. The market design effort could concentrate on how to achieve the most efficient use of that existing capacity.[4]

The focus of reliability concerns over the first decade of the market was solving the 'dry year' problem—that is, the reliability concerns that arise when inflows into the hydro storage lakes are lower than expected. New Zealand's electricity reliability concerns then centred on whether the

[2] Transpower warning notice of 9 May 2024 at 10:51, warning that there may not be sufficient generation and reserve offers to meet demand and N-1 security.

[3] From being an internal management decision by the former monopoly ECNZ, to 'least cost' dispatch based on competing offers to supply.

[4] The New Zealand wholesale market was the first electricity market globally to dispatch generation based on price offers and to solve simultaneously for both energy and short-term reserves. In testimony to the New Zealand Commerce Commission in 2002, Professor Bill Hogan of Kennedy School of Government at Harvard University described the rules of the market at that time as "at the forefront of best practice" (Kieran Murray et al., 2009, p. 12).

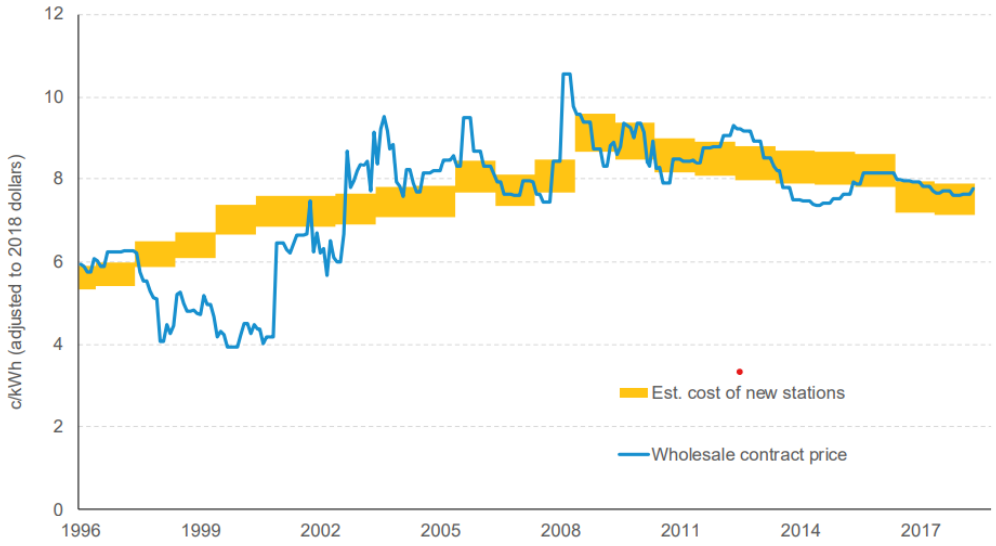
available generating capacity could produce sufficient energy over time to meet demand—we were *energy constrained*.

By contrast, designers of electricity markets in the United States, Europe, and Australia were concerned with whether sufficient generating capacity would be in the market at the instant the system reached its peak demand. These markets are *capacity constrained*. In these markets, some generating capacity, invariably thermal generation, is maintained to be used for only a small fraction of the hours during a typical year.

Observed market conditions created no imperative to monitor how investments in peak capacity were rewarded

Little to no growth in peak demand in New Zealand between 2006 and 2015 meant that questions, as to whether market would provide commercial incentives to maintain capacity to meet peak demand, remained unaddressed for a further decade. Official investigations focused on measures of average price levels, comparing wholesale price levels with the lowest cost source of new generation capacity regardless of whether it could provide firm capacity to meet peak demand. Figure 1 reproduces a familiar chart from the 2019 Electricity Price Review. As the authors noted, the comparative framework is similar to that adopted in earlier reviews, in particular the 2009 Ministerial Review of Electricity Market Performance, and the 2007 market design review by the Electricity Commission (Electricity Price Review Panel, 2018b, p. 4).

Figure 1: Wholesale contract prices versus cost of building new power stations



Source: Electricity Price Review Panel, 2018b, p. 4

The type of analysis presented in Figure 1 allows broad conclusions that competition is effective in restraining wholesale prices in line with the cost of adding more electricity supply, which has been the finding of each review of wholesale prices (Electricity Price Review Panel, 2018a). However, the analysis provides no insight into whether the market provides sufficient commercial returns to maintain firm capacity, and hence reliable supply.

Meanwhile, the general perception within the industry until about 2015 was that low demand growth was temporary, and demand growth would return. Investment continued in geothermal and wind. Up until 2014, the net increase in firm capacity generally kept pace with or exceeded the growth in peak demand (see Figure 2). To some extent, investment in new capacity 'overshot,' supressing wholesale prices.

By 2015, this 'oversupply' situation challenged the economics of Contact's gas-fired power station, Otahuhu B, and Mercury's gas-fired Southdown plant. The fixed costs of maintaining these power stations were not being recouped by the relatively low wholesale prices, and the plant were decommissioned. The market appeared to be doing what it was designed to do—prices were driving both investment and disinvestment.

The decisions to decommission Otahuhu B and Southdown not only removed energy from the system, but also removed reliable firm capacity. Possibly, these events were the first hint that the remuneration for low-utilisation plant during system peaks (that is, high spot prices for short periods of time) was insufficient for investors.

2.2 Government interventions undermined the business case for investing in firm capacity

Soon after these plant closures, in 2017, the then government announced its intention to remove fossil fuels from the electricity system and to ban offshore oil and gas exploration.

The business case for new firm capacity was undermined by the Lake Onslow proposal…

The Minister of Energy indicated that the government would consider entering the electricity market as a generator. Officially referred to as the New Zealand Battery Project, the investigation focused on a proposed pumped hydro scheme at Lake Onslow. Although the Onslow scheme was initially pitched to resolve dry-year concerns while removing coal generation, it became clear the plant would be used whenever it was 'economic' to operate. Minister Woods described the intent of the scheme would be to draw electricity from the grid when wholesale prices were low to pump water to be stored for generation when prices were high.[5]

Since Onslow would have had an instantaneous capacity of approximately 1,200MW, it would have been the biggest peaker in New Zealand's history. With the prospect of the government entering the market to provide firm capacity on a massive scale, the business case for commercial investment in peak-supporting plant became very difficult, at best.

…and by uncertainty around the future of gas in a low-carbon economy

In 2018, the government moved to ban offshore exploration and in 2022 paused issuing permits for onshore exploration in Taranaki (Wannan, 2024). These interventions, combined with concerns about how the government might view the role of gas as the New Zealand economy decarbonises, and with investors increasingly less willing to allocate capital to the greenhouse gas-emitting industry,

[5] Papers showing the evolution of the NZ Battery project are available at: https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/low-emissions-economy/nz-battery

significantly reduced incentives to invest in maintaining New Zealand gas production. At the same time, major gas fields (Pohokura, Maui, and Kupe) had production problems and declining production rates.

The resulting disruption to the gas market made it progressively more difficult to obtain a fuel contract for a gas-fired generator to meet peak demand.[6]

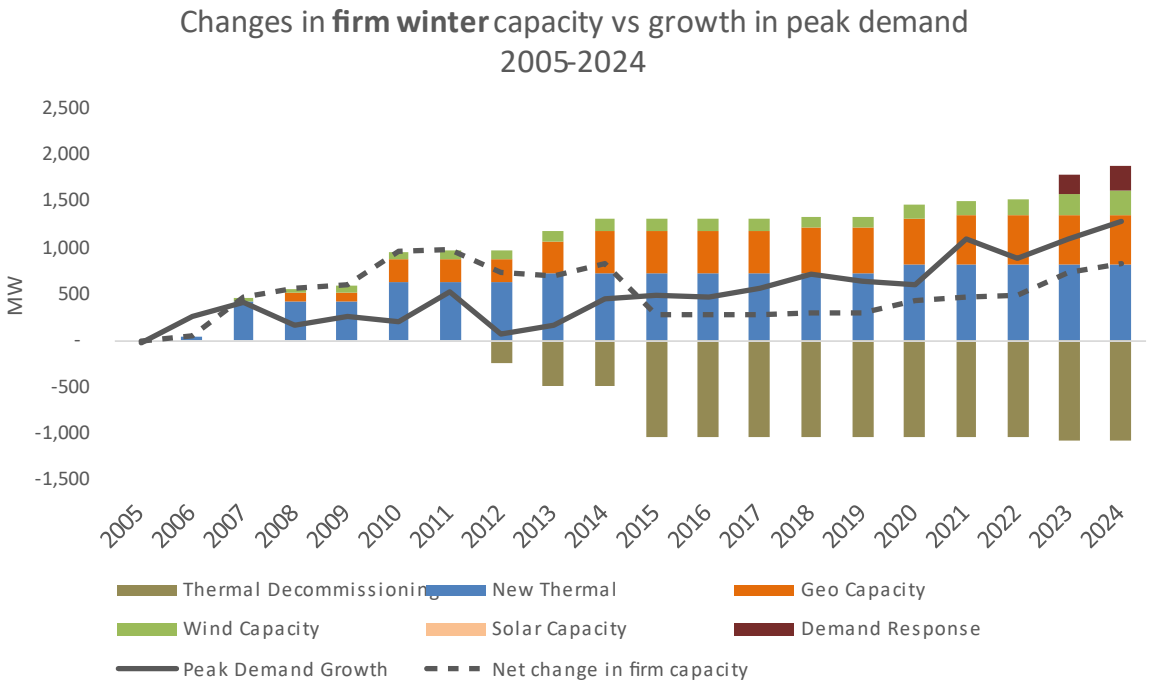
2.3 Peak demand has been growing faster than firm capacity for nearly a decade

While there was a significant net reduction in firm capacity in 2015, and only modest growth in firm capacity in the last few years, peak electricity demand resumed growing around 2013. As a result, growth in peak electricity demand exceeded growth in firm capacity for the past decade.

Figure 2: Changes in firm winter capacity vs growth in peak demand 2003-2024

Figure 2 reproduces a chart prepared by Whiteboard Energy. It shows the changes in firm winter capacity compared to the growth in peak demand.

Figure 2: Changes in firm winter capacity vs growth in peak demand 2003-2024



Source: Analysis provided by Whiteboard Energy

The chart uses similar assumptions to the Authority's Security Standards Assumptions Document (SSAD), in particular that 25 per cent of wind generation is deemed likely to be available at the peak.

[6] During the same period, Rio Tinto's threat to close the Tiwai aluminium smelter raised the prospect of a significant reduction in demand that would have reduced wholesale prices, further undermining the business case for new firm capacity.

Whiteboard's assessment makes Huntly unit five available but only two Rankine units, whereas the SSAD derates all thermal by an average outage factor.

Although firm capacity has grown over the period since 2015, the balance of firm capacity to peak demand only improved in 2023 with the Authority's rule that requires non-contracted water heating control to be offered in as difference bids. The improvement in 2024 was due to the demand response arrangements in the New Zealand Aluminium Smelter (Tiwai) agreements. The assessments do not allow for any derating of thermal generation due to gas supply shortages, but the third Rankine unit can offset some of this. Both the Whiteboard assessment and the SSAD approach rely on 300MW of wind generation during the worst peak (with this generation assumed to be produced by new and existing windfarms).

New capacity is expected for 2025 (Tauhara No.2, Te Huka expansion, and the Ruakawa BESS). However, once the Taranaki Combined Cycle exits, 57MW of firm capacity will be removed from the market. Despite some increase in firm capacity, the cumulative shortfall of firm capacity from 2003 to 2024 is 427MW (analysis provided by Whiteboard Energy).[7]

Peak consumption increased after the Authority removed the peak pricing signal

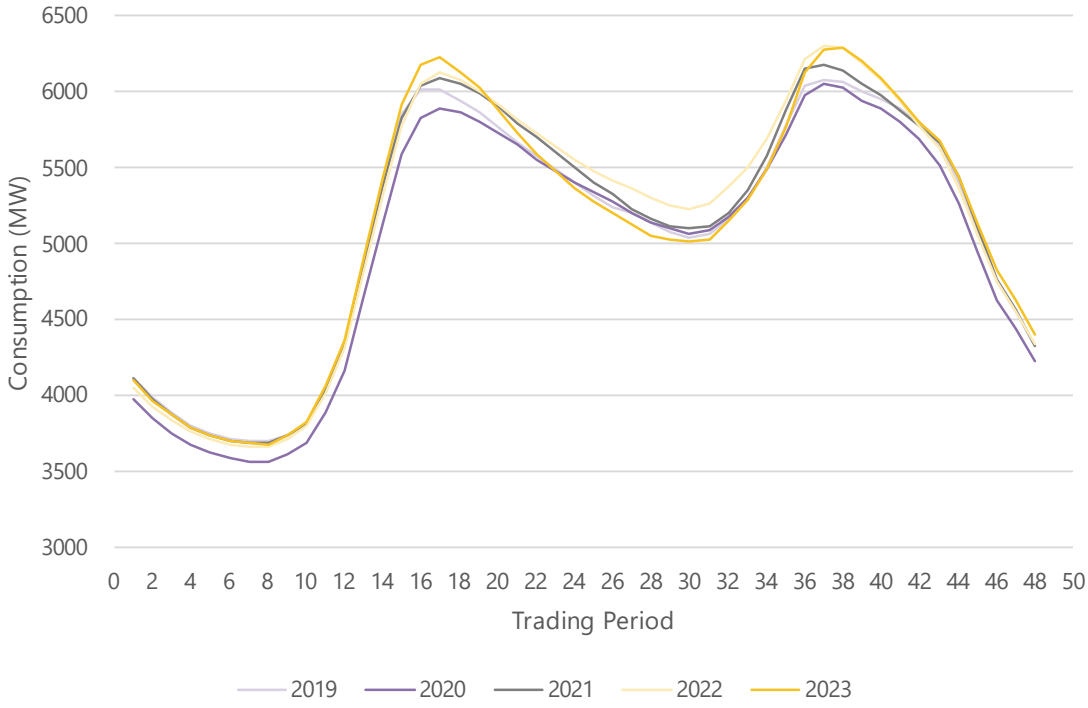
During the same period as incentives to invest in firm capacity were supressed by government interventions, the Authority removed the regional coincident peak demand (RCPD) price signal. Under former RCPD pricing, the cost of transmission was allocated based on demand during peak periods in each region. This meant regions with higher demand during peak times paid more for transmission services. The methodology encouraged large consumers to shift or reduce their electricity usage during these peak periods to lower their transmission charges. The RCPD was removed by the Authority in September 2021 when amending the transmission pricing methodology.

In Appendix A, we present a comparative analysis of national trading period peak consumption during the winters of 2019 to 2021 (RCPD winters), and the winters of 2022 and 2023 (post-RCPD winters). This analysis reveals an average increase of 157MW (or 2.6 per cent) of daily peak consumption in 2022 and 2023 compared to 2020 and 2021. This analysis confirms the findings from the Authority's 2023 report that peak consumption increased after the RCPD was removed (Electricity Authority, 2023e).

Figure 3 shows the top 20 daily maximum consumption trading periods nationally each year between 2019 and 2023, normalised to daily total consumption in 2023. The evening peak for 2022 and 2023 is higher than in 2019, 2020, and 2021. The morning peak in 2023 is also higher than in previous years.

[7] www.whiteboardenergy.co.nz

Figure 3: Annual top 20 daily max national consumption trading periods between 2019 and 2023 normalised to 2023



The Authority removed the RCPD charge after concluding the charge was higher than the economic cost of congestion in peak periods. The Authority reasoned the charge was distortionary and discouraged consumers from using the grid at times they value it the most. Removing the RCPD therefore likely involved a trade-off between efficient transmission pricing and promoting reliable supply. As discussed below, it is no longer clear how the Authority weighs reliability when evaluating trade-offs between the limbs of its statutory objective.

With peak demand growing at a faster rate than firm capacity on average, a shortage of supply during winter peak demand (as occurred on 10 May) becomes inevitable. This worsening outlook for electricity reliability did not go unnoticed in the sector.

2.4 Firm capacity shortfall evident in security of supply assessment

In November 2022, Transpower warned:

> The increased number of low-residual CANs and corresponding GENs issued in 2021 and 2022 demonstrate peak demand growth that is not sufficiently balanced by existing generation availability. There is an important distinction between generation capacity and availability.

Source: (Transpower, 2022)

Looking forward, the peak capacity shortfall is evident in Transpower's security of supply assessment. A key aspect of the existing security of supply framework is the medium-term energy and capacity

security of supply standards (Transpower, 2023a, p. 3). The capacity security standards are defined in relation to winter peak demand, as this is when demand is typically highest and when generation and transmission capacity is under the most stress. The standard is referred to as the winter capacity margin (we discuss the derivation of the existing standard in the following chapter).

In its Security of Supply Annual Assessment, Transpower assesses security of supply scenarios. It establishes a reference case and explores sensitivities around that reference case. For each case, Transpower assesses different potential supply contexts:

- Stage one – considers only existing and committed generation
- Stage two – adds projects that are not yet committed or are on hold, but have consents
- Stage three – adds projects that are on hold but where the consents have lapsed
- Stage four – adds projects that are expected to apply for consent within the next two years.

Transpower's 2024 stage one assessment has the winter capacity margin falling below the existing standard by 2026. The existing standard would not be met under the stage two assessment by 2028, and under the stage three assessment would not be met by 2029. Stage four is the only new supply scenario which shows the existing winter capacity margin being sustained.

Transpower undertakes sensitivity cases, one of these includes low gas supply. The low gas supply scenario—which should probably now be considered the reference scenario—shows all stages falling below the winter capacity margin by 2029, even under stage four which assumes substantial investment in new generation. Although the winter capacity margin does not drop much earlier under the low gas sensitivity scenario, it drops far further with stages one, two, and three all falling below expected peak demand by 2028 (if not earlier). The security of supply assessment anticipates demand curtailment even at N security,[8] if the difficulties of the gas market are recognised.

For its low gas supply scenario, Transpower uses a gas forecast that would have been considered conservative even a year ago. However, it now looks like it might overstate gas supply as major fields are in decline and recent well drilling and refurbishments have failed (Electricity Authority, n.d.). As the state of the gas market has been a concern since 2018, it is deeply concerning that the standard assumptions for the winter capacity margin yield a reference scenario that assumes stronger gas supply than is the case. These assumptions should have been reviewed by now.

At the very least, the Authority's conclusions related to the gas market in its market competition review issues paper of November 2022 should have prompted a review of how the "uncertain and dwindling supply" of gas would impact on electricity reliability. In its market competition review, the Authority concluded that fossil fuel generation was being displaced, and that this would affect flexible generation:

[8] A power system is described as being N-1 secure when it is capable of maintaining normal operations in the event of a single contingency event, such as the unplanned loss of a transmission line, generator or transformer. A power system operating at N security is not capable of maintaining normal operations after a single contingency event.

B4. Three factors are causing displacement of fossil-fuelled generation by renewables:

- falling investment costs of wind and solar to the point that the LRMC of both wind and solar PV are now well below gas and coal
- increasing fuel costs for gas and coal – for domestic gas **due to uncertain and dwindling supply**, while for coal it is mainly reflective of international markets [emphasis added]
- increasing carbon costs through the NZ ETS (Electricity Authority, 2022b B4).

And

> Some portion of flexible generation: renewables are starting to displace some flexible fossil-fuelled generation. Rising carbon prices are making renewables increasingly economic even if some output is spilled. Diversity (technology, location) of the new renewable generation helps with the loss of fossil-fuelled generation (Electricity Authority, 2022b B5, point 2).

2.5 Increasing industry and consumer concern

Surveys indicate that our communities are becoming increasingly concerned about reliability. In the Authority's latest *industry perceptions* survey, 10 per cent fewer respondents agreed that there is a reliable supply of electricity each day (75 per cent compared with 85 per cent last year) (Electricity Authority, 2023b). Only 45 per cent (down 13 per cent) agreed that there will be enough electricity to meet ongoing needs. The Authority's *consumer perceptions* survey also indicated that 49 per cent (down 1 per cent) agreed that there is enough electricity to keep New Zealand powered in the future.

Moore et al. (2023) noted these survey results were consistent with concerns about the future reliability and security of electricity raised in interviews as part of the recent strategic baseline review of the Authority. This is also consistent with surveys undertaken by the Consumer Advocacy Council which show resilience as a key and growing concern for consumers and small businesses.

These concerns are important as they will impact decisions by consumers to invest in electrification.

2.6 The Authority has been slow to respond

Agitation from the Chief Executives Forum (including an attempt to develop a temporary ancillary service to meet peak demand concerns for 2023) prompted the Authority to adopt some urgent measures for 2023. However, no comprehensive programme emerged from the Authority to understand and address the growing concerns about firm capacity, despite this also being an urgent recommendation by the Market Development Advisory Group (MDAG) high-renewables project.

In July of this year, "based on submissions and lessons learned from the recent low residual situation on 10 May 2024," the Authority decided to:

- accelerate demand response participation in the market by exploring a full range of regulatory levers
- update and consult on the Security Standards Assumptions Document

- start developing a standby ancillary service to cover a sudden reduction from intermittent generation
- undertake work to enhance battery energy storage systems and dispatchable demand participation, and remove barriers to entry (Electricity Authority, 2024).

In the following sections, we consider how the Authority came to misjudge the market and seemingly be surprised by impending shortfalls of electricity supply during periods of peak demand.

3. Reliability standards not updated for 12 years

3.1 Capacity standards were meant to minimise shortfall and additional capacity costs

In July, in response to the low residual supply events of 10 May, the Authority announced it would review the Security Standards Assumptions Document (Electricity Authority, 2024). This document informs the medium-term energy and capacity security of supply standards which form "a key aspect of the existing security of supply framework" (Transpower, 2023a, p. 3). Startlingly, the Authority has not updated the document since 2012. It reviewed the standard in 2017 and decided that, while changes to the 2012 standard may be warranted, the benefits of changing the standard at that time would be minor (Transpower, 2023a, p. 3). That conclusion is highly unlikely to hold in 2024.

3.1.1 Method applied by the Authority in 2012

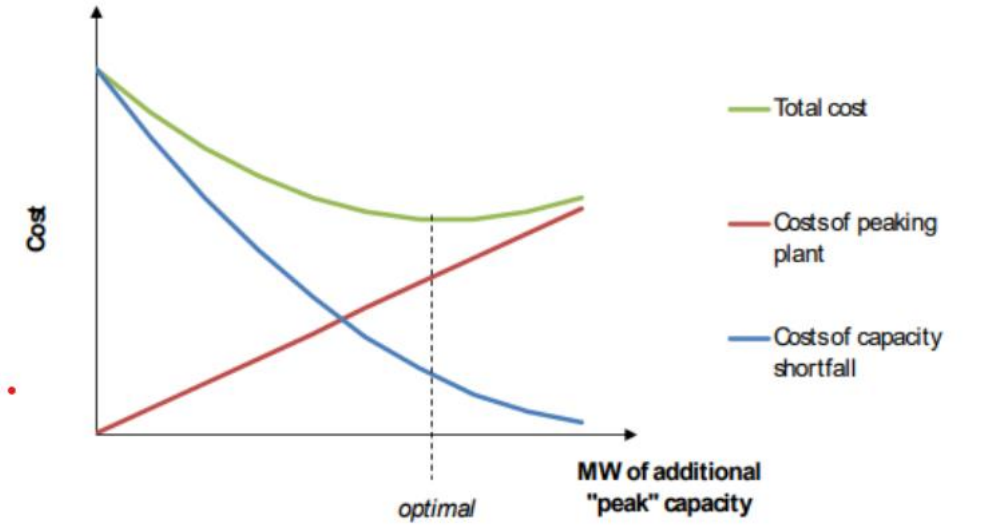
The North Island winter capacity margin (NI-WCM) is New Zealand's relevant resource adequacy standard for capacity—the South Island generally has ample generation capacity to meet demand.

The NI-WCM is a winter peak demand-oriented standard, as this is when demand is typically highest and when generation and transmission capacity is under the most stress. The standard is defined in the Electricity Industry Participation Code (the Code) as "the difference between a measure of the expected capacity and expected demand from 1 April to 31 October between 7am and 10pm." Part 7 of the Code specifies that capacity is expected to exceed demand by 630MW to 780 MW.[9]

The Electricity Authority determined this capacity adequacy standard in 2012 by considering the costs of new firm capacity (to address capacity shortfalls) and the costs of capacity shortfalls (Electricity Authority, 2012a). As illustrated in Figure 4, the 'efficient' capacity margin is where the total cost (cost of firm capacity and cost of capacity shortfall) is minimised.

[9] The Authority calculated an optimal level at approximately 690MW; the range recognises the uncertainty in input assumptions in deriving the standards.

Figure 4: Illustration of NI-WCM cost minimisation approach



Source: (Transpower, 2023a)

While the modelling done at the time (2012) was robust, for a topic as important as security of supply we would expect, over time, alternative modelling and analytical methods to be used to assist decision-making and corroborate results. For example, some analysis into the customer damage functions for loss of supply now add a fixed cost component to recognise there is an underlying level of damage that occurs simply because there is an outage, with the damage building over the duration of the outage.

This way of costing customer shortages would lend itself to the screening curve approach for the optimal mix of meeting demand. We make this point because, if it was determined that the fixed costs of customer outages were higher than the fixed costs of firm capacity, then the screening curve approach would yield an optimal winter capacity margin far higher than the current level. Although, the 2012 modelling could well yield a similarly higher capacity margin if its inputs were simply updated.

3.2 Today's market does not match 2012 input assumptions

To highlight the extent to which the input assumptions that underpin the current winter capacity margin (WCM) are out of date, the generation assumptions include Southdown and Otahuhu B. These two power stations were decommissioned in 2015. It is particularly concerning that these two stations remain in the generation assumptions as much of the generation capacity added since then has been intermittent generation. The 2012 modelling treated discrete and intermittent generation differently, and we would expect the significant change which has occurred in the ratio of discrete to intermittent generation would yield quite different outputs.

The 2012 consultation paper also offers many reasons why it should have been reviewed (Electricity Authority, 2012b). The paper asserts there was no reason to update the previous work on customer

losses, which was undertaken in 2008. Therefore, one of the fundamental input assumptions for the winter capacity margin has not been reviewed since 2008.[10]

The paper also noted, of the shortage cost curve, that:

> This curve is a key input and has a strong influence on the optimal level of the WCM. Even the early part of the curve is influential (with a WCM of 700 MW- 900 MW, the model finds that about 35 per cent to 40 per cent of shortage costs arise from the first 200 MW of instantaneous reserve shortfall, which is priced at just $2,420-4,840/MWh).

Given how sensitive the optimal level of winter capacity margin is to the input costs, we would expect reviews every year.

3.3 Importance attached to reliability increasing

The importance that New Zealanders attach to reliable supply will have increased materially since the Authority calculated its 'optimal' capacity margin 12 years ago (let alone since it last estimated the losses to consumers from outages in 2008).

The value of economic activity supported by each unit of electricity has increased significantly. Nominal GDP has increased 83 per cent, from $213 billion to $389 billion (Stats NZ Infoshare) since 2012, while over much of this period, growth in electricity demand was relatively flat. As a result, the economic value supported by electricity will likewise have increased—that is, the slope of the blue curve in Figure 4 (the economic costs of a capacity shortfall) would have increased, raising the 'optimal' capacity margin.

Furthermore, the history of the New Zealand electricity sector demonstrates the increasing importance of security of supply to consumers over time. New Zealand had electricity shortages consistently from 1939 to 1958 with significant rationing. Significant shortages, and rationing, occurred again in the 1970s. These periods of shortage were generally accepted as part of the consequence of a country rapidly electrifying.

A severe drought in 1992 led to some electricity rationing—not as severe as that incurred previously, but the result was a ministerial inquiry. The inquiry was partly due to concerns the newly corporatised Electricity Corporation of New Zealand (ECNZ) was deliberately lifting prices by causing shortages, but it was also clear the appetite for rationing in the power system was far lower now that the country had been fully electrified. ECNZ demonstrated in the inquiry that it had maintained the same security standard as the former New Zealand Electricity Department—a risk of shortage of one in 20 years on average. The inquiry identified that the appetite for security had increased and ECNZ should review the standard. In the meantime, ECNZ should operate and plan for a risk of shortage of one in 60 years on average (this was chosen because ECNZ had 60 years of inflow data).[11]

ECNZ confirmed a standard in which they would manage to the worst inflow sequence available. This was the standard applied by the successors to ECNZ (that is, Contact, Meridian, Genesis, and Mercury)

[10] Though the 2012 work applied a 10 per cent uplift in the cost functions for inflation.
[11] Inquiry by former Chief Justice, Sir Ronald Davison into the 1992 Electricity Shortage.

when energy shortages occurred in 2001, 2003, and 2008. There was some incredulity at the time, and since, that there were three one in 100-year droughts in a row. However, the periods of 2001 and 2008 did set new boundaries for dry conditions, as have years since (2012, 2019, and 2022).[12] This history highlights that even 90 years of inflow data is a small sample and, of course, doesn't capture climate change.

In 2003, the Government's response to an obviously higher appetite for security of supply was to establish the Whirinaki reserve energy scheme and then, in 2009 (as recommended by a 2008 review), establish the Electricity Authority with a mandate to implement a hard trigger for energy conservation campaigns and the customer compensation scheme. The customer compensation scheme is a blunt instrument, applied across all retailers, but it created strong incentives for hydro operators to operate to the worst inflow sequences they could anticipate rather than the sequences they had recorded—a significantly higher security of supply standard. An explicit winter energy margin was established in 2012 in parallel to the customer compensation scheme.

The discussion above relates more to the *winter energy margin* rather than the *winter capacity margin*, as the focus of reliability concerns at the time was solving the 'dry year' problem (as discussed in section 2.1 above). However, the point is that the appetite for security is increasing over time, and governments have a keen interest in ensuring this appetite for security is reflected in industry standards and focus.

The importance consumers attach to reliable electricity will continue to escalate as electricity becomes a key element in decarbonising our energy supply. Electrification of transportation, industrial processes,[13] and new loads to support an ever-increasing digital future,[14] means electricity not only plays a more crucial role in our economy than it did 12 years ago, but its importance will continue to increase.

Finally, the relative per customer cost of achieving reliable electricity supply gets smaller as power systems get larger. The incremental costs of supply do not tend to get relatively larger, but those costs are borne over a larger base. This means that, even if consumers do not value reliability more than in the past (which they clearly do), the optimal capacity margins will still increase over time as the per-unit cost decreases.

3.4 The Authority and Transpower appear not to believe the security standards they set and apply

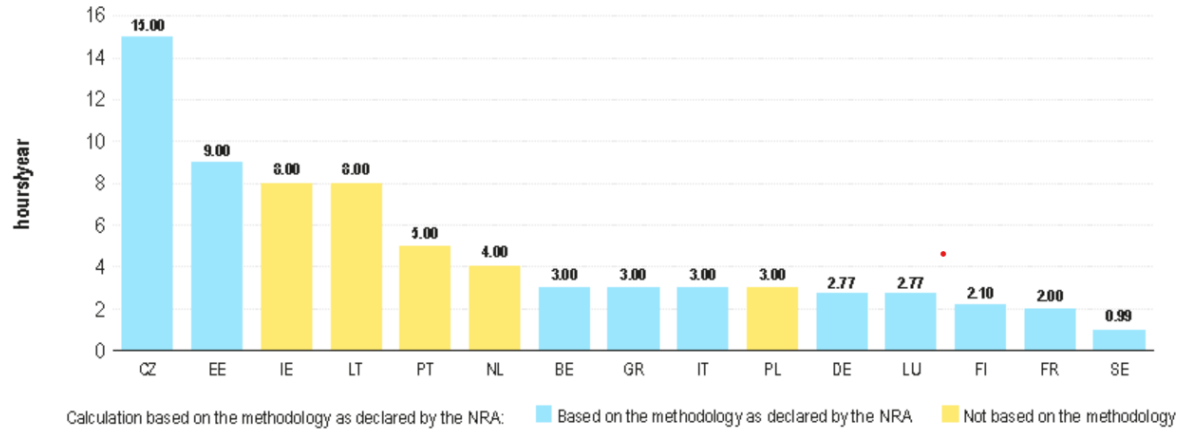
When the Authority calculated the existing standard in 2012, its cost-benefit analysis concluded that up to 22 hours per annum of energy or reserve shortfall (as a result of a capacity shortage) is

[12] 2003 was mis-specified. It wasn't particularly dry but was an overall energy shortage with low inflows, low coal stockpile and Maui nearing redetermination.
[13] See for example NZ-Steel-Media-Release_Electric-Arc-Furnace_21-May-web.pdf (nzsteel.co.nz)
[14] See for example Auckland data centres Contact gets Microsoft backing for Te Huka 3 | Energy News

economic before additional investment in peaking generation is warranted (Transpower, 2023a).[15] Such a conclusion is unlikely to be politically credible today—New Zealand political leaders, representing consumers, are more likely to echo former Australian Prime Minister Malcolm Turnbull who reportedly stated that the political tolerance for blackouts is zero (Aurora Energy Research, 2022).

By way of comparison, fifteen countries in the European Union provide an equivalent estimate (referred to in Europe as a 'loss of load expectation'). Only the Czech Republic arrives at a similar order of magnitude estimate to New Zealand, though materially lower at 15 hours compared to New Zealand's 22 hours.[16] Countries we more typically use as comparators, such as France, Italy or Netherlands, set loss of load expectations at two to four hours. Although it may cost less to achieve a given standard in Europe (depending on the scale and costs of interconnectors), this seems unlikely to explain why Europeans are estimated to value secure supply at a standard up to 11 times higher than the Authority's capacity adequacy standard assumes New Zealanders value reliable electricity (22/2 = 11).

Figure 5: European loss of load expectation in hours per year (NZ Electricity Authority assumed 22 hours)



Source: (ACER, 2022)

In practice, both Transpower and the Authority act as if they consider the current winter capacity margin as inadequate. On 9 May, Transpower made a public call for savings with the apparent approval of the Authority. This call was primarily concerned with not meeting the low residual supply, rather than not meeting peak capacity (energy plus reserve). Taking precautions to maintain a buffer over the peak is not consistent with allowing 22 hours of reserve relaxation every year. It seems that while neither Transpower nor the Authority considered the winter capacity margin as adequate, it took the events of 10 May to trigger the Authority into reviewing the capacity margin (Electricity Authority, 2024).

[15] Usually, some reserves would be forgone before curtailing load. Procuring less reserves means the system is more exposed to a contingent event risk and the consequential triggering of automatic underfrequency load shedding.

[16] The standards are not directly comparable as New Zealand's standard assessment is inconsistent with international norms.

Transpower has brought in the low residual supply measure to allow for variance in increasing intermittent generation, which might otherwise undercut N-1 peak capacity. This measure reinforces the need to review the winter capacity margin. As noted above, recognising the changing ratio of intermittency to discretionary generation in an update of the 2012 modelling would result in an increase in the winter capacity margin, and consequently highlight the poorer performance in the security of supply forecast. In short, treating an increasing proportion of intermittent generation as an operating issue has potentially masked worsening peak security.

3.5 Dynamic management of security and reliability is required

3.5.1 Little attention to resource adequacy in New Zealand relative to other electricity markets

As discussed above, the North Island winter capacity margin is New Zealand's sole resource adequacy standard for capacity. This emphasis on a single static measure (not updated for over a decade) compares unfavourably with electricity markets elsewhere, which take a much more dynamic approach to assessing and managing reliability.

Electricity markets in North America are arguably quite similar to New Zealand. For the Northeastern Power Coordination Council (NPCC), the resource adequacy standard is an average of 0.1 days (2.4 hours) of lost load per year, and Reliability First (RF) has a resource adequacy target of one day of lost load in 10 years (again 2.4 hours on average per year).[17]

Like New Zealand's winter capacity margin and winter energy margin, these are described as standards, but unlike New Zealand, they must be achieved.[18] From NPCC's Regional Reliability Reference Directory number one:

> R6 Each Reliability Coordinator shall coordinate outages and deratings of resources to verify adequate resources **will** be available to meet the forecasted demand and reserve requirements [emphasis added].

The Pennsylvania Jersey Maryland (PJM) regional transmission area relies heavily on their capacity market, but the reliability requirement influences the capacity market design, with firm capacity obligations to be met out to three years. The New York Independent System Operator (NYISO) goes further and includes mechanisms such as designating that generators which are planned to be deactivated be retained to meet their short-term assessment of reliability (STAR).

[17] NPCC and RF are regional entities with an agreement with the North American Energy Reliability Council (NERC) to oversee the management of reliability in their areas. NPCC covers the northeastern United States and southeastern Canada including New York state. RF covers the Pennsylvania Jersey Maryland (PJM) regional transmission area and market.

[18] In New Zealand, the Code does not contain tools to rectify a situation where the standard is not met.

Both system and market operators assess the security standards regularly, as does Transpower, but in the United States action is taken when resource adequacy is a problem.[19]

PJM and NYISO also do deeper analysis of security and reliability, often required by the North American Energy Reliability Council (NERC)[20] and/or NPCC/RF. For example, in response to a changing mix of generation supply, NYISO now undertakes fuel and energy security assessments which are comprehensive assessments of fuel supply risks during winter. The first was done in 2019 and a follow up report was completed in 2023. Interestingly, NYISO's concerns about the changing mix of generation were not just because of increasing renewables but also due to increasing reliance on pipeline natural gas (from increasingly cheap shale gas resources). The previous fuel mix was both more diverse and had onsite storage.

The focus on resource adequacy by PJM and NYISO could be ascribed to their need to establish the settings for their capacity markets. However, the requirements are set by NERC and the regional entities.[21] Also, although it seems obvious that an electricity market operator with a two-part market (energy and capacity) would seek to ensure its market is delivering security and reliability, it seems no less obvious that an electricity market operator with a one-part market (energy) as in New Zealand would seek to promote reliable supply.

It is useful to also compare the Electric Reliability Council of Texas (ERCOT).[22] The ERCOT market is more similar to the New Zealand market—both operate one-part (energy) markets, and both have high intermittent renewable penetration and reliance on pipeline gas supplies. We have not undertaken a detailed comparison between the North American jurisdictions, but a summary assessment seems to show less detail and analysis on security of supply for both ERCOT and the Texas Regional Entity compared to PJM, NYISO and their regional entity.

Nevertheless, since the major power outage of February 2021, ERCOT has completed further analysis and made modifications to the market.[23] In 2023, a new ancillary service was introduced for reserve plant that can provide two hours of supply when called. In addition, there have been two tranches of the Firm Fuel Supply Service where ERCOT contracts directly for firm energy supply. A key requirement

[19] An independent system operator (ISO) or regional transmission operator (RTO) under the Federal Energy Regulatory Commission (FERC) standard model has responsibilities for both system and market operation. Under the American model, an ISO/RTO makes the market rules and operates the system, aspects that fall across the Authority and Transpower in New Zealand. However, the standards themselves are set by NERC and NPCC/RF.

[20] NERC is a regulatory authority charged with assuring the effective and efficient reduction of risks to the reliability and security of the grid. It develops and enforces reliability standards; annually assesses seasonal and long-term reliability; monitors the bulk power system through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. It is subject to oversight by FERC and governmental authorities in Canada.

[21] Regional entities are contracted to NERC to discharge the regional responsibilities for reliability.

[22] While ERCOT is described as a reliability coordinator, it is the ISO for the Texas electricity market. The regional entity for Texas (under NERC) is the Texas Regional Entity.

[23] A major power outage in Texas during significant winter storms in February 2021 left at least 246 people dead. While the weather was extreme, the key problem was not the grid but the failure of generation resources—some wind generation that wasn't suitably winter-proofed, but mainly gas-powered generation that was not 'winterised' and froze up.

for firm energy supply is that there must be local fuel storage. In November of last year, Texas voters authorised a $5 billion fund to provide low-interest loans to finance new construction or upgrades to existing dispatchable electric generating facilities within the ERCOT region (Proctor, 2024).

In Texas, between the independent system operator (ERCOT) and the regional entity there is constant review of resource adequacy, transmission adequacy, operating management and coordination, and system planning covering the setting of standards, implementation, monitoring, and audit. The other North American independent system operators, regional transmission operators, regional entities, and NERC are even more active.

3.5.2 New Zealand's static standards that have not been updated

While aspects of the above are done in New Zealand, predominantly by Transpower, the list of security and reliability standards and guidelines that have not been substantially reviewed or audited since the establishment of the Authority includes:

- winter energy margin
- winter capacity margin
- grid reliability standards
- core grid determination
- technical codes
- security policy
- dispatch objective
- ancillary service settings.

Some of the activities performed by North American operators have never been done in New Zealand. For example, there is no published, independent audit of Transpower or the Authority for security and supply. This lack of an independent audit is despite previous reviews suggesting greater accountability for security and supply (Electricity Price Review Panel, 2019a).[24]

Looking at the Authority's project plans, it seems evident that it is far more comfortable being a market regulator than a regulator for security and reliability. Part of the problem is, of course, the Authority has responsibilities for security and reliability while also being the regulator. However, unless an organisation is tasked with maintaining the expertise for security and reliability from grassroots to management, which is highly technical, then it will always struggle.

Although we would not want to replicate the size of the North American reliability system (as in addition to being substantially larger than New Zealand, it has the complexity of federal and state levels), it seems advantageous to have an independent entity responsible for the oversight of security and reliability (bearing in mind that we consider that the Authority cannot be that entity as it has direct responsibilities for security and reliability).

[24] Recommendation G3, and Investigation into electricity supply interruptions of 9 August 2021- recommendation 2.

In our view, the Security and Reliability Council was supposed to play some of this role, but the arrangements for establishing the council never allowed the level of independence and resources necessary to perform the role.

4. How the Authority weighs its reliability objective is now unclear

4.1 Reliability is one of three limbs

The Authority's main objective is to "promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers" (Electricity Industry Act 2010).[25]

From recent High Court and Court of Appeal decisions, we understand that if the Authority considers that a particular measure, consistent with one of the three limbs of section 15(1) of the Act, would achieve the long-term benefit of consumers, it is entitled to pursue that measure—there is no requirement for the Authority to promote all three limbs equally (Manawa Energy Ltd v Electricity Authority, NZHC 1444 (2022), para 71).

The Act presumes all three limbs serve the long-term benefit of consumers. Any given decision by the Authority may therefore engage more than one limb and may involve trade-offs among them. In such a case, we understand the Authority must consider the impact on one limb of a decision to promote another (Nova Energy v Electricity Authority & Meridian Energy, NZCA 275 (2023), para. 35).

In 2011, the Authority published how it interpreted its statutory objective at that time. The Authority explained that it viewed "the interpretation of its statutory objective as a key strategic statement." By clarifying how it interpreted its statutory objective, the Authority expected to "assist the Authority Board to make consistent decisions, and [to] assist staff and advisory groups to develop Code amendment and market facilitation proposals" (Electricity Authority, 2011).

How the Authority weighs 'reliable supply' when considering trade-offs among the limbs of its statutory objective is now unclear. The importance of reliability to the long-term benefit of consumers will have increased since 2011 (as discussed in section 3.3 above). But the Authority has not explained how it factors into its decision-making the changing importance of each limb in serving the long-term benefit of consumers.

Presumably, an interpretation of its objective is still needed to "assist the Authority Board to make consistent decisions." The Authority announced several years ago that it intended to review its interpretation, but that work seems not to have progressed.[26] Rather than update its interpretation document, the Authority recently added a warning in bold red ink to the front page of its

[25] The Authority has an additional objective to protect the interests of domestic consumers and small business consumers in relation to the supply of electricity to those consumers. This additional objective applies only to the Authority's activities in relation to the dealings of industry participants with domestic consumers and small business consumers, and hence does not appear relevant to achieving reliability.

[26] The Authority advised in its Strategy Development paper in 2020 that "there is clear support from stakeholders for us to review our interpretation of our statutory objective, especially given the length of time that has elapsed since the original interpretation was released. We intend to commence this review in the 2020-21 Financial Year." From https://eacorpsitelegacy.z8.web.core.windows.net/assets/dms-assets/27/27030Strategy-development-Final-strategy-discussion-paper.pdf

interpretation document. This notice warns readers that the Authority has not updated how it interprets its statutory objective following Parliament amending its objective with effect from December 2022, nor has the Authority reviewed the document to ensure it is consistent with the guidance provided by the courts.

4.2 Focus seems to have shifted from the Authority's statutory objective

Until 2020, the Authority's corporate documents centred its strategy and operations on its statutory objective. For example, the Authority's Statement of Intent 2014-2018 begins:

> The Electricity Authority was formed on 1 November 2010 to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.

The Authority's Chair in its Statement of Performance Expectations 2017/18 says:

> We are driven by section 15 of the Electricity Industry Act, which requires the Authority to promote competition in, reliable supply by, and the efficient operation of the electricity industry for the long-term benefit of consumers.

However, by 2020 the Authority had undertaken a 'strategic reset.' The Authority advised that it was now focused on five key sector ambitions, supported by five key strategic capabilities 'in which we will invest for success.' These five key sector ambitions on which it would focus, and the key strategic capabilities it would develop are as follows:

Table 1: Authority's key sector ambitions and strategic capabilities

Sector ambitions	Strategic capabilities
• **We want *consumer centricity* to guide regulation and the industry** • **We want *low-emission energy* to electrify the economy** • **We want to build *trust and confidence* in the industry for all stakeholders** • **We want to see *thriving competition* delivering better outcomes for New Zealanders** • **We want to see *innovation flourishing***	• Listening and empathy • Purposeful connection • Inspired culture • Transformative mindset • Impactful delivery

Source: (Electricity Authority, 2020a, p. 2) emphasis in original.

Notably, the reliability and efficient operation limbs of its statutory objective are not mentioned within its key sector ambitions, and its strategic capabilities do not include developing the expertise and experience required to monitor and assess the reliability of the electric power system.

The Authority announced that now:

> We are the kaitiaki of electricity. Our purpose is to enhance New Zealanders' lives, prosperity and environment through electricity (Electricity Authority, 2020b).

The foreword by the Chair to the Authority's Statement of Intent 2021-2025 does not lead or conclude with its statutory objective. In fact, the foreword does not mention its statutory objective at all. The Authority's documents now give prominence to being the kaitiaki of electricity, with a purpose to enhance lives, prosperity and the environment.

It is not clear how the Authority derived this purpose from its statutory objective, which does not mention enhancing the environment but does require it to promote reliable supply. Facilitating the transition to a low-emissions economy, which the Authority now maintains is a key strategic objective (Electricity Authority, 2023c), is not one of the three limbs of the Authority's statutory objective (though an efficient transition may contribute indirectly to one or more of the limbs).

The Electricity Price Review considered whether the Authority's objectives should be extended to include environmental goals. It concluded that adding to the Authority's:

> …existing objectives could pull them in too many directions, require difficult trade-offs between competing objectives and blur their accountability. This is the very reason the Authority's statutory objectives were narrowed as a result of the 2009 review (Electricity Price Review Panel, 2019b).

How the Authority might trade off advancing its key strategic ambition against its statutory requirement to promote reliable supply is not explained in any document we could locate.

Similarly, the Authority added in its current statement of intent that "we see our role as broader than electricity—we are part of the wider energy discussion" (Electricity Authority, 2021b). It is not clear what the Authority means by seeing its role as being broader than electricity and how that broader role ties to its statutory objective. This broader role the Authority envisions for itself did not seem to include taking an active stance in relation to the factors impacting the gas market and its implications for reliable electricity supply, which we discuss below.

5. Independent voice lost from the market

5.1 The Authority may have compromised its independence

There are two main reasons for delegating regulatory or quasi-regulatory powers from Parliament to government agencies such as the Authority (Majone, 2005). These two reasons are to:

- reduce decision-making costs, for example by taking advantage of agency expertise
- enhance the credibility of long-term policy commitments.

Each of these motivations for delegating decisions share a number of common features. In both cases, Parliament remains interested in the competence of the entity making the decision and in the costs of the decision process. However, the two motivations require quite different governance structures.

Where the purpose of the delegation is to reduce decision-making costs, the key problem addressed in the governance design is ensuring that the agent makes decisions that represent the preferences of the delegating principal. Hence the governance arrangement contains various controls that *align* as much as possible the preferences of the agent with the principal. For example, a core government department such as MBIE is expected to implement and support government policy decisions.

The situation is very different if the main reason for delegating the decisions is to enhance credibility of long-term policy commitments, which is necessary to support investment decisions in long-lived assets such as electricity generation and electrification. Where this is the objective, the policy preferences of the party to which decisions are delegated, with its focus on the long-term objectives, may differ from the short-run preferences of the delegating principal. This is why, for example, central bankers are independent from ministers, because otherwise the long-term policy commitment to maintaining low inflation would be overruled for short-term political imperatives (Rogoff, 1985).

Independence of a regulator is therefore a means for achieving higher-level objectives, which in the case of the Authority are specified in its statutory objectives to promote competition in, reliable supply by, and the efficient operation of the electricity industry for the long-term benefit of consumers. These policy objectives are at risk in circumstances where a government's short-run objectives may conflict with its long-term commitments. Without a binding commitment to the long-term policy, the government may use its discretion to switch to what appears a better policy politically (in the short-term). Scarcity pricing provides a strong example of the conflict between short-term political objectives (keeping prices as low as possible) and the long-run objective of ensuring security of supply.

To avoid these long-run costs, decisions by an electricity regulator that impact on pricing and investment must be free from direction or influence of political interests. This is why the former Electricity Commission (which was subject to government direction via frequently amended government policy statements) was abolished and replaced by an independent Electricity Authority. In recent years, the intent of Parliament in establishing the Authority as independent of government appears to have been forgotten by the Authority.

In its response to a letter of expectations from Minister Woods in 2022, for example, the Authority repeated its view that its purpose is to enhance New Zealanders' lives, prosperity and the environment through electricity, and that the breadth of its purpose reflects the broader social and economic framework within which it operates. It then advised the minister:

> We note the government's focus, to be reflected in the forthcoming energy strategy, is a just transition to net zero carbon emissions by 2050, while building a more productive, sustainable and inclusive economy…
>
> The Authority is well-placed to align with the government's priorities… (Electricity Authority, 2022a).

The Authority is not a core government department—its job is not to align with the government's priorities. Parliament stipulated that the Authority's main objective is to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers. It must pursue those objectives even if they do not align with the government's priorities— that is why it is independent, so that it can promote these long-term benefits to consumers even if that conflicts with the government's short-term priorities.

Where the Authority refers to its statutory objective, it is now often somewhat perfunctory rather than a test of its intervention. For example, in its consultation paper on distribution pricing, the Authority refers to its statutory objective, however the focus of the paper is stated as follows:

> "This paper discusses the regulatory settings for distribution pricing and how to ensure they support the shift to a low emissions future at the least cost to consumers" (Electricity Authority, 2023d).

The only reference to reliable supply, in a document that affects the pricing incentives for those that would directly interact with the power system, was to acknowledge in two places that reliable supply is part of its statutory objective. It is for Parliament to direct the Authority, by amending its statutory objective, to include an emissions reduction or environmental element directly into its objective if the government wants the Authority to pursue these objectives in addition to, or instead of, its current objectives.

5.2 Blinkered view of impending failure of gas market

On 8 May 2024, the day prior to Transpower requesting consumers reduce electricity demand, the Gas Industry Company released figures showing a 12.5 per cent reduction in gas production during 2023, and a 27.8 per cent reduction in gas production in the first three months of this year beyond what was projected (Gas Industry Co., 2024). The Gas Industry Company advised that insufficient gas was available to meet contracted demand, and it expected gas supplies to be constrained throughout the decade.

The Authority was warned in 2021, 2022, 2023, and 2024 that the government's interventions were damaging the gas market with severe implications for security of supply in electricity (Contact Energy, 2021; Electricity Authority, 2021a; Energy Link, 2021; Energy News, 2022a, 2022b; Gas Industry Co., 2021, 2023; Mercury Energy, 2022; Meridian Energy, 2021; Stephens, 2021). In the final conclusions of the Market Competition Review 2022, the Authority accepted that gas market uncertainty was

affecting the electricity market. It made recommendations to MBIE that the gas strategy be prioritised. There was no mention of the council of regulators being the solution, which was MBIE's response to the Electricity Price Review recommendation in relation to the potential impact on electricity reliability of disruptions in the gas market.

There seems to be two possible explanations for the Authority's seemingly inactive response to the developing risks of gas supply when the consensus among industry commentators was increasing concern:

- The Authority gives little weight to the link between poorly conceived regulatory interventions and investment incentives.
- The Authority felt obligated to support the policies of the government rather than express an independent view.

We consider each of these possibilities in turn.

Achieving clarity of the policy objectives and stability in the instruments used to achieve those goals has long been accepted in the economics literature as critical for performance in capital intensive sectors such as gas and electricity (see for example Spiller & Vogelsang, 1997; Levy & Spiller, 1994; Spiller, 1993). Assets deployed in these sectors embody the economic and regulatory conditions at the time of construction, hence inappropriate investment decisions due to poor regulatory policy settings or signals may go on influencing the efficiency and effectiveness of the sector for long periods after initial construction. If construction is delayed or abandoned, because of regulatory uncertainty, the costs are greater still because consumers may be denied services for which they would have been willing to pay. In short, behaviour and incentives will not be modified in ways that improve welfare unless policies are credible and predictable.

The electricity and gas sectors are particularly vulnerable to behavioural uncertainty by regulators because of three particular factors:

- Technology is characterised by large, specific, fixed investment, providing regulators and political stakeholders considerable leeway to act opportunistically.
- The entire population consumes electricity services and hence politicians and interest groups are sensitive to price and service levels.
- The services are a focal point for individuals and groups concerned with climate change and emissions.

These characteristics mean governments face strong incentives to adopt short-run policies that may harm its long-run policy. In the absence of a safeguard against regulatory actions that undermine investment, businesses subject to intervention will protect themselves from this risk by under-investing. Investment that does occur will require higher rates-of-return or will be undertaken from entities well connected politically. Sustained underinvestment will imply higher costs in the future and/or potentially capacity constraints and other symptoms of deterioration in service levels.

These effects are so well established in the literature, and were so evidently occurring in the gas sector, in significant part due to government interventions (for example, its ban on off-shore exploration), it is difficult to conceive that the Authority is unfamiliar with the research. Such a conclusion would be alarming in relation to a regulator responsible for the electricity market.

A more plausible explanation is that the Authority thought it should support government policy, or at least not be vocal in pointing out the implications of that policy for promoting its statutory objectives in the electricity sector. That is, the Authority lost its independent voice.

5.3 Muting the Security and Reliability Council

The Electricity Industry Act 2010 (sec 20) requires there to be a Security and Reliability Council (SRC). The Act specifies the function of the SRC is to provide independent advice to the Authority on:

- the performance of the electricity system and the system operator
- reliability of supply issues.

The Act provides for the SRC to determine its own procedure, subject to the Act and the advisory group charter established by the Authority. The Authority's Working Group Charter, updated in December 2023, outlines the basis of how the SRC should work and interact with the Authority. Appropriately, the Charter recognises that the SRC will provide advice on any matters it considers relevant and necessary to fulfil its statutory function. The Charter provides for the Authority to require the SRC to examine certain issues (Electricity Authority, 2023a).

However, the Authority has also issued a terms of reference for the SRC (Electricity Authority, n.d.), which subordinates the SRC to the Authority. The terms set out to do the following:

- Define the matters on which the SRC is to provide advice (paragraph 10.2) culminating in "any other matters that the Authority considers to be within the function of the SRC as set out in the Act."
- Make the SRC's procedures subject to "these terms of reference," whereas the Act stipulates the SRC is to determine its procedures subject only to the Act and the Charter.
- The terms of reference expand the role of the Authority as secretariat to include scheduling meetings and proposing the agenda for each meeting—via the Charter, the Authority appoints itself as the secretariat and appoints a staff member as the Authority's 'representative' to attend SRC meetings.

There is also an implicit problem in the Act and the Charter where the role of the SRC is only to provide advice to the Authority. An improvement would be for the SRC to be required to publicly publish any concerns it has with power system and system operator performance, and supply reliability. Neither the Act nor the Charter prohibit this, but we are not aware of any public commentary by the SRC on recent supply issues.[27]

The material that is published by the SRC seems remarkably sedate. For example, SRC periodically updates a risk register and this is included in the meeting paper zip file. The latest version available when writing this paper was October 2023 and simply listed a "persistent risk" being "P2: Gas supply running down (in part due to exploration uncertainty) reduces generation adequacy and availability." This risk was blandly noted amongst a host of other issues, such as the Tree Regulations.[28]

[27] Minutes of SRC meetings are published but the SRC seems to be rarely referenced in any other reports.
[28] SRC meeting papers - 26 October 2023.zip

In subordinating the SRC to the Authority, the Authority has muzzled the only check on accountability of the Authority and the system operator. This accountability was determined to be a problem in the review of the 9 August 2021 load shedding, and that review's recommendations do not appear to have been adequately addressed by the Authority (MBIE, 2021).[29]

5.4 Reluctant to hold system operator to account

The Authority's lack of emphasis on security of supply seems evident in its tacit acceptance of a prima facie rule breach by the system operator concerning residual supply.

Clause 8.11(3) of the Code outlines what the policy statement must include:

> "A policy statement must include—
>
> (a) the policies and means that the system operator considers appropriate for the system operator to observe in complying with its principal performance obligations; and
>
> (e) the policies and means by which scheduling and dispatch are adjusted to meet the dispatch objective, and must include the provision of a dispatch process statement. The dispatch process statement must contain the details of the processes that enable the system operator to meet the dispatch objective, including the methodologies to be used by the system operator for planning to meet the dispatch objective during the period leading up to real time and meeting the dispatch objective in real time…"

The system operator uses a low residual band to influence scheduling and dispatch. It clearly believes that the low residual band is a necessary means to meet its principal performance obligations (Transpower, 2023b). However, the low residual band is not in the policy statement. The policy thereby escapes the rigour of oversight that changes to the policy statement should be subject to. This seems to be a worrying lax in both the management of security and reliability, and accountability that the Authority appears to be taking less seriously than it should.

After the load shedding of 21 August 2021, the Hodgson review recommended that system operator accountability be reviewed. Nothing meaningful was implemented.

5.5 Recommendations from the Electricity Price Review on security not followed through

Recommendation G2 from the Electricity Price Review was to examine the security and resilience of the electricity system:

> "The Electricity Authority should commission the Security and Reliability Council to examine the potential impact of technological advances and other changes on the long-term security and resilience of the country's electricity supply. The Council should interpret resilience and reliability broadly, taking into account developments throughout the electricity supply chain. It should draw on relevant reports written here and overseas to avoid duplication of effort… The Council should complete its work within 12 months,

[29] P.2 Recommendation 2

having been given sufficient resources, including access to specialist advice and analysis, to carry out the task."

Source: (Electricity Price Review Panel, 2019a)

It appears the Security and Reliability Council (SRC) gave some consideration to the possible scope of such a review, with one paper identifying potential issues (Security and Reliability Council, 2019, 2020; Security and Reliability Council Electricity Authority, 2019). However, the Authority did not ask the SRC for advice and the SRC did not continue with its initiative. MBIE decided that all that was needed was more coordination through a council of energy regulators and marked that action as completed.[30]

The Authority did eventually initiate the Future Security and Reliability project, but gave that project to Transpower for transmission—the Authority is supposedly looking at distribution itself, however its scope does not comprehensively consider externalities.

In summary, the Authority was established by Parliament as an independent regulator so that it would promote competition, reliability, and efficient operation of the electricity sector, even when doing so conflicts with short-term political objectives. The Act assumes that promoting these objectives will be in the long-term interest of consumers.

The Authority appears to have lost sight of the reason for its independence and has sought to align its priorities with the government of the day's priorities. It has constrained and muted the Security and Reliability Council.

[30] Implementing the Electricity Price Review: Dashboard (MBIE, 2024), recommendation: Explore new institutional arrangements for policy and regulation.

6. Recommendation

In our view, the problems identified above have led to adverse outcomes in the electricity industry to the detriment of consumers. We consider that an independent entity, which is adequately resourced, and is responsible for monitoring all aspects of reliability, security, and resilience is necessary to meet security of supply to the level wanted by consumers of electricity. We also believe this would make it easier for the Authority to meet its statutory objective.

Ideally, this outcome would have been ensured through the Electricity Industry Act 2010 through, for example, being explicit that the Authority may not direct the SRC in its workplan or investigations, and that the SRC charter may not impede the SRC from discharging its legislated role.

However, we consider that the SRC can still perform the required role through rewriting the Authority/SRC charter. To do this, the charter must make it clear that:

- the SRC must act independently of the Authority
- the SRC may consider any aspect of the electric power system and any upstream supply chains that it reasonably considers may impact reliability, security, or resilience, prioritised by impact on the New Zealand economy
- the SRC's considerations are not limited to the Authority's jurisdiction and may include, for example, aspects normally covered by the Commerce Commission, MBIE's Energy Safety Service, or other regulators
- any recommendations by external reviews to the SRC must go to the SRC and not the Authority
- the SRC may commission its own studies
- the SRC must regularly review the damage to electricity consumers and the economy from power supply failures, and the security of supply standards including monitoring those standards using a range of techniques
- the SRC may, through a suitable planning process, require an independent audit of Transpower in any aspect of its function as system operator
- the SRC may make recommendations for rule changes to the Authority, or comment on the Authority's own rule changes, that the Authority must duly consider
- the SRC may make public comment, and must publish its final reports, under its own name.

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Appendix A Analysis of peak consumption trends following RCPD removal

Peak consumption increased following the removal of RCPD

Comparing the 300 peak consumption trading periods each year from 2019 and 2023 shows a significant increase in national peak consumption in the two years following the removal of the RCPD (Figure 6).

The trend in the graph indicates that the highest electricity consumption periods have generally increased over the years, with 2023 having the highest consumption levels, followed by 2022, 2021, 2020, and then 2019. This suggests a trend of increasing peak electricity consumption over the observed period.

Figure 6: Top 300 national consumption trading periods each year between 2019 and 2023.

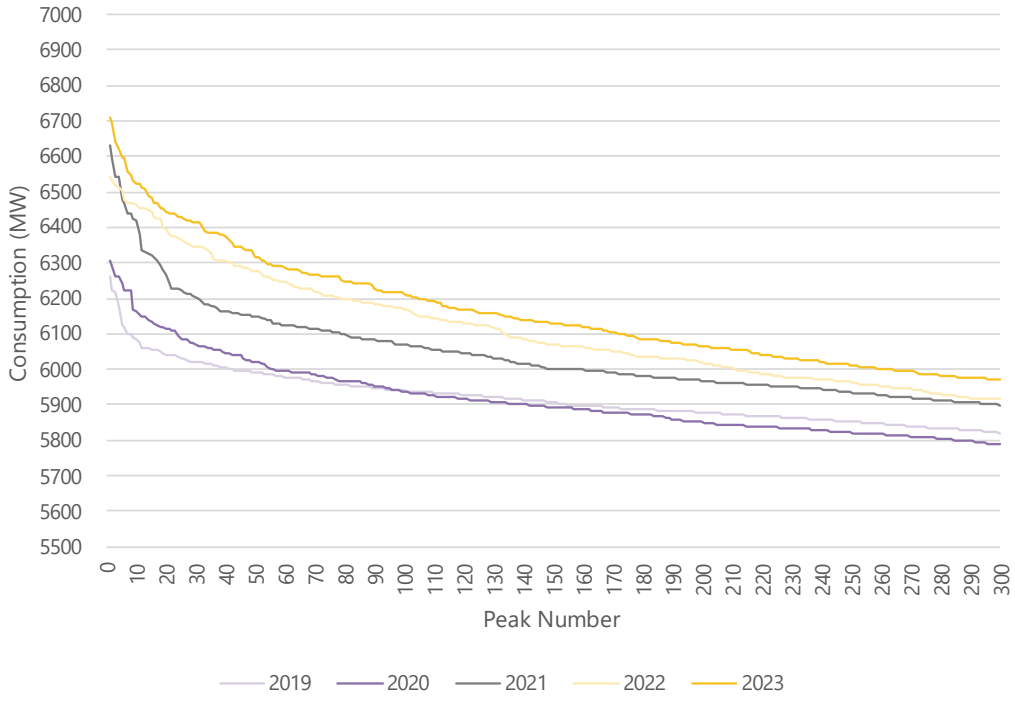


Figure 7 shows the same 300 peak consumption trading periods each year as a box plot. The horizontal line within each box indicates the median and the 'x' marks the average of the 300 trading periods.

Over the five-year period, the data highlights a general increase in both the average and median peak consumption (see Table 2), with a noticeable widening of the interquartile range (the shaded box in the plot) and an increase in the upper whisker boundary (the largest data value that is within 1.5 IQR above the third quartile), in the post-RCPD years.

This growing variability in demand indicates a shift in consumer behaviour following the removal of the RCPD towards higher demand during peak consumption trading periods, which is likely to increase the occurrence of low residual situations.

Figure 7: Box plot illustrating the distribution of the top 300 national consumption trading periods annually from 2019 to 2023

Note: The cross on each box is the average of the top 300 trading periods each year

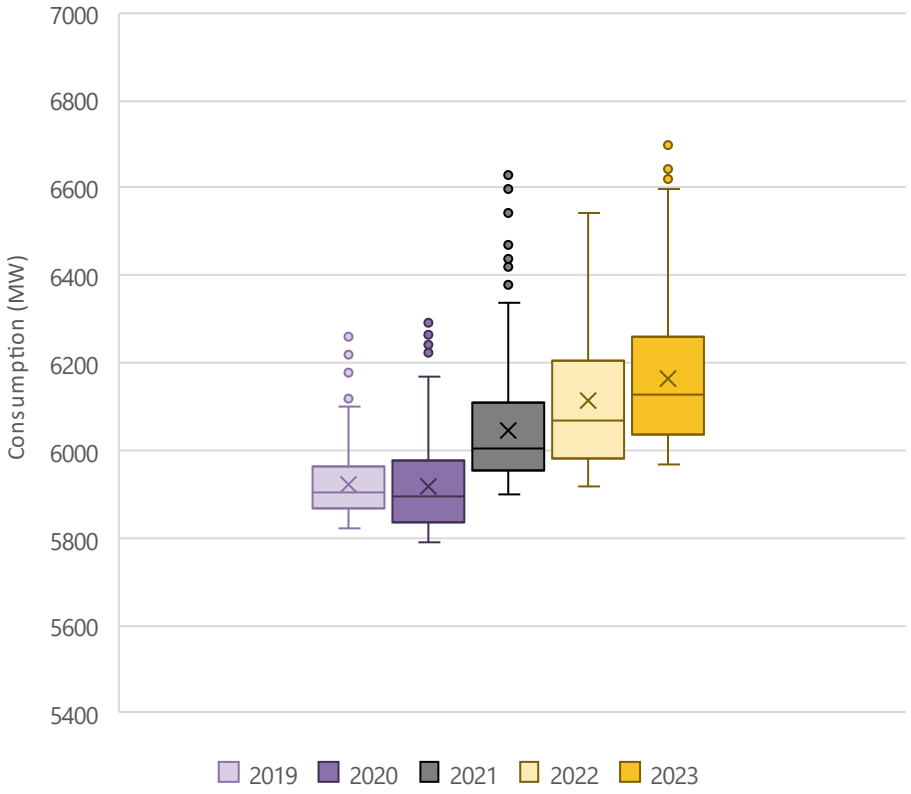


Table 2: Average and median consumption for the top 300 trading periods each year between 2019 and 2023.

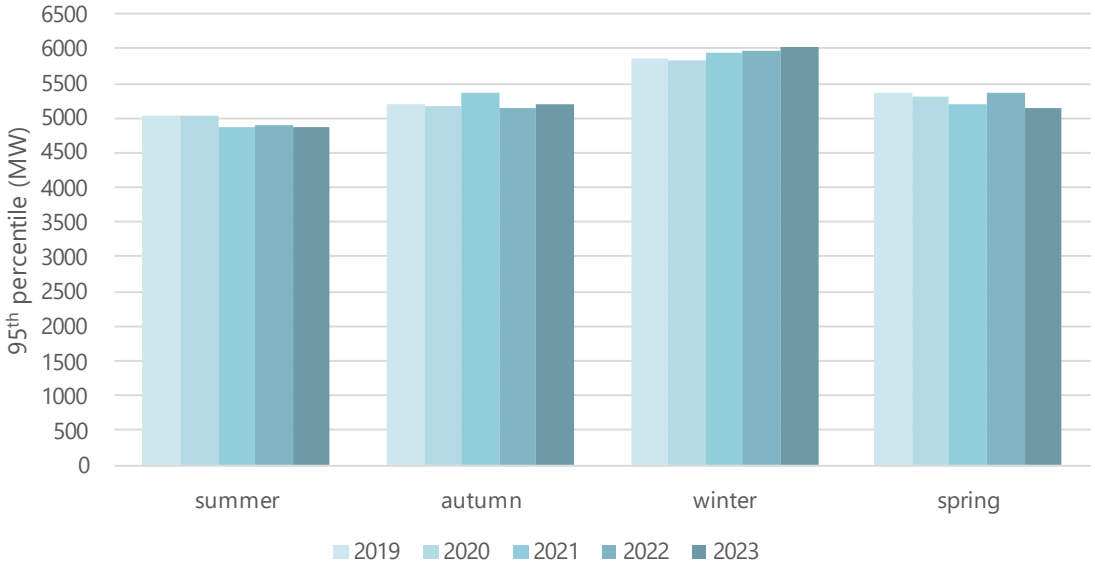
Year	Average (MW)	Median (MW)
2019	5921.0	5905.6
2020	5918.9	5893.2
2021	6044.6	6002.3
2022	6112.6	6068.0
2023	6165.2	6128.6

Peak consumption is most common during winter

Unsurprisingly, peak consumption occurred during the winter months. On average, 92 per cent of the top 300 peaks each year occurred during winter. Figure 8 below shows the 95th percentile of trading period peaks during each season over the five years.

Looking specifically at peak trading periods during winter (6am to 9am and 5pm to 8pm) we found that trading period peak consumption during the post-RCPD winters surpassed the 95th percentile of RCPD winter consumption 15.1 per cent of the time. This signifies a substantial increase in peak consumption when the RCPD was removed. Performing a proportion test confirms that this is a statistically significant increase. On average, the 95th percentile of peak consumption during peak trading periods in winter post-RCPD is 121 MW higher than during the RCPD winters.

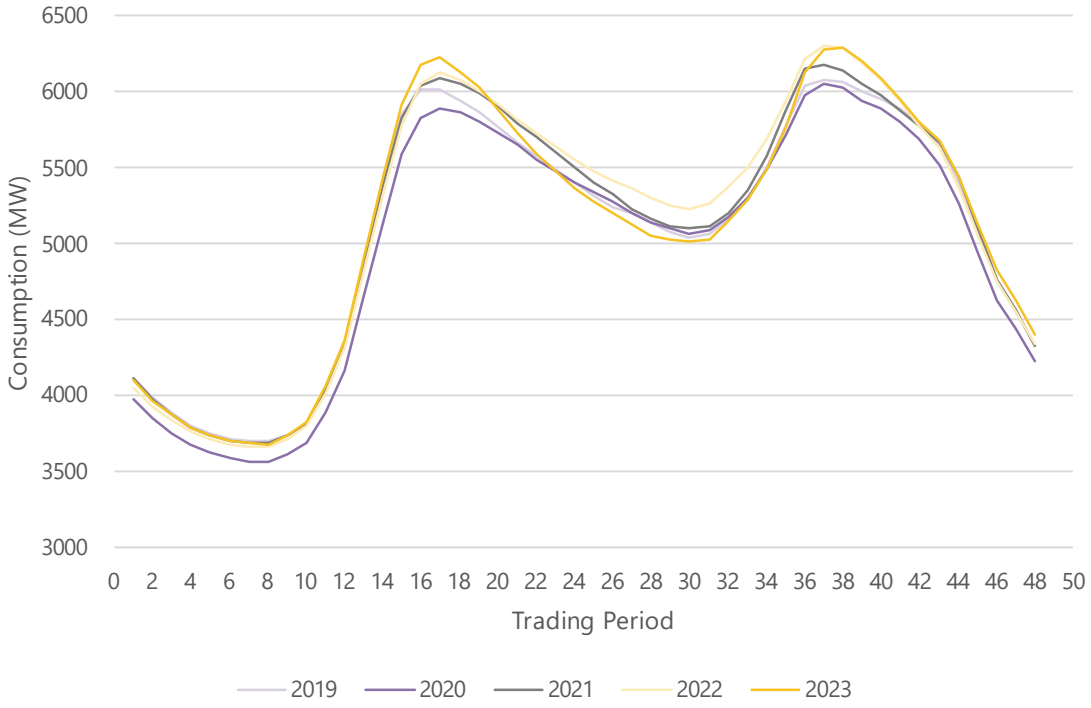
Figure 8: Column graph showing the seasonal 95th percentile of national trading period consumption from 2019 to 2023



Daily consumption peaks are also higher

Figure 9 shows the top 20 daily maximum consumption trading periods nationally each year between 2019 and 2023, normalised to daily total consumption in 2023. The figure confirms the findings from the Electricity Authority's 2023 report (Electricity Authority, 2023f) that peak consumption was higher after the RCPD was removed. The evening peak for 2022 and 2023 is higher than in 2019, 2020, and 2021. The morning peak in 2023 is also higher than previous years.

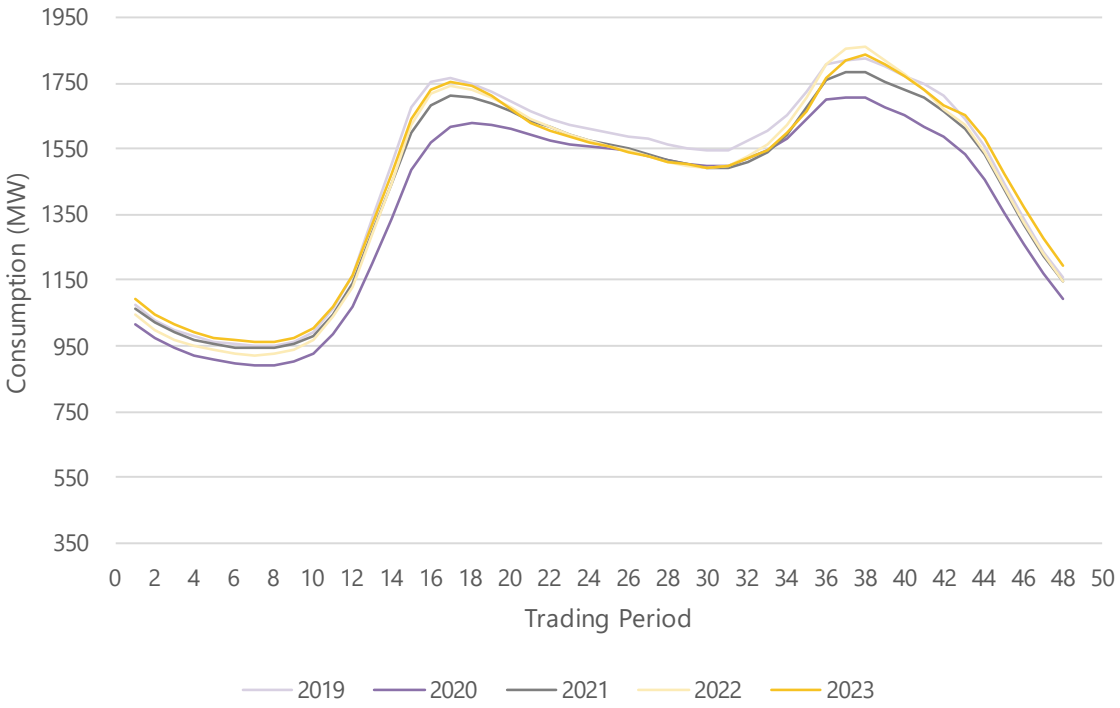
Figure 9: Annual top 20 daily max national consumption trading periods between 2019 and 2023 normalised to 2023



The graphs below show the top 20 daily consumption trading periods by region. All regions, apart from the Central North Island region show a similar trend to the national daily consumption, indicating that these regions are all contributing the national peaks. The Central North Island region showed higher peaks in 2022 but daily consumption in 2023 appears to much lower compared earlier years.

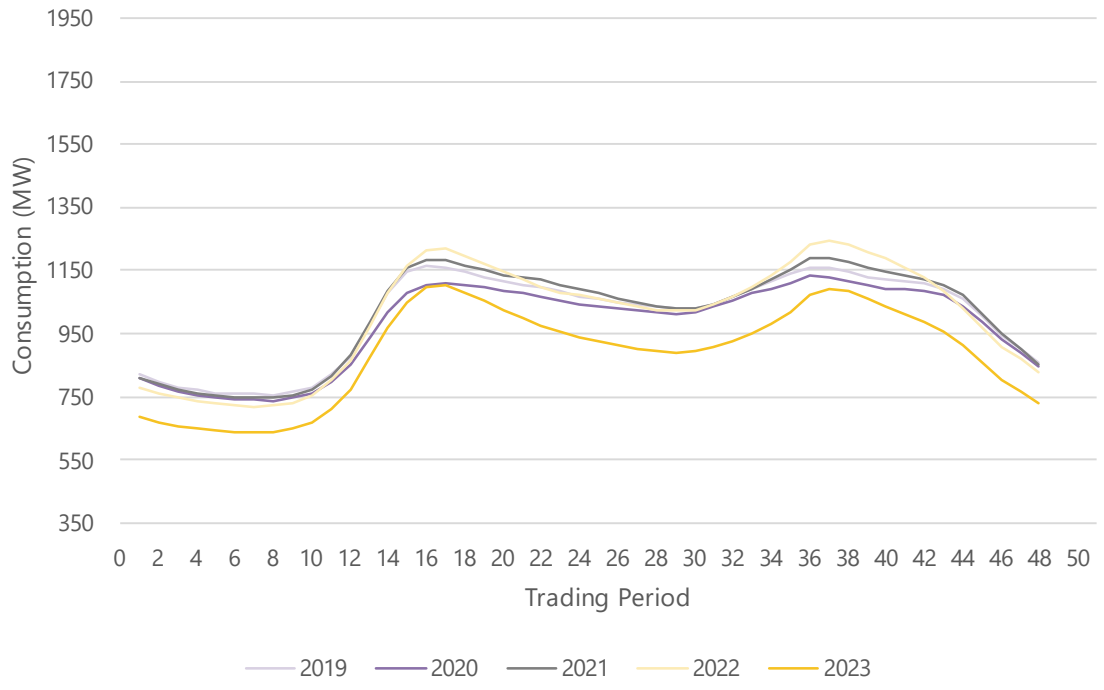
Upper North Island

Figure 10: Upper North Island annual top 20 daily max consumption trading periods between 2019 and 2023 normalised to 2023



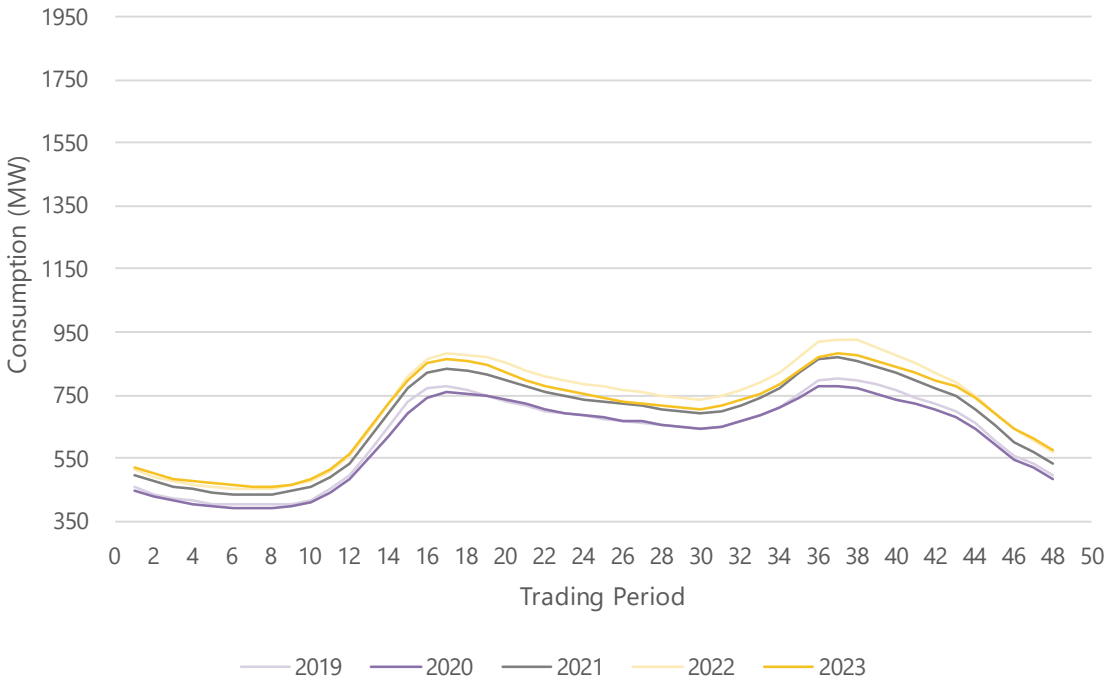
Central North Island

Figure 11: Central North Island annual top 20 daily max consumption trading periods between 2019 and 2023 normalised to 2023



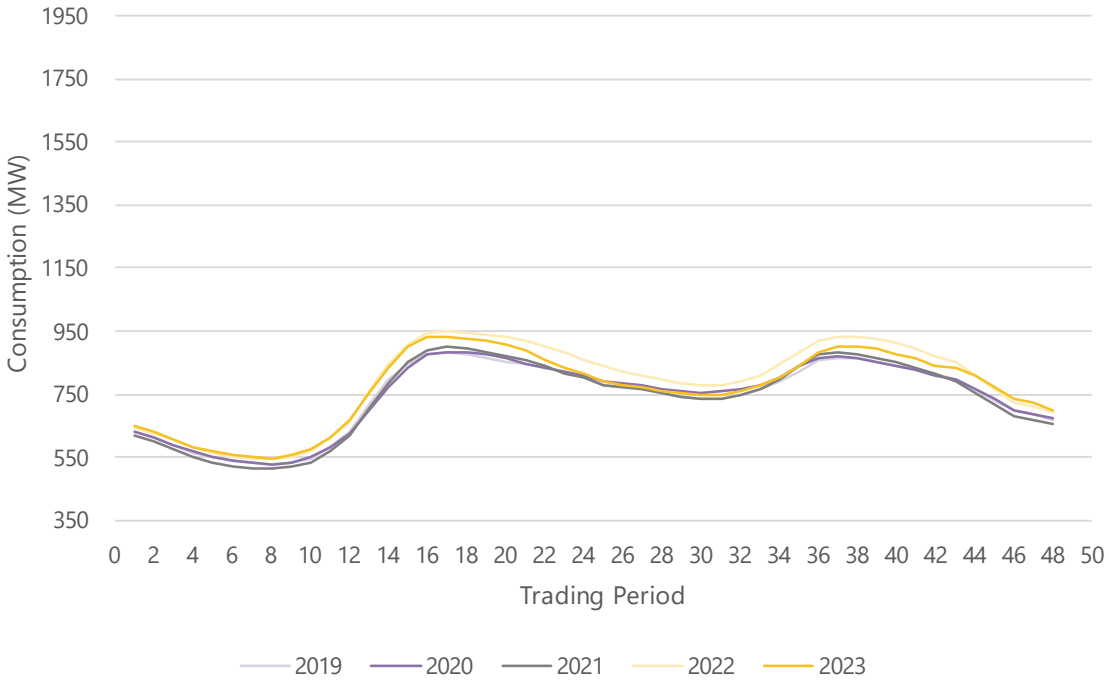
Lower North Island

Figure 12: Lower North Island annual top 20 daily max consumption trading periods between 2019 and 2023 normalised to 2023



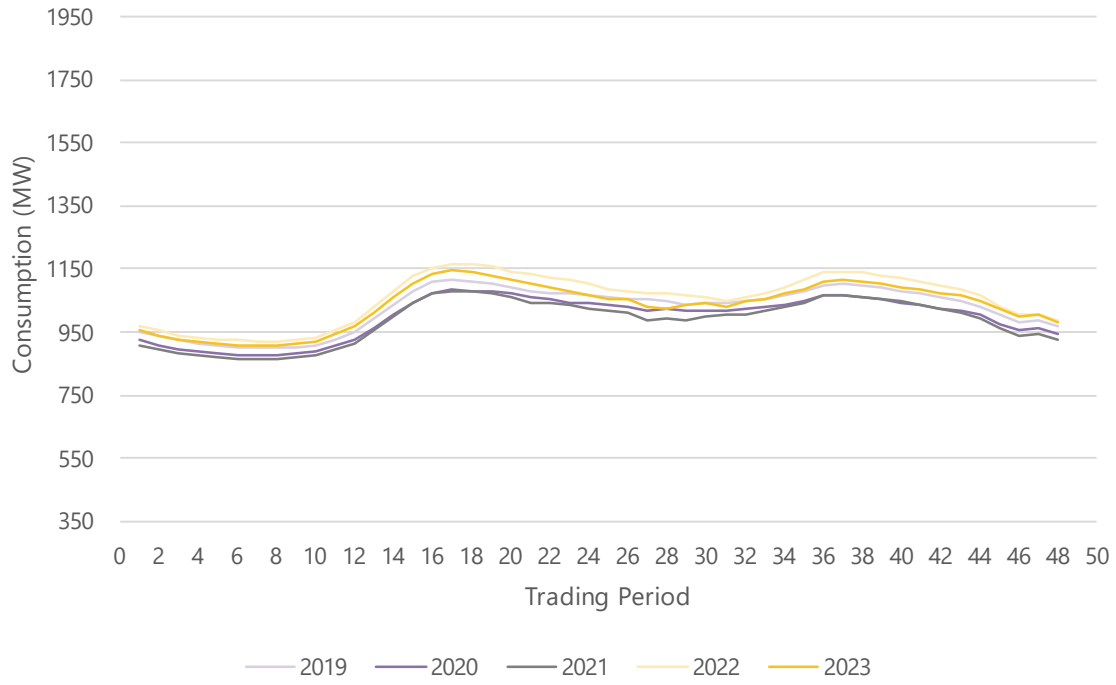
Upper South Island

Figure 13: Upper South Island annual top 20 daily max consumption trading periods between 2019 and 2023 normalised to 2023



Lower South Island

Figure 14: Lower South Island annual top 20 daily max consumption trading periods between 2019 and 2023 normalised to 2023



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