TRANSPOWER

Security of Supply Review – Winter 2025

November 2025

Contents

Transpower in its role as System Operator is responsible for providing information and forecasting on all aspects of electricity security of supply as well as managing any electricity supply emergencies. This includes publications such as the annual Security of Supply Assessment (SOSA), monthly Energy Security Outlooks, New Zealand Generation Balance (NZGB) and quarterly Security of Supply Outlooks, through to market schedules and forecasts from one week ahead through to real-time dispatch.

The Electricity Authority (Authority) sets the electricity market design and the rules and frameworks the System Operator must follow in performing its security of supply functions. These frameworks are designed to support the market to coordinate resources and maintain reliable power supply to Aotearoa New Zealand electricity consumers at all times. In other words, to prioritise a market-led approach that protects security of supply and resource adequacy.

Energy demand is the electricity need over time (i.e. across the cold winter months). New Zealand’s largest source of stored energy and electricity generation is from hydro generation. When hydro storage lakes are low our ability to meet the energy demand has a heightened risk. Ensuring we have sufficient resources to meet forecast energy demand is often referred to as “dry year risk”. Fossil-fuelled thermal generation ramps up during these dry spells to reduce this “dry year risk”, however if these thermal generators are limited (e.g. by fuel supply availability), the energy risk escalates.

Peak demand is the highest point of electricity demand on any given day. Peak demand risk occurs when there is insufficient generation online to meet the demand and reserve requirements. Meeting peak demand on the coldest winter evenings or mornings requires most electricity generators to be in service. If available generation is low, peak demand risks can occur when demand is not necessarily at its highest.

New Zealand’s electricity demand is at its highest during the cold winter months, for both energy demand and peak demand. This paper evaluates the electricity market’s coordination of security of supply over Winter 2025 against the two major challenges: energy and demand. We welcome any feedback you may have.

Winter 2025 Overview

Each winter New Zealand's highly-renewable and hydro-dominated electricity system faces two key risks: energy adequacy (the risk of running out of energy in a dry year, which is highest across the winter months when hydro inflows tend to be lower and demand is higher) and capacity adequacy (the risk of having insufficient generation available to meet demand peaks, which are typically highest on cold, still, dark winter mornings and evenings).

This Winter 2025 security of supply review evaluates the performance electricity market's coordination of resources against these two key risks over Winter 2025.

Energy demand challenge

The year began with high storage levels. However, national hydro storage levels dropped to below the 10th percentile of historical average for the time of year in March and April raising concerns about energy security going into Winter 2025. A combination of factors including record low hydro inflows into our major hydro catchments,[1] lower wind generation, thermal generator outages and insufficient thermal fuel availability to maximise thermal generation, accelerated the rate of hydro storage decline leading up to Winter 2025.

Early in the year, the System Operator signalled the need for generators to secure thermal fuel contracts. Generators responded proactively, locking in additional gas and coal supplies that buffered the system against the risk of further hydro declines. This early action ensured alternative fuel supplies were available when needed to substitute for declining hydro fuel, which helped moderate and stabilise prices through Winter 2025.

In May, hydro storage levels approached within 560 GWh of the Watch curve (which signals a 1% risk of running out of hydro storage) - the closest in recent winters - before improving later in the season when inflows arrived. With limited hydro and wind output, thermal generation (gas and coal) became essential to maintaining energy security.

As was the case in Winter 2024, demand-side responses played a pivotal role. As hydro storage levels declined, large industrial electricity users - most notably the New Zealand Aluminium Smelter (NZAS) through its contract with Meridian - curtailed load to ease pressure on hydro reserves. Methanex on-sold gas supplies to generators, shutting down its own production for seven weeks from mid-May to the end of June. The longer-term downstream effects of such material industrial demand response arrangements on the sustainability of industrial businesses operating in New Zealand, and the consequences for the wider economy, remain a concern.

In May and June strong inflows had lifted National hydro storage back to mean at the start of July. The Lower South Island Waiau catchment recovered to mean in May, in time to alleviate developing operational issues in the region. Inflows into other key South Island storage lakes took until October to lift storage above mean with inflows persisting below average until September. As we go into summer at the end of 2025, hydro storage and snowpack levels are well above average.

Winter 2025 underscored the importance of fuel diversification, and the availability of firm, dispatchable generation to substitute for hydro generation during extended dry periods (currently provided by thermal generators and contracted demand response). This depends on early contracting that supports ongoing investment and reinvestment in generation assets, and timely contracting for associated fuel supplies across thermal fuels and hydro storage. The insurance value of cross-system diversification and

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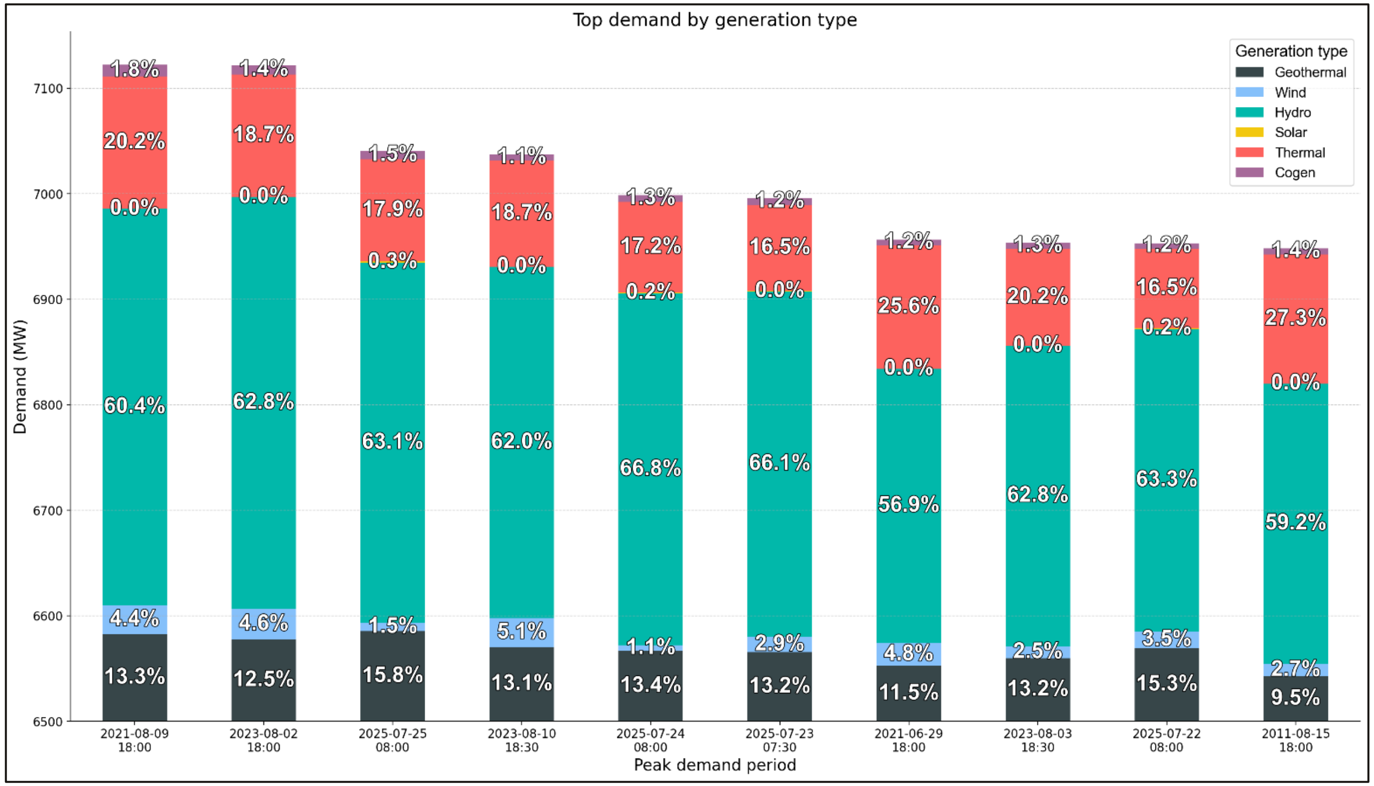
1 This includes Lakes Pukaki, Tekapo, Manapouri, Te Anau, Hawea and Taupo.

flexibility to mitigate energy supply risks is increasingly important given the risks of plant outages, changing, more volatile climate and in the context of our hydro-dependent, increasingly renewable and intermittent electricity system.

Peak demand challenge

Thermal generation played a critical role in meeting peak demand during Winter 2025 as low hydro storage heading into winter led to high thermal unit commitment. Contact Energy secured additional gas supply to ensure the Taranaki Combined Cycle (TCC) plant was operating which further helped mitigate capacity risks. As winter approached, hydro inflows improved which allowed greater amounts of hydro generation to supply the demand peaks. Wholesale prices dropped from the shoulder season into winter in-line with improving hydro storage.

Figure 1: Generation types that supplied the all-time peaks



Cold temperatures in July 2025 drove high demand peaks despite the reduced industrial load. The highest demand for the year reached 7,015 MW on 25 July, which was the third highest in New Zealand for all time. Several other top contenders occurred in the same week and can be seen in Figure 1 which shows the contribution by generation type during these highest demand periods.[2] Geothermal, hydro and thermal generation remained essential for meeting our winter peak demand periods. With historically low national storage levels going into Winter 2025, average wholesale prices were elevated but moderate relative to 2024 generally reflecting improved market co-ordination and earlier contracting to ensure firming thermal fuel supplies were available as needed. Prices were high enough to incentivise the commitment of slow-start thermal units across peak-demand periods, resulting in fewer tight capacity situations than in recent winters. Two Customer Advice Notice (CAN) for Low Residual Situations were issued this year[3]. One was before winter (24 February) and the result of reduced generation offers in the

2 Note the total in the Figure 1 also includes transmission losses which is supplied by generators.

3 A "test" low residual CAN was issued in early May. This was to test the "difference bids" submission process prior to Winter 2025.

North Island coinciding with an HVDC pole 2 outage[4]. The second was issued in late October after stormy weather temporarily disrupted multiple generation assets ahead of the morning peak.

Over the past year, additions of geothermal and solar generation strengthened New Zealand's long-term energy outlook. However, intermittent generation (such as wind and solar) continue to test short-term reliability, particularly during calm and/or overcast periods. Geothermal developments provide steady baseload generation, while the expanding share of weather-dependent renewables reinforced the critical role of flexible resources such as hydro storage, demand response, Battery Energy Storage Systems (BESS) and fast-start thermal generation to maintain system resilience as the power system decarbonises.

Batteries are emerging as a key flexible resource, but their role is still evolving, as the market arrangements adapt to incorporate their capabilities. The 100 MW Ruakaka BESS began offering into the market in July which now (together with the Rotohiko BESS) provides the grid with 130 MW of total BESS installed capacity.[5] It has been observed that New Zealand BESS currently primarily support system stability through reserves rather than directly supplying peak energy. To date we rarely see a BESS offer its full capacity whether as energy, reserves or a combination. It is recognised that this trend may change as BESS participation in the market picks up from its current relatively small base.

Outlook into 2026

The 2025 security of supply risk has eased with hydro storage recovering to above historic mean levels for the time of year across all the major catchments. In addition the Commerce Commission has recently authorised the agreements between Genesis, Contact, Meridian and Mercury that are necessary to ensure the third Huntly Rankine unit remains in the system. The agreement includes holding an initial reserve coal stockpile of at least 600 kilo-tonnes ahead of winter each year (in addition to coal stockpile Genesis holds for its own needs).[6] Mitigating security of supply risks for 2026 remains dependent on plant availability, market trading and contracting to ensure sufficient resources, including fuel, generation capacity and demand-side resources are available when needed. Below are some of the key issues when considering energy and capacity risks for 2026:

- It is critical the industry continues to focus on fuel storage and availability ahead of 2026, including across controlled hydro storage and thermal fuel arrangements. The latest Energy Security Outlook (Electricity Risk Curves (ERCs) and Simulated Storage Trajectories (SSTs)) indicates a similar level of energy risk that we saw going into the beginning of 2025 reflecting healthy stored fuel levels across hydro, gas and the coal stockpile. It also shows the importance of having three Rankine units to manage dry years by providing hydro-firming generation that is independent of constrained gas supply.
- This energy risk position reflects the forecasts and physical capability of thermal fuel supply and generation assets. The currently under review Security of Supply Forecasting and Information Policy (SOSFIP) proposes to establish another scenario where the ERCs assume only contracted thermal fuel supply, rather than the physical capability.

4 See here for further details.

5 More is expected to come online with Contact's 100 MW, 200 MWh Glenbrook BESS expected to be online in early 2026. Genesis are also building a BESS of similar size at its Huntly power station.

6 Commission authorises Gentailers' application for Strategic Energy Reserve Huntly Firming Option | Commerce Commission

- The Taranaki Combined Cycle (TCC) gas-fuelled generator is expected to close at the end of 2025. This heightens dry-year risk and winter supply challenges. Several solar and wind generation projects on the horizon are expected to commission by Winter 2026, however with no firm thermal to replace TCC, flexibility decreases.
- Having sufficient backup fuel is essential for managing energy and capacity risks, especially during extended dry periods when hydro storage is low and renewable generation is limited. The Winter 2025 review highlights that early procurement and contracting of thermal fuels allowed generators to arrest hydro storage decline. Without adequate backup fuel, the system becomes more vulnerable to supply shocks and the risk of not meeting peak demand which increases electricity spot price volatility.
- Our 2025 annual Security of Supply Assessment (SOSA) highlights that accelerating the commissioning of renewable generation is key for reducing reliance on fossil fuels and enhancing long-term energy security.[7] While new wind and solar projects have increased the share of renewables in the generation mix, the pace of development must keep up with demand growth and the retirement of thermal units. Expansion of renewables supports decarbonisation goals and helps diversify the energy supply but must be complemented by investments in firm and flexible resources to manage variability.
- Flexible resources are increasingly important for managing peak demand and balancing the variability introduced by intermittent renewables. While thermal generation plays a significant role, the system's resilience depends on the ability to quickly ramp up or down in response to sudden changes. Investment in flexible resources ensures the grid can reliably meet peak loads, respond to unexpected events, and maintain security of supply as the generation mix evolves. Flexible resources can come in the form of demand response resources, fast-start thermal plant, and BESS. The third grid-scale BESS, operated by Contact at Glenbrook, is expected to start offering energy and reserves into the market in early 2026.

[7] Security of Supply Assessment | Transpower

Typical security of supply challenges

Security of supply challenges: Energy

Thermal generation has traditionally provided additional generation during prolonged dry spells at our hydro storage catchments (i.e. when hydro lakes are low and water is conserved). For thermal generation to sustain long periods of high output market participants need to secure access to sufficient thermal fuel, largely coal and gas.

Additional coal supply can come from increased imports and draw down of existing storage, however these can have lead times of several months. Securing sufficient stockpile and imports of coal ahead of time helps reduce energy risks during periods of low renewable generation due to extended periods of low inflows and low intermittent generation. This was observed ahead of Winter 2025 with Genesis securing 630 kT of coal imports between March and September this year.[8]

Gas currently cannot be imported, and increasing its domestic production requires investment and development work that needs 12 months or more lead time. This means short term increases in supply for electricity generation can only come from drawing down stored gas or buying from other users such as petrochemical manufacturers. This became evident ahead of Winter 2025, when Contact and Genesis secured significant additional gas supply from Methanex.[9] Industry experts note that production can only increase when gas users commit to long-term supply agreements that underwrite the necessary development work. However, in recent years overall gas production has continued to decline with numerous drilling campaigns yielding little-to-no increases in gas supply.

The demand response agreements between Meridian and NZAS in 2024 and again in 2025 helped manage the energy challenge this winter, given long ramp-up timelines. Industrial shutdowns also limited demand growth, but these forms of demand destruction and significant industrial demand response are inherently short-term and should not be viewed as sustainable levers for ongoing energy security, nor a positive market outcome.

Resource consent arrangements specify that hydro contingent storage is only available to be used as a last resort, after other market resources have been exhausted. Access to contingent storage can be granted ahead of complete usage of controllable storage if either; a) the buffer is raised under the SO's buffer discretion process or b) the current Alert level calculated in the monthly Energy Security Outlook exceeds the level of available hydro storage.

The ongoing increase in renewable generation sources (wind, solar and geothermal) will reduce the dependence on gas and other fossil fuels, but there also needs to be additional firm generation and flexible resources to mitigate the uncertainty of intermittent generation. This transition is happening, but it will take time. Maintaining energy security requires generation development to happen at a faster rate than electricity demand grows and thermal backup generation declines.

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8 See coal announcement here.

9 See Methanex gas deals here and here.

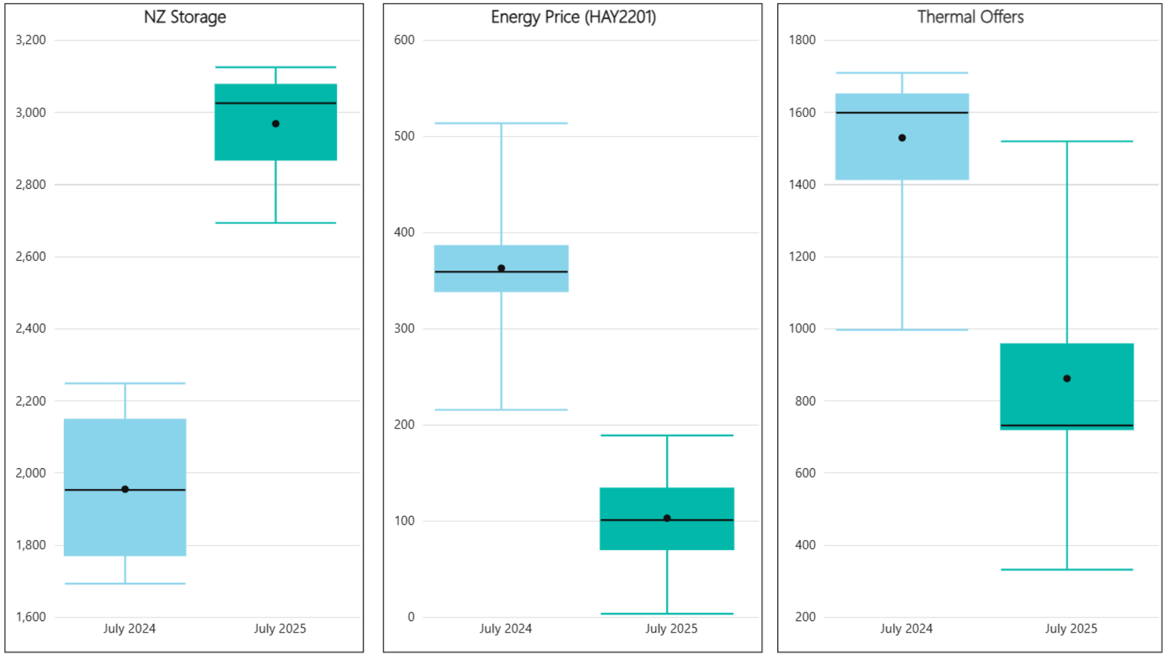
Security of supply challenges: Meeting peak demand

This challenge continues to be driven by growth in peak demand and the need for flexibility to balance intermittent renewable generation. Wind and solar generation are considered 'intermittent' because they rely on variable natural sources (i.e. the wind blowing or the sun shining). As peak demand increases, additional capacity is needed to meet it, and as intermittent generation grows, more flexible capacity is required from other sources to maintain supply when there is little or no wind or sunshine. Investment in additional capacity and flexible resources has not kept pace with demand.

Thermal commitment is less prominent in 2025 due to improved hydro conditions. Higher hydro storage levels have led to lower electricity prices, reducing the commercial viability of slow-start thermal units and resulting in fewer thermal offers into the market. Better hydro availability reduces the need for thermal unit commitment.

Figure 2 compares July 2024, when hydro storage was at record lows, with July 2025, when hydro conditions improved. It shows fewer thermal generation offers in 2025, reflecting reduced reliance on thermal units due to better hydro availability.

Figure 2: Comparison of average national storage, prices and offered thermal generation between July 2024 and 2025



Supplying energy demand through 2025 – Key observations

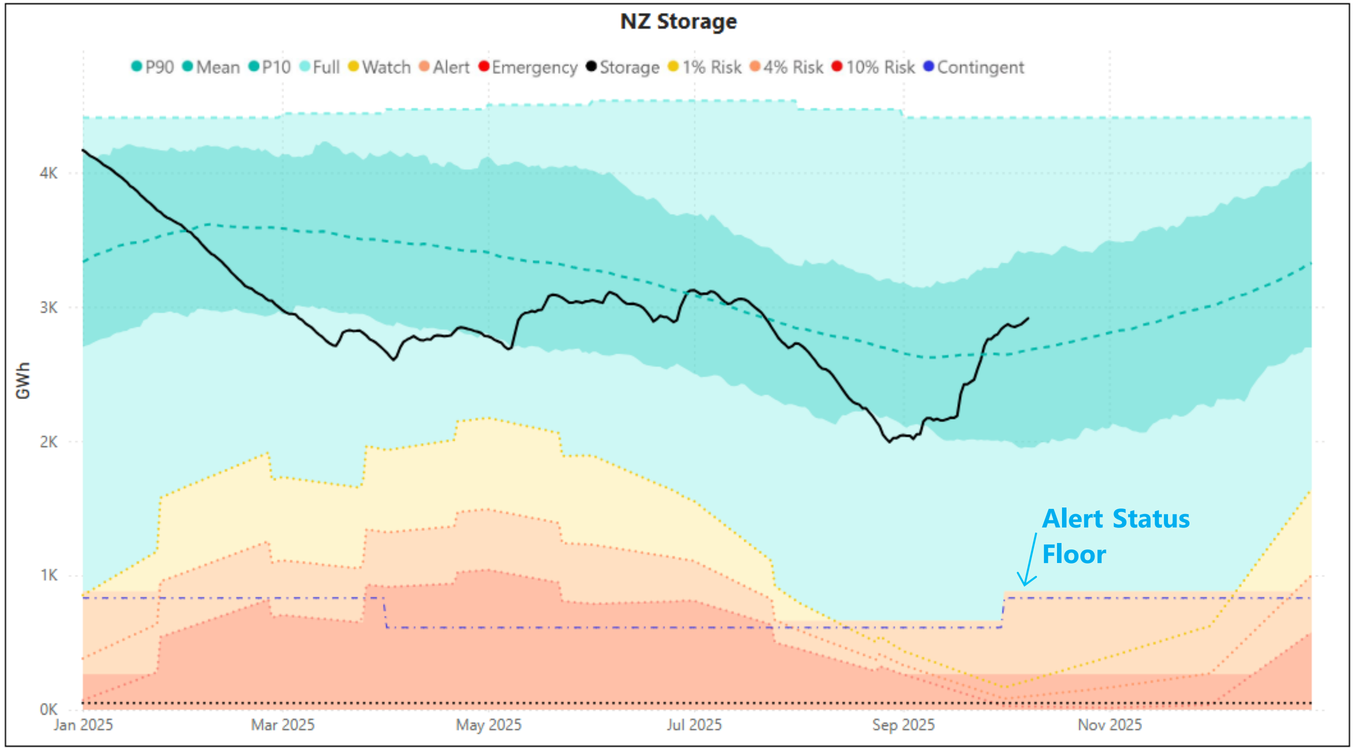
Rapid decline in hydro reservoirs called for early signalling of high energy risk

The focus on energy risk has significantly increased over the last couple of years, represented by the elevated electricity risk curves (ERCs) in Figure 3. This was largely due to the declining gas supply over the past several years – particularly since 2019 - resulting in limited fossil fuelled thermal generation capability to supplement reduced hydro generation during periods of extended low inflows. The consequent increased system exposure to energy risk was apparent as hydro storage declined rapidly over the months leading up to winter. The rapid decline was due to multiple contributing factors including record low hydro inflows, thermal plant outages, below average wind generation, constrained thermal fuel availability and high demand.

Hydrological conditions in early 2025 presented significant challenges for system energy management. From January to April, inflows into key hydro catchments were extremely low, leading to a sharp decline in storage levels. Although national hydro storage began the year at well above-average levels, it fell to historically low levels by April and May after record-low total inflows, placing pressure on generation planning heading into winter. These conditions reinforced the importance of maintaining diversified fuel sources, with the early securing of thermal fuels proving critical to maintaining energy adequacy. The experience underlined the volatility of hydro-dependent supply and the continuing need for prudent energy management strategies.

National hydro storage levels got to within 560 GWh of the Watch curve in May 2025, the closest it has been in recent winters. Figure 4 shows the cumulative inflows (in GWh) in the year to date compared to the historical mean.

Figure 3: NZ ERCs and available hydro storage in 2025



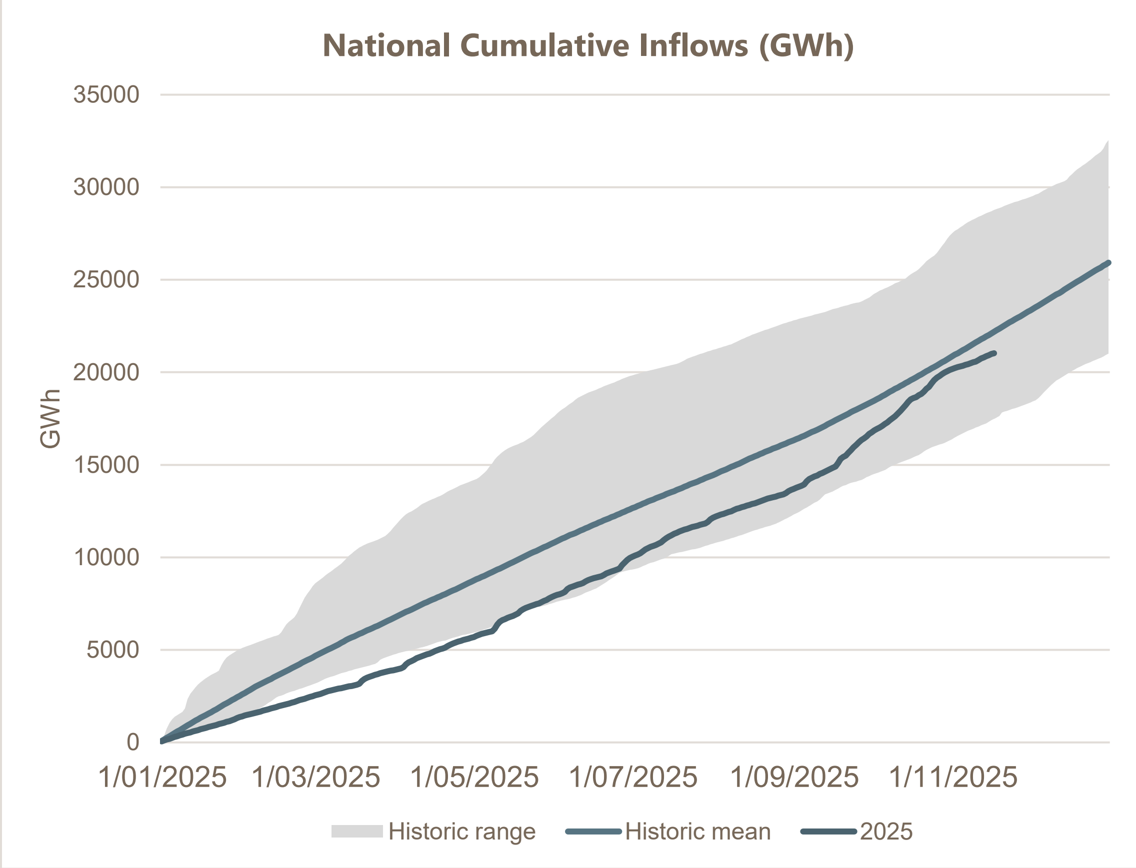
Thermal fuels were secured ahead of winter in market response to elevated risk

Gas production has continued to decline over past years with limited ability to support increased thermal generation without reduction of industrial gas demand. This year increased thermal generation was required to provide energy security, with reduced hydro inflows and wind generation. Gas and coal contracts played a crucial role in mitigating energy risk over the 2025 winter period.

Early in the year, the System Operator (SO) communicated to the market the importance of securing adequate thermal fuel supplies in anticipation of potential hydro shortages. In response, generators acted early to secure both gas and coal contracts (see Figure 5), which provided a reliable energy buffer as hydro storage levels declined.[10] This proactive approach eased supply-side tension, reduced price volatility, and supported system security through periods of low renewable generation. The early contracting of thermal fuels demonstrated effective coordination between market participants and the SO, highlighting the value of clear, timely market signalling.

However, gas production (actual and forecast) continued to decline, as reflected in both Enerlytica and MBIE forecasts.[11] This heightened concerns about decisions to be made in the next 1-3 years about the future of key gas-industry assets including OMV's Maui gas field, Methanex New Zealand and Ballance industrial operations, and the potential consequences for other gas users including generators.

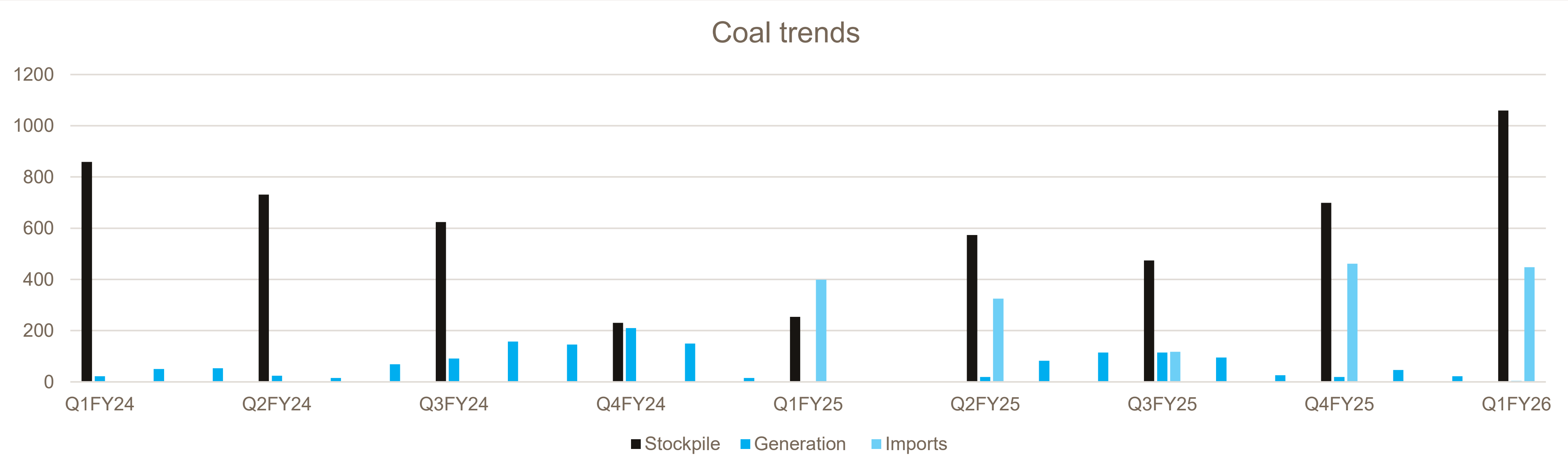
Figure 4: Cumulative inflows: 2025 versus historic mean



10 Coal stockpile is reported as at the end of each quarter according to Genesis' quarterly performance reports.

11 MBIE gas forecasts can be found in this media release on declining gas supply.

Figure 5: Operational coal stockpile and estimated imports



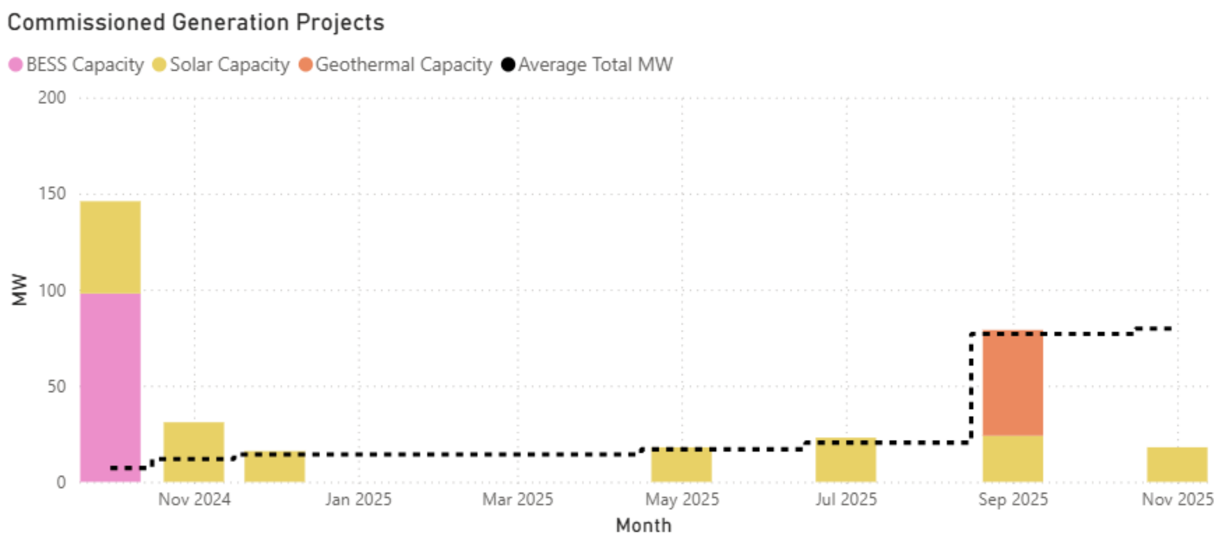
Energy security risks were compounded with volatility in increasing weather-dependent generation

Over the past 12 months, there has been substantial progress in the commissioning of new renewable generation projects, particularly wind and solar. These developments have contributed to a growing share of renewable energy in the generation mix and supported overall energy availability over longer timeframes. However, their intermittency continues to pose challenges for managing short-term supply-demand balance and meeting peak demand periods, particularly during calm or overcast conditions. The expanding renewable base underscores the importance of complementary flexible resources—such as hydro storage, demand response, and fast-start thermal generation—to ensure reliability as the generation mix transitions further toward renewables.

Figure 6 shows the new generation capacity commissioned on the New Zealand grid over the past year, broken down by generation type. Most of the new capacity additions are solar farms, reflected in the relatively low average MW output shown by the line. While these projects add a noticeable amount of installed capacity, their contribution to actual energy generation is modest due to solar's low capacity factor and intermittent output. In contrast, the single geothermal project commissioned during the year stands out —its near-constant operation allows it to deliver close to its full rated capacity around the clock, providing a much more consistent supply of energy to the system.

The ongoing transition toward renewable energy is a critical step in decarbonising New Zealand's electricity system and meeting national climate goals. However, while the growth in solar and wind generation represents important progress, these technologies also introduce new challenges for system reliability. Their output depends heavily on weather conditions, meaning extended periods of low wind or reduced solar irradiance can significantly limit generation. Without sufficient firm or flexible capacity — such as hydro storage, geothermal generation, or demand response — these periods can lead to tight supply conditions and price volatility. As the renewable build-out continues, maintaining a balanced mix of generation types will be essential to ensure that the electricity system remains both sustainable and secure under a wide range of weather scenarios.

Figure 6: Commissioned Generation Projects since October 2024



Demand response helped manage energy security with growing amounts of renewable generation

Winter 2024 demonstrated the significant impact that large-scale demand-side responses can have on maintaining security of supply. Reductions in industrial consumption played an important role in helping to slow the drawdown of hydro storage. However, some of the 2024 industrial demand reduction was permanent – demand destruction that resulted in decisions by owners to permanently close industrial operating sites with negative longer-term implications for the wider economy. In contrast, other reductions were compensated under contractual arrangements with generator/retailers and supported electricity security without eroding longer-term economic activity. This distinction highlighted both the value of genuine demand flexibility and the broader risks associated with relying on long-term or involuntary industrial curtailment to maintain security of supply.[12]

Following sustained high energy prices during the dry year of 2024, several large industrial consumers either closed or reduced operations, contributing to a lower level of industrial demand through Winter 2025. Despite this reduction, overall electricity demand remained broadly stable compared to previous years, indicating growth in the commercial and services sectors. A key factor was the gradual recovery of demand from the Tiwai Point aluminium smelter, which had ramped down production in late 2024

[12] This winter is different: Lessons from NZ's 2024 electricity crisis | BusinessNZ Energy Council

and was still returning to full operation through the first half of 2025. These shifts in demand composition illustrate ongoing structural changes in electricity consumption patterns, with industrial load declining but commercial activity maintaining overall system demand. With recent closure of industrial demand which did have the ability to flex, a smaller proportion of today's demand is flexible and can respond in security of supply events.

Figure 7: Tiwai demand response

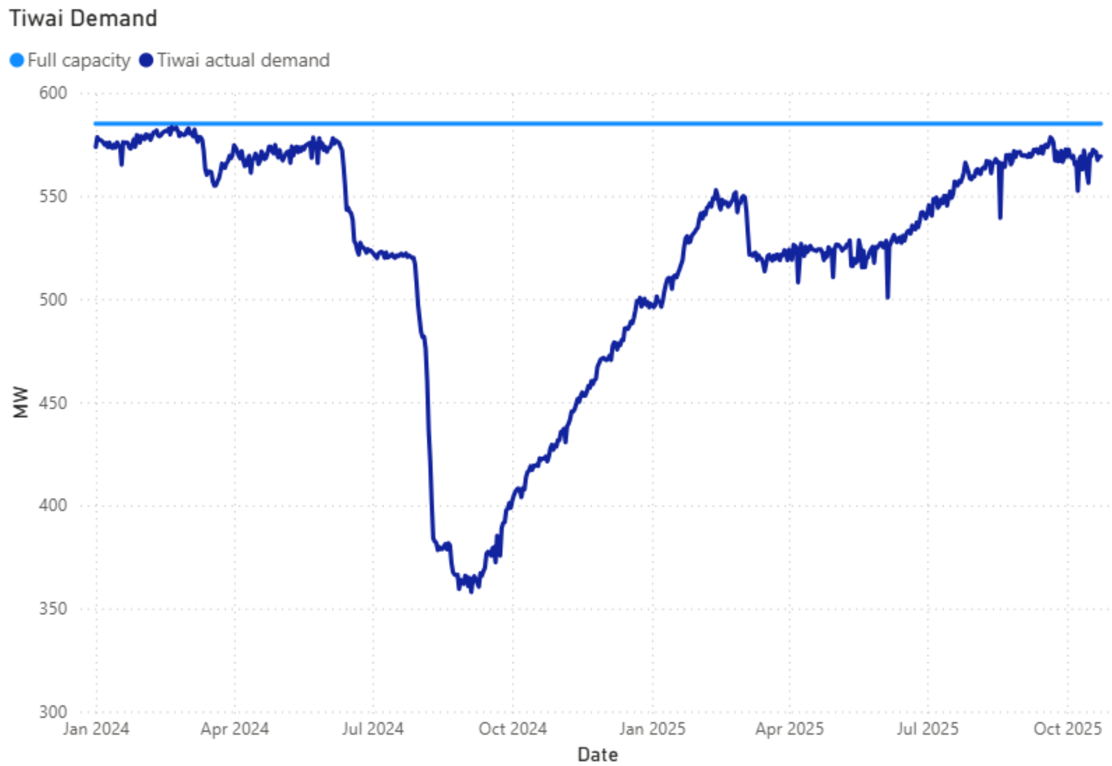
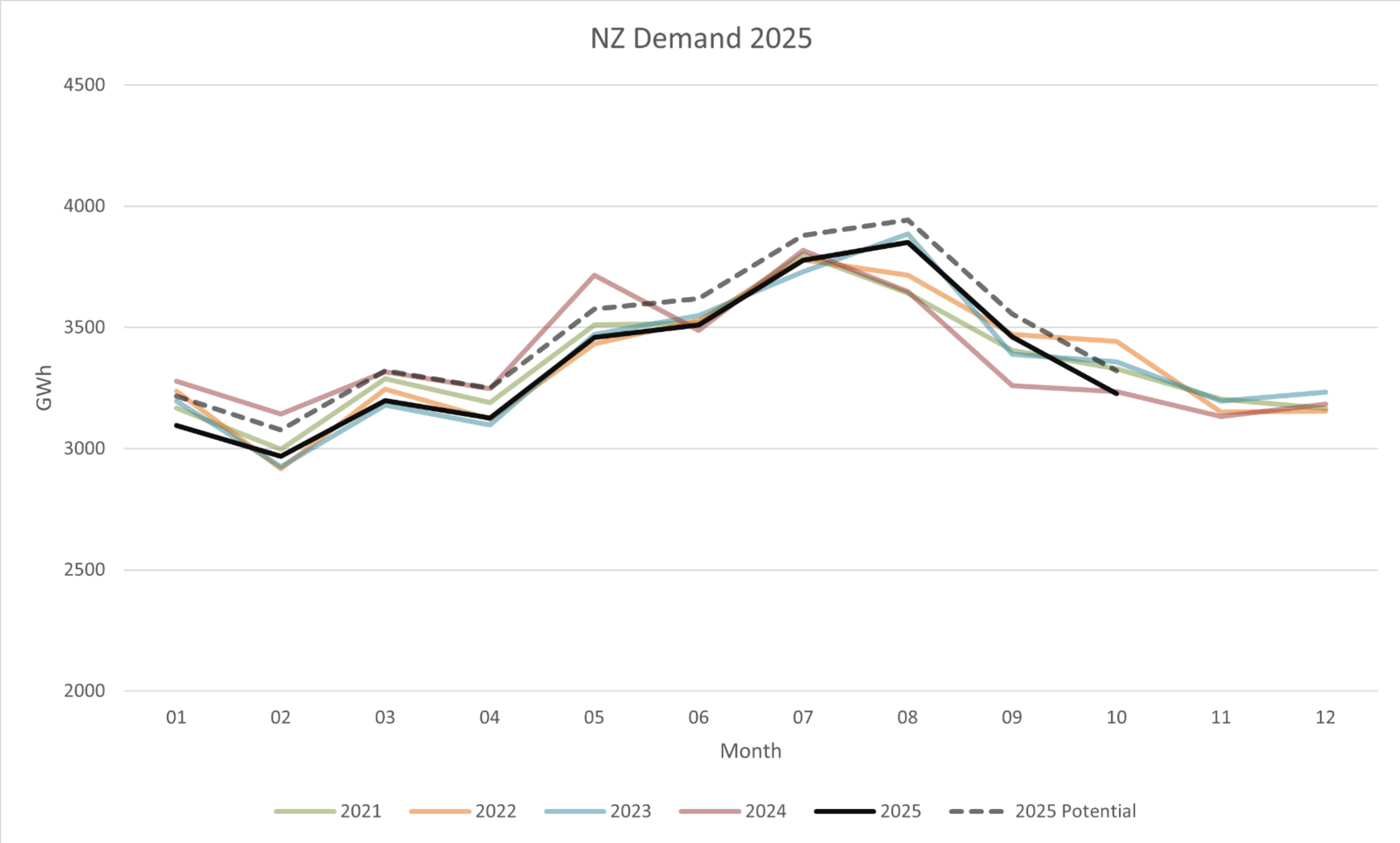


Figure 7 to the right highlights the clear impact of Tiwai Point's demand response programme on national electricity demand. In 2024, a significant reduction in load can be seen as the smelter curtailed production in response to sustained high wholesale prices, before resuming normal operations later in the year. A similar response was triggered again in early 2025, with the aluminium smelter gradually ramping load back up through much of the winter period. The magnitude of this response — around 40 MW over Winter 2025 — reflects a meaningful but controlled level of flexibility from one of the country's largest single electricity users, helping to alleviate stress on the grid during periods of tight supply and elevated prices.

The second figure (Figure 8) places this activity in a broader context, showing monthly electricity demand trends over the past five years. While demand in 2025 remains relatively strong, it stands out from prior years due to the visible suppression caused by both the Tiwai demand response and the industrial load reductions that occurred in 2024. The dotted line for 2025, which represents a counterfactual scenario without these reductions, sits notably higher than actual demand across most months. This divergence illustrates that underlying demand growth has continued but has been temporarily offset by industrial curtailment and ongoing demand response efforts, masking what would otherwise have been a clear upward trend in national electricity consumption. As we have noted this has raised wider questions for electricity participants about wider short and longer-term economic effects for Aotearoa New Zealand's economy of reliance on industrial demand response to support energy security during extended dry periods.

Figure 8: National demand – Historic and 2025 potential



Supplying peak demand through 2025 – Key observations

Hydrology and thermal generation in the shoulder and winter seasons

Below average hydro levels before winter meant there were high levels of thermal generation and offers when winter began. While thermal generation did begin to decline with the improving hydro situation, thermal commitment was still high as described in Figure 9.

While thermal commitment was high, the majority of our peaks were met from the supply of hydro generation after the hydro situation improved. Prior to Winter 2025, Contact secured gas from Methanex to over an eight-week period ending 3 July. This allowed Contact's Taranaki Combined Cycle (TCC) gas-fired power plant to be available to run during the winter.

Coming into winter, spot prices were high with declining hydro storage as hydro generators were trying to conserve water in preparation for a potential dry winter. As things turned out, timely inflows brought storage levels back up and wholesale prices dropped before the start of winter.

Figure 9 Thermal generation since January

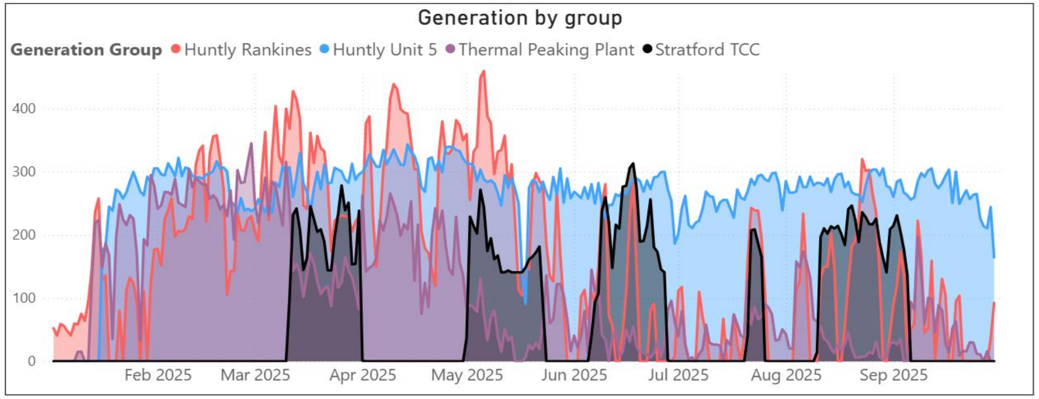
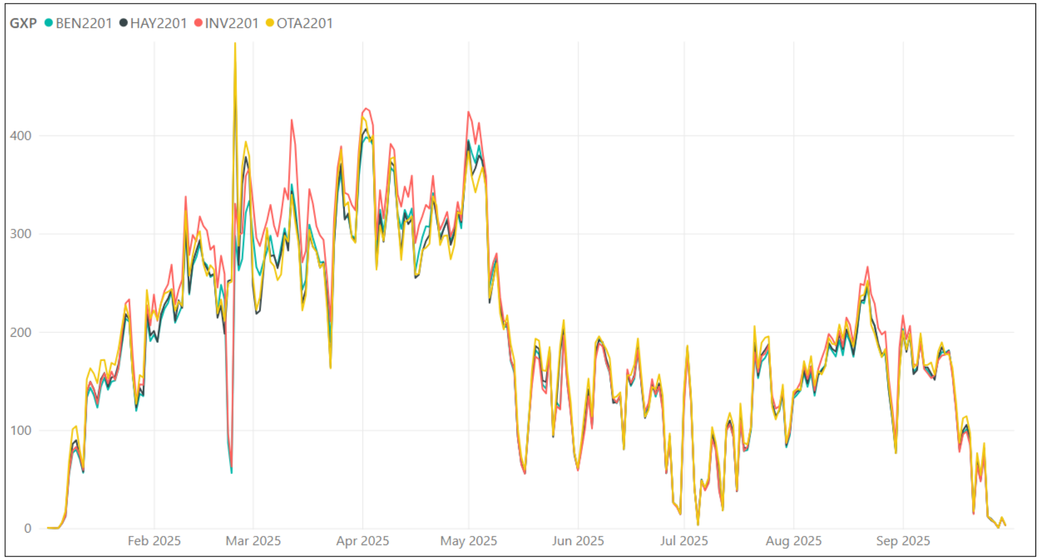


Figure 10: Wholesale reference prices since January



Colder temperatures caused greater demand peaks despite reduced industrial demand

Figure 11 shows the top 20 daily load peaks in 2025. These peaks were significantly higher than in 2024 and are matching the same distribution as 2023. While there has been a reduction in industrial demand, the higher peaks are more a result of the colder temperature during winter (as shown in Figure 12) compared to the last few years.

The tightest residual point occurred on the morning of 21 July during one of our top demand periods at 65 MW. During this same week where the tight residual occurred demand peaked at 7,015 MW on 25 July, which was the third highest level of electricity demand in New Zealand history, and three other morning peaks in that same week ranked among the top 10 demand periods. As can be seen from Figure 1, the majority of supply meeting peak demand comes from flexible generation sources such as hydro and thermal generation, and these types of sources of supply are what are required to meet national demand during sudden cold spells.

The beginning of 2025 saw a declining hydro storage availability, however timely inflows during Autumn allowed the hydro generators to make up a greater majority of the supply compared to previous top demand peaks. In addition, 2011 had thermal generators contributing 27% of the mix during the demand peak whereas other peak demand periods had much less thermal response. The contribution of thermal generation during our highest peaks has since decreased from this time due to the decommissioning of several thermal units. To help manage peak capacity risks with the growing supply from intermittent generation we also need growth in firm, flexible resources such as batteries, demand response and peaking generation.

Figure 11: Top 20 demand peaks since 2015

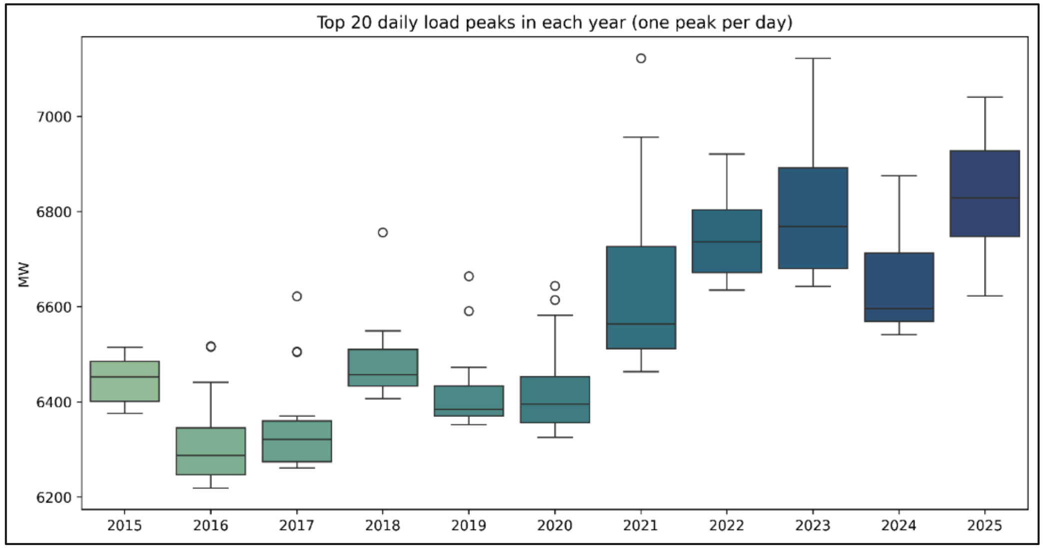
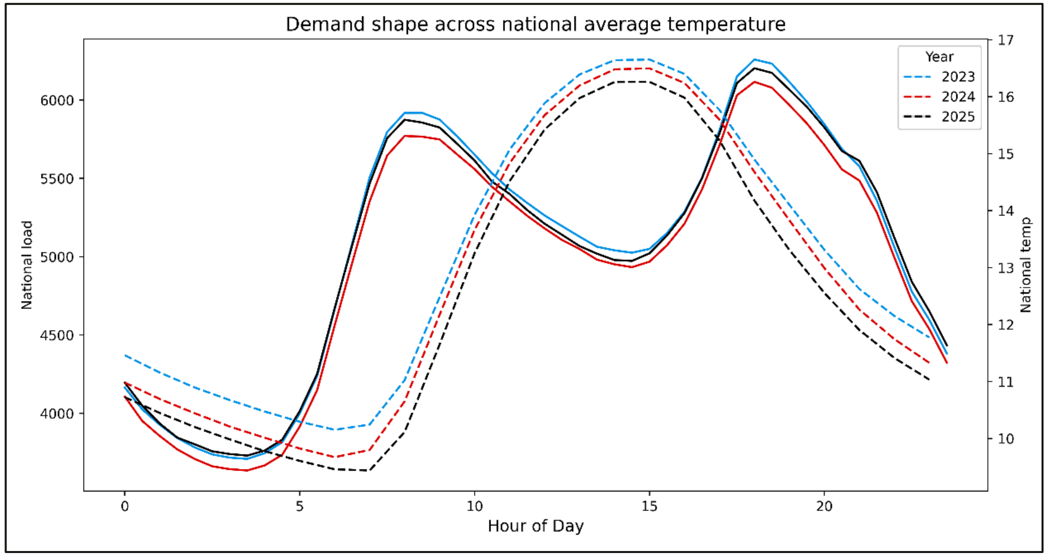


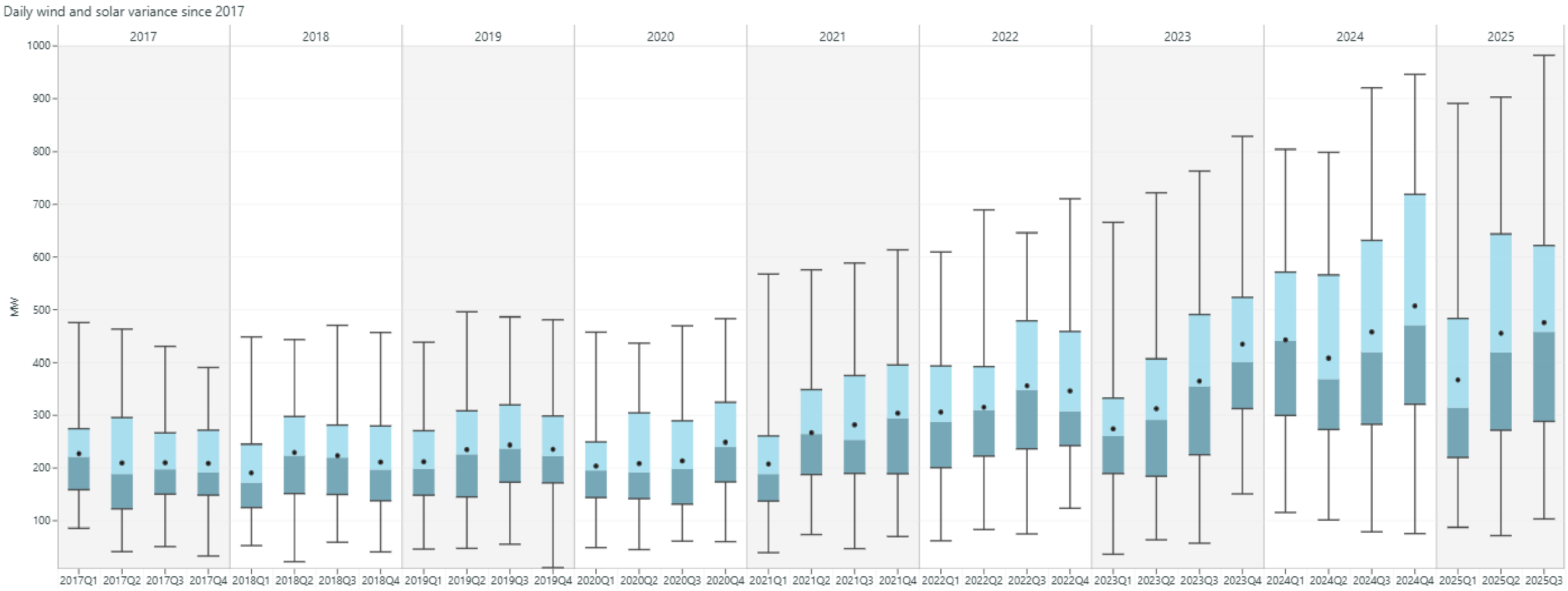
Figure 12: Demand shape since 2023



Intermittent generation growth increases the need for flexibility

Wind and solar farms have made a significant majority of the commissioned generation in 2025 and is expected to grow further in the future. The growing supply from these intermittent generation sources means the power system needs to be further supported by flexible resources such as demand response, batteries and firm, flexible generation. Flexibility is the ability of resources to quickly ramp up or down when required to maintain supply-demand balance on the power system. Figure 13 shows the increase in variability of wind generation over time as more wind and solar farms have come online. This increased variability means increasing need for flexible resources which can ramp up and down to compensate for the variability in intermittent generation output.

Figure 13: Daily wind and solar generation variance since 2017.



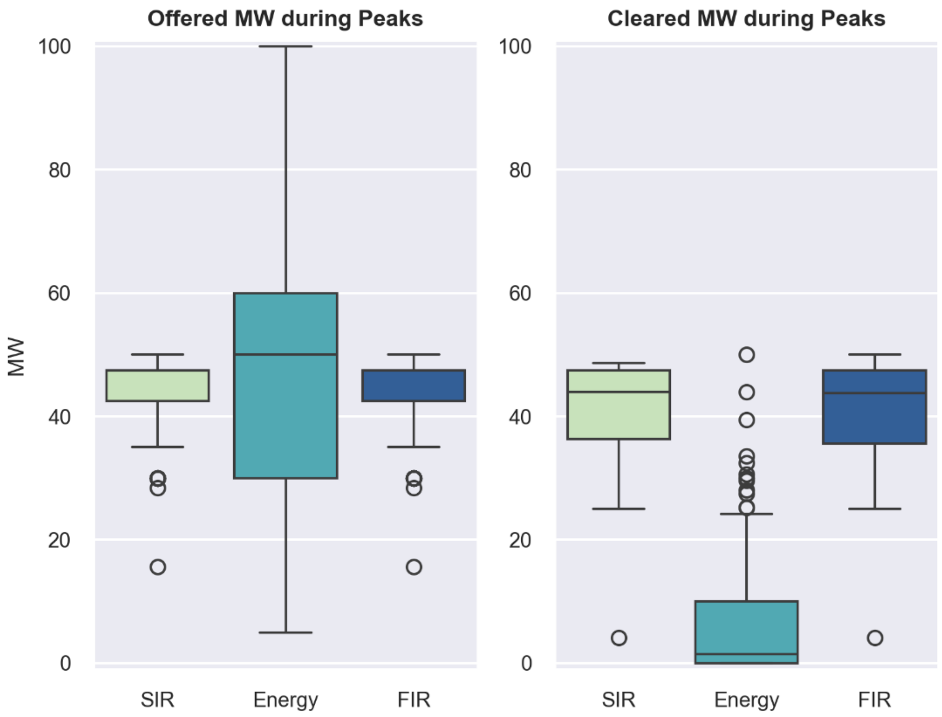
Batteries during peak periods

Batteries are able to assist in winter demand peak periods by offering their charge in the form of energy, FIR (Fast Instantaneous Reserve), and SIR (Sustained Instantaneous Reserve). These reserves respond to drops in system frequency arising from tripping of generation or an HVDC pole. FIR arrests the fall in system frequency and SIR restores frequency to within the normal band (49.8 – 50.2 Hz) within 60 seconds of the event.

Prior to Winter 2025, the 30 MW Huntly Rotohiko BESS was the only fully commissioned grid-scale battery in the market. As of July 2025, the 100 MW Ruakaka battery has begun offering into the market. Batteries as a market technology are still evolving in New Zealand. Because of this, a BESS's involvement in the New Zealand electricity market face several uncertainties and challenges:

- BESS tend to have comparatively low energy storage capabilities (e.g. Rotohiko is 35MW/35MWh and Ruakaka is 100MW/200MWh). In Winter 2025, BESS did not often offer their full installed capacity into the energy and/or reserve market. The current lack of transparency of their state of charge, and a 1-hour gate-closure leaves uncertainty about the accuracy of their future energy offers – deviations from what is forecast to happen and what does happen can have an out-sized impact on future BESS capability because of their low energy storage capability.
- While batteries can and do offer into the energy market, much of their cleared offers come from providing reserves in the form of FIR and SIR. As described in Figure 15, the price of reserves have decreased since the Ruakaka battery was fully commissioned. Figure 14 shows that Ruakaka consistently offers and clears for reserves during peak demand periods, while clearing for energy occurs less frequently.

Figure 14: Ruakaka BESS offered and cleared megawatts during winter peaks



With limited installed capacity, utility-scale batteries are currently more active in supporting system stability through ancillary services than in directly supplying energy during peak periods. This may shift as more BESS assets come online.

The Electricity Authority released a consultation paper on 11 November 2025 seeking views on proposals designed to improve wholesale market operations for utility-scale BESS.[13] The proposals concern:

- Dispatch requirements for BESS when charging,
- Bid and offer forms for BESS,
- Gate closure arrangements for BESS, and
- Constrained off payments for BESS.

State of charge is considered under the gate closure proposals and also under the Connected Asset Testing and Information Standard (CACTIS) proposals.[14]

13 Wholesale market arrangements for BESS: Issues and options paper
14 CACTIS

Reserves prices

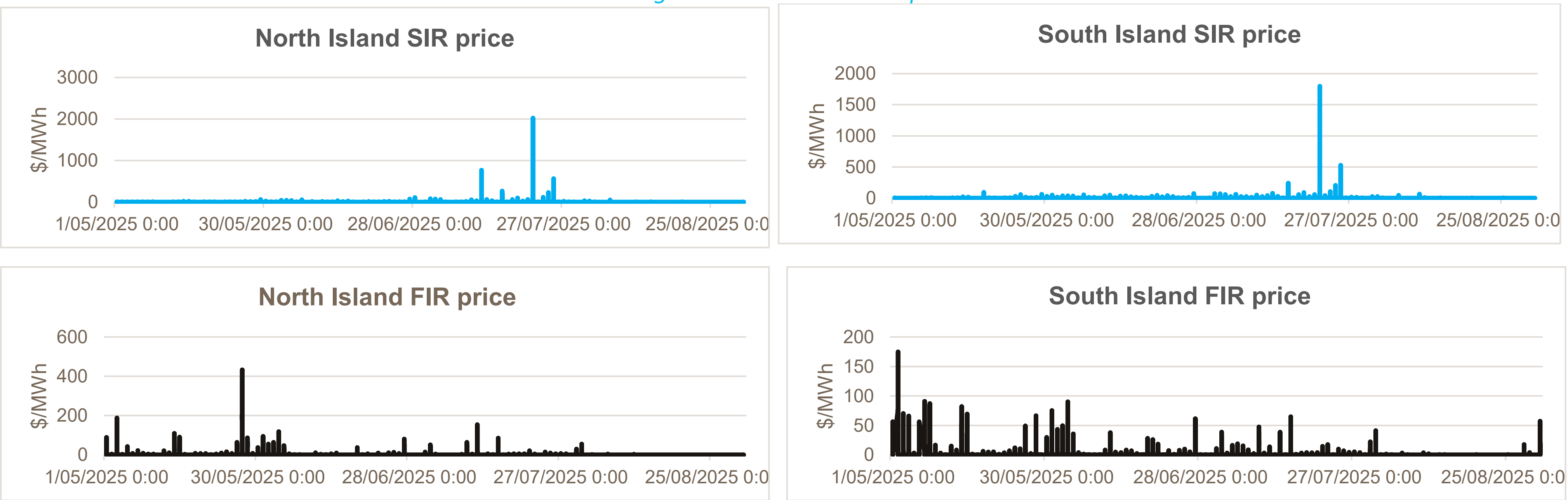
In late July, the 100 MW Ruakaka BESS began offering reserves and energy into the wholesale electricity market. Since this time, while it is still early days, reserve prices before and after the introduction of this battery have shown a downward trend.

Batteries can cover the variations that may occur with intermittent generation and rapid changes on the power system (such as under-frequency events). Such examples are:

- On 3 July, wind generation dropped off by almost 600 MW in the space of 30 minutes (before the Ruakaka battery was offering into the market)
- Winter 2025 has experienced some significant cold snaps. Colder temperatures increase demand, and sudden cold spells can have an adverse impact on security of supply if there is insufficient supply to balance the increased demand.

Solar output is low during winter evening peak load periods, and wind can be unreliable despite the 1300 MW of installed capacity.

Figure 16: Winter reserve prices



AM/PM peaks – potential shift from evening to morning peaks

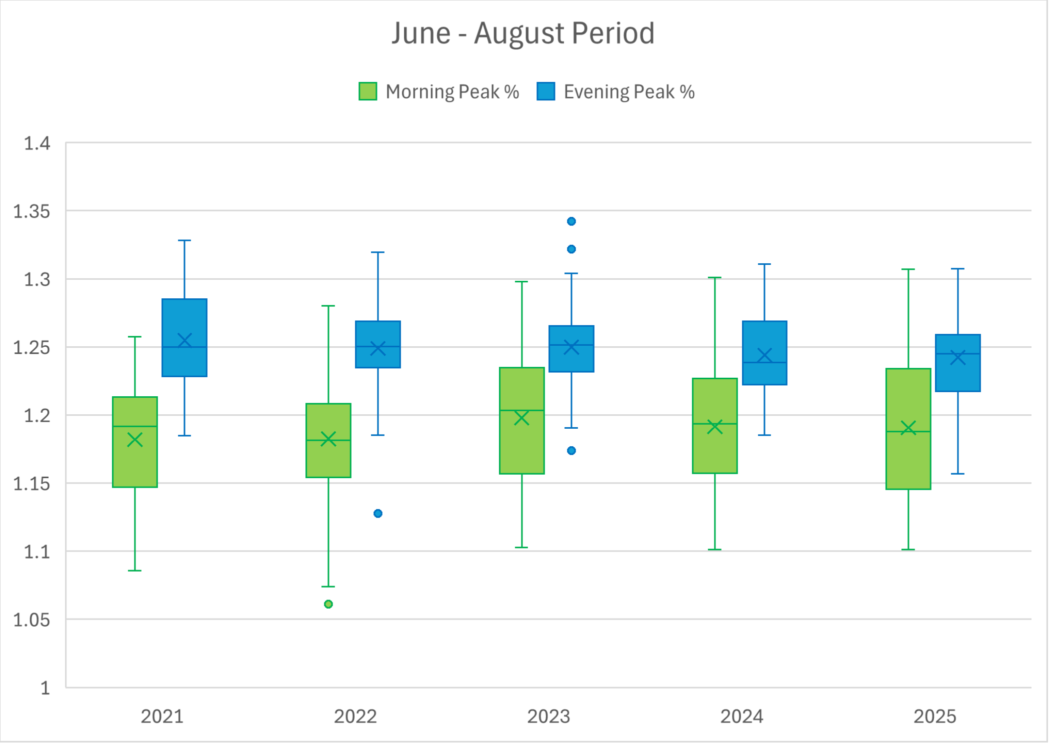
Figure 16 shows the changing distribution of the 'peak-to-average load ratio'. This ratio is defined as $\frac{\text{MAX}(\text{Load}_{AM/PM,DAY})}{\text{AVG}(\text{Load}_{DAY})}$, and it aims to capture the 'peakiness' of daily electricity demand by comparing the highest morning or evening load to the average daily load. This metric is useful for understanding how sharply demand spikes during peak periods.

Over the past decade, Aotearoa has experienced a gradual flattening of the demand curve, particularly in the North Island, where the winter peak-to-average load ratio dropped by approximately 5% between 2015 and 2024. The South Island saw a smaller decline of around 2%. This trend reflects the growing influence of time-of-use (ToU) pricing plans and ripple control mechanisms implemented by electricity distribution businesses (EDBs), which have helped shift demand away from traditional peak periods.

Evening peaks, historically more dominant, have become less pronounced due to these shifts in demand. In contrast, morning peaks have become more variable with an upward trend, especially in colder years like 2023 and 2025, where increased heating needs have driven higher and more volatile morning demand.

The number of evening peaks still exceeds morning peaks, but this gap is narrowing. This shift is evident in the changing shape of the peak-to-average load ratio distribution. Additionally, ToU plans have introduced new load surges in the late evening. These surges are especially visible in the North Island during summer, where the 9:00–9:30 PM period has occasionally become the daily peak.

Figure 17: Peak ratios since 2021



Evolving our Security of Supply Information

Following the 2024's dry winter and the tight capacity events during the shoulder seasons, there was industry feedback that more information about our low residual threshold and processes was required. Consequently, we released a consultation in November 2024 on our review of the low residual threshold and processes. After the consultation, we have indicated our intention to review and propose amendments to the Policy Statement to formalise the Low Residual Situations process, and we will also consider whether NZGB arrangements should be formalised through the Policy Statement[15]. We will review the Low Residual threshold every two years whilst reserving the right to depart from the threshold should changing system conditions warrant it.

During the events of winter 2024, we released a consultation on an adjustment to the Alert Contingent Storage Release Boundary to allow for generators to access contingent storage earlier than the default. This was largely supported by the industry and was implemented for September 2024 and October 2024. The responses from industry lead to support for an earlier review of the Security of Supply Forecasting and Information Policy (SOSFIP).[16]

The SOSFIP[17] is central to how New Zealand's System Operator forecasts and communicates the electricity system's ability to meet demand. Following the challenges of the 2024 dry winter, in early 2025 we commenced a review of the SOSFIP to ensure the policy remains robust in the face of increasing reliance on renewable generation, heightened fuel supply risks and evolving market conditions. Feedback we received in response to our Issues Paper consultation informed the review.[18]

The review covers key topics such as the assumptions behind risk curves, criteria for accessing contingent hydro storage, and the impact of energy and capacity risks. Consultation on the draft SOSFIP amendment proposal closed in early November. We are currently considering our response to the feedback we received. In December we will publish and submit our final proposal to the Authority.[19]

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15 Invitation to Comment: Low Residual Review Consultation (Closed) | Transpower

16 Consultation – Adjustment to Alert Contingent Storage Release Boundary (Closed) | Transpower

17 See the SOSFIP here.

18 Invitation to Comment: Security of Supply Forecasting and Information Policy (SOSFIP) Review Issues Paper 2025 (Closed) | Transpower

19 Invitation To Comment: SOSFIP Consultation 2025 - Draft amendment proposal (Closed) | Transpower