

Improving incentives for long-duration firming

Issues and options paper

1/10/2026

Executive summary

The Electricity Authority Te Mana Hiko (Authority) is seeking feedback on whether and how we could strengthen market settings to support the efficient supply of long-duration firm energy.

New Zealand's reliance on renewables, and particularly on hydro generation systems with limited storage, makes us vulnerable to extended periods when it does not rain, blow or shine. Long-duration firming refers to reliable and dispatchable energy that can fill these supply gaps for weeks or months at a time.

The changing generation mix creates challenges for reliable, long-duration energy supply

New Zealand has an energy-only, market-based electricity system. It relies on clear price signals, commercial incentives and supporting regulatory arrangements. Together, these encourage participants to contract for, and invest in, reliable electricity supply including sources of long-duration firming.

Historically, thermal generation has underpinned baseload supply and provided firming when unfavourable weather impacts the output of renewable generation.

However, the decline in the availability of natural gas has reduced the ability of thermal generation to provide this backstop. While some of these shortfalls can be made up by new wind and solar generation energy, as happened in 2025 and 2026, these sources are themselves weather dependent, which can create new sources of system vulnerability.

The risk of energy shortfalls is reducing overall, but some risks remain

The Authority commissioned the consulting firm Sapere to explore how demand for additional long-duration firm energy is expected to evolve over time, including the impact of severe dry years on annual energy balances.

Under both *high demand, high build* and *low demand, low build scenarios*, Sapere estimates the risk of a long-duration firm (LDF) energy gap in any year will likely reduce by 2032. It may even disappear by 2031 if future demand growth is low.¹ But if we were to experience a severe hydro inflow shortfall, high demand growth and conservative use of hydro storage, the risk of a LDF gap could remain.

This finding is broadly consistent with the Authority's own analysis. We modelled the energy balance over three-month periods; seasonal energy shortfalls are more likely than annual shortfalls overall.²

Several barriers may limit the market's ability to deliver long-duration firming

The Authority has identified barriers that may limit the supply of firming resources, while recognising that reliability risk cannot be entirely eliminated. These are:

- The value of firm energy may not appear in market prices in an average hydro year.
- Revenues from firming investments may be infrequent and uncertain.
- There may be too few prospective buyers and sellers of firming contracts, operating with imperfect information, different capabilities, and time horizons.

¹ The gap was only assessed to 2032 as no firm investments are in the pipeline beyond that point.

² Sapere assessed the dry period shortfall over multiple durations from 2 to 12 months but assessed the long-duration energy gap analysis based on average years.

Addressing these barriers could support provision of long-duration firming

The Authority has identified the following options to improve price signals and incentives to invest in long-duration firming:

- 1) Regular reporting on the LDF energy gap using an established methodology.
- 2) Enhanced disclosure obligations for firming contracts.
- 3) Building blocks for negotiating firming contracts.
- 4) Co-development of a long-duration firming contract, including potential standardisation.
- 5) Mandated sell-side auction of a small amount of firming contracts.

These options have been informed by modelling, stakeholder engagement, previous analysis of these long-standing issues, and the advice of external experts.

These options could work alongside other Government initiatives including a liquefied natural gas (LNG) import terminal and measures being developed by the Ministry of Business Innovation and Employment's (MBIE) to improve the management of electricity supply risk.

We are seeking feedback from stakeholders on the barriers that we have identified to the provision of long-duration firming and the options to address these barriers. Consultation is open until 13 November 2026.

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1 Purpose of this consultation paper

- 1.1 The Electricity Authority Te Mana Hiko (Authority) seeks feedback on:
- (a) barriers in the energy-only market to provision of long-duration firm energy, and
 - (b) measures to support long-duration firming solutions from a variety of sources.
- 1.2 Exploring these issues supports our main statutory objective to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers under section 15 of the Electricity Industry Act 2010 (Act).³
- 1.3 This paper, along with another proposing to update the minimum weekly compensation amount for an Official Conservation Campaign (OCC) ⁴, aligns with the Authority's goal to ensure the system delivers reliable power at least cost to consumers, and has regard to the Government's expectations in the Government Policy Statement on Electricity, including that the Authority:
- (a) ensure participants have clear and enduring incentives to manage 'dry-year' and other long-duration supply risks as part of reliability and security of supply;⁵
 - (b) explore, develop and promote liquidity in new risk management products that enable participants to manage their evolving risks, including dry-year risk as part of spot price volatility and risk management product markets.⁶
- 1.4 The options in this paper are intended to work alongside other measures currently being considered by the Government, including a proposed Winter Energy Reliability Obligation, and an import terminal for LNG. The Authority will take account of the Government's decisions on these measures alongside feedback on this paper prior to determining next steps.

³ [Electricity Industry Act 2010 | New Zealand Legislation](#), Section 15

⁴ [Review of the minimum weekly amount to be used in official conservation campaigns](#)

⁵ [Statement of Government Policy to the Electricity Authority Under Section 17 of the Electricity Industry Act 2010: New Zealand Electricity Industry – 9 June 2026 | New Zealand Gazette](#), paragraph 18

⁶ [Statement of Government Policy to the Electricity Authority Under Section 17 of the Electricity Industry Act 2010: New Zealand Electricity Industry – 9 June 2026 | New Zealand Gazette](#), paragraphs 32 to 33.

2 How to make a submission

- 2.1 The Authority's preference is to receive submissions in a Word document or a searchable pdf in the format shown in Appendix A.
- 2.2 Submissions should be emailed to wholesaleconsultation@ea.govt.nz with '*Consultation - long-duration firming*' in the subject line by 5pm, 13 November 2026.
- 2.3 The Authority will confirm receipt of all submissions.
- 2.4 If you cannot send your submission electronically, please email wholesaleconsultation@ea.govt.nz or call 04 460 8860 to discuss alternative arrangements.
- 2.5 We will publish all submissions. If you consider that we should not publish any part of your submission, please:
 - (a) indicate which part should not be published and explain why,
 - (b) provide a version of your submission that we can publish, with any redactions applied (if we agree not to publish your full submission).
- 2.6 All submissions, including any parts the Authority does not publish, can be requested under the Official Information Act 1982. This means the Authority would be required to release material not published unless good reason existed under that Act. We would consult with the submitter before making a decision on whether to release the information requested. We may also share information with another public sector agency, statutory entity, the gas industry body and overseas regulators if it would help with their functions, pursuant to section 47A of the Act. We would only do that if we were satisfied that appropriate protections were in place. For more information see our information management policy.⁷

⁷ [Information Management policy](#)

3 Pillars of New Zealand's energy-only electricity market

- 3.1 New Zealand has an energy-only, market-based electricity system. It relies on prices, commercial incentives, and supporting regulatory arrangements to encourage private businesses to contract for, and invest in, an efficient amount of reliable electricity supply. Electricity is traded through a central pool, and generators are primarily paid for the electricity they produce.⁸
- 3.2 An energy-only market can support efficient and reliable supply when participants have the right **information, incentives, tools, and competitive pressures**:
- (a) **Information:** To know whether investment is likely to be profitable, participants need transparent and timely information about future supply, demand, hydrology, fuel availability, planned or anticipated investment and the potential size and timing of any LDF energy gap. This information feeds into accurate pricing of the value of different resources that could be brought to market, including sources of firming.⁹
 - (b) **Incentives:** Market settings need to give buyers and sellers clear financial incentives. Buyers need incentives to manage scarcity risk through physically based risk management contracts or self-supply, storage, or demand response. Sellers need incentives to maintain, invest in and use resources efficiently. This also requires confidence that prices can rise during scarcity, so resources that run less frequently, like firming, can recover costs during short periods with high revenue, after long periods of low utilisation and limited revenue.
 - (c) **Tools:** Participants need effective tools to manage exposure to spot price volatility and long-duration firming risks. These tools may include standardised and bilateral contracts, flexible generation, storage, demand response, self-supply, and market information that can be used to assess and price risk. Together, spot and contract markets allocate risks to those parties best placed to manage them.
 - (d) **Competitive pressures:** Effective competition among buyers and sellers is needed so prices and contract terms reflect underlying supply and demand conditions, and to discipline prices to reflect costs. Weak competition, market power or thin trading can undermine confidence in the validity of price signals.
- 3.3 In theory, an energy-only market should support efficient long-duration firming.

How can prospective investors in sources of LDF expect to be remunerated?

Investors in LDF can be remunerated in **two broad ways**.

First, they can earn revenue from the wholesale electricity market by supplying energy or reducing demand during periods of scarcity, when spot prices are elevated. While this approach can provide significant returns, revenues are inherently uncertain because they depend on the frequency, timing, and severity of scarcity events.

Second, investors can earn revenue through long-term contracts with buyers. These arrangements typically involve agreeing a price (or pricing formula) for future firming services in advance, reducing exposure to fluctuations in spot market revenues. By reducing revenue uncertainty, long-term contracts can improve investment certainty and incentivise the financing of new LDF resources.

⁸ Separate to the energy market, the pool also clears an instantaneous reserve market, which pays providers explicitly for making *short-duration* firming capacity available in case of a grid emergency.

⁹ For further discussion of the importance of price discovery, see also MDAG's final report: '[Price discovery in a renewables-based electricity system](#).'

Existing regulatory arrangements that strengthen these pillars

- 3.4 A suite of regulatory mechanisms has been put in place over time to strengthen the energy-only market. Table 1 outlines these regulatory measures and the primary market pillars that they contribute to.
- 3.5 Information tools, such as existing forward markets on the Australian Securities Exchange and over-the-counter, generation pipeline disclosures, the System Operator's Security of Supply Assessment (SOSA), forward price curves, and spot price risk disclosure (stress testing) help participants form expectations about future market conditions, risks and the need for investment or contracts.
- 3.6 Incentive tools, such as the Consumer Compensation Scheme (CCS), require retailers to make compensation payments to eligible customers during an Official Conservation Campaign. This measure is intended to encourage retailers to manage their exposure to scarcity events through hedging and firming arrangements.
- 3.7 The Authority is currently exploring options to enhance the stress testing regime and is also seeking feedback on updating the minimum weekly compensation amount for an OCC.
- 3.8 Existing regulatory arrangements also include security-of-supply mechanisms that provide for the orderly management of electricity shortages, such as the System Operator's shortage management procedures.

Table 1. Existing regulatory arrangements that support market pillars

Regulatory support	Primary market pillar supported
Spot price, scarcity pricing, Value of Lost Load (VOLL)	Incentives
Standardised and bilateral contracts	Tools
Generation pipeline information, SOSA, forward price curve	Information
Official Conservation Campaign	Information
Customer Compensation Scheme	Incentives
Stress testing regime	Information
Level playing field measures, market-making arrangements	Competitive pressure

- 3.9 For further information on these existing regulatory arrangements, see **Appendix E**.

4 The importance of long-duration firming

- 4.1 Long-duration firm energy resources have a particular characteristic: they can be relied on to produce additional energy in a sustained way over a long period of time. They differ from short-duration firming resources, such as batteries, which can produce additional energy over seconds, minutes or hours, but do not add net generation. Long-duration firm energy is therefore particularly important for managing severe hydro inflow shortfalls and dark lull events.
- 4.2 Long-duration firming can be provided by a range of products, including dispatchable thermal generation, fuel storage, demand response, geothermal generation, conventional

hydro reservoirs or pumped hydro storage, and, indirectly, renewable overbuild. Some types of hydro shortfall risk (eg, seasonal dry-year energy risk) are better addressed by particular products.

Table 2. Different resources address different risks in different ways

		Risk		
		Seasonal dry-year risk	Multi-week lull risk	Multi-year risk
Direct	Existing thermal			
	New thermal			
	Demand response			
	Geothermal			
	Pumped hydro			
Indirect	Wind and solar overbuild			

Key:

= High impact
 = Medium-high impact
 = Medium impact
 = Low impact

Direct resources can be deployed during a scarcity event, while **indirect resources** reduce the likelihood or severity of scarcity events occurring.

New Zealand's electricity system was built on a foundation of hydro, supported by gas and coal-fired generation

- 4.3 New Zealand's electricity system is highly renewable (~85%) and more than half of our electricity comes from hydro (55-60%). Specifically, hydro inflows tend to average around 26TWh per annum, while total annual electricity consumption is around 40TWh. However, the amount of energy stored in hydro lakes is relatively small (4.5TWh). This limited storage capacity means that extended periods of low rainfall can create supply risks, particularly during winter when inflows tend to be lower and demand for electricity is higher.

Hydro inflow shortfalls have **three dimensions**:

- **Frequency** – how often an inflow shortfall is likely to occur, such as a 1-in-10 dry year.
- **Duration** – the period for which an inflow shortfall persists, typically measured in days, weeks or months.
- **Severity** – the size or magnitude of the inflow shortfall (in TWh).

And contribute to **three types of risk**:

- **Seasonal dry-year energy risk** – where insufficient inflows, particularly ahead of (or lasting into) the winter period, reduce available hydro generation.
- **Multi-week renewable drought / lull risk** – where prolonged periods of low hydro inflows coincide with low renewable output (eg, low wind and solar due to lack of wind and sun).
- **Multi-year carryover risk** – where consecutive years of below-average inflows reduce the system's ability to replenish hydro storage across years.

- 4.4 Low wind or limited sunlight can compound this hydro shortfall risk, if unfavourable weather conditions are overlapping (less rainfall, wind and sunlight at the same time). The Authority's review of winter 2024 identified low wind generation as a contributor to high prices during this time.¹⁰
- 4.5 The possibility of unplanned outages, particularly from ageing equipment, also adds to this risk. In 2023, two important thermal generation units shut down due to faults (Huntly unit 5 in June, due to a broken circuit breaker, and Stratford unit 22 in September, due to a broken engine blade). These outages lasted for several months, and represented a 21% decrease in New Zealand's total available thermal electricity generation capacity.¹¹
- 4.6 Unlike other nations, New Zealand is unable to import electricity from other countries when supply is limited.

Thermal generation provides a necessary back-up, but gas availability is in decline

- 4.7 Historically, thermal generation (from gas and coal) and official conservation campaigns¹² have helped to manage these risks by providing flexible back-up and demand response during dry years, high demand peaks, and other periods of system stress. For many years domestic gas has provided an inexpensive and readily available source of continuous dispatchable capacity that can be scaled up to meet demand.
- 4.8 Domestic production of gas has declined by half since 2015, reducing this thermal buffer, and gas prices have more than doubled over this time, contributing to higher electricity wholesale prices. Since 2012 the amount of thermal generation capacity in New Zealand has fallen by around 1100MW.¹³
- 4.9 In recent years, new investment in solar, wind and geothermal has helped to fill this gap left by declining thermal generation. However, as with hydro, when weather conditions do not allow wind and solar to generate at or near full capacity, or demand spikes suddenly, remaining thermal plant is still needed to fill the gap. In this way, thermal assets continue to provide important insurance for the electricity system.
- 4.10 The importance of thermal back-up as insurance against dry year risk was a key factor in the Commerce Commission's authorisation of the Strategic Huntly Firming Options in 2025.

Demand for electricity has been flat, but is expected to grow

- 4.11 While economic activity and population growth increased between 2010 and 2025, total demand for electricity has remained relatively flat.¹⁴ In 2010, New Zealand consumed 40.5TWh of electricity, broadly identical to its consumption of 40.6TWh in 2025. In per capita terms, demand has actually fallen (from 9300 kWh in 2010, to 7600 kWh in 2025).
- 4.12 In 2024, 36% of electricity was consumed by industry, 35% by households, 23% by offices and commercial premises, and 6% for transport and other purposes.¹⁵
- 4.13 However, total demand for electricity is expected to increase in the coming years, particularly as part of the transition to a lower-emissions economy.

¹⁰ [Eye on electricity: Dunkelflaute and its impact on our electricity sector | Electricity Authority](#)

¹¹ [Security of supply while two thermal generators are on outage | Electricity Authority](#)

¹² [Official conservation campaign | Electricity Authority](#)

¹³ [A proposed reliability obligation to manage dry-year risk - Energy package - action 2.5](#)

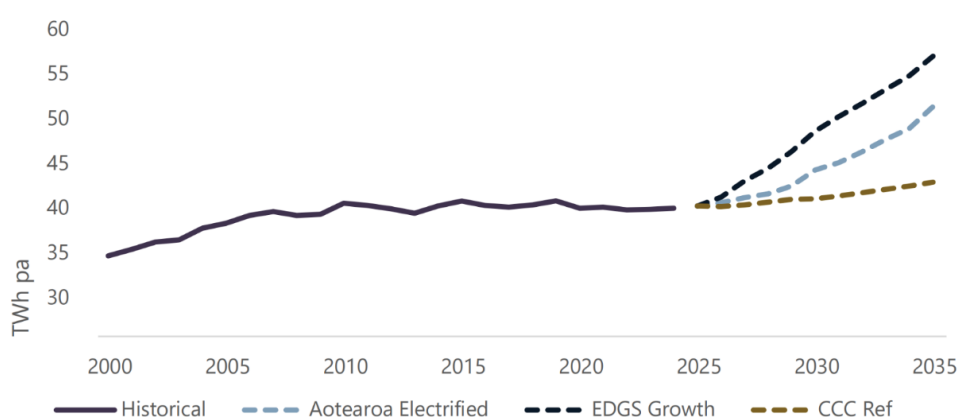
¹⁴ [Electricity statistics | Ministry of Business, Innovation & Employment](#)

¹⁵ Frontier, p30 [link](#)

Table 3. Estimates of electricity demand growth

	2030	2035	2050
MBIE (July 2024) ¹⁶		+24% to 61.3%	+32.8% to 77.9%
Boston Consulting Group (BCG) (November 2025) ¹⁷	+8 to 10%		
Transpower (June 2026) ¹⁸			+38.9% to 140%

- 4.14 Estimates of future electricity demand vary depending on the assumptions used. Key drivers include population growth, economic activity, immigration, digital infrastructure growth, the uptake of electric vehicles, the electrification of buildings and industrial process heat, behavioural change, and broader decarbonisation settings such as carbon prices. Scenarios that assume faster economic growth and stronger electrification of transport, buildings and industry generally project higher electricity demand, while scenarios based on more gradual growth and electrification tend to project lower demand.

Figure 1. Energy demand growth scenarios

Source: Sapere, Electrify NZ, MBIE, and the Climate Change Commission

New renewable electricity generation is being built at pace

- 4.15 Recently, a wave of new investment has flowed into geothermal, wind and large-scale solar generation, as well as some upgrades to existing hydro stations. Total renewable generation capacity has increased by 1356 MW (18.3%) since 2020.
- 4.16 In July 2026, renewable sources accounted for more than 90% of New Zealand's electricity production, while the contribution from gas and coal has steadily declined. Distributed energy generation, like rooftop solar and household batteries, are also becoming more common.

¹⁶ [Electricity Demand and Generation Scenarios: Results summary July 2024](#)

¹⁷ [Energy to Grow Securing New Zealand's future, BCG](#), p45

¹⁸ [Te Kanapu Our Energy Scenarios](#)

Figure 2. Thermal electricity generation has declined, as renewables have grown

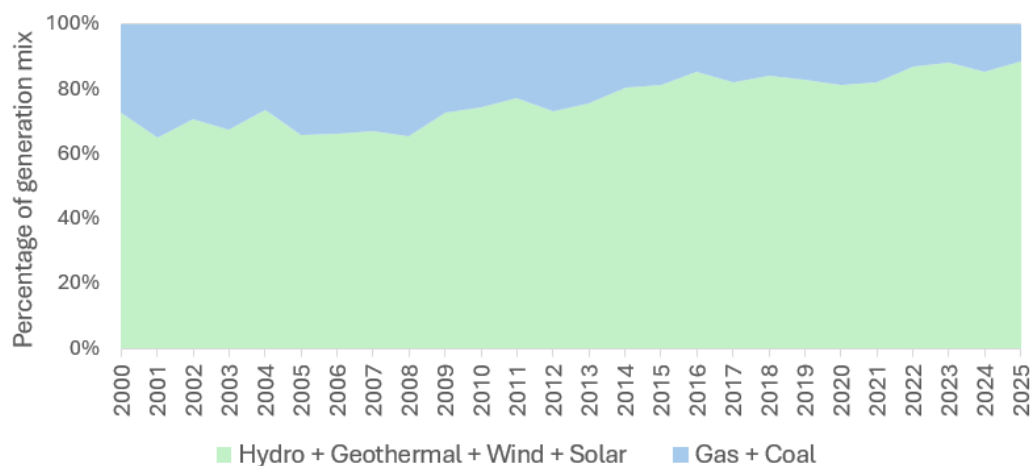


Figure 3. Electricity generation by type, as a % of total load, 2023/24-2025/26

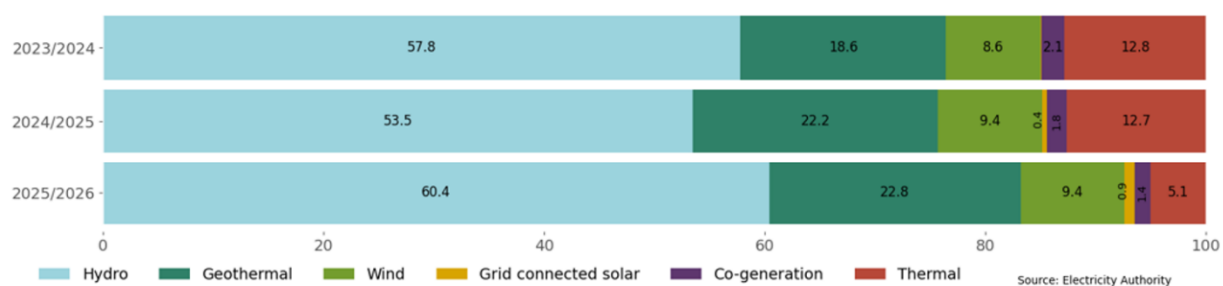
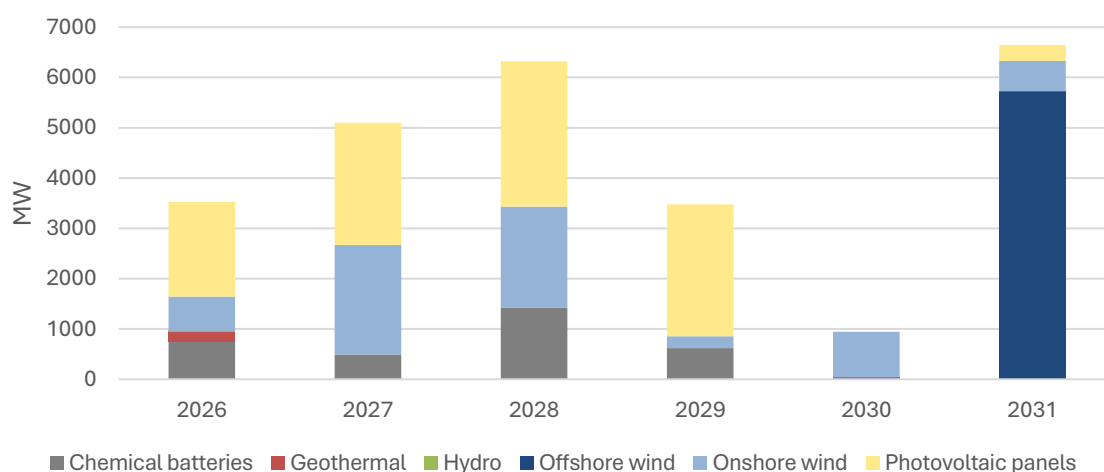


Figure 4. Generation Investment Pipeline¹⁹ 2026-2031, by expected commissioning year and technology type



¹⁹ Not every project in the pipeline will be built. New generation plants are significant investments for developers, and the complexity of these projects means it can take a long time to decide on feasibility before construction can begin. Early-stage projects can therefore drop out of the pipeline if they are not viable.

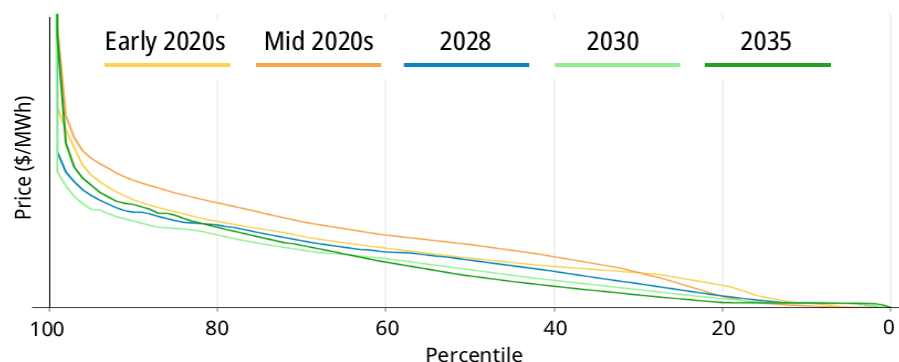
Most renewables growth is expected to be weather-dependent (or intermittent)

- 4.17 Many new capacity additions are expected to come from intermittent renewable generation sources (see Figure 4). While being a welcome development, these technologies may not always be able to substitute for gas and coal-fired power generation, which can provide firm and long-duration supply, even when the rain, wind and sun are not cooperating.

Increased renewable generation will change (and is already changing) the 'shape' of prices.

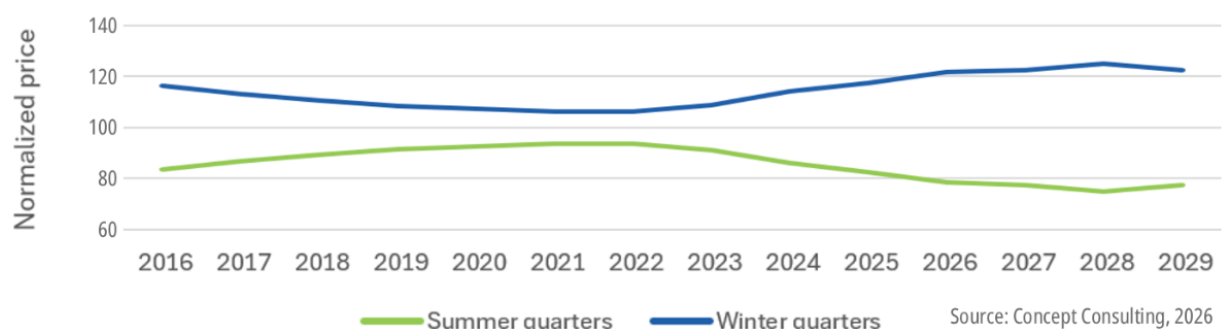
- 4.18 We expect (and observe) that renewables growth will change (and is already changing) the 'shape' of wholesale prices. Price duration curves for 2028, 2030 and 2035 have been modelled by Concept, and illustrate this expectation.

Figure 5. Historical and modelled future price duration curves (2020s-2035)



- 4.19 Specifically, Concept's modelling suggests there will be more low-price periods (and lower wholesale prices, overall) in future years. The primary reason is that, as renewables increase, there will be more periods where these cheaper generation sources will run at or near full capacity, and dispatchable generation sources (such as hydro and thermal) are not needed. A key variable is future demand growth, which may absorb some of this additional renewable generation, and reduce the frequency of low-price periods occurring.
- 4.20 Curves for the 2020s are based on historical data, and also illustrate an increase in the frequency of low-price periods.
- 4.21 Offsetting this, there will also be periods with little sun, wind and rain when the system becomes tight, and prices increase to reflect scarcity. Figure 6 shows that this dynamic, lower summer prices and higher winter prices, is already observable in normalised hedge price data.

Figure 6. Representation of normalised prices for summer and winter quarters



Source: Concept Consulting, 2026

As renewables put downward pressure on prices in summer and autumn, hydro operators may be incentivised to conserve more water ahead of winter

- 4.22 As renewables increase, there will be more low-priced periods that incentivise storing water, and less need for thermal fuels. We expect this will push hydro reservoirs higher later into the autumn, with more spill in a mean year and, correspondingly, an increase in the capacity of hydro to provide LDF in winter.
- 4.23 The minimum price at which a hydro generator is willing to release water from storage and generate electricity is known as the water value (or value of stored water). If spot prices drop below this value, a hydro operator may decide that the water value is likely to be higher in the future than it is today.
- 4.24 This approach, selling when spot prices equal or exceed the water value, and conserving water when future prices are expected to be higher, maximises the value obtained from hydro resources across days, weeks and seasons. This contributes to providing reliability at a lower overall cost to the system.

Why would hydro operators spill? Wouldn't it be better for them to generate at any price?

Generally, hydro operators *do* seek to utilise as much of the water they receive as possible, rather than spill it. However, when future prices are expected to be higher, such as during winter or periods of scarcity, it can be economically efficient to maintain higher lake storage levels and accept some risk that inflows exceed expectations. In other words, some spill may be the consequence of holding additional water in storage to improve security of supply and preserve generation for periods when it is most valuable.

This is the case today, for example, modelling from Concept indicates an optimal hydro spill for 2024 in excess of 1 TWh. This reflects what revenue-maximising hydro operators consider to be an economically optimal use of hydro storage to firm electricity supply.

- 4.25 As renewables increase, there will also be more periods where there is so much non-discretionary generation (solar, geothermal and run-of-river hydro)²⁰ relative to demand that wind will also be forced to spill. Unlike hydro, spilled wind cannot be stored. However, this overbuild of wind and solar nonetheless adds to the firming effect of renewable spill.²¹
- 4.26 It is also important to note that annual average spill does not directly translate to long-duration firming. I.e, much of the spill will occur in the 'wrong' season. To provide a more relevant indication, Figure 7 shows modelled spill for winter months only (July to September).

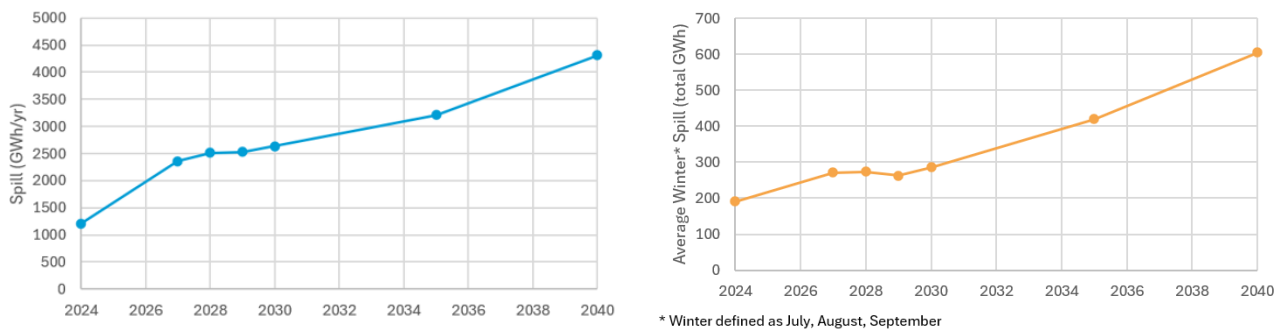
While wind and solar overbuild mitigates some risks, a combination of different tools is needed

While renewable energy overbuild can help reduce seasonal energy risk, prolonged periods of low renewable output (ie, multi-week renewable drought risk) may still require resources that can respond independently of weather conditions. For further discussion of this idea, that different resources mitigate different risks in different ways, see Table 2, above.

²⁰ In this context, 'run-of-river' includes controlled hydro output needed to satisfy consented minimum flow requirements.

²¹ Building enough wind and solar to cause spill at times of excess means there is more generation at times of shortage. Since costs (and prices) are asymmetric, this can be a good use of resources. A similar dynamic is observed in the common practice of solar developers oversizing panels relative to invertors (or network connections). This 'spills' energy when it is low value but increases production when it is more valuable.

Figure 7. Modelled renewable spill (hydro + solar + wind) for all months (left) and winter months only (right) (2024-2040)



Source: Concept Consulting, 2026

Figure 7 show Concept’s modelling of increasing renewables spill as more renewables are added to the system. In effect, increased wind and solar pushes lakes higher causing more spill, and less need for thermal and less shortage.

This modelling indicates that, in an optimised system, renewable spill can make a material contribution to system firming.

5 The risk of a long-duration firm energy gap

5.1 We define the LDF energy gap as the difference between spare firm energy and the hydro shortfall:

- (a) **The hydro shortfall** is the net effect of a hydro inflow shortfall and the reservoir operator’s drawdown of hydro storage. The hydro inflow shortfall is measured as the cumulative deviation of inflows (over varying durations) from historical mean inflows.
- (b) **Spare firm energy** means the portion of existing reliable generation and demand response not already required to meet normal baseload demand in average hydro years.

5.2 Forecasting an LDF energy gap implies that, based on a set of assumptions (about future demand, investment, and other factors formed today), more investment in sources of LDF energy will be needed to deal with the worst historical inflow sequence.²²

Recent investigations of New Zealand’s LDF energy gap

- 5.3 Several recent independent reports into New Zealand’s electricity system have focussed on security of supply and the availability of LDF energy during times of low hydro inflows. These include Frontier Economics’ (Frontier) *Review of Electricity Market Performance*,²³ Boston Consulting Group’s *Energy to Grow*,²⁴ and the OECD’s 2026 Economic Survey.²⁵
- 5.4 Broadly, each of these investigations has suggested that New Zealand faces risks to security of supply as electricity demand grows, gas availability declines, and the electricity system becomes more reliant on variable renewable generation.

²² In this sense, forecasting a ‘gap’ does not necessarily imply involuntary demand curtailment.

²³ [Frontier, 23 May 2025](#)

²⁴ [BCG, 19 November 2025](#)

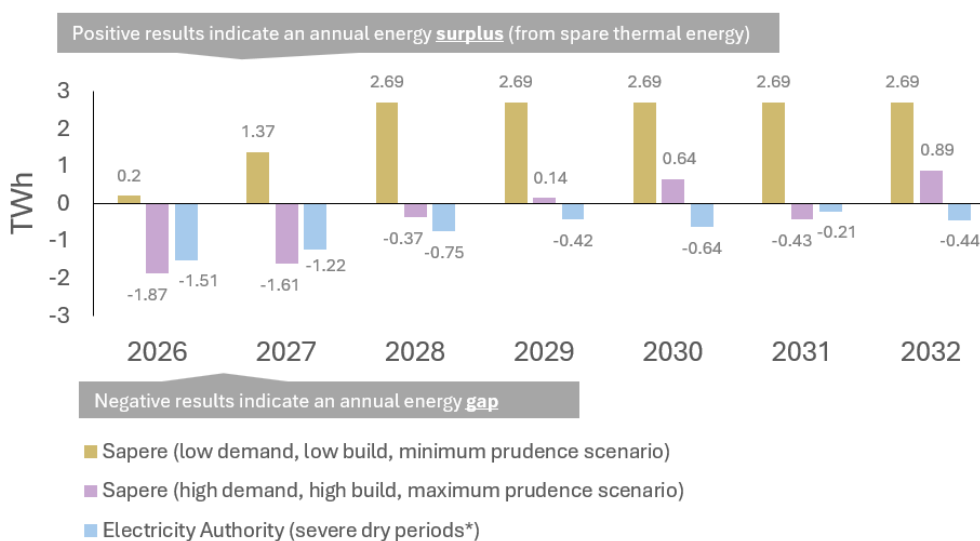
²⁵ [OECD, May 2026](#)

- 5.5 In October 2025, MBIE also convened an expert advisory group to help clarify problems with dry-year risk management and assess options to provide stronger assurance that dry-year risk will be well-managed in future.

Hydro shortfall risk declines over time, but does not disappear

- 5.6 To refine our understanding of this issue, we commissioned consulting firm Sapere to assess the LDF energy gap. Their full report is attached to this paper (Appendix B) and is discussed in more detail below. In parallel, the Authority also undertook its own complementary analysis, which is also discussed in greater detail in Appendix C.
- 5.7 Despite differences in approach, both our analysis and that of Sapere conclude that:
- (a) **Hydro shortfall risk declines over time:** Our collective work suggests that, subject to underlying assumptions, New Zealand's hydro shortfall risk may decline over time.
 - (b) **But does not disappear:** However, even with such a decline, there may still be periods where long-duration firm energy resources are insufficient under some high demand growth scenarios, at least until 2031.
- 5.8 Broadly, this work suggests that New Zealand's electricity system is becoming more resilient to dry-year disruptions, but may still be vulnerable to supply shortages under some scenarios.

Figure 8. The long-duration firm energy gap (2026-2032)²⁶



Different assumptions lead to different energy gap estimates

- 5.9 Estimates of the LDF energy gap are sensitive to the assumptions used. The size of any LDF energy gap depends on how demand and supply evolve over time, both of which are inherently difficult to forecast, including because they are not independent. In general, assumptions of higher demand growth, slower supply growth, more cautious hydro storage management, lower availability of alternative firming resources (such as thermal), less demand response and higher estimates of the worst-case hydro shortfall will tend to produce

²⁶ Sapere's approach assessed hydro shortfalls, and use of storage, over multiple periods to discover the worst possible combination, and then analysed energy balance (demand growth vs new investment) on an annual basis. Rather than assessing the long-duration energy gap on an annual basis, the Authority's methodology focused on three-month periods in which supply wouldn't meet required demand, given specific supply assumptions. This approach was designed to find periods within the historical record in which three-month hydro shortfalls occurred, even if the overall aggregate inflows for the annual period were typical

larger energy gap estimates. Conversely, an opposite set of assumptions will tend to result in a more optimistic estimate.

Sapere estimates that the LDF energy gap will reduce, while the Authority estimates a more persistent energy gap

- 5.10 Sapere assessed the long-duration firm energy gap by (a) estimating the worst hydro inflow shortfalls based on historical patterns of hydro inflows and storage across New Zealand's major hydro schemes, and (b) determining the energy balance between different scenarios of (i) demand growth and hydro shortfalls and (ii) available generation, based on assumptions on hydro storage draw-down, an upper bound for existing thermal generation, and the new generation pipeline.
- 5.11 To complement Sapere's work, the Authority carried out its own analysis of the risks of severe dry periods to the electricity system. Key differences between our work and Sapere's are that:
- (a) Our analysis identifies potential dry seasons, where estimated supply does not meet demand in a three-month period based on the historic hydro inflow record, rather than assuming that storage is drawn down for a three-month dry period.²⁷ This means that our estimate of decreased solar output in winter periods is not averaged away by increased solar output during other, sunnier times of the year.
 - (b) Sapere's analysis uses scenarios that incorporate high and low demand growth,²⁸ while we use a medium demand growth scenario.
 - (c) We assume hydro operators will not use storage early in a dry sequence. This is more conservative than what Sapere has assumed in their high demand, high build, maximum prudence, scenario.
- 5.12 These differences contribute to the Authority's assessment of a more persistent LDF energy gap than Sapere.

Q1: Do you agree with the Authority and Sapere's analysis that New Zealand faces an ongoing, but declining, long-duration firm energy gap? Please explain your views.

6 Barriers to the market solving the LDF energy gap

- 6.1 New Zealand's energy-only market is expected to become more resilient to hydro shortfall risk in future. However, the transition to a more renewable electricity system is changing the nature of price information and risks participants need to manage, increasing the need for LDF. Several measures to support LDF are already in place, while new measures are also being developed by Government and industry. These include:

Existing market long-duration firming arrangements

- Huntly Firming Options (HFOs)
- Bilateral long-duration firming contracts

²⁷ Focusing on a period of three months is also worthwhile, given that the amount of energy stored in hydro lakes is relatively small (4.5TWh).

²⁸ Sapere also investigated a scenario incorporating medium growth demand, but was commissioned by the Authority to provide a range for the energy gap estimate, hence their use of high and low demand as variables.

- Other contracting arrangements (eg, fixed-price variable-volume and baseload agreements)
- Large scale demand response
 - The Tiwai Aluminium Smelter
 - The Glenbrook Steel Mill
 - Official Conservation Campaigns

Additional measures that are being developed and/or considered

- Building a new facility to import LNG – *Government*
- Designing a Winter Energy Reliability Obligation – *Government / MBIE*
- Enhancing the stress testing regime – *Government / Authority*
- Pursuing the Lake Onslow pumped hydro scheme – *Industry*
- Investigating a diesel-fired peaking plant at Marsden Point – *Industry*

6.2 For further description of these measures, see Appendix E.

6.3 The Authority has identified several barriers that may prevent the market from delivering LDF as efficiently as expected. These barriers may affect one or more of the four market pillars.

Table 4. Relationship between identified barriers and wholesale market pillars

Barriers	Information	Tools	Competition	Incentives
Value gap	●●●	●		●●●
Infrequent revenues	●●●	●	●●	●●●
Low liquidity	●	●●	●●●	●●
Purchaser incentive		●		●●●
Limited visibility	●●●	●●	●●	●
Tenor gap		●●●		●●●

●●● primary impact ●● secondary impact ● indirect impact

Value gap between market price and the value of firming

- 6.4 Market prices may not fully reflect the value of LDF energy in average hydro years. In a more renewable electricity system, prices are shaped not only by short-run fuel costs, but by the opportunity cost of scarce stored energy and flexible generation. Hydro storage, batteries, demand response and other flexible resources are valuable because they can shift energy from periods of low demand or high renewable output to periods of high demand or scarce supply.
- 6.5 Firming resources may provide significant insurance value by being available during dry years, renewable droughts, major outages or other prolonged scarcity events, even if they operate infrequently in average conditions.
- 6.6 However, this insurance value may not be fully reflected in forward market prices during average hydro years.

Infrequent revenues for owners of long-duration firming assets

- 6.7 Energy-only markets may provide limited investment incentives for infrequently used long-duration firm energy. In an energy-only market, generators are primarily paid for the electricity they produce. When LDF generation is required to meet demand, prices need to be high enough and sustained long enough to cover fuel cost and the largely fixed costs of maintaining plant availability. However, severe scarcity events are relatively infrequent and are likely to become even less frequent as renewable generation grows. As these events become less frequent, prices during those events must be higher to recover the same fixed carrying costs over fewer operating hours. This can make firming revenues more volatile and dampen investment incentives.
- 6.8 Revenue uncertainty is compounded by difficulty predicting the size and timing of future LDF energy gaps. The size of any LDF energy gap depends on how demand and supply evolve over time, both of which are inherently difficult to forecast. There are differing views on the pace of demand growth, the scale and timing of new renewable generation, retirement of existing plant,²⁹ future thermal generation availability, hydro inflows, fuel supply, storage investment and demand-side flexibility.
- 6.9 The Expert Advisory Group assembled by MBIE to advise on the dry-year regulatory framework noted that private investment in dry-year risk can face a weak business case because dry years are inherently unpredictable. This creates significant revenue uncertainty for assets whose value depends wholly or partially on rare scarcity events.
- 6.10 This challenge is relevant not only for new investments but also for existing plants. Existing assets must continue to maintain fuel arrangements and operational capability to provide a timely and reliable response during LDF energy gap conditions. Decisions to retain, refurbish, or retire existing assets are commercial decisions based on expectations of future revenue and costs. Where profitability is uncertain, owners may choose to retire assets before replacement firming solutions have been developed.
- 6.11 Regular and transparent assessment of potential LDF energy gaps can reduce these risks by providing a common evidence base for market participants and policymakers.

Low liquidity due to few buyers and sellers

- 6.12 There are few buyers and sellers of long-duration firming products, and the current firming market appears concentrated. Firming contracts are often linked to ownership or control of physical firming assets, so supply largely comes from parties that own thermal generation, hydro storage, large-scale interruptible load or other firming resources.
- 6.13 As a result, price signals for firming services may be limited or difficult to interpret. Thin trading can make it harder for participants to assess the value of long-duration firming and may weaken incentives if developers cannot determine whether sufficient contract demand exists to support new projects.
- 6.14 Low liquidity may also discourage participation by intermediaries or traders that could otherwise help deepen the market. These participants could facilitate contract trading by managing contract risk, bridging differences in contract duration, aggregating small transactions, and potentially supporting investment where incumbent providers are unwilling to offer firm supply.

²⁹ Because decisions to retain, refurbish or retire existing sources of long-duration firming are private commercial decisions made by owners based on expected future revenues and operating costs, there is a risk that, if owners regard future profitability as insufficient or uncertain, plant will be retired before replacement firming solutions are fully developed. If these retirement decisions are not signalled far enough in advance, this could create coordination risks.

- 6.15 Low liquidity and limited participation by speculators may be mutually reinforcing. Thin trading reduces opportunities to manage and diversify risk, making participation less attractive. In turn, the absence of these participants can further reduce liquidity and weaken price discovery. A lack of standardised long-duration firming products may exacerbate this dynamic by increasing transaction costs and making contracts more difficult to value, compare and trade.

Purchaser incentives to contract for firming may be weak

- 6.16 Purchasers may have weak incentives to contract for firming services. For example, limited confidence in future price signals, credit constraints, lack of information, expertise and bargaining power, or incentives to self-insure may reduce the likelihood that buyers will contract for firming.
- 6.17 In an energy-only market, efficient investment in firming relies on purchasers being willing to pay to manage scarcity risk. However, some participants may choose to remain exposed to spot prices. This may occur if they expect scarcity events to be infrequent, believe future spot prices will remain low, or consider the firming contracts too costly. Extended periods of low wholesale electricity prices can reinforce this behaviour.
- 6.18 Self-insurance is a legitimate commercial decision. However, participants must bear the consequences when scarcity occurs. If exposure to high prices is underestimated, participants may face significant financial stress during prolonged scarcity events. This may create broader market risks if retailers fail or parties exposed to high prices seek regulatory or political intervention, weakening expectations that scarcity pricing outcomes will be allowed to occur and persist.
- 6.19 With regard to capability and information, firming contracts can be complex. They often require specialised knowledge to assess and negotiate, including knowledge of hydrology, fuel availability, dispatch arrangements, contract triggers and settlement provisions. Smaller retailers, independent generators and new entrants may have fewer resources and less experience to assess these products, which can reduce their demand for firming contracts.

Limited visibility of existing firming arrangements

- 6.20 Visibility of existing firming arrangements is limited. While firming contracts must be disclosed to the Authority under hedge disclosure obligations, they can be difficult to identify under current disclosure settings. This limits the information available to market participants and the Authority about price signals that may support firming investment, making it more difficult to assess the fairness and credibility of offers for firming services.
- 6.21 The Authority has updated hedge disclosure obligations to require participants to disclose the generation station associated with the contract. This change took effect on 1 August 2026 and is expected to help distinguish physical firming contracts from power purchase agreements.³⁰
- 6.22 However, visibility may remain limited because detailed information on prices and key terms are withheld from the market for reasons of commercial sensitivity.
- 6.23 Better information on the volume, type and broad pricing characteristics of firming contracts could complement the price signals already available through prices of other contracts. However, providing this information in a way that improves transparency without compromising confidentiality may be challenging.

³⁰ [Code amendment omnibus #6: tie-breaker enhancement, materially large contracts, hedge disclosure obligations](#)

Tenor gap driven by a mismatch between buyers and sellers' time horizons

- 6.24 A further barrier to investment, including in long-duration firming, is the mismatch between the contract terms sellers require and those buyers are willing or able to enter into.
- 6.25 Sellers of new generation, storage or firming services generally need stable long-term cashflows to support financing over the life of an asset. This tenor gap is not unique to firming and affects investment in new generation more broadly. In contrast, most buyers only contract a few years ahead due to uncertainty about future demand, customer load, technology costs, wholesale prices and policy settings. For some buyers, particularly independent retailers, lack of credit strength may also limit their ability to agree to longer term contracts.
- 6.26 This creates a “tenor gap”, a disconnect between the long-lived nature of firming assets and the shorter-term risk management products available in the market.
- 6.27 The futures market is typically short-dated, and while the Authority's recent decision to extend the forward price curve horizon to five years improves information, it does not fully resolve the tenor gap for projects requiring 10 to 15 years of financing. However, a tenor mismatch does not necessarily prevent investment where sellers and their financiers have confidence that future prices are efficient and that liquid markets would allow them to progressively roll their contracted positions forward over time.
- 6.28 In a less liquid, volatile market, participants may instead seek to overcome the tenor gap through vertical integration, which allows firms to rely on internal demand to support investment. However, this solution is not available to all participants.
- 6.29 Addressing the tenor gap directly would likely require a more active role for government in the market, such as centralised procurement or long-term underwriting arrangements. At this stage, the Authority is focusing on whether market-based mechanisms can strengthen investment incentives for firming generation. The Authority welcomes feedback on the significance of the tenor gap as a barrier to investment in long-duration firming and whether alternative approaches may be warranted.

Q2: Do you agree with the Authority's assessment of barriers to the market providing additional sources of long-duration firming? Please explain your views.

Q3: Are there any other barriers you think limit participation in firming contract markets for buyers, sellers and potential new entrants? Please explain your views.

Q4: Does the tenor gap represent a material barrier to investment? What additional work or interventions, if any, could be considered by the Authority to address this issue?

7 New measures may be needed to address these barriers

- 7.1 Our electricity system relies on commercial incentives to drive market participants to provide reliable supply efficiently. A key challenge for the market is not simply to build firming resources, but to ensure that the value of the different firming services can be revealed, priced and rewarded. Where transparent price signals and effective contracting arrangements exist, participants should have incentives to provide and contract for firming resources.
- 7.2 The Authority's preliminary view is that any solution to address identified barriers should maintain the core energy-only market design. This reflects a preference for targeted

interventions that address specific issues without fundamentally altering a market structure that is otherwise functioning effectively.

- 7.3 This section sets out a package of options intended to address identified barriers. Some options primarily improve information, while others facilitate the contracting process. Together, they are intended to help participants identify the value of long-duration firming and, ultimately, strengthen incentives to provide additional sources of long-duration firming.
- 7.4 These options have regard to the Government Policy Statement on Electricity and could work alongside other Government initiatives currently being developed, including a liquified natural gas (LNG) import terminal and measures being developed by the Ministry of Business Innovation and Employment's (MBIE) to improve the management of electricity supply risk.
- 7.5 Table 5 summarises how proposed options address identified barriers and support the four pillars of a well-functioning wholesale market.

Table 5. How we propose to address barriers to the market working as expected

Options	Barriers						Rationale
	Value gap	Infrequent revenues	Low liquidity	Complexity	Purchaser incentives	Limited visibility	
Option 1: Regular reporting on the energy gap using an established methodology							- Improves information on the likelihood, timing and scale of energy shortfalls. - Strengthens visibility of future long-duration firming needs and supply risks. - Supports more informed firming and investment decisions.
Option 2: Enhanced disclosure obligations							- Improves transparency of firming arrangements and market activity. - Supports more accurate price signals and investment incentives for long-duration firming. - Improves confidence that firming value can be observed and contracted for.
Option 3: Building blocks for negotiating firming contracts							- Reduces information barriers and complexity associated with firming contracts. - Improves participants' ability to assess and use long-duration firming contracts. - Supports broader participation in firming markets.
Option 4: Co-development of a long-duration firming contract							- Improves price signals by concentrating liquidity and improving product comparability. - Supports competition through a more tradable and accessible contract. - Strengthens investment incentives through clearer revenue opportunities for long-duration firming providers.
Option 5: Mandated sell-side auction of small amount of firm energy							- Provides for a transparent and competitive bidding mechanism to help reveal the value of firming contracts. - Improves liquidity, by creating an obligation on providers of qualifying firming capability to sell a limited volume of firming contracts.

Improving transparency

Option 1: Regular reporting on the LDF energy gap using an established methodology

- 7.6 A regular, published assessment of the LDF energy gap would provide a common evidence base for participants, investors, policymakers and consumers. It would help clarify whether a gap is emerging, its potential size, timing and drivers.
- 7.7 As weather-dependent renewable generation increases, participants may need better information about a wider range of scarcity risks. Existing measures, such as Transpower's Winter Energy Margin,³¹ provide useful information on seasonal energy adequacy. A common methodology could build on these assessments while also considering other dimensions of long-duration firming risks, including multi-week weather lulls and multi-year risks.

Table 6. Overview of Option 1

Key consideration	Description
Rationale	Improves transparency and provides a common evidence base for investment and contracting decisions
Risks	Agreement on one methodology, forecast uncertainty
Key design questions	What risks should be assessed? How should they be measured and reported?

- 7.8 Regular reporting using an established methodology could help participants to form clearer expectations about future scarcity risks and the value of maintaining, contracting for or investing in firming capability. If regular reporting is adopted by the Authority, the methodology would be expected to evolve over time. This option would primarily strengthen the information pillar.
- 7.9 The Authority welcomes feedback on an appropriate method for assessing LDF risks, including whether assessments should focus on dry seasons, dry years, prolonged renewable droughts, multi-week lulls, multi-year risks or a combination of these. Appendix C outlines the Authority's recent method that was used to assess the risk of a LDF energy gap as an example for discussion.

Option 2: Enhanced disclosure obligations for firming contracts

- 7.10 A further option would be to improve transparency in the market for LDF contracts. Greater transparency could support liquidity, price discovery and investment signals by helping participants understand the volume, pricing approach and key features of firming services currently being offered.
- 7.11 Enhanced disclosure could involve the Authority publishing anonymised or aggregated information on LDF contracts, subject to safeguards for commercially sensitive information. Relevant information could include product type, duration, volume, trigger, conditions, settlement approach and whether the product is linked to physical availability.

³¹ [Security of Supply Assessment | Transpower](#)

Table 7. Overview of Option 2

Key consideration	Description
Rationale	Improves transparency, price discovery, market visibility, and investment signals
Risks	Not being able to publish data to protect commercially sensitive information in a small, bespoke market
Key design questions	What information should be disclosed? How should confidentiality be protected?

- 7.12 Improved disclosure may help participants understand how reliability needs are managed through existing arrangements. This could improve visibility of how market participants manage seasonal shortages, renewable droughts and other long-duration risks.
- 7.13 This option would primarily improve the information market pillar by making the development of the firming market more visible. It could also support competition by helping potential buyers, sellers and investors understand whether equivalent products are available and how the market is evolving. Over time, better transparency may strengthen incentives by improving confidence that firming value can be observed, priced and contracted.
- 7.14 The Authority recognises that this option may be challenging while the market remains small and contracts are highly bespoke. Where only a few contracts exist, even aggregated disclosure could reveal commercially sensitive information. Any enhanced disclosure would therefore need to balance improved transparency with legitimate confidentiality concerns.

Option 3: Building blocks for negotiating firming contracts

- 7.15 The Authority could publish guidance on the role of LDF contracts and how they may help participants manage scarcity risk in a renewables-based electricity system. This could include publishing information on common contract structures, key risks allocated through these arrangements, and how firming products interact with renewable generation and retail risk management products.

Table 8. Overview of Option 3

Key consideration	Description
Rationale	Improves understanding of firming products and supports informed risk management decisions
Risks	Guidance might become outdated and be interpreted as endorsing particular product
Key design questions	What contract types should be covered? How detailed should the guidance be?

- 7.16 This option would improve information and tools by helping participants understand the purpose and value of LDF contracts.
- 7.17 Better information may be particularly useful for smaller retailers, independent generators, large users, and other parties that may not currently have the commercial capability or market visibility to assess firming products on equal terms with larger participants. By

reducing information and capability barriers, this option could also support competition by helping a wider range of participants assess, negotiate and use firming products.

Strengthening incentives

Option 4: Co-development of a long-duration firming contract

- 7.18 A more targeted option would be to work with industry to design voluntary LDF contracts, or contract design principles, that participants could use to manage long-duration scarcity risk. The absence of a standardised market instrument that rewards multi-week or multi-month flexibility can make it difficult for developers to monetise firming value in advance, limiting revenue certainty for both gentailers and new entrants.

Table 9. Overview of Option 4

Key consideration	Description
Rationale	Improved liquidity, price discovery, participation, and investment signals
Risks	Low uptake, poor standardisation, reduced flexibility
Key design questions	Physical or financial? Degree of standardisation? Trigger and settlement design?
Example contract types	Energy-limited cap, energy-limited swaption, hydro storage products

- 7.19 A common product specification could support liquidity, price discovery and market participation while allowing flexibility for participants to negotiate bespoke arrangements where these better reflect particular risks or operational requirements.
- 7.20 This option would primarily strengthen the tools pillar by supporting products that allow buyers and sellers to allocate LDF risk. It could also support competition by reducing complexity, improving comparability and making it easier for participants to assess and trade firming products.
- 7.21 Contract design should preferably remain technology-neutral as a range of resources may be capable of contributing to LDF including existing thermal generation, new thermal generation, hydro storage, demand response, wind and solar generation, geothermal generation, and emerging technologies and other innovative sources of flexibility.
- 7.22 A standardised or semi-standardised contract could be physical or financial and could specify parameters such as duration, volume, delivery period, firmness, trigger conditions, pricing, settlement methodology and performance obligations. The degree of standardisation would require careful consideration. Too little standardisation may limit liquidity, while too much may reduce flexibility.
- 7.23 Two possible contracts, suggested by Market Development Advisory Group's final report, are:
- (a) **Energy-limited cap:** A cap contract offers buyers protection in any trading interval in which the spot price exceeds the strike price with a fixed amount of energy covered.
 - (b) **Energy-limited swaption:** An energy-limited swaption has parallels with an energy limited cap except that it applies to a swaption. A swaption is essentially "an option on a contract" that allows a buyer to pay an upfront premium for the right to enter into a hedge or swap agreement in the future if conditions make that valuable.

- 7.24 The Authority is also interested in exploring contract structures that allow hydro operators to monetise the value of conserving water and operating hydro storage more like a long-duration battery. Hydro storage plays a unique role in New Zealand's electricity system because it can transfer energy between seasons and provide protection against extended periods of energy shortage. This could include contracts that reward availability, storage conservation, or delivery during defined scarcity conditions, subject to careful design to preserve efficient operational incentives.
- 7.25 The Authority welcomes views on alternative contract structures and on whether physical or financial products would be more effective in supporting liquidity, managing risk and providing investment signals.

Volume obligations

Option 5: Mandated sell-side auction of small amount of firming contract

- 7.26 Under this option, providers of qualifying firming capability would be required to offer a small volume of firming contract through a mandated sell-side auction. This auction could occur around one year ahead of the relevant delivery period.
- 7.27 The Authority's preliminary view is that a mandated sell-side auction may be more appropriate than market-making obligations for long-duration firming contracts. Because demand for LDF is likely to be infrequent, market-making obligations could impose unnecessary costs.
- 7.28 An auction would provide a transparent and competitive bidding mechanism, through which the value of an existing amount of long-duration firm energy could be tested. As the auction would be sell-side only, it would not involve a requirement to purchase any quantities that are offered.
- 7.29 By creating a regular opportunity for LDF contracts to be offered and traded, this option could improve discovery of the prices at which participants would be willing to provide firming (including during periods of potential scarcity) and liquidity of LDF contracts.
- 7.30 Auctioned products could include contracts that provide buyers with the right, but not the obligation, to purchase firm energy or hedge cover during periods of scarcity at a pre-agreed strike price (ie, a swaption or similar option style contract). Other designs could include contracts linked to average spot prices over a specified period (ie, an Asian-style option), or contracts that provide protection against sustained high price events (eg, a cap contract).
- 7.31 Careful design would be required to minimise compliance costs and unintended impacts on existing contracting arrangements. We welcome feedback on the most appropriate product (or products) that could be auctioned.
- 7.32 Options 1 to 4 are intended to improve information, transparency and contracting arrangements for LDF. These measures, together with the recently introduced non-discrimination obligations (NDOs), may improve access to firming products and support greater participation in firming markets over time.
- 7.33 However, effective price discovery relies on sufficient volumes being available for trading. If liquidity is limited, price signals become less reliable. Much of the capability that could contribute to managing lull events is currently held as an internal hedge by vertically integrated generator-retailers, rather than being actively traded in transparent markets.

Table 10. Overview of Option 5

Key consideration	Description
Rationale	Improved transparency, observable pricing, wider participation, better investment signals
Risks	Compliance costs, reduced flexibility, interaction with existing contracts
Key design questions	What qualifies as firm energy? What volumes should be auctioned? How should participation obligations be set? What is the appropriate length of the contract?
Indicative role	Backstop option if liquidity remains limited

Demand response can provide an indirect source of firming, but has some practical limits

- 7.34 As part of their business strategies, some electricity users can enter into demand response agreements to monetise reductions in their electricity use during periods of high national demand (such as during winter) or fuel shortage (during a dry year). Reducing demand in this way, demand response, is a key tool in a highly renewable and weather dependent electricity market.³²
- 7.35 However, demand response, like other means of firming, can have practical limits. In particular, substantial and sustained reductions in electricity use over weeks or months can impose significant costs on economic activity, even where firms are compensated.
- 7.36 The Authority has taken some measures to reduce barriers to voluntary demand response already, including establishing a scheme to allow industrial demand flexibility to be used before involuntary load shedding (the Emergency Reserve Scheme / ERS).³³ Work is also underway to develop a standardised demand flexibility product to support commercial arrangements between retailers and demand flexibility providers.³⁴
- 7.37 The options in this paper may also improve incentives for demand response where it can contribute to LDF. For example, clearer information on LDF energy gaps and better contract design could help demand-side participants understand when flexibility is valuable and how it could be rewarded.
- 7.38 We welcome stakeholder views on the role demand response could play in managing the risks of a LDF energy gap, and whether further measures should be considered.

Other measures that have been suggested by stakeholders

Obligations on generators

- 7.39 The draft outline of virtual disaggregation has previously been consulted on through level playing field workstreams in February 2025.³⁵ Virtual disaggregation, informed by Market Development Advisory Group's recommendation,³⁶ would have required generators to offer

³² [The Tiwai Point smelter demand response in winter 2024 | Electricity Authority](#)

³³ The ERS mainly supports *short-term* demand flexibility, including intra-day balancing and peak capacity support during periods of high demand and tight supply.

³⁴ [Authority to progress Standardised Demand Flexibility Product recommendations | Electricity Authority](#)

³⁵ [Level Playing Field measures - options paper](#)

³⁶ [Price discovery in a renewables-based electricity system: Final Recommendations PAPER 2023](#)

a specified volume of financial products linked to their flexible generation capability to address market power. The Authority concluded that further development of this option was not warranted at that time.

- 7.40 The level playing field work concluded that several other workstreams were already underway to improve the availability of firming capacity, including the broader level playing field measures and the market making review. It therefore decided to allow those pro-competition measures take effect before considering whether to progress virtual disaggregation further. Work on virtual disaggregation was placed on hold and will be reconsidered as part of the 2027 effectiveness review of the broader hedge market package.
- 7.41 Since then, the Authority has implemented two measures relevant to access to firming. First, NDOs require gentailers to supply risk management contracts on a non-discriminatory basis, supporting more even-handed access to risk management contracts and greater transparency. These obligations took effect on 1 July 2026. Second, the Authority amended the Code to require market making of standardised super-peak contracts from 31 July 2026.³⁷ Under these requirements, four large gentailers must offer a total volume of 6 MW per contract, with a 5% bid-ask spread through fortnightly auctions on an approved over-the-counter platform.
- 7.42 The Authority considers that these measures should be given time to operate before further obligations on gentailers are considered. Their effectiveness will be assessed through the 2027 review, which will provide an opportunity to consider whether additional interventions, including virtual disaggregation or other firming-related obligations, are warranted.

Capacity markets and a strategic reserve

- 7.43 Frontier recommended a strategic reserve to manage dry-year risk. Under this approach, a limited amount of generation capacity, fuel, or demand response would be held outside the normal market and only deployed during periods of severe system stress.
- 7.44 Frontier also identified a capacity market as a mechanism to support investment in firming resources and maintain security of supply. Capacity would be procured separately from energy through centrally administered auctions held several years ahead of delivery, providing investors with greater revenue certainty.
- 7.45 Capacity markets have been adopted in several jurisdictions with mixed results. While they can improve reliability and investment certainty, poor calibration can lead to consumers paying for excess capacity. A capacity market would represent a fundamental shift from New Zealand's energy-only market design and require significant market redesign. Given the scale and complexity of such a reform, we do not consider a capacity market a proportionate response to the issues considered in this paper at this time.

Central buyer similar to Australia

- 7.46 The recent Australian National Electricity Market Wholesale Market Settings Review³⁸ concluded that the core wholesale market continues to effectively dispatch resources and reward physical energy services, and did not recommend a capacity market. However, it also recognised growing challenges in supporting investment in firming and storage resources as traditional sources of long-term contracting become less available.
- 7.47 The review recommended reforms to strengthen investment signals while preserving market-based incentives. These included measures to improve contract market liquidity and depth, such as a permanent market-making obligation, and the proposed Electricity Services

³⁷ [Market making review – strengthening price discovery in the forward electricity markets](#)

³⁸ [National Electricity Market wholesale market settings review](#)

Entry Mechanism (ESEM). ESEM would provide standardised, tradable contracts for firming, shaping and energy services, helping address long-term revenue certainty needs of developers. This review's approach was to support investment in new generation, including firming generation and storage, through enhanced risk-management and contracting arrangements, while retaining the energy-only market as the primary mechanism for operational and investment decisions.

- 7.48 The Authority considers that central buyer arrangements can facilitate investment where private contracting is limited, particularly for assets requiring long-term revenue certainty, such as LDF. However, as with a capacity market, a central buyer scheme could risk inefficient procurement decisions if poorly calibrated and would increase the cost to consumers.

Dedicated firming and flexibility market

- 7.49 The OECD identified several seasonal firming options that could reduce New Zealand's reliance on gas, including biomass, industrial demand response, pumped hydro, geothermal, coal, gas storage, LNG, renewables overbuild and super-critical geothermal.
- 7.50 Investment barriers differ across these options. Gas uncertainty constrains new thermal investment, while pumped hydro and biomass face long consenting processes, high upfront costs and uncertain long-term revenue streams. These factors raise firming costs and contribute to forward-market premia.
- 7.51 To address these barriers, the OECD recommends a dedicated firming and flexibility market to provide clearer investment signals as thermal generation declines. Such a market would value both short-duration flexibility and LDF for dry years and other prolonged scarcity events, expanding tradable flexibility services and supporting investment in seasonal flexibility.
- 7.52 The OECD notes that current arrangements rely heavily on bilateral deals between gentailers and large industrial users. A transparent platform could improve price discovery, lower barriers to entry, support investment in firming technologies, and complement existing hedge products while retaining the energy-only market.
- 7.53 The Authority considers that a dedicated firming and flexibility market could have some merit but may be constrained by a small number of buyers and sellers. On balance, the Authority does not consider further development of this option is warranted at this time.

Q5: What is the most appropriate method for assessing long-duration firming risks? For example, should the assessment focus on dry seasons or dry years or both?

Q6: What information or guidance on firming contracts would be most useful for market participants?

Q7: What information relating to firming contracts should be disclosed to improve market transparency?

Q8: What measures, if any, should be prioritised to improve investment incentives for long-duration firming?

Q9: Would a physical or financial firming product be more effective in supporting market liquidity, managing risk, and supporting investment signals? Please explain your views.

Q10: Do you support the introduction of a mandated sell-side auction for a small volume of firm energy products? Why or why not? If you support this option, please include in your response the types, volume, and duration of products that should be auctioned.

Q11: What additional measures could be introduced to facilitate more effective, or additional, demand response arrangements?

8 Next steps

- 8.1 The Authority will consider feedback on this paper alongside any decisions that the Government makes in relation to plans to establish an LNG terminal and introduce reliability obligations. Subject to consultation feedback, we intend to publish the Authority's proposed options for further consultation in early 2027.

Appendix A – Submission form

Long-duration firming – issues and options paper

Please email your submission to wholesaleconsultation@ea.govt.nz by 5pm, Friday 13 November 2026

Name	
Organisation	

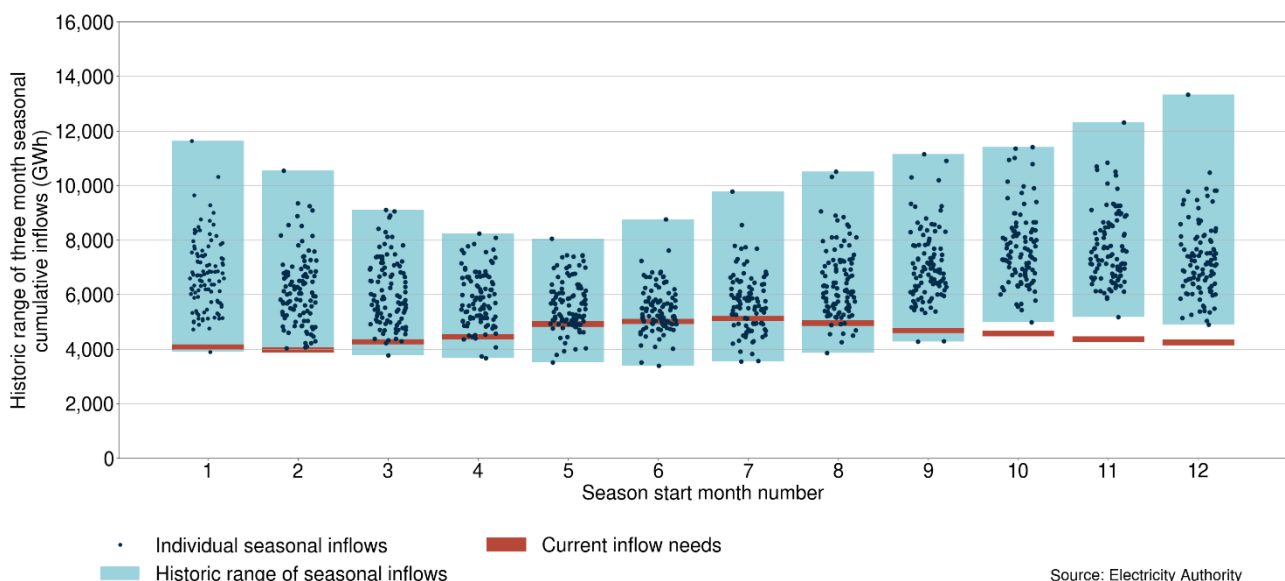
Questions	Comments
Q1: Do you agree with the Authority and Sapere's analysis that New Zealand faces an ongoing, but declining, long-duration firm energy gap? Please explain your views.	
Q2: Do you agree with the Authority's assessment of barriers to the market providing additional sources of long-duration firming? Please explain your views.	
Q3: Are there any other barriers you think limit participation in firming contract markets for buyers, sellers and potential new entrants? Please explain your views.	
Q4: Does the tenor gap represent a material barrier to investment? What additional work or interventions, if any, could be considered by the Authority to address this issue?	
Q5: What is the most appropriate method for assessing long-duration firming risks? For example, should the assessment focus on dry seasons or dry years or both?	
Q6: What information or guidance on firming contracts would be most useful for market participants?	
Q7: What information relating to firming contracts should be disclosed to improve market transparency?	
Q8: What measures, if any, should be prioritised to improve investment incentives for long-duration firming?	
Q9: Would a physical or financial firming product be more effective in supporting market liquidity, managing risk, and supporting investment signals? Please explain your views.	
Q10: Do you support the introduction of a mandated sell-side auction for a small volume of firm energy products? Why or why not? If you support this option, please include in your response the types, volume, and duration of products that should be auctioned.	
Q11: What additional measures could be introduced to facilitate more effective, or additional, demand response arrangements?	

Appendix B – Report from Sapere

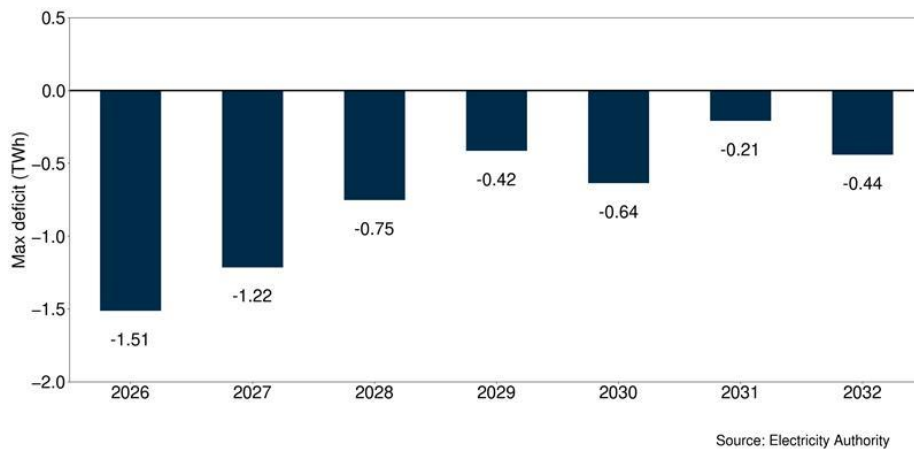
Appendix C– Our approach to measuring the long-duration firming gap

- C.1 To complement Sapere’s work, the Authority carried out its own analysis of the risks of dry periods to the electricity system. Rather than aggregating inflows on an annual basis, the Authority’s methodology focused on three-month periods in which inflows wouldn’t meet required demand, given specific supply assumptions.
- C.2 This approach was designed to find periods within the historical record in which hydro shortfalls occurred, even if the overall aggregate inflows for the annual period were typical. This allows for the capture of periods such as occurred in winter 2024, despite that year experiencing above average inflows overall.
- C.3 We began by estimating electricity supply and demand without considering hydro inflows. We used the following assumptions:
- (a) Demand: We assumed average demand (i.e. mean demand) over the 2021–2025 period and projected this forward using an annual growth rate of 1.9% from MBIE’s EDGS reference scenario. We also assumed that three months of demand response from Tiwai Point (equivalent to the contract maximum of 185MW) would be provided.
 - (b) Supply: We assumed generation from geothermal and intermittent renewable sources according to capacity factors calculated from average generation over the 2021–2025 period. For thermal supply, we assumed sufficient coal to run three Rankines for three months, together with gas-fired generation based on minimum contracted gas and 1.3PJ of gas from Ahuroa storage. We also assumed 1TWh of hydro energy from storage, but no hydro inflows. For future years, we assumed that 90% of both committed and actively pursued generation projects were realised.
- C.4 The difference between energy demand and supply without hydro inflows produced a total energy deficit.
- C.5 We then compared this deficit to hydro inflows for three-month periods across the 93-year historical record to identify periods where this energy deficit would not be met with hydro inflows, shown in Figure 1. Importantly, these results suggest gaps between supply and demand may occur, but only under the above modelling assumptions.

Figure 1: Distribution of 3-month cumulative historic inflows by starting month, compared to current needs from inflows based on supply and demand assumptions



C.6 Next, we examined how the maximum potential energy deficit identified in this analysis is impacted by future supply and demand. Similarly to Sapere, our analysis broadly shows a declining risk in severe dry periods in 2026 to 2029, although the deficit increases again in 2030 and 2032. We note that this is on the basis of a hydrological worst-case from the historic inflow record.



Appendix D– Key terms

In this paper, we use the following terms:

- D.1 **Capacity:** The maximum rate at which electricity can be generated, stored, or consumed at a point in time, typically measured in MW or GW.
- D.2 **Demand response:** A reduction or shift in electricity consumption by consumers in response to price signals, contractual arrangements, or system needs, helping to balance supply and demand and improve security of supply.
- D.3 **Dispatchable generation:** Generation that can be increased, reduced, or scheduled when required, independently of prevailing weather conditions. Examples include thermal generation and hydro generation with storage.
- D.4 **Energy:** The total amount of electricity produced, stored, or consumed over a period of time, typically measured in GWh or TWh.
- D.5 **Energy-only market:** A market design in which generators are primarily paid for the electricity they produce, rather than receiving separate payments for maintaining generation capacity
- D.6 **Firming:** The provision of electricity supply, storage, demand reduction, or other services that help maintain reliability when renewable generation output is low, hydro inflows are reduced, or demand is unusually high.
 - (a) **Short-duration firming:** Resources capable of supplying or reducing demand for seconds, minutes, or hours.
 - (b) **Long-duration firming:** Dispatchable resources capable of supplying or reducing demand for weeks or months, helping manage prolonged energy shortages and dry-year risk.
- D.7 **The hydro inflow shortfall:** The net effect of a hydro inflow shortfall and the reservoir operator's drawdown of hydro storage. The hydro inflow shortfall is measured by the cumulative deviation of inflows (over varying durations) relative to historical mean inflows.
- D.8 **Long-duration firm energy gap (LDF energy gap):** The difference between available spare firm energy and the energy required to manage severe hydro inflow shortfalls under a given set of assumptions about demand, supply, and system conditions. A forecast gap indicates that additional long-duration firming resources may be needed.
- D.9 **Multi-year carryover risk:** The risk that consecutive years of below-average hydro inflows reduce the system's ability to replenish hydro storage across years.
- D.10 **Multi-week renewable drought (or lull) risk:** The risk that prolonged periods of low hydro inflows coincide with low output from renewable generation sources such as wind and solar.
- D.11 **Seasonal dry-year energy risk:** The risk that insufficient hydro inflows, particularly ahead of or during winter, reduce the availability of hydro generation over an extended period
- D.12 **Spare firm energy** means the portion of existing reliable generation and demand response not already required to meet normal baseload demand in average hydro years.
- D.13 **Water value:** The opportunity cost of water stored in a hydro reservoir, representing the minimum price at which a hydro operator is willing to generate electricity rather than conserve water for future use.

Appendix E – Both industry and government have taken measures to support long-duration firm energy, or have plans to do so

Existing measures

Huntly Firming Options

- E.1 The Huntly Firming Option (HFO) is an arrangement under which Mercury, Meridian and Contact pay Genesis to keep one of Huntly Power Station's thermal generation units available as a strategic back-up resource. Agreements have been in place since 1 January 2026, and were developed after Genesis determined that, without support from other market participants through long-term hedge contracts, it would retire Huntly's Rankine Unit 2 in early 2026.³⁹
- E.2 In simple terms, if a dry year or other supply shortage occurs, then participating generators can access Huntly's generation capacity to supply additional electricity to the market. This helps ensure the continuation of Huntly's thermal generation capacity as a source of firm, dispatchable electricity during dry years and other periods of supply stress, reducing the risk of shortages and extreme price spikes. In terms of energy, the HFOs could contribute about 400GWh over three months if they were called.
- E.3 The arrangement was authorised by the Commerce Commission in 2025 for a ten-year period.

Firming contracts

- E.4 New Zealand has an existing market for long-duration firming contracts. In its engagement on the topic of long-duration firming with industry participants, the Authority has learned that:
 - (a) Long-duration firming contracts are a tool to help participants manage spot price exposure (both high and low prices), provide revenue certainty, and manage locational risk and transmission constraints. Participants prefer contracts that are viably priced and callable, but with adequate notice periods.
 - (b) Firming contracts have become more complex and bespoke, different businesses want contracts with different characteristics, limiting standardisation.
 - (c) Because firming contracts have physical as well as financial implications, access to underlying firm physical assets (ie, plant and fuel) is important to the availability of these agreements.
- E.5 The Authority currently has limited visibility of the firming contracts market, which makes it difficult to monitor its development. Limited visibility and other issues with the existing firming contracts market are discussed further in our barriers section, below.

Other contracting arrangements

- E.6 Dedicated firming contracts are not the only contractual arrangements that can support investment in, or access to, firming capability. Other contracts, such as fixed-price variable-volume and baseload agreements, can transfer spot price and firming risk to other market participants, such as retailers. Participants that assume these risks may then be incentivised to respond by securing firming capability through contractual arrangements (eg, HFOs), operational measures, or investment in physical assets.

³⁹ [Commission authorises Gentailers' application for Strategic Energy Reserve Huntly Firming Option | Commerce Commission](#)

Voluntary Demand Response

The Tiwai Aluminium Smelter

- E.7 The Tiwai demand reduction agreements are a form of demand response that reduces dry-year risk by lowering electricity demand for days or weeks, rather than increasing electricity supply. Under agreements between New Zealand Aluminium Smelter (NZAS), Meridian Energy and Contact Energy, the Tiwai Point aluminium smelter can be paid to temporarily reduce its electricity consumption during periods of system stress, freeing up electricity for other consumers and helping to conserve water in hydro lakes.
- E.8 Because Tiwai is New Zealand's largest electricity user (at 572MW) the arrangement can provide significant dry-year cover and improve security of supply without requiring additional generation to be built. In winter 2024, the smelter agreed from 23 August to temporarily increase its demand response to 205MW, above the contracted maximum of 185MW. That is, a 36% reduction in total consumption.⁴⁰
- E.9 There are stand-down periods for Tiwai's demand response options, meaning they cannot be fully called on again within the applicable stand-down period (one to two years). Large-scale demand response agreements of this kind are becoming more common.

The Glenbrook Steel Mill

- E.10 The New Zealand Steel mill at Glenbrook, located 60 km south of Auckland, is the country's sole primary steel producer. In 2025, the mill announced the commissioning of a new electric arc furnace, which may also be used for rapid demand response (up to 70MW within the hour when given an appropriate notice period).⁴¹

Official Conservation Campaigns

- 1.1 Official conservation campaigns are another mechanism that can help to manage dry-year risk. The Code sets out that the System Operator must call an OCC if:
 - (a) the risk of electricity shortage is 10% or more for one week or more
 - (b) hydro storage is forecast to fall below the contingent storage level and the buffer, or
 - (c) it has agreed a date to start an OCC with the Authority.⁴²
- E.11 A campaign typically involves public appeals for households and businesses to voluntarily reduce their electricity consumption.
- E.12 By achieving sustained reductions in demand over weeks or months, conservation campaigns can help reduce the size of the long-duration firm energy gap and support security of supply during extended periods of low hydro inflows.
- E.13 Historically, some stakeholders have expressed concern that conservation campaigns may reduce incentives to develop other firming solutions if they are viewed as a readily available source of emergency demand reduction. More recently, the customer compensation scheme⁴³ has sought to strengthen incentives by imposing costs on market participants during conservation campaigns, while also supporting a more orderly use of such campaigns.

⁴⁰ [The Tiwai Point smelter demand response in winter 2024 | Electricity Authority](#)

⁴¹ [NZ Steel - TF2D submission.pdf](#)

⁴² For New Zealand or for South Island. Clause 9.23 of the Code.

⁴³ [Customer compensation scheme | Electricity Authority](#)

Additional measures that are being developed and/or considered:

Building a new facility to import Liquefied Natural Gas (LNG)

- E.14 An LNG import terminal is another option currently being developed by the Government for managing dry-year risk and potential long-duration firm energy shortfalls. An import terminal would enable New Zealand to access LNG from international markets, supplementing declining domestic gas supplies and providing fuel for thermal generation during periods of prolonged hydro shortages. Proponents argue that access to imported gas could improve security of supply and reduce the risk of electricity shortages during dry years.⁴⁴

Diesel-fired peaking plant at Marsden Point

- E.15 Another example of potential firming investment is Channel Infrastructure's proposed 72 MW diesel-fired peaking plant at Marsden Point. While the project had progressed through front-end engineering and design and was reportedly supported by electricity market participants, Channel Infrastructure announced in February 2026 that it had paused further development of the project while monitoring the Government's proposed LNG import terminal.⁴⁵

Pumped Hydro at Lake Onslow

- E.16 Another potential source of long-duration firming is the proposed Lake Onslow pumped hydro scheme. The project was originally investigated by the Government as part of the New Zealand Battery Project but was discontinued in 2023. It is now being advanced by the private-sector Clutha Pumped Hydro Consortium, which is seeking to progress the project through the fast-track consenting process. If developed, the scheme could provide approximately 4TWh of stored energy for use during prolonged periods of electricity scarcity, including dry-year conditions. While being actively pursued, the project is still subject to project approvals and financing.⁴⁶

Winter Energy Reliability Obligation

- E.17 MBIE has recently consulted on a proposed two-layer Winter Energy Reliability Obligation designed to improve management of dry-year risk. Under the proposal, major market participants would be required to secure adequate firm energy cover ahead of winters where a shortfall is forecast, while generators would need to demonstrate access to sufficient fuel or firm generation capability if hydro storage levels deteriorate. The proposal aims to encourage earlier investment and procurement decisions, and to ensure sufficient long-duration firming is available when required.

⁴⁴ <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-generation-and-markets/gas-market/lng-in-new-zealand>

⁴⁵ [Channel Infrastructure pauses diesel peaker plans as Govt pursues LNG terminal | BusinessDesk](#)

⁴⁶ <https://www.fasttrack.govt.nz/projects/clutha-pumped-hydro>