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MARKET INSIGHT

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NEW ZEALAND'S ELECTRICITY MARKET

The New Zealand electricity market is undergoing significant transformation driven by regulatory shifts, technological advancements, and evolving market dynamics. This latest Market Insight will give you a clear understanding of the market with analysis of key trends, drivers, and outlook, focusing on the growing role of renewable energy sources like solar and wind.

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Executive Summary

The New Zealand electricity market is undergoing significant transformation driven by regulatory shifts, technological advancements, and evolving market dynamics. Operating as a centrally run wholesale market with half-hourly prices based on demand, generation, and transmission limits, it is characterised by high price volatility that incentivises participants to use hedge contracts for risk mitigation. Gentailers (energy companies that both generate and retail electricity) benefit from natural hedging, while Power Purchase Agreements (PPAs), generally with power consumers, provide price stability and underpin investments in new generation projects.

Since 2019, the market has faced supply constraints due to retiring thermal generation, gas shortages, limited investment in new generation, and low hydro lake levels. Looking ahead, challenges include shrinking gas reserves, rising demand, and the need for grid and storage advancements to manage volatility from renewable energy sources.

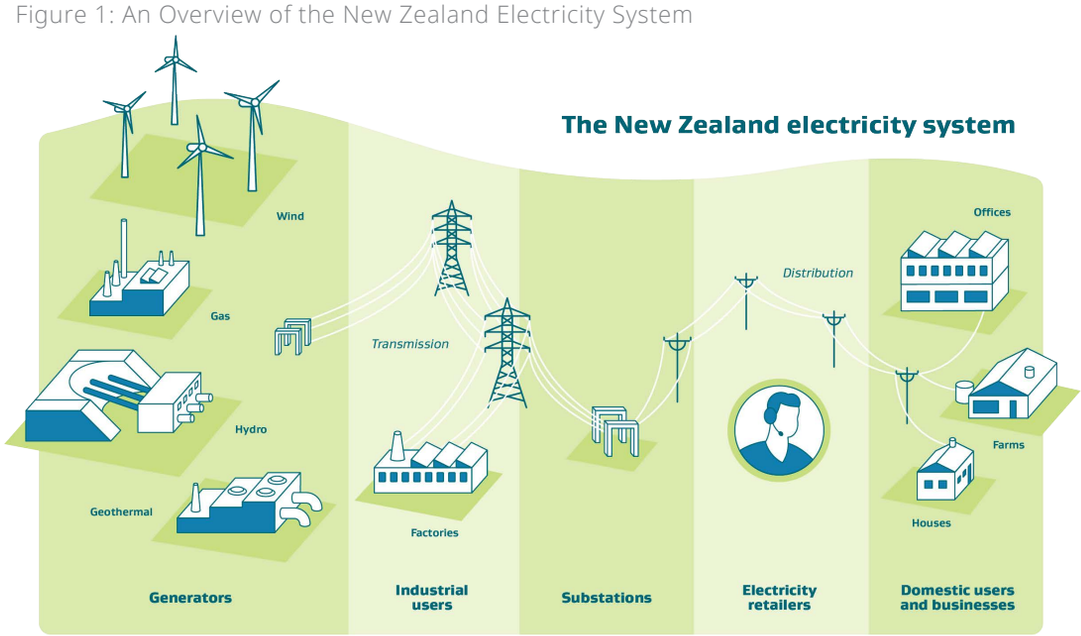
The transition to renewable generation like solar and wind, supported by their low Levelised Cost of Energy (LCOE) and favourable political and market conditions, will require an estimated $20-$30 billion in investment over the next decade. While large-scale renewable projects continue to face challenges associated with consenting and connection timelines, smaller-scale projects, such as 5MW solar projects, offer a more agile approach to navigating these hurdles.

Overview of the New Zealand Electricity Market

The New Zealand electricity market operates as a centrally run wholesale market where a diverse mix of generation sources compete to sell electricity. The System Operator dispatches generation in real-time to meet current demand, with the market price set by the offer price of the last megawatt (MW) dispatched to meet real time demand. Prices change every half hour, influenced by demand, available generation, and transmission limits.

A diagrammatic depiction of the New Zealand electricity system is shown in Figure 1.

Figure 1: An Overview of the New Zealand Electricity System



Source: www.mbie.govt.nz

Key Drivers of Market Prices

Demand:

Demand can be considered within a 24-hour period (Intraday), over a 12-month period, and over the long term.

Intraday Demand: Electricity demand in New Zealand peaks in the morning and evening, with the lowest demand overnight. Prices are generally lower in the weekend vs weekdays. This pattern is driven by residential and commercial activities.

Seasonal Demand: Demand is highest in winter due to heating needs and lowest in summer. Seasonal variations significantly impact electricity prices and generation strategies.

Long term: Figure 2 shows the historic sources of energy. This demand is projected to rise between 35% and 82% by 2050, primarily due to population growth and increased electrification of transport and industry (see page 8).

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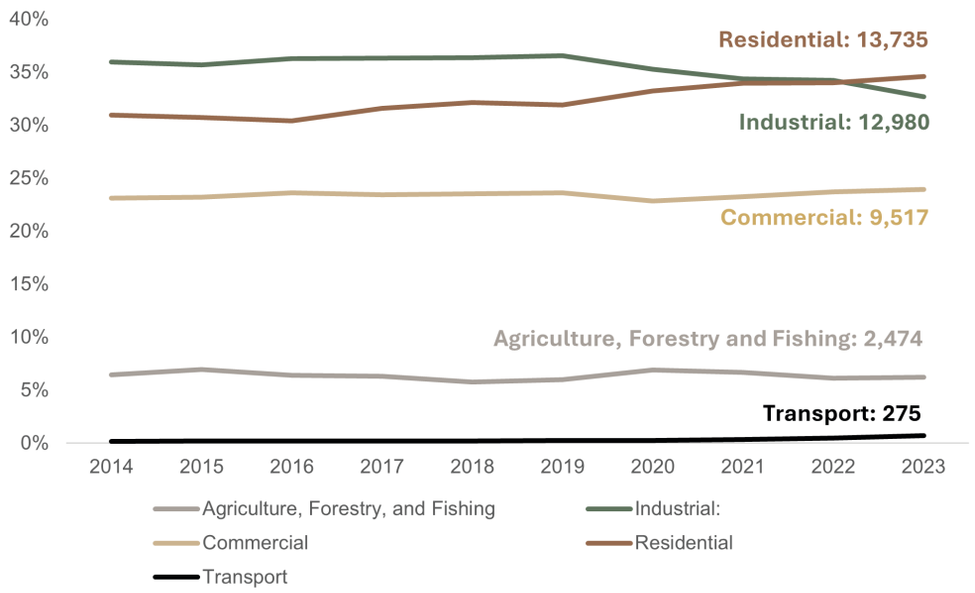
Figure 2: Electricity Consumption by Sector 2014 – 2023 (GWh)



Source: www.mbie.govt.nz

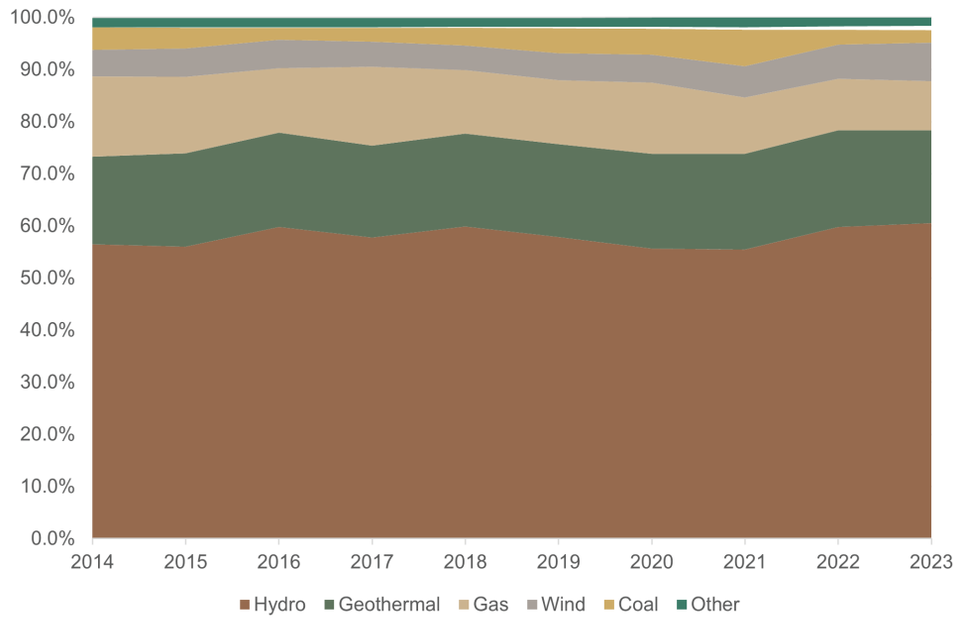
Generation

Electricity generation capacity can be considered as being of two primary sources: renewable energy and thermal energy (Figure 3).

Renewable Generation: Wind, hydro, solar, and geothermal sources have low or no fuel costs, leading to lower prices when these sources are abundant. In 2023, electricity generated from renewable sources reached 88% of total energy generation, the highest level on record. The availability of these renewable sources is crucial in setting market prices and means that weather conditions create volatility in electricity prices as recently evident during the winter of 2024 when low rainfall in the South Island resulted in low water/fuel availability at New Zealand's largest hydro lakes.

Thermal Generation: When renewable sources are insufficient to meet demand, thermal generation (using gas and coal) is necessary. The cost of thermal generation is linked to gas and coal prices, which can fluctuate based on global market conditions. Gas provides a valuable role in that has "quick start" capability meaning it can be 'turned on and off' relatively quickly so complements the variability of renewable energy supply. Coal has higher CO2e emissions and is less flexible in being able to compliment renewable energy use.

Figure 3: New Zealand Electricity Generation by Plant Type 2014 - 2023



Source: www.mbie.govt.nz

Price Volatility and Hedge Markets

Due to high price volatility, market participants use hedge contracts to mitigate exposure. Companies that are both generators and retailers (Gentailers) have a natural hedge by meeting their own demand with their own generation. Generators contract future production at fixed prices to guarantee revenue streams, while retailers purchase future generation at fixed prices to secure their cost base. Hedging contracts are traded both over-the-counter and on exchanges like the ASX.

Natural Hedging: Gentailers such as Contact Energy, Genesis Energy, Mercury Energy and Meridian Energy benefit from a natural hedge by balancing their generation and retail operations. This balance allows them to manage price risks more effectively and stabilise their revenue streams.

Power Purchase Agreements (PPAs): PPAs are long-term contracts between generators and buyers, providing a fixed price for electricity over a set period. These agreements underpin secure returns on investment in new generation projects, making them a critical tool for financing renewable energy developments.

Futures Contracts: Buyers and sellers enter contracts to buy or sell electricity in the future at a fixed price. There is sufficient liquidity in the New Zealand futures market for buyers and sellers to hedge their future exposure 3 years ahead of time. The fixed price of a futures contract is based on the forecast price of electricity plus a risk premium paid to the counterparty taking on price and volume risk.

Current price of futures contracts is reported here: https://www.asxenergy.com.au/futures_nz.

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Market Status and Outlook

Since 2018, the market has experienced a supply shortage, leading to sustained high prices. Electricity prices averaged $71MWh over the five years from 2013 – 2017. Figure 4 highlights the significant increase in electricity price from 2018 onwards. Several factors contribute to this situation as noted below.

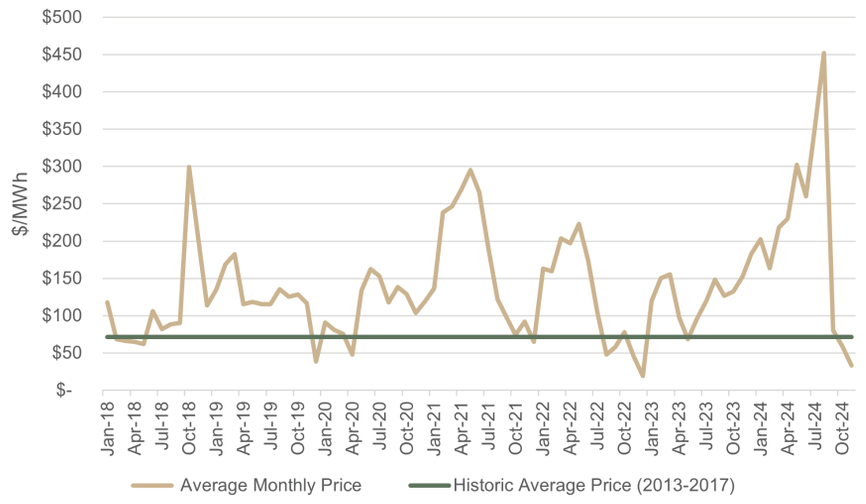
Retirement of Thermal Generation: The gradual phase-out of thermal power plants has reduced the overall generation capacity, increasing reliance on renewable sources. Huntly Power Station, the only remaining large-scale coal-fired plant, has not been fully retired but its operation has been significantly reduced, now primarily serving as a 'Peaker plant', only used during sustained periods of electricity supply shortfall (i.e. when hydro lakes are low).

Shortage of Gas Supply: The declining productivity of existing gas fields, regulatory uncertainty and the 2018-2024 ban on new exploration[1] have led to a shortage of gas supply for electricity generation and lack of investment in finding new sources of gas supply to replace the depleting existing gas reserves.

Lack of Investment in New Generation: Uncertainty surrounding regulatory policies and major industrial demand has deterred investment in new generation projects, further straining the supply-demand balance. This uncertainty was notably tied to the future of the Tiwai Point aluminium smelter, which consumes 13-14% of New Zealand's electricity. However, in May 2024, New Zealand Aluminium Smelter (NZAS), the smelter's owner, committed to a 20-year power agreement, reducing this particular uncertainty but locking in significant electricity demand for the next 20 years.

Hydro Lake Levels: Low hydro lake levels, particularly during 2023 and 2024, have led to extreme and sustained price spikes. With hydro generation accounting for 61% of New Zealand's electricity supply in 2023, its variability significantly impacts market stability. While heavy rainfall in late August 2024, coupled with reduced industrial demand, provided temporary price relief, prices are expected to increase again starting in Q2 2025.

Figure 4: Average Monthly Electricity Price (2018 - 2024) vs Historic Average (2013 - 2017)



Source: CEIC

[1] https://www.beehive.govt.nz/release/government-reverse-oil-and-gas-exploration-ban

[2] https://www.riotinto.com/en/news/releases/2024/long-term-future-for-new-zealands-tiwai-point-aluminium-smelter-secured-with-new-power-deals

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Key Themes for the Future

The following themes are likely to shape the electricity market in New Zealand through to 2050.

Shrinking Gas Reserves: Gas reserves are depleting faster than expected, with current exploration projects turning up 'dry' and limited planned investment in new exploration. This trend poses a significant risk to the stability of thermal generation.

Increasing Demand: Population growth and the transition of industries from fossil fuels to electrification—such as process heat and transport—are driving a significant increase in electricity demand. By 2050, electricity consumption is projected to rise by between 32% to over 80%, reaching 72 terawatt-hours (TWh). A key constraint is ensuring this demand is met entirely from renewable sources. Achieving this would require the equivalent of more than 8,000 proposed 5 MW solar farms.

Increased Volatility: The transition from baseload thermal generation to intermittent renewable generation increases market volatility. Managing this volatility requires advanced grid management and storage solutions.

Firming Intermittent Generation: Technologies like hydro and batteries are essential to firm intermittent renewable generation, ensuring a stable supply during periods of low renewable output.

Distributed Generation: The market is moving from large, centralised generation to geographically diverse distributed generation. This shift enhances grid resilience and reduces transmission losses.

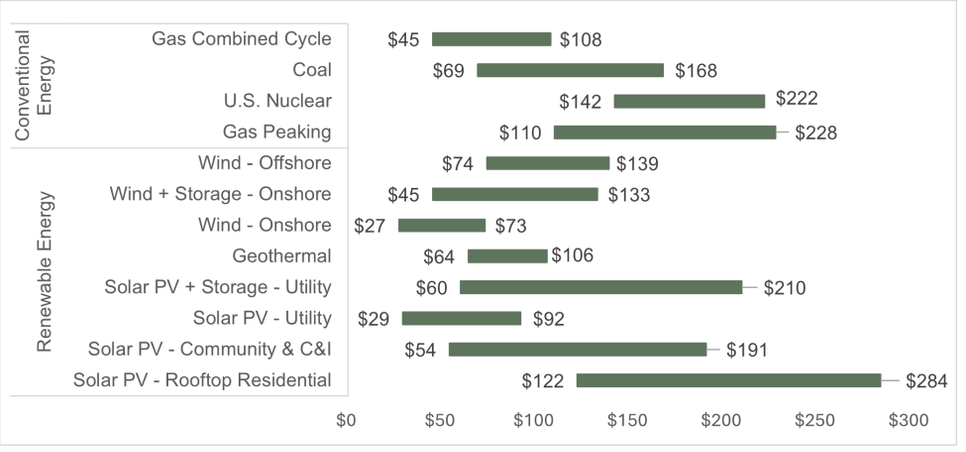
The Role of Renewables

The New Zealand electricity market is transitioning further away from fossil fuels to renewable generation, particularly solar and wind. These sources are the lowest cost for new electricity supply, with significant cost reductions over the last decade. Both major political parties support increasing renewable generation, with Labour aiming for 100% renewable electricity by 2030 and National aiming to double the amount of renewable electricity[3].

Levelised Cost of Energy (LCOE)

LCOE measures the average cost of generating electricity over a generator's lifetime, representing the price needed to achieve a set return on investment. Solar and wind currently have the lowest LCOE compared to other generation technologies, making them the preferred choice for new generation projects.

Figure 5: Levelised Cost of Energy Comparison - $/MWh (USD)



Source: Lazard. (2024, June). Lazard's Levelized Cost of Energy Analysis – Version 17.0. Retrieved from: https://www.lazard.com/media/xemfey0k/lazards-lcoeplus-june-2024-_vf.pdf

Solar Energy

Solar energy is becoming increasingly viable due to technological advancements and cost reductions. Over the past decade, LCOE for utility-scale solar has fallen by over 80%, making it one of the cheapest electricity sources globally. New solar generation projects have a capacity factor of 20-30%, with generation concentrated in the middle of the day. Solar energy's reliability during daylight hours makes it a valuable component of the renewable energy mix. Generation from Solar energy is currently responsible for 1% of New Zealand's energy generation. By 2050, it is estimated that solar could generate up to 11% of total electricity.

However, the LCOE increases when storage solutions, such as batteries, are integrated with utility-scale solar, as solar panels are currently far more economically efficient than batteries. Nonetheless, as battery costs continue to decline and efficiencies improve, they are becoming increasingly competitive, especially for longer-duration storage (e.g., 4-6 hours or more).

Over the coming decade, storage solutions are expected to play a critical role in renewable energy developments, enabling greater integration of intermittent sources like solar while enhancing grid reliability and flexibility.

[3] https://www.national.org.nz/press/national-will-electrify-nz

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An alternative use of intermittent renewable electricity supply is Green Hydrogen production, as the technology used to produce hydrogen can turned on and off quickly to follow intermittent generation. Parties such as Hiringa Energy are looking to innovate in this area and have already built out three Hydrogen refuelling stations with one further in the pipeline.

Wind Energy

Wind energy offers a more consistent generation profile than solar, with modern wind farms achieving capacity factors of 35-45%. While wind generation can exhibit some volatility, it often generates more power overnight, effectively complementing the daytime production of solar. As of 2023, wind energy contributed approximately 8% to New Zealand's total electricity supply, a figure projected to rise to 21% by 2050.

Investment in Renewables

Independent experts estimate that between $20 and $30 billion of investment in renewable generation will be required in New Zealand over the next decade[4]. Both solar and wind are necessary as they provide complementary generation profiles, reducing intermittency risk. When wind and solar are generating, energy storage solutions such as hydro, gas, and batteries can be utilized to meet peak demand periods.

[4] https://www.pwc.co.nz/insights-and-publications/building-prosperity/building-prosperity-through-the-energy-transition.html

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Challenges and Opportunities for Renewables

Challenges

- **Connection Time:** There is currently a 3-5 year wait to connect new generation to the Transpower transmission network. This delay poses a significant barrier to the rapid deployment of new renewable projects.
- **Resource Consenting:** Obtaining resource consent for new generation can be complex, costly, and time-consuming. Streamlining the consenting process is essential to accelerate renewable energy development.
- **Storage Solutions:** Increasing intermittent generation requires more storage solutions to meet peak demand. Developing cost-effective and scalable storage technologies is crucial for integrating higher levels of renewables.
- **Offtake Agreements:** Limited parties are willing to offtake electricity at fixed prices and manage the intermittency of renewable generation. Gentailers generally prefer to build their own generation, creating a challenge for independent renewable developers looking for long-term offtake.

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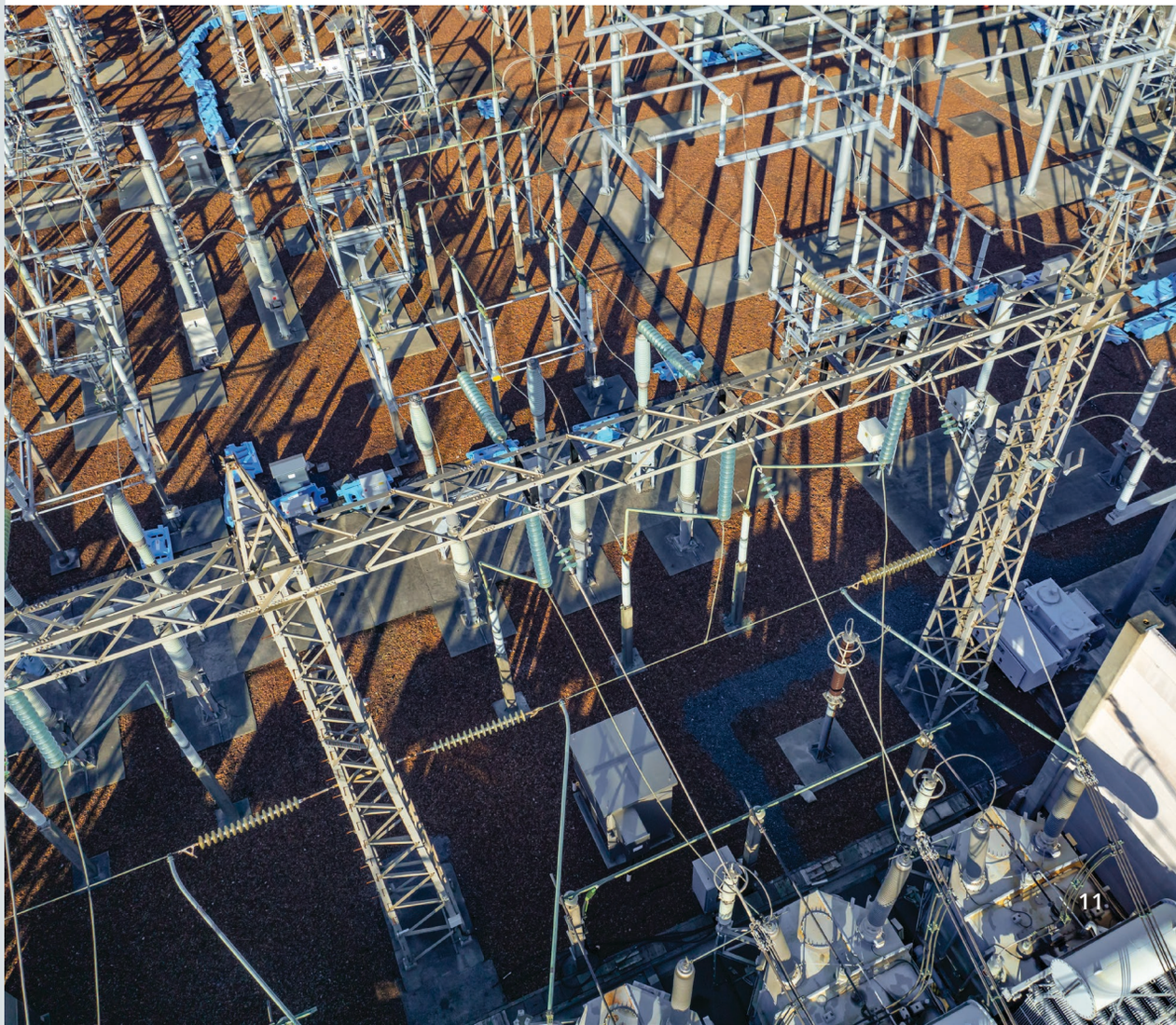
Opportunities

- **Low Penetration of Solar:** While wind generation is relatively mature in New Zealand, solar generation is still in its early stages, presenting a near to medium-term opportunity for growth. Investing in solar projects can capitalise on this untapped potential.

- **Smaller-scale generation:** Smaller scale generation projects (typically less than 10 MW) benefit from streamlined consenting, construction, and connection processes, as they connect to distribution networks rather than requiring lengthy transmission connections. This allows for faster and more flexible deployment.

- **Flexible Demand:** Energy users with flexible demand can provide long-term offtakes with fixed pricing to underpin investment in renewable generation. This flexibility can help manage intermittency and stabilise revenue streams.

- **Grid Inertia:** New Zealand's hydro-generation provides large-scale, fast-response, and flexible generation to manage higher penetration of intermittent renewables. Leveraging hydro's capabilities can enhance grid stability and support renewable integration.



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Conclusion

The New Zealand electricity market is at a pivotal point, with significant opportunities for investment in renewable energy. The transition from fossil fuels to renewables, particularly solar and wind, will occur because of their low LCOE costs compared to the alternatives, supported by political and climate change forces. However, challenges such as lengthy connection times, complex resource consenting processes, and the need for scalable storage solutions present substantial obstacles to the rapid deployment of large-scale renewable generation.

Understanding these dynamics is essential for making informed investment decisions. While the market's shift towards renewables carries risks, it also offers substantial opportunities for significant returns on new generation projects.

Small-scale utility solar projects, in particular, present an attractive investment opportunity, meeting demand efficiently while offering a favourable return profile.

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