# Effects of uncertainty on generation investment decisions

## Disclaimer - Purpose of our report and restrictions on its use

This report was prepared on the instructions of the Ministry of Business, Innovation and Employment (MBIE) solely for the purpose of supporting MBIE by answering a prescribed set of questions regarding how risk and uncertainty affect the willingness and ability for parties to invest in generation. The report should not be relied upon for any other purpose.

In carrying out our work and preparing our report, we have worked solely on the instructions of MBIE and for MBIE's purposes. This report was developed as a 'white paper' style report, based on our insights and experience in the market, which were tested and supplemented by confidential, non-attributable discussions with parties involved with development and financing of generation projects. However, this is not intended to be a comprehensive review these issues and no additional analysis was conducted to further test these findings.

Our report may not have considered issues relevant to any third parties. Any use such third parties may choose to make of our report is entirely at their own risk and we shall have no responsibility whatsoever in relation to any such use. We disclaim all responsibility to any other party for any loss or liability that the other party may suffer or incur arising from or relating to or in any way connected with the contents of this report, the provision of this report to the other party or reliance upon this report by the other party.

In preparing this report we have considered and relied upon information from a range of sources believed to be reliable and accurate. We have not been informed that any information obtained from public sources was false.

Our work has been limited in scope and time and we stress that a more detailed report may reveal material issues that this report has not.

# Contents

# Scope

The NZ Battery team has sought answers to the following 11 questions in relation to investment given the future generation scenario outlined in the following section. The intent of this work has been defined as follows:

- *We seek advice on how **risk and uncertainty** affect the willingness and ability for parties to invest in generation - taking account of the range of uncertainties impacting investments, including variable dry year return periods. This will inform our understanding of the **likelihood that private investment will be sufficient** to ensure security of supply.*

It is noted that capital markets activity for renewable generation investment in NZ is dominated by gentailers and somewhat underdeveloped as it relates to project finance. Hence initial insights have been provided in an Australian context, and then calibrated where relevant, for a New Zealand market context (through project team knowledge and anonymous discussions with lawyers and bankers familiar with the NZ market). The pipeline of forward activity is also dominated by gentailers, although there are a number of other developer types emerging.

A glossary of terms used in this paper is given in Appendix A and a comparison of the different classes of investors is given in Appendix B.

**Future Generation Scenario**

The electricity market is expected to change significantly over the next 40 years. While it is impossible to know how things might change over this timeframe with any accuracy, we are interested to understand the potential direction of travel, noting the typical expectation is for a future scenario in which the following may occur:

- There is significant potential for electricity demand growth as applications previously relying on fossil fuel transition to electricity – particularly transport and process heat along with population and GDP growth.
- Wind and solar are the primary sources of supply available to meet increasing electricity demand due to lower costs and ease of consenting. This leads to significant variability in generation given the intermittent nature of these technologies, and hence significant electricity price and revenue volatility. These technologies tend to operate on an as generated basis (and be dispatched first given the energy cannot be stored) and may be 'over-built' such that, at times, their output cannot be fully utilised and so is 'spilt'.
- Electro chemical cell batteries may play a significant role in balancing demand and supply over the course of a day (i.e., storing solar output for use in the evening), but at present they are not cost effective in providing longer duration storage (e.g., beyond 2 hours).
- The existing hydro system plays a significant and growing role in operating around wind and solar variation and managing seasonal variation in demand and supply.
- There are limited options for controlled generation that can operate for short bursts with limited notice at peak times, or where wind and solar output is supressed for several days. Gas continues to operate in this role, as its low capital costs make it least-cost at low rates of utilisation.
- Gas production is in gradual decline and there is a need for gas supply to be more flexible, as electricity demand for gas transitions to other options and that what remains is increasingly intermittent.

This 'highly renewable' scenario has been identified and discussed in work undertaken by others, including Boston Consulting Group's "The Future is Electric" report, and by the Electricity Authority's Market Development Advisory Group.

# Summary of key findings and areas for further analysis

Virtually all electricity in New Zealand is produced by the large vertically generators/retailers (gentailers) who comprise over 99% of generation capacity. While there is some evidence of investment in new generation by project developers their contribution to date is very small. (Further detail on the characteristics of portfolio vs project developers is provided in the following section). This paper discusses how financing and financing issues for the sector may change over the course of the next 40 years.

We note that although there are examples from other industries of major changes in market structure over time – these are typically a result of either technological change/innovation or Government policy. It is these sorts of catalysts that are likely to lead to change in the market structure of the electricity generation sector. Absent these sorts of changes project developers are likely to continue to have a minor role in the sector.

A key enabler for other markets which have had a more active project developer market the use of Power Purchase Agreements (PPA) to underwrite these developments. The PPA market is relatively immature in New Zealand and faces challenges not only as a result of the nascent nature of the market, but also due to challenges in accessing firming which is primarily held by the gentailers.

With respect to projects with a security of supply focus, there are increased challenges in financing these projects. This is because these projects, absent any contractual support, face considerable, additional types and levels of risk. There are few examples of such assets that have been developed by the private sector as the market risks are considered to be too high, without some form of incentive mechanism. There is a further challenge for fossil fuel-based security of supply generation as financiers move away from investment in fossil fuel assets.

Through this work we have identified a number of areas which could warrant further investigation depending on MBIE's needs and priorities. These are broken into two areas below: understanding the 'base case' of what would likely occur without an NZ Battery investment, and; understanding potential role of Government and regulators in supporting the energy transition.

<u>Understanding the base case:</u>

- **Deep dive on security of supply investments:** This basis of the findings in this report are primarily based on historic generation investments and current market activity, and therefore has limited information to draw on with respect to projects with a security of supply focus. While we note that these types of investment face additional challenges and are not attractive from a private sector investment perspective, it could be worth further analysis to understand the specific conditions and thresholds the project developers and financiers would be willing to consider.
- **Understanding flow-on impacts of gas generation investment constraints:** This report has focussed on investment constraints on electricity generation, but understanding the investment constraints and impacts of uncertainty of future gas production will be critical for any new gas peaking generation. This would include consideration of how these projects would be financed and contracted to ensure sufficient gas availability over their life and could be extended further to consider investments in any required supporting infrastructure (e.g., gas storage, LNG import terminal etc).
- **Understand potential for demand response:** When considering availability of demand response, it is important to not only understand the technical capacity available, but also what investment is likely under the existing arrangements and how this could change if contracting or other mechanisms were introduced.

- **Cost of capital analysis:** While this report provides guidance on ranges for hurdle rate, further analysis would enable a narrower cost of capital range to be used, with a more nuanced understanding of where different types of investments would fall in the range.

Supporting the energy transition:

- **Unpack barriers to PPA market development:** This report identifies a number of barriers to establishment of a PPA market in New Zealand, including limited access to firming (e.g., sleeved PPAs) and lack of standardisation of PPA agreements. Further analysis to better understand the barriers which are restricting investment and options for relieving those could support increased participation of generation project developers.
- **International Government intervention review:** Further to the above point, Government-led mechanisms were seen as critical in incentivising generation in other countries and establishing a liquid PPA market. This report lists some of these, but developing a database of these mechanisms, what issues they seek to address, their costs and effectiveness could be useful in identifying and assessing mechanisms which could be used in NZ to address any energy transition issues which were not expected to be able to be solved by the market alone.
- **Assess barriers due to gentailer structure:** Through our discussions, the historic dominance and structure of the existing gentailers (including their vertical integration and asset portfolio) was noted as a barrier to new entrants, which has the potential to reduce competition and reduce economic efficiency of the system. Specifically, it was noted that gentailers do not have incentives to provide firming to third parties (e.g., via sleeved PPAs) as this would essentially offset their own project pipeline. Further understanding these barriers would help assess their impact and, if necessary, inform options development for addressing them.
- **Identifying and reducing/eliminating unintended regulatory barriers:** Several parties noted barriers for investment in generation resulting from unintended consequences of market structure or regulation. For example, the multiplicity of different processes for dealing with the 29 different Electricity Distribution Businesses (EDBs) across the country increased cost and introduced delays for developing embedded generation. Similarly, the Overseas Investment Act was seen as adding complexity and cost, to the point where it could make international investment in some projects uneconomic, despite these projects potentially not creating the same types of issues the Act is intended to address. These unintended barriers add to the challenges for new generation investment and could likely be addressed relatively quickly and easily through a nationally coordinated approach to these issues.

## Types of Investors in New Generation

A key concept throughout this report is the difference between 'portfolio players' and 'project developers'. A summary of what is meant by these terms, and their key features and differences, are described below for clarity.

<table>
<tr><td colspan="2">Market Structure<br><br>The financing needs and approaches of portfolio players compared with project developers are very different as outlined below.</td></tr>
<tr><td>Portfolio Players</td><td>Project Developers (Project Finance)</td></tr>
<tr><td>• Investment is part of a wider portfolio of generation<br>• Will have a downstream offtake portfolio (e.g., retail, C&I, other generators) to underwrite investments<br>• Investment is at the corporate level – debt or equity to finance an integrated market operation<br>• Financing recourse is to the company based on the corporate P&L<br>• Financiers are interested in the profitability of the entire portfolio and the corporate entity<br><br>Examples:<br>• Genesis<br>• Contact<br>• Mercury<br>• Meridian<br>• Manawa Energy</td><td>• Investment is at the project level and for a specific development (s)<br>• Financiers are interested in the credit characteristics of the specific project<br>• Extensive analysis and structuring around risks needed at the project level<br>• If the project fails, the company fails, and credit losses may result<br>• Considerably more challenging to arrange finance involving much greater scrutiny from financiers and higher costs of capital – no diversified strong credit backing the project.<br>• Offtake is sold to the wholesale market (merchant risk) or via bilateral contract (PPA)<br><br>Examples:<br>• Lodestone (has achieved financial closure)<br>• Multiple solar developers currently developing projects but yet to confirm funding</td></tr>
</table>

## Key Terms

| Term | Description |
|---|---|
| EPC | Engineer, Procure and Construct – typically refers to firms that provide contracts with fixed price components to deliver a completed engineering project. Such contracts provide higher levels of certainty to developers as to the cost of completion of an engineering project. EPC contracts appear in many sectors involving infrastructure. |
| Merchant Generator | Refers to electricity being sold at spot prices (albeit possibly with some use of futures markets). The distinction is with electricity sold under a PPA. This generator is typically an independent generator who does not have the benefit of a PPA or a wide customer base. Merchant risk is challenging for a bank to finance given the uncertainty of revenue. |
| Non-recourse funding | Non-recourse funding is where returns to debt and equity are from the project only – there is no support from the shareholder or other cashflows of a company. Project finance (as described below) is typically non-recourse however there may be situations where some shareholder support is provided. |
| Portfolio players/developers | In the context of this paper, we use this term to mean the generator/retailers – who have both vertical integration (generation and retail) as well as a portfolio of generation and retail assets. These providers currently make up ~99.6% of generation capacity. These businesses are very different from project financiers/ independent generators given their significantly larger scale and vertical integration. |
| PPA | Power purchase agreement – a long term agreement between an energy buyer and seller with substantial fixed elements for both parties with respect to volume and price of electricity. The PPA is, in essence, an insurance arrangement. The underlying energy is traded through the pool. PPAs can be purely synthetic arrangement for the energy produced or can be firmed by a third party (e.g., a retailer). The buyers could be an electricity retailer and/or a major user. The seller could be an existing portfolio player or a new entrant independent generator? |
| Project finance/financiers<br>Independent generators | Independent generators are characterised by a small number of generation assets only and often financed using project finance. Project finance refers to financing a new generation asset through debt and equity with the returns to each based on the project cashflows only. Normally involves de-risking of the project through contracting away major sources of project risk so the returns to debt and equity are more predictable. Typical contracts used to offset risk are EPC contracts and PPAs. These projects currently make up ~0.4% of generation capacity. Project finance is usually non-recourse (as described above). |

## Questions and responses

| Item no. | Question | Answer | How might this change over the next 40 years given the scenario described above |
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| 1 | How are generation investments in New Zealand typically financed. | • Portfolio players/gentailers dominate the market for new electricity generation investments.<br>• New generation projects are almost always financed on balance sheet (i.e., with recourse) due this delivering the lowest cost of capital for portfolio players and being the simplest to execute. The gentailers operate sophisticated treasury teams and can tap a wide variety of capital markets to raise funds. There is a ready source of bank or bond market debt available for the gentailers. Banks understand the gentailer business model and have dedicated teams available to assist in meeting their financing needs.<br>• Gentailers have ready access to equity capital markets given their listed status (although noting some constraints may exist through the mixed ownership model).<br>• Non-recourse financing is considerably more complex than on balance sheet financing and there is much more limited capability in the New Zealand market to deliver such financing. The risks needing to be taken by a capital provider to non-recourse projects are complex to analyse and greater in magnitude. Different teams within banks are responsible for project finance compared to the funding of the gentailers and much of the project finance expertise is offshore given the more developed nature of project finance in offshore markets. | • Under the future generation scenario, more generation and storage will require large amounts of capital (debt and equity) to be deployed either through portfolio players or project financiers<br>• As a general principle most material sources of capital are sourced from financial institutions with a physical presence in the New Zealand market (or Sydney or Melbourne). Some specialist finance (debt and equity) might be sourced directly from offshore.<br>• This could lead to new market entrants entering the market, which there is already some evidence to support. These new generation and storage projects may be delivered under non-recourse structures<br>• If more single assets rather than portfolios come into the generation and storage mix, then this is likely to be through non-recourse financing occurring. This would require investors to be confident that the risk mitigation tools typically available to project financing (discussed below) are available in New Zealand. |

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| | | • There is some evidence for non-recourse project financing in the New Zealand Electricity Market with at least two recent projects understood to have been financed on that basis (Lodestone's Kaitaia and Edgecumbe solar farms). A pipeline is understood to be building. Non-recourse funding is common in the Australian market.<br>• While Lodestone is an example of domestically sourced capital for project finance, we would expect capital sourced from overseas to be important for project development given that offshore investors are more familiar with the project finance business model.<br>• Equity capital for project finance is also complex to source given the higher risk nature of such projects. | |
| 2 | What factors do investors and financiers consider when making generation investment decisions? | Considerations that investors and financiers consider when making new generation decisions include:<br>• The primary basis for the investment decision will be: does the project have a positive net present value as calculated by a forward-looking assessment of project revenue and costs discounted at a weighted average cost of capital?<br>• Assessments will need to be made across a wide range of project revenue and costs which can be considered under the following broad risk categories: construction; operating; market; regulatory; resource; technical; interest rate; environmental; negotiations with iwi; refinancing;<br>Specific issues include: | Most of the factors that investors and financiers consider when making generation investment decisions will remain similar, but developments may include:<br>• More focus around future electricity pricing (with coal and gas being taken out of the market this removes an external benchmark against the cost of other energy sources – has implications for how you consider the value attached to say stored water particularly given hydro's role in conjunction with wind and solar for offering certainty of supply)<br>• Growth in EPC market will be required due to both the capability and appetite of the local market to execute the volume of projects required to meet the demand projections |

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| | | • Capability of the Engineering, Procurement and Construction ('EPC') market to price and take the risks associated with the project construction.<br>• The outlook for electricity prices and who is to take this price risk (can it be passed onto a customer through a PPA or a portfolio of users).<br>• Capability to assess market and resource profile risks and willingness to take regulatory change risks, negotiations with iwi and environmental risks<br>• Whether the risk adjusted returns on investment meets its investment / credit hurdle rates.<br>• The outlook for the economy and energy demand.<br><br>While the risks are the same between portfolio developers and independent developers the risk is more acute for an independent developer. From a risk management perspective:<br>• An independent and purely merchant generator – high risk. Takes full volume and price risk - and few parties are willing to develop on this basis<br>• A vertically integrated portfolio developer – moderate risk. Has a portfolio to absorb and manage volume and price risk and accordingly have ready access to debt markets (banks and bond markets)<br>• An independent generator with a long-term offtake agreement with a counterparty such as a retailer or a major end user – relatively low risk provided the counterparty has a good credit rating (investment grade). Taking relatively modest volume risks and no price risk. This enables project finance | • Considerably more diligence and contracting complexity if financing is on a non-recourse basis although as the market develops there is likely to be more standardisation of contracts<br>• Revenue certainty becomes more important from a non-recourse financier perspective including credit strength of purchasers<br>• Offsetting some of these considerations could be energy traders entering the market to fill a potential gap in the energy commercialisation market. It is understood energy traders are a greater feature of offshore markets<br><br>In terms of the issues impacting getting to 100% renewables:<br>• The view of the industry is that, in line with the BCG Future is Electric report, the market will get to 97%-98% renewable generation by 2030 through retirement of existing thermal fleet and a focus on renewables by developers as thermal generation will have low social licence and be difficult to finance<br>• However, the last 2-3% is likely to be particularly problematic as the revenue from these assets may not be sufficient in an energy only market to cover costs. This is due to the following factors:<br>o Renewable technologies that can provide the necessary peaking and dry year cover are higher cost than intermittent renewables or existing thermal plant.<br>o The energy only market means that peaking/dry year cover plant rely on high |

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| | | Access to the risk mitigation tools necessary to enable project finance will be required for independent generators to be able to compete with portfolio players. This includes access to a source of "firming" such as hydro to sit alongside the solar/wind generation. Access to Power Purchase Agreements is an important enabler of project finance<br>• In Australia (and elsewhere) governments have created mechanisms to enable renewable energy developments to be developed using project finance, and this has led to new developers coming into the market. These mechanisms include governments underwriting PPAs, other financial instruments to underwrite debt costs only and directly investing debt and equity in certain projects. | price periods to generate revenue. The frequency, duration and magnitude of these high price events is highly uncertain.<br><br>It is difficult to finance this investment due to the high costs and uncertainty of returns which are beyond those considered normal for established investment markets. These issues are similar for the gentailers as they are for independent players (namely the risk/return trade-off may prove too high for even the gentailers).<br><br>The market will need to work through the decommissioning of existing fossil fuel assets that provide peak supply and dry year generation. These are "sunk cost" and can store fuel at relatively low cost. The higher capital costs associated with replacing these assets with renewable energy require commitments to debt and equity that are inconsistent with the variable cashflow. |
| 3 | How do investors and financiers measure and assess risk and uncertainty when considering investments? | We have provided an overview of the risks in the answer to question 2.<br><br>The primary difference between portfolio and independent developers are that portfolio developers can manage risk within their business structure (and therefore debt providers need only make limited enquiry to how the risks are being managed) however independent developers need a considerably more | Consistent with the feedback in question 2 above, it is expected that the assessment framework would be largely consistent over time, however there will be a greater focus on diligence items for banks credit processes if more non-recourse financing is prevalent.<br><br>Consistent with other more developed and liquid markets such as in the areas of interest rates or foreign currency money markets the amount of data available and the types of financial instruments that are available to |

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| | | detailed for measuring, managing, and communicating risk to their debt providers.<br><br>Both investors and financiers will rely on independent assessments of the technical and market matters. Whilst they should be able to make internal assessments of the financial parameters and exposures, they may also take some independent advice on some of these matters based on the guidance of their respective investment and credit committees. | manage risk are likely to increase. Published "screen rates" allow for greater levels of transparency in contracts and the growth of derivative markets to assist with risk mitigation and long-term planning. Our understanding is that some offshore energy markets are more developed in this area than New Zealand. In competitive electricity markets a variety of derivative instruments exist both over the counter (OTC) between parties and exchange traded, and both futures and options. New Zealand has similar exchange traded products to Australia, with exception of $300/MWh caps. The key issues with most electricity derivative markets are their liquidity particularly over longer tenors. In Australia most of the markets are not very deep beyond 1-2 years, which limits their value to managing shorter term volatility risks. There may be a role for regulation to ensure these markets develop in a transparent and effective manner, and in the past stock and futures exchanges have facilitated the development of new products to meet market demand. |
| 4 | How might the different drivers of risk and uncertainty in the table in the 'background' section (and any others not identified) impact these measures of risk. Are some drivers likely to be seen as higher/lower risk in NZ than others? | **<u>Macro environment</u>**<br>• Government policy and regulatory risks are key risks globally to the extent they influence the economics of generation projects, such as removing a subsidy. Given that there is no subsidy for renewables in New Zealand this is not currently a significant influence, likewise for carbon pricing.<br>• Cost of capital considerations and general economic conditions are more material in driving investment | Financiers focus on markets with relatively easily understood risks and investment periods of no more than 20 years with shorter periods for debt markets (perhaps 10-15 years being the typical forecast period for debt). The types of issues associated with a 40-year timeframe whilst of interest are outside the planning horizon for new investment decisions.<br><br>Capital from offshore is relatively more straight forward to source if the risks associated with the New Zealand |

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| | | decisions, and all else being equal the less volatile the economic conditions, the more investable the market is for new generation. Given the close inter-linkage of capital markets between Australia and NZ, it is expected that cost of capital between them should not be materially different, but this will still be influenced by what is happening in each economy at the time.<br>• We have recently observed that geopolitical events and pandemic considerations have impacted supply chains and freight corridors which places pressure on key material and equipment costs driving up the levelized cost of energy.<br><br>**<u>Project Development</u>**<br>• Project approvals are one of the key risks to developing a pipeline of generation projects both in New Zealand and globally (investors refer to the Overseas Investment rules and the complexity of dealing with the electricity distributors). Consideration of ways to advance the development and consenting process will enhance the swiftness that new generation can be introduced to the market. The Overseas Investment Act process for solar developments was mentioned as relatively complex and costly – particularly given the often-marginal nature of the project economics.<br>• As indicated in item 2 above, development of the EPC market is key to be able to deliver a pipeline of generation projects by the market under bankable procurement strategies. Unwillingness of the local | market follow other markets. A key feature of the New Zealand market distinguishes it from many other electricity (excepting some of those in Scandinavia) is the reliance on hydro and thus exposure to dry weather risk. This can impact on supply, both from a peak and energy perspective. Where there are differences in market structure in New Zealand compared to other markets that increase risk this makes capital harder and/or more costly to obtain.<br><br>The relative underdevelopment of the Power Purchase Agreements market in New Zealand is noted. There are not regulatory barriers to these being established so the absence of such agreements may be a function of our market structure. |

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| | | EPC market to take and manage interface risk (e.g. as well as issues associated with accessing a small pool of skilled labour given the low unemployment rate, will force developers to manage these risks themselves, which may lead to unbankable, and expensive projects being deployed particularly in non-recourse structures.<br>• Pressure on access to skilled labour continues to be a constraining factor for a lot of infrastructure development in New Zealand and the energy sector is no different. Access to a well understood pipeline of investment is an important factor in offshore providers setting up business in New Zealand.<br>• New Zealand has an abundant source of renewable resources (fuel source) that can be deployed either onshore or offshore. There is a risk however as identified above that the consenting and development approval process may hamper potential growth.<br><br>**<u>Project Revenue</u>**<br>• Understanding energy (wind/solar etc) profiles for generation projects is a key risk, however technical experts provide probabilistic estimates that financiers rely on for predictability of cash flows.<br>• Assessment of market/price risk is a key focus of due diligence for both investors and financiers due to this driving market pricing outcomes, however if projects are delivered under non-recourse structures, then this risk is typically allocated to the offtaker through a long term PPA. However, in case of termination of | |

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| | | key contracts the risk needs to be considered in detail.<br>• Bidding behaviour of market participants influences spot pricing outcomes, however as most renewables can bid in at close to zero on a short run marginal cost basis, this tends to drive volatility of pricing seasonally and at certain times of the day rather than in the long run.<br>• As the market replaces existing generation with new forms of generation, bidding behaviour will reflect the market power of participants in alignment with the overall generation mix of the market (including storage). | |
| 5 | How might the NZ electricity market be viewed in terms of investment risk overall, given the range of risks and uncertainties identified (and any others not identified). How might these views differ between investors? How might it compare to other industries or countries competing for capital. | The New Zealand electricity generation market is categorised by a few large players holding a certain degree of market power which has implications generally in the cost of dispatched energy to the electricity network. Understanding this complexity is a key consideration for new entrants.<br><br>Other key considerations include:<br>• State of the EPC market given investors preference to manage this risk through an EPC contract;<br>• Offtake market (outside of hedging gentailer portfolios) being limited though underdevelopment of the PPA market;<br>• Long term demand growth, particularly if the longevity of the Tiwai Aluminium Smelter is restricted. | Under the future generation scenario, any changes to market structure/incentives to address the key risks identified will influence whether there is a material movement in risk associated with the investment thesis of generation investment in New Zealand.<br><br>In the Australian market, for example, numerous complementary mechanisms have been introduced that have spurred investments in generation. These include: the Long-Term Energy Service Agreement (LTESA), Renewable Energy Zones (REZ) in New South Wales and the Capacity Investment Scheme (CIS) at the Commonwealth level. These types of Government interventions to the extent that they create clarity or reduce risk are seen as positive by new investors. The impact on existing generators will depend on the nature of the mechanism. |

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| | | While some of these considerations are not unique to the New Zealand market, there is arguably more concentration risk to a small number of players which may create a perception that new entrants have to take a greater level of risk compared with other markets.<br><br>To accurately quantify the levels of risk between countries would require detailed analysis, which is outside of the current scope. We note that other countries have developed incentives for building renewable generation, such as feed-in tariffs, contracts for difference and renewable certificates. These are viewed positively by financiers and have been seen as integral to the development of liquid PPA markets in countries such as the UK as they can de-risk revenue. It should be noted that the benefits of these measures are seen to outlast the measures themselves. It was noted by one financier with UK experience that once the 'investment ecosystem' is created to take advantage of government measures, those in the market continued to look for new opportunities and remained supportive of the UK market. | |
| 6 | What are the bounds of acceptable commercial parameters for generation investment in NZ. Specifically:<br>• Over what timeframe would an investor typically seek to | Investment hurdle rates are sensitive and commercially protected information. We do have some benchmarks across Oceania; however, it would require some further refinement to provide estimates that are fit for purpose. The following information can be used as a general guide based on our experience in the market:<br>• Debt profile over time (debt term and repayment profile): Typically based on up to 20 years depending | Under the future generation scenario, more generation and storage will require increasing levels of risk capital to be deployed.<br><br>If more revenue volatility is introduced into the electricity market this may drive expected hurdle rates higher. This in turn may influence the acceptable parameters for generation investment such that there is more (or less) |

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| | recover its investment costs?<br>• What risk parameters and levels may be acceptable?<br>• What is the WACC / required rate of return that an investor would typically expect for that risk<br>• What would be the requirements for revenue / cash-flow (e.g., regularity, predictability)<br>What factors influence these parameters, and how? How would they differ for different generation types – specifically for wind, solar, gas peakers, and batteries (i.e., please provide a range for each generation type). | on generation type although the period until the project needs to refinance maybe shorter (10 years)<br>• Asset life: Typically, between 25-30 years depending on generation type (lower for some storage types)<br>• Debt Sizing: Typically, debt repayment profile based on the credit worthiness of the offtaker with gearing limited if <10 years weighted average offtake period exists<br>• Credit Rating / Term of Offtake: The cost of capital goes up for shorter term offtake agreements or lower credit rating offtake counterparties<br>• Post-tax project IRR: Higher complexity technologies such as wind and gas peaking plants require higher expected post-tax project IRRs compared with lower complexity technologies such as solar and batteries. This development premium is primarily driven by the complexity in the civil and connection works, and the limited number of parties with the capabilities needed to do this.<br><br>As a general rule, the most de-risked assets (e.g., new operational assets with long term offtakes with creditworthy counterparties) might require equity returns moderately above regulated assets (e.g., electricity distribution) of circa 6-7%. At the other end of the spectrum (e.g., standalone development projects proposing to take full merchant risk), the equity returns are likely to be in the mid-teens. It should be noted that there are relatively few parties (both in New Zealand and in other markets) willing to contemplate such investments at least at scale. This is also at least in part a | margin of safety (or alternative, allocation of risk) built into the commercial parameters. |

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| | | function of carbon pricing risk for conventional generation technologies. | |
| 7 | What other preconditions may typically need to be met for a project to proceed within normal commercial bounds given risk and uncertainty (e.g., forward contracting requirements) | As referred to in item 1, the market is currently dominated by portfolio players.<br><br>If new projects are to be developed by independent developers, there is likely to be more of a focus on non-recourse structures similar to global markets, including Australia, the U.S. and European markets.<br><br>This is likely to lead to financers being unwilling to significantly gear projects on a merchant basis and therefore long-term offtake contracts are expected to become a key focus on the market. Our experience in Oceania is such that for bankability, PPAs with investment grade parties of at least 10 years are required to create a bankable project.<br><br>There are likely to be some modest differences in the hurdle rates for different types of generation, but they may vary depending on the circumstances. In some offshore markets, wind and solar are being developed in response to specific government policies which tend to equalise the risks that they entail:<br>• Both are intermittent in nature, which creates ~~by~~ volume and price risks, unless the policy arrangements address these risks (as they typically do)<br>• As a general rule: | Given the benefits of incumbency the existing portfolio players are likely to be a significant source of new generation investment but a more dynamic market is likely to result if increasing numbers of project financiers enter the market. A good pipeline of new generation is understood to be building from both portfolio players and project financiers.<br><br>To make the market attractive to project financiers there may need to be more of a focus on non-recourse structures and therefore long-term offtake contracts (PPAs) to ensure bankability and attract the required level of capital to deliver increasing generation and storage to the market. It is uncertain whether this market will develop given the current industry structure.<br><br>Addressing any market structure issues and lowering the barriers to investment for project financiers will likely lead to a more dynamic market and increase the likelihood that private capital will contribute to creating more supply in general. The situation around peaking/dry year supply (security of supply) is more complex. The uncertain nature of the cashflows associated with providing this supply will make it difficult for project financiers to fund projects based on peaking or dry year cashflows. Portfolio players are most likely in a similar position of having difficulty justifying projects with relatively uncertain cashflows. They have commitments |

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| | | o Wind involves more development approval and construction risk<br>o Solar involves more market risk (e.g., they all compete head-to-head and with rooftop solar)<br>o Wind is more established in the NZ market than solar, which may marginally increase the risks of the latter as there is less local knowledge on development, performance and related risks | to debt and equity providers that justify taking a cautious approach to investments with an irregular cashflow profile. They will also have concerns about the implications having this capacity in the market (if it were to be used more broadly) might have for prices more generally and the viability of some existing capacity.<br><br>The risk of adverse unintended consequences to the wider market from decisions by the portfolio players because of greater investment by project financiers is likely to be low. More likely is that that the greater competition will lead to lower electricity prices than otherwise. Given the expected increase in demand for electricity arising from decarbonisation the risk of overbuild at this point is likely to be low. |
| 8 | Are there factors that could limit the rate or extent to which any single generation investor could expand their portfolio, or types of investments they could make? (e.g., debt carrying capacity). What are these factors, and what will influence them and the extent to which they bind? Are they likely to impact some types of investment more so than | The factors that could limit the ability of a generation investor to expand its portfolio, are consistent with the factors of enabling a single generation investment. However, there are approaches that an incumbent generation investor can take to expand its portfolio over others that may not have existing assets in the market, these include:<br>• Maximising gearing on the existing portfolio to build the new generation asset;<br>• Contract further offtake from the market to deploy the new asset on a portfolio basis;<br>• Expand current projects to attract new offtake which it could then roll over to new generation assets as the portfolio expands (subject to specific provisions in the | Expansion of a portfolio may be enhanced under the future generation scenario, due largely to the following:<br>• Under demand growth cases, more supply is required to be deployed swiftly;<br>• This leads to an increasing pool of investors or at least investment opportunities;<br>• Expanded technology applications and/or declining? levelized cost of energy increases the potential for investors to participate provided market structure barriers can be overcome;<br>• As the operational demand profile changes relative to supply this creates different opportunities for the market and therefore this can lead to increased investment attractiveness. |

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| | others? What options or approaches may exist for an investor to overcome these limitations. | offtake contracts that may allow project contracting flexibility).<br><br>This strategy can act to 'warehouse' projects until they can be fully deployed under a non-recourse structure to advance the project pipeline. Depending on the generation and storage mix within the portfolio specific types of projects may be smoother to execute this transition, such as:<br>• Combining storage and generation assets to provide a firm product to deploy to the market; and<br>• Assets that have profiles that are dispatchable or are more correlated to operational demand. | Projects with a security of supply focus create substantial challenges for bankability. This is because the developer, absent any contractual support, faces considerable:<br>• Volume risk – how much the asset can be expected to be used<br>• Volume timing risk – when that might happen<br>• Price risk – the price when it does happen<br><br>These risks will be reflected in the financing:<br>• The returns on equity required – these are likely to be very high<br>• The amount of debt the asset will be able to support – which is likely to be low or very low (e.g., a project financed asset is likely to enable gearing of circa 70%, an investment with security of supply focus – and which is taking this risk – will be much lower and possibly nil)<br>• There are few examples of such assets that have been developed by the private sector as the market risks are considered to be too high, without some form of incentive mechanism (i.e., a fixed payment is made for the capacity to exist and is not dependent on the extent to which that capacity is used). This is similar to the contracting structure for the Ahuroa Gas Storage field. |
| 9 | Are there factors that could limit the extent to which new parties might invest in generation in | Other than the factors already considered, there are some additional considerations that parties consider when investing in new market such as the New Zealand | Under the future generation scenario, how the market addresses the key risks identified will influence whether there is a material movement in risk associated with the |

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| | New Zealand. Does this differ for different types of generation? | electricity market, such as (including some key considerations that have been previously discussed):<br><br>• **Target Returns:** Whether the expected returns are within investment hurdle rates<br>• **Risk Allocation:** Whether the market is sufficiently developed to handle de-risking mechanisms such as offtake arrangements, construction market maturity and a capable financing market to deal with market complexities.<br>• **Pipeline:** Whether there is a sufficient pipeline of transactions to achieve the necessary scale to justify focusing on the market. In general, for a project finance opportunity to be attractive to bankers it needs to be of sufficient scale and able to be repeated to justify the time involved in structuring, executing and managing the transaction.<br>• **Investment Attractiveness:** Given global supply chains and industry knowledge needed will the EPC market for deploying technologies such as wind turbines or battery modules be interested in New Zealand, whether there is an ease of doing business or restrictive business practices from central government that makes the investment proposition more challenging.<br>• **Local Content:** Ensuring that investors are aware that they may need to engage with local community stakeholders (including Iwi where appropriate) which will assist with the project approval process.<br>• **Environmental, Social and Governance (ESG):** Consideration of the ESG impact on the project and | investment thesis of generation investment in New Zealand.<br><br>The same risks will apply, but how the market develops will influence the extent of the risk present in the market and its capacity and capability to manage it.<br>• Offshore investors are typically used to PPAs in the range of 5-20 years<br>• Shorter offtake arrangements are less attractive<br>• A minimum of 7-8 years is normally required to enable new renewable development (create a debt amortisation profile that enables cost effective project finance; otherwise the required PPA strike price tends to be too high). Equity is also taking more market risk beyond the contract period and will require a higher return<br>• Longer duration offtake arrangements will typically attract an observable and material discount in terms of the PPA price they require (between 7-8 years and up to at least 15 years)<br>• For an asset that is developed for security of supply purposes, it is likely that the offtake length would need to be much longer to enable cost effective development (e.g., at least 15 years and more likely 20-25 years). |

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| | | the respective economics, both currently and within the 40-year scenario indicated. | |
| 10 | To what extent might the above considerations similarly apply to investment in electricity demand-response in New Zealand? | Demand response is a voluntary shift by users of energy to help stabilise the power network by balancing supply/demand similar to what other forms of balancing services may provide, such as batteries for example.<br><br>The value embedded within demand response is to reduce peak demand insofar as it provides an alternative to increasing the volume of electricity generated or investing in new capacity.<br><br>It typically functions by incentivizing the user to cut their load or to better match supply during peak periods. This is valuable to the system and to integrated utilities by reducing the likelihood of deficits in supply and moderate wholesale pricing at those peak demand periods where they might have significant exposures.<br><br>Typically, integrated utilities might invest in demand response as an effective reserve capacity mechanism to maintain reliability of the electricity network during critical events.<br><br>Demand response programmes have generally been successful (for example, the AEMO wholesale demand response mechanism introduced in 2021 now has over 65MW of registered capacity). However, the mechanism is key to incentivising performance. Large energy users should be targeted to maximise the impact to the market. There is evidence of demand response programmes being | Under the future generation scenario, there would be more investment required in capacity. Therefore, an alternative to investing in some of that capacity could be incentivising demand response from large users.<br><br>If a formal demand response market eventuated, then demand responses might be a separable product but it is difficult to see this eventuating without intervention.<br><br>A formal demand response market could overcome some of the challenges identified in the bilateral negotiation discussions currently in play. Bids and offers in the market would allow those offering or buying demand response to consider the value to them of the product independently of the other party.<br><br>We note that there are practical challenges in getting management buy-in to demand response initiatives. It can be difficult for management teams outside the electricity industry to understand how demand response can work and focus attention on this 'outside BAU' activity. This can flow into challenges in getting both generators and users to agree and document the commercial arrangements associated with demand response programmes. Each counterparty has to understand the value to the other of demand response and agree how to share that value. |

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| | | utilised in New Zealand and Australia, mainly from integrated utilities and large users such as the New Zealand Aluminium Smelter. Demand response is able to be offered into the wholesale market (dispatchable demand) but uptake has been limited.<br><br>Some of the key considerations that may influence investment in demand response, include:<br>• Investment mechanism, including price incentives<br>• Opportunity cost of utilising the energy<br>• Ability to monitor load in real time<br>• Identification of suitable load profiles that will maximise the desired market impact<br>• Seasonality considerations<br><br>To date demand response has been bundled with large user contracts and therefore it has been difficult to separate this into an 'investable' project. Our view is that demand response will be increasingly valuable but will be a consideration in offtake negotiations (e.g., as part of supply agreements when existing contracts are up for renewal) rather than as a separate contractual arrangement. | |
| 11 | To what extent might the above considerations similarly apply to investment in gas production and storage in New Zealand? | Similar factors to those identified for new parties investing in generation in New Zealand would apply to investment in new gas production or generation, assumed to be for peaking (e.g., OCGTs). Similar to electricity, there are significant, and in some cases greater, uncertainties associated with gas investment. Both the positions of Government on gas production and | Under the future generation scenario indicated, similar factors would be relevant as those noted as currently existing. Feedback from the industry was that challenges to financing fossil fuel generation would increase with time. |

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| | | other market conditions create a challenging environment for investment. Specifically, uncertainty about whether Methanex will exit New Zealand, and decarbonisation of other large users creates challenges for investment to underwrite future production.<br><br>These challenges for investment for future gas production have knock-on effects for investment in gas-fired electricity. Investment in gas generation would require certainty that the plant would operate for long enough to provide a return, and this would be impacted by both the potential constraints on gas supply as well as the social license of continued operation into the future as the economy continues to decarbonise. Further to this, some financiers raised issues relating to investment in fossil fuel generation that limited investment in both gas generation and production, with some indicating they were aggressively exiting fossil fuel assets. | |