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COST OF CAPITAL SURVEY 2023

REPORT PRODUCED FOR THE AUSTRALIAN ENERGY MARKET OPERATOR

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KEY TERMS

Key Terms	Definition
Asset Lifecycle	The asset lifecycle is the various stages involved in the management of the asset. This goes from planning to construction / acquisition to commercialisation (i.e. when it generates revenue).
Basis Points (bps)	This refers to one hundredth of one percentage point. i.e. 100 basis points = 1 percentage point.
Contracted Revenue	Refers to future revenue secured through a contract agreement between a buyer and seller.
Cost of Capital	This is derived from the Weighted Average Cost of Capital (WACC) approach and is used to calculate the net present value of future cashflows from investment. The cost of capital and WACC are used interchangeably in this report.
Brownfield	Brownfield refers to the purchase or lease of an existing asset.
Greenfield	Greenfield refers to investments into a new asset that requires initial planning and construction before it is ready for commercialisation.
Hurdle Rate	The hurdle rate is the minimum rate of return on a project or investment required by a manager or investor.
Idiosyncratic Risk	This refers to asset-specific risks. This can be risk can be diversifiable.
Systematic Risk	This refers to risks that affect an entire market, and can be attributed to economic, socio-political, or other market-related events.
National Electricity Market (NEM / The Grid)	The NEM is a wholesale market through which generators and retailers trade electricity in Australia. It interconnects the six eastern and southern states and territories and delivers around 80% of all electricity consumption in Australia. Western Australia and the Northern Territory are not connected to the NEM.
Offtake Agreement	An offtake agreement is an agreement to buy or sell, in advance, some of the production that hasn't yet been produced.
Power Purchase Agreement (PPA)	A power purchase agreement (PPA) is a contractual agreement between energy buyers and sellers. They come together and agree to buy and sell an amount of energy which is or will be generated by a renewable asset.

EXECUTIVE SUMMARY

Oxford Economics Australia (OEA) was commissioned by the Australian Energy Market Operator (AEMO) to review the cost of capital[1] input assumptions in the *2023* Input and Assumptions Report (IASR) against the prevailing market view. This is then used as an input to develop the Integrated Systems Plan (ISP) report.

The discount rate serves two purposes for ISP modelling – it is used to compare costs and benefits between projects as well as to calculate the net present value of future cashflows from generation, storage or network investment.

Synergies Economic Consulting (Synergies) provided AEMO with lower[2], central and upper bound assumptions on the discount rate in December 2022. Synergies recommended the use of a Weighted Average Cost of Capital[3] (WACC) based estimate for the discount rate.

To develop the market view of cost of capital, OEA surveyed energy market participants. This report presents a comparison of the survey findings with Synergies' estimates and presents qualitative insights obtained through interviews.

The survey was conducted during May and June 2023 and covered participants across the supply value chain for energy assets including private sector equity providers, lenders, developers, asset owners, as well as government and independent bodies[4]. The responses also covered regulated and unregulated assets[5].

Fig. 1. Break-down of Survey and Interview Engagement by response type

	Solar	Wind	Battery/Storage	Regulated Asset	Other*	Total
Survey Response Only	1	1	-	1	2	5
Survey & Interview Response	3	3	4	4	9	23
Total	4	4	4	5	11	28

Source: Oxford Economics Australia

[1] Cost of capital in this report refers to the Weighted Average Cost of Capital (WACC) as defined in *AER's* *Review of Weighted Average Cost of Capital Parameters for Electricity Transmission and Distribution*, consistent with the Integrated System Plan (ISP). For more details on the definition, please see Appendix A1.

[2] As per AER Cost Benefit Analysis Guidelines, the lower bound is set to the regulated cost of capital, based on the AER's most recent regulatory determination at the time of the final ISP.

[3] Cost of capital in this report refers to the Weighted Average Cost of Capital (WACC) as defined in *AER's* *Review of Weighted Average Cost of Capital Parameters for Electricity Transmission and Distribution*, consistent with the Integrated System Plan (ISP). For more details on the definition, please see Appendix A1.

[4] For more details on survey design and approach, please see Appendix A2.

[5] Regulated assets refers to transmission and distribution assets while unregulated assets refer to utility scale generation and storage assets.

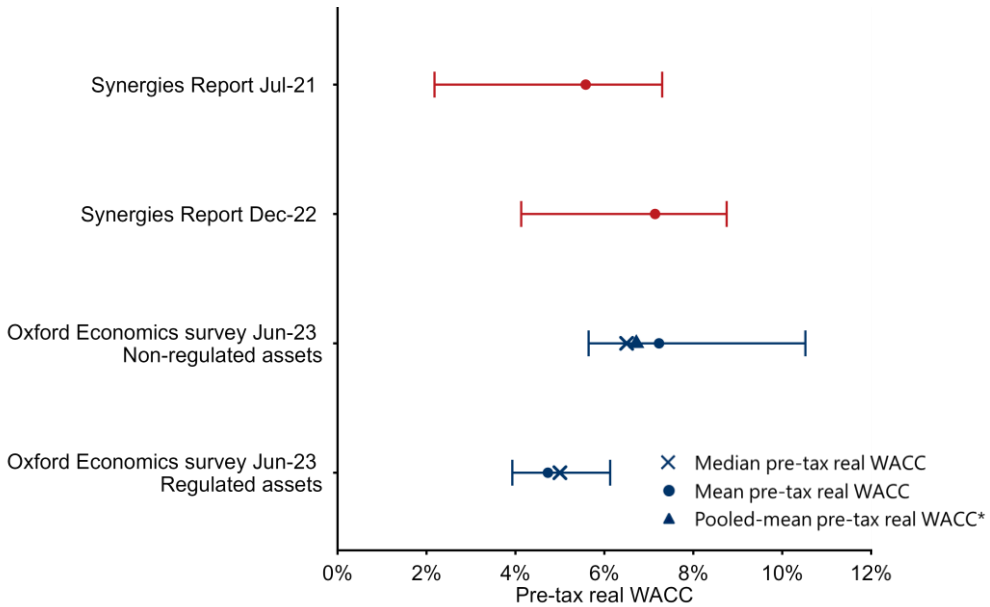
** Other denotes responses that were not discernible by technology, such as where a respondent has provided a single WACC but has a portfolio of assets. This may also include responses that could not be separated to maintain confidentiality.*

Key Findings

In aggregate, the survey results show a simple average pre-tax real WACC of approximately 7.2% for non-regulated assets. We contrast this against the central scenario cost of capital of 7.1% by Synergies in December 2022[6]. This suggests that the estimate is reasonable. We also provide the regulated asset responses which are considerably lower at 4.7%. These differences are discussed in the insights below.

By contrast, the survey reports more upside risk than what was estimated by Synergies in December 2022. For the upper bound, the survey results imply a higher risk premium of 3.3% for non-regulated assets, taking the pre-tax real WACC to 10.5% compared with Synergies' upper bound pre-tax real WACC of 9%. The survey results imply a lower bound of pre-tax real WACC of 5.6% for unregulated assets (3.9% for regulated assets).

Fig. 2. Comparison of Synergies estimated pre-tax real WACC (Dec-22) vs. Survey Responses (Jun-23)



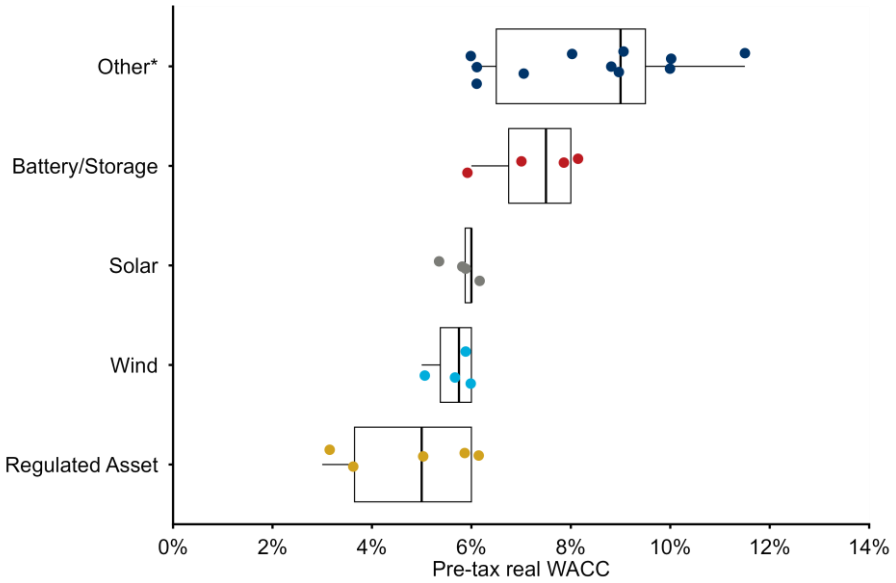
Source: Oxford Economics Australia
** Pooled mean of responses for each asset type (Wind, Solar, Battery/Storage, Other assets)*

Figure 3 below presents a summary of the key survey responses. Each dot on the chart represents a survey response, categorised by type of asset. In total 13 survey responses were received covering 28 asset types and/or portfolios. Across asset types there is a noticeable difference in the cost of capital. Wind

[6] In line with our interpretation of promoting competitive neutrality (*2020 Cost Benefit Analysis Guidelines,* AER) we have compared the Synergies' values to survey responses for private sector unregulated assets. More information is provided further below.

has the lowest cost of capital while battery storage has the highest. The reasons behind this are explored in the next section.

Fig. 3. Survey response for Central Pre-tax real WACC by asset type†



Source: Oxford Economics Australia
† Please note that one participant may have provided multiple responses by technology type.
** Other denotes responses that were not discernible by technology, such as where a respondent has provided a single WACC but has a portfolio of assets. This may also include responses that could not be separated to maintain confidentiality.*

Insights on risks and drivers of Cost of Capital

In addition to the quantitative results collated from the survey responses, OEA conducted 15 interviews with industry participants. These interviews gave the following insights into risks and drivers of cost of capital:

Project Specific Risk for Greenfield Investment: Merchant Risk and Construction Risk were identified as the two most important considerations for greenfield non-network energy projects.

Type of technology can materially impact both these risks. Pre-tax real WACC estimates ranged from 3% to 12% across technology responses. Interview participants consistently flagged Pumped Hydro and Battery as having higher construction and revenue risk.

In the case of battery storage, owing to this being relatively nascent technology, creates revenue uncertainty. For Pumped Hydro, construction risk was a more prominent risk owing to geological concerns. This implied a higher cost of capital for these technologies.

For Wind and Solar, which are more mature technologies, revenue risk is partially mitigated through contracted offtake agreements (such as PPA[7])

[7] PPA refers to Power Purchase Agreement, which is typically a long-term 'off-grid' agreement between a commercial generation asset and a wholesale customer (such as an industrial load or retailer).

meaning a lower cost of capital. However, concentration of Solar and subsequent negative prices is emerging as a risk to revenue stream for this asset.

Moreover, connection to the grid was a recurring theme in participants' consideration of construction risk as this can mean significant delays to construction of an asset.

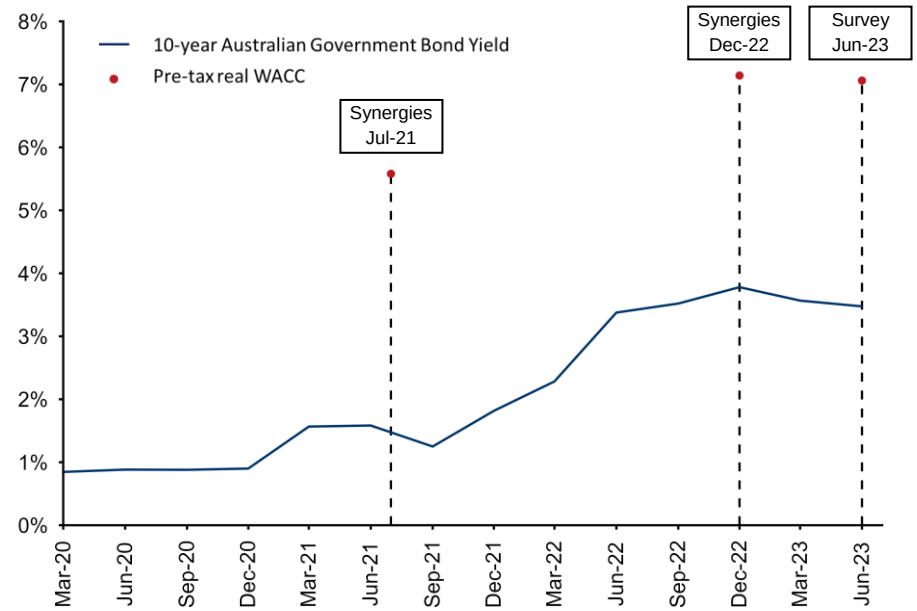
Regulated network assets are relatively insulated from these factors. Their main exposure is to regulatory risk and contestability risk (where another network option is available).

Participants considered fossil fuel investment to have a higher risk premium to reflect policy risk and lower investment appetite.

Macroeconomic Risk: The surveys and follow up interviews revealed that participants tend to look through near term volatility in macroeconomic conditions. Most energy assets have a lifecycle greater than 15 years and so long-term expectations on interest rates were more prominent considerations for their pre-tax real WACC estimates.

This is also evidenced by the significant increase in the pre-tax real WACC between the two reports produced by Synergies. This aligns with movements in the 10-year government bond yield which increased in this period. While there have been continued increase in the short-term cash rate, the 10-year government bond yield has tapered since, which may explain why there hasn't been a noticeable change between Synergies' December 2022 report and the June 2023 survey results. This further reinforces the finding that participants tend to look through near-term cycles and that movements in their long-term pre-tax real WACC is better aligned with the 10-year bond-rate rather than the short-term interest rates.

Fig. 4. Pre-tax real WACC estimates and the 10-year Australian Government bond yield[8]



Source: Oxford Economics Australia/Synergies

Capital Structure and Availability of Capital: The capital structure itself can also have a material bearing on the weighted average cost of capital. The interviews showed that the mix of debt to equity for a project can vary by the stage of the project life cycle and its exposure to risk. For example, a greenfield project in early stages of development has high construction risk exposure and therefore has a greater reliance on equity for project financing, which inherently raises WACC. Whereas a project that is commercial and has a high level of contracted offtake may be able to achieve a greater debt financing component, thereby reducing its average the cost of capital. The responses on capital structure varied significantly depending on technology type, stage of project development and revenue profile.

[8] Survey participants were asked to provide an upper bound and lower bound for their WACC estimates. The upper and lower bounds reported here are an average of these responses, respectively, rather than upper or lower bounds in the range of central estimates provided.

Capital Structure Implications from Availability of Purchase Power Agreements

A number of parties indicated that the availability of long-term power purchase agreements (PPAs) had declined over time, which in turn is increasing merchant risk and decreasing the number of contracted volumes. This implies a structural shift in the maximum debt-to-equity ratio for a given project. As the cost of equity is higher than the cost of debt, this inherently increases the WACC.

One retailer explained that their willingness to purchase long-term PPAs was hampered by their confidence that they would be able to pass those purchase costs onto customers, and that the current policy environment did not provide sufficient retail price revenue guarantees or price floors over the long-term.

Availability of capital was not a concern for participants. A consistent view across participants was that Australia is generally seen as an attractive destination for capital flows (particularly from Asia), owing to the regulatory and prudential frameworks in place. Moreover, the ability to make substantial investments makes Australia an attractive investment destination

Going forward market participants do not expect policies such as the US Inflation Reduction Act (IRA)[9] to materially impact cost of capital in Australia. Policies such as the IRA are expected to substantially increase the attractiveness of US for capital flows. Market consensus was that though this may present upside risk to the cost of capital for Australia, this is perceived to have a low likelihood of materialising. Australia is still expected to remain an attractive destination for investment for the reasons mentioned above, particularly from neighbouring Asian investors.

Domestic Policy Implications on Cost of Capital: Responses to policy considerations was mixed. While policy was generally perceived as beneficial (as it reduced revenue uncertainty) this did not appear to have a prominent influence on the cost of capital. Jurisdiction specific policy was also not a material consideration for investment and greenfield development decisions. Some participants did note, however, that government financing helped get projects with greater revenue uncertainty (such as batteries) off the ground. In the absence of this, survey participants estimated the private rate of return would be 1-2% higher. We add a note of caution that the portion of survey respondents that flagged government financing impacted their cost of capital was less than 25% of the sample (3 surveys) and should not be considered a whole of market view.

Application of WACC for Project Investment Decisions

Several participants noted that for renewable energy projects that the WACC approach in practice is not necessarily used as the project hurdle rate. The key reasons flagged were:

[9] The Inflation Reduction Act of 2022 is the most significant climate legislation in U.S. history. The policy contains AUD $520 bn worth of funding, programs and incentives to accelerate the decarbonisation of the US economy.

- It is hard to establish a credit rating benchmark for the cost of debt. Every project has very different risk profiles. For this reason, some participants have noted they look at counter-party risk rather than the traditional Capital Asset Pricing Model (CAPM) approach.
- The risk profile and subsequently capital structure also changes through the life of an asset. The early stage of project development tends to require more equity financing, which raises the cost of capital, and this may move towards greater debt financing once the project is operational.

Final Recommendation

Our survey of market participants indicates that Synergies' central discount rate estimate of 7% is reasonable.

Beyond the central estimate, the survey indicates that the upper bound assumption may be significantly higher than estimated by Synergies. Despite the limited response rate to the survey, we recommend that AEMO considers the use of a 3.3% increase to the central estimate when calculating an upper bound cost of capital, and continue to test this assumption in future research.

Consideration of competitive neutrality in the selection of the cost of capital

Under the 2020 cost benefit analysis guidelines provided by the AER, AEMO is required to use a single discount rate for assessing net present value of future cash flows as well as for compare costs and benefits across projects.

Additionally, AER provides discretionary guidelines for AEMO to select a discount rate which promotes competitive neutrality across network and non-network options in the selection of a discount rate.

Source: 2020 Cost Benefit Analysis Guideline, Australian Energy Regulator

Our understanding of this is that the *non-network* options refer to assets that provide a service to the network (such as utility scale generation and battery). The majority of this is investment made by the private sector. These assets are typically unregulated whereas *network* options (such as the transmission and distribution networks) are regulated assets.

The private sector unregulated assets tend to bear greater risk than the regulated assets, which is reflected in their cost of capital estimates. This is confirmed by the findings in our interviews and survey results (see Fig 2).

For this reason, we separate the regulated and unregulated asset pre-tax real WACC responses. We use the latter to compare against Synergies' discount rate to provide our recommendation.

By setting the WACC sufficiently high enough that it reflects private sector risks, it does not preclude these options from being considered and thereby avoids inherent bias towards network options that have a lower discount rate.

1. INTRODUCTION

Oxford Economics Australia (OEA) has been engaged by the Australian Energy Market Operator (AEMO) to review the appropriateness of their current cost of capital assumptions for long-term private sector investments in the National Electricity Market (NEM). This review also examines the impact of asset-specific and market risks has on the cost of capital.

AEMO develops a long-term road map for the NEM, via the Integrated System Plan (ISP), that optimises consumer benefits through Australia's transition to net zero. The ISP and its optimal development path enable low-cost renewable energy and essential transmission development to provide consumers with access to affordable, secure and reliable energy. The ISP helps to identify actionable future ISP projects, as well as providing broader benefits by informing market participant, investors, policy decision makers and consumers.

The upper, lower and central discount rates provided by Synergies Economic Consulting (Synergies) are a key input to the ISP. Given AEMO's pivotal role in developing the optimal path for Australia's energy transition and the evolving investment environment, it was important and timely to test the assumptions against empirical evidence.

The report has been structured as follows:

Section 2: includes a review of the cost of capital assumptions featured in Synergies' December 2022 report. The section also features an analysis of asset-specific and market-risk factors that can impact the cost of capital.

The Appendix: provides a detailed specification of the pre-tax real WACC and its associated components. The appendix also features further details on the survey design and methodology that was utilised to gather empirical evidence to review the cost of capital assumptions.

2. COST OF CAPITAL REVIEW

2.1 OVERVIEW

This section presents a comparison of the survey findings on market view of cost of capital[10] to the empirical discount rate estimations developed by Synergies Consulting in their December 2022 report.

Additionally, this section presents qualitative insights (obtained through participant interviews) into how factors such as type of technology, project lifecycle, macroeconomic and policy environment impact the cost of capital used when assessing generation or network projects.

2.2 COMPARISON TO SYNERGIES ECONOMIC CONSULTING

The key purpose of this report is to provide a review of the cost of capital assumptions presented in the Synergies December 2022 report. The cost of capital assumptions are key inputs for AEMO in their development of the ISP.

The cost of capital assumptions were assessed through an empirical study of survey and interview responses from energy market participants. The survey responses provided quantitative and qualitative insights to inform a pre-tax real WACC estimation and understand the key risks and drivers associated with the cost of capital responses provided. Further details on the empirical approach and survey design can be found in Appendix A.2.

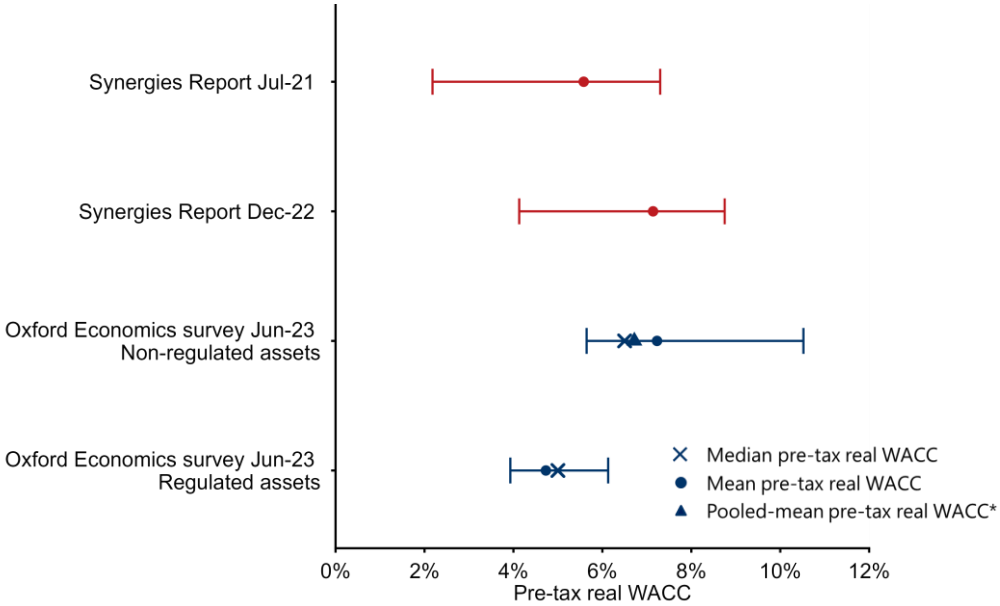
The survey results suggest that the cost of capital assumptions in the Synergies December 2022 report are reasonable.

As shown in Fig. 4, the central or average cost of capital response provided by survey respondents was 7.2% for non-regulated assets. This is largely consistent with the central discount rate assumption published in Synergies' December 2022 report, of 7.1%[11]. We also provide the regulated asset responses which are considerably lower at 4.7%. These differences are discussed in the insights below.

[10] Cost of capital in this report refers to the Weighted Average Cost of Capital (WACC) as defined in *AER's Review of Weighted Average Cost of Capital Parameters for Electricity Transmission and Distribution*, consistent with the Integrated System Plan (ISP). For more details on the definition, please see Appendix A1. *Cost of capital in this report refers to the Weighted Average Cost of Capital (WACC) as defined in AER's Review of Weighted Average Cost of Capital Parameters for Electricity Transmission and Distribution, consistent with the Integrated System Plan (ISP). For more details on the definition, please see Appendix A1.*

[11] In line with our interpretation of promoting competitive neutrality (*2020 Cost Benefit Analysis Guidelines,* AER) we have compared the Synergies values to survey responses for private sector unregulated assets.

Fig. 5. Pre-tax real WACC comparison, Jun-23 Survey vs. Synergies Dec-22 Report vs. Synergies Jul-21 Report



Source: Oxford Economics Australia/Synergies

** Pooled mean response for each asset type (Wind, Solar, Battery/Storage, Portfolio, Pumped Hydro Energy Storage and Fossil Fuel assets)*

Survey respondents also frequently noted that their cost of capital had increased by around 100-200 basis points (bps)[12] over the past year. This aligns with Synergies Consulting update to the cost of capital assumptions between the July 2021 and December 2022 reports. The December 2022 report featured a 150 bps increase to the central pre-tax real WACC assumption from the July 2021 report.

Our survey of market participants indicates that Synergies' central discount rate estimate of 7% is reasonable.

Beyond the central estimate, the survey indicates that the upper bound assumption may be significantly higher than estimated by Synergies. Despite the limited response rate to the survey, we recommend that AEMO considers the use of a 3.3% increase to the central estimate when calculating an upper bound cost of capital and continue to test this assumption in future research.

2.2.1 Changes to the investment environment since the Synergies December 2022 report

Changes to the domestic and global macroeconomic and policy environments can significantly impact the cost of capital. The empirical study has been undertaken to assess whether any of the recent changes to the investment environment have impacted the respondents cost of capital assumptions. This section considers how the investment environment has evolved over the past six months to assess the appropriateness of empirical findings in comparison to the Synergies' December 2022 report assumptions.

[12] Basis points refers to one hundredth of one percentage point. i.e. 100 basis points = 1 percentage point.

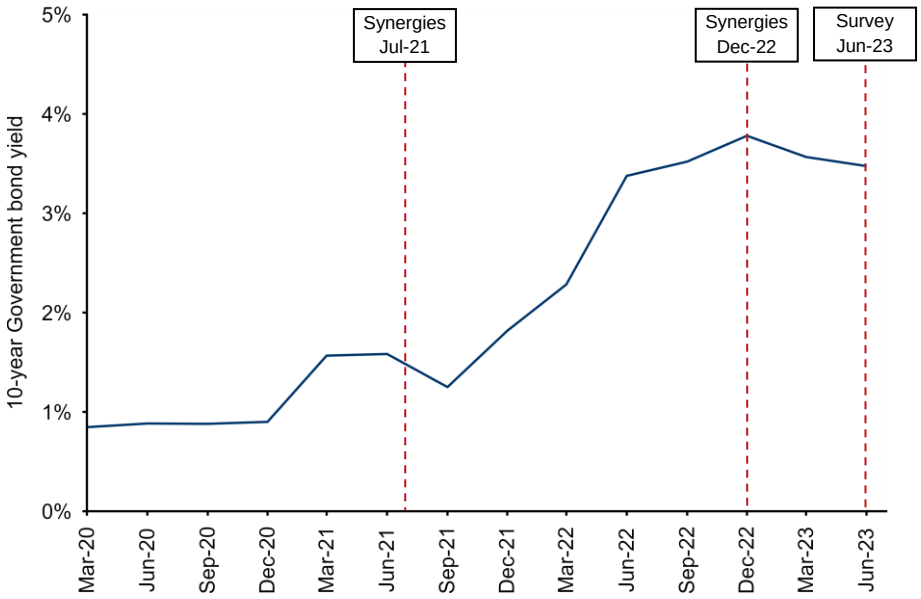
Recent developments of key macroeconomic drivers

The macroeconomic environment has continued to evolve quite significantly since the Synergies report was published. The Reserve Bank of Australia (RBA) has continued to tighten monetary policy, raising the official cash rate target to 4.1% in their June 2023 meeting. Globally, central banks have pursued similar tightening cycles to the RBA. These increases have raised commercial lending rates in Australia and globally.

A key motivation for surveying market participants was to understand the impact that the recent interest rate movements have had on the cost of capital and how exposed the cost of capital is to these near-term fluctuations. Interestingly, the surveys show that while the cost of capital has moved (owing to the risk-free rate), the movement is much more muted relative to the short-term interest rates. The pre-tax real WACC appears to follow Australian long-term bond yield movements more closely.

Australia long-term government bond yields have increased close to 200 bps since June 2021. Much of this rise occurred over the twelve months to June 2022, as shown in Fig. 6. This dramatic rise in yields generally aligned with the tightening of monetary policy as the economy emerged from the pandemic and certainty in the long-term outlook being restored.

Fig. 6. Australian 10-year government bond yield



Source: Oxford Economics Australia

However, over the past six months, the risk-free rate has remained relatively high. The bond yield marginally decreased by 30 bps from December 2022 to June 2023. Further rate hikes by the RBA have not appeared to have a significantly impact on Australian 10-year government bond yields. This result is largely due to the further interest rate hikes not coming as a major surprise to bond markets.

This supports the review's key recommendation that the cost of capital assumptions in the Synergies December 2022 report are reasonable, as yields have not materially changed over the past six months.

Recent policy announcements

The announcement of policy initiatives and regulatory changes can warrant updates to the cost of capital assumptions as they can impact revenue certainty. However, there has been limited key policy announcements that are likely to impact the cost of capital assumptions since the publication of Synergies' December 2022 report. Major policies such as the Rewiring the Nation Concessional Finance, ARENA Funding and the Large-scale Renewable Energy Target (LRET) scheme were all announced prior to the publication of Synergies December 2022 report.

This supports the review's key recommendation that the cost of capital assumptions in the Synergies December 2022 report are reasonable, as there hasn't been any major policy announcements over the past six months.

Respondent's inflation expectations

A respondent's inflation expectations provide the necessary information to estimate the respondent's pre-tax real WACC from their pre-tax nominal WACC responses. Formally this adjustment is known as the Fisher equation[13].

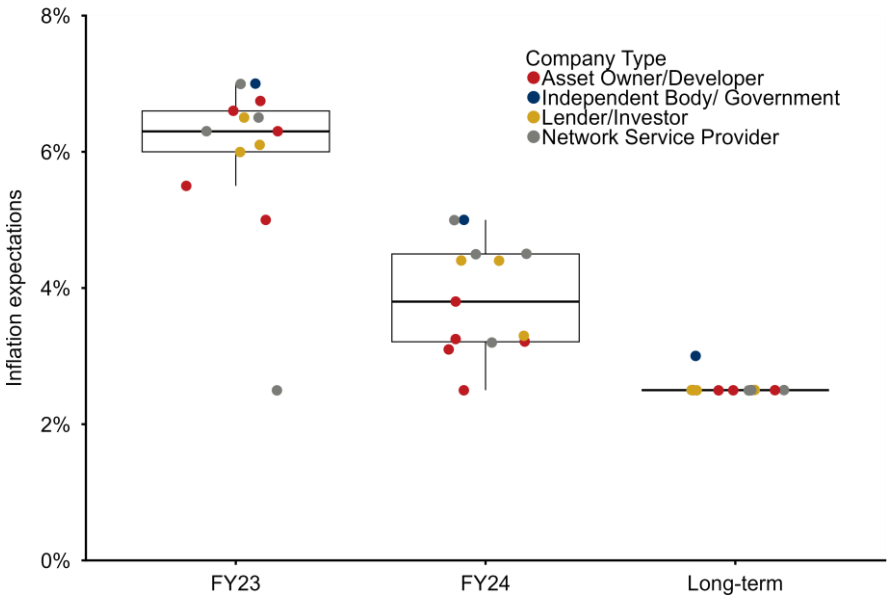
The long-run rate for each survey respondent was used to derive their real pre-tax rate. The basis for this is that the pre-tax nominal WACC responses received were for long-term investments. Where a survey response was not provided, OEA used the mid-point of RBA's target range (i.e., 2.5%) for long-term inflation to adjust the responses.

The survey respondents had relatively consistent inflation expectations. The recent cost pressures are expected to gradually dissipate going forward, with many of the respondents expecting inflation to remain above the RBA's target over FY24.

However, respondents indicated that they tend to look past these short-term cyclical impacts and only adjust the WACC due to long-term structural impacts. This was evident in survey responses. Almost all participants expect annual inflation to be at the midpoint of the RBA's target range of between 2% and 3% p.a. over the long term. As shown in Fig. 7., this finding was also consistent across the respondent groups. This indicates that the respondents take the RBA as credible and return inflation to their target range.

[13] Crowder, W. J., & Hoffman, D. L. (1996). The long-run relationship between nominal interest rates and inflation: the Fisher equation revisited. Journal of money, credit and banking, 28(1), 102-118.

Fig. 7. Survey respondents' inflation expectations, near and long-term outlook



Source: Oxford Economics Australia

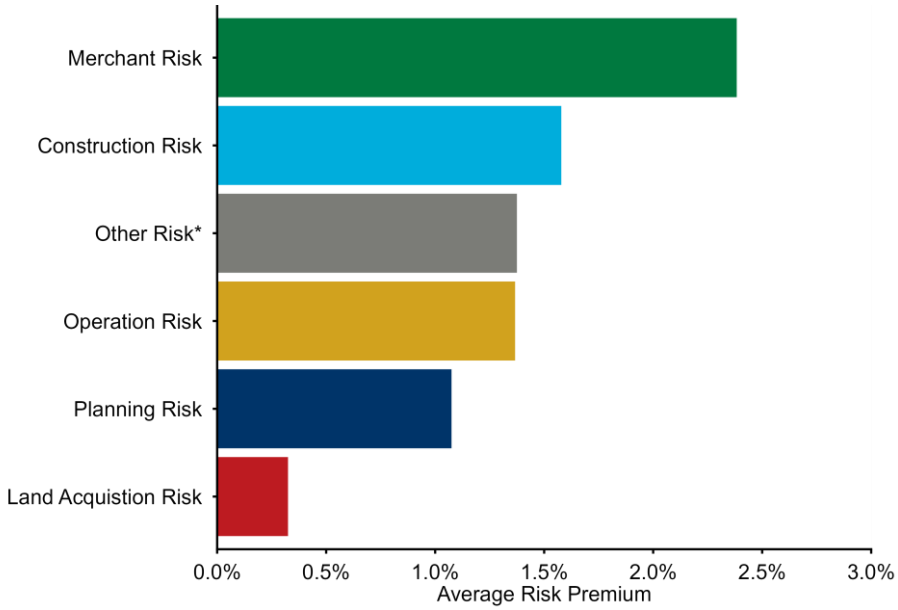
2.3 KEY CONSIDERATIONS FOR DRIVERS AND RISKS TO THE WACC ESTIMATES

There are further key considerations when looking at the cost of capital in section 2.2. Firstly, there is a great variance in reported WACCs across the survey responses. Secondly, interview respondents have highlighted that they do not necessarily use the WACC to evaluate energy investment decisions. This section explores the drivers of variance in the reported WACCs, including asset-specific risks, market-specific risks, and funding accessibility for certain projects. Furthermore, the section will provide insights into why the WACC may not accurately reflect the required rate of return or hurdle rate for investment in the NEM.

2.3.1 Asset-Specific Risks Impacting WACC

The survey responses have indicated that asset-specific risks are a key driver of differences in the cost of capital. The differences generally reflect relative risks across projects. These risks can stem from cash flow uncertainty (i.e. merchant risk), uncertainty around construction costs and timing (i.e. construction risk), and a lack of historical commercial transactions for benchmarking certain projects (i.e. planning risk). In particular, merchant risk and construction risk were the most commonly selected risks across survey responses with an average risk premium of 2.38% and 1.58%, respectively (Fig. 8).

Fig. 8. Reported premiums of significant asset specific risks



Source: Oxford Economics Australia
** "Other risk" covers all other risks noted by respondents and includes new technology and regulatory risk*

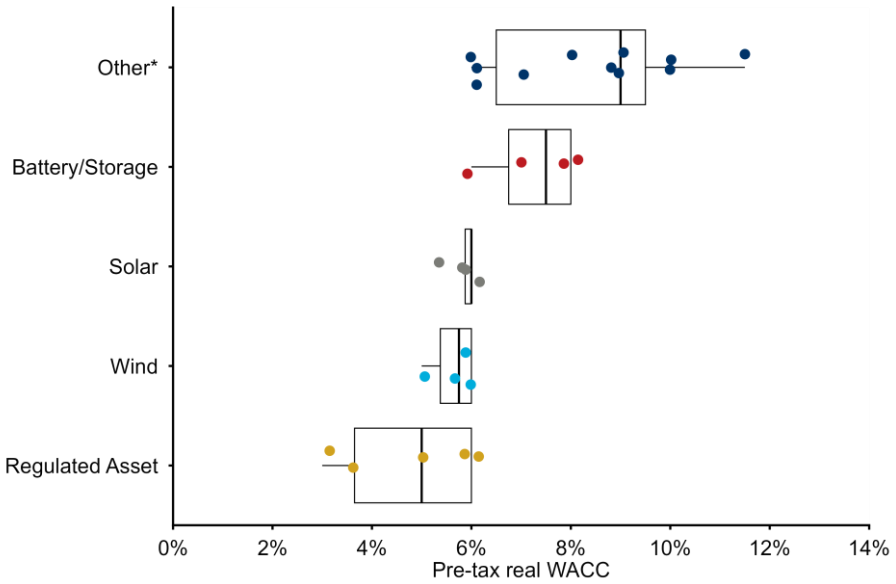
These risks are generally similar for a particular asset and therefore differences in WACCs can be observed based on asset types (Fig. 9).

The survey results show that solar and wind projects generally have relatively lower WACCs compared to other renewable projects such as battery and or, storage and pumped hydro. Interview respondents have largely attributed this to greater certainty in cash flow (lower revenue risk) and greater access to benchmarks for solar and wind projects compared to other renewable projects (lower planning risk).

Some interview respondents also noted that solar projects tend to have a slightly higher risk premium. This is due to solar being exposed to concentration risk and subsequently greater negative pricing pressures compared to wind, which can be mitigated through location diversification.

Overall, the survey responses across technology types were quite consistent.

Fig. 9. Survey Response for Central Pre-tax real WACC by type of asset



Source: Oxford Economics Australia
**Other denotes responses that were not discernible by technology, such as where a respondent has provided a single WACC but has a portfolio of assets. This may also include responses that could not be separated to maintain confidentiality*.

2.3.2 Market Risk Factors

Market-level factors may also affect the cost of capital through risk premiums and the risk-free rate. Examples of market-level factors include location-based risks, near-term macroeconomic outlook, and federal policies.

The interview responses consistently suggested that a jurisdiction-based premium was not applied to the WACC. However, it is worth noting that to the degree that location impacts the connectivity of a project (connection risk), this may have a bearing on whether a project goes ahead. This is because connection risk creates uncertainty in revenue streams as project timelines may be delayed in the process. Furthermore, location was also noted as an important factor when it came to operational and strategic decisions. Specifically, some interview respondents cited that they may choose a particular jurisdiction for a specific asset type or may choose a particular state as a method of diversification for their Australian portfolio.

Investments generally consider the long-term outlook, but changes in the near-term macroeconomic outlook may have some bearing. Survey responses suggested that this is primarily through the cost of debt, which is determined by the market. Investment decisions generally look past short-term cyclical factors that do not have any material structural impacts on the economy. This is because the investment lifecycle of renewable projects is generally over 15 years. However, the recent change in the monetary policy environment and higher inflationary expectations have increased the risk-free rate and therefore increase the cost of capital mechanically through the cost of debt.

Going forward, some of the survey responses suggest that changes in federal and state policies may have some bearing on the cost of capital. Survey participants were asked if policies and government financing impacts their cost of capital and if so, what premium they would apply in the absence of these

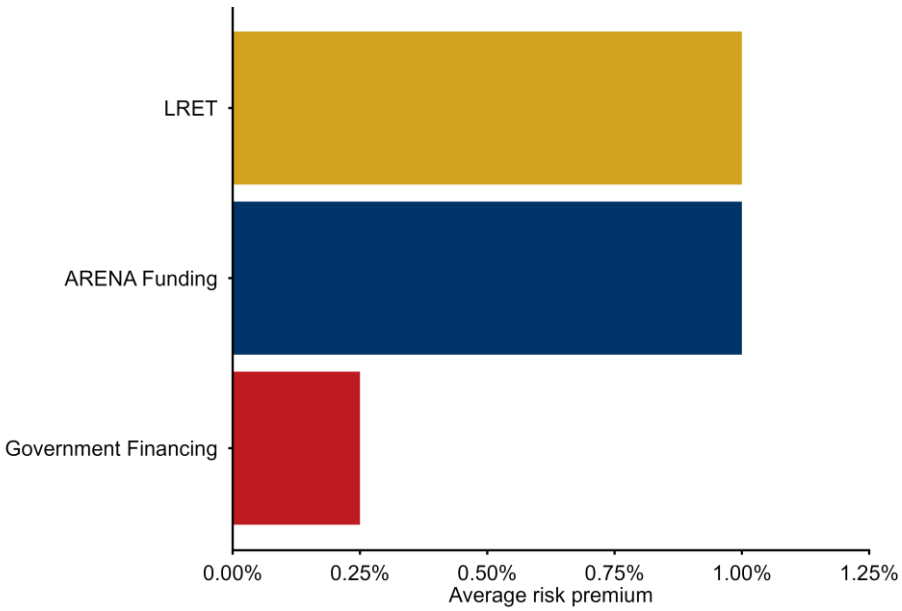
policy support. The figure below shows the average premium for those that responded to this question.

These survey responses highlighted that these policies can lower the risk premiums on the cost of capital by providing greater certainty on revenue. This is especially the case for battery projects due to its greater revenue and construction risks. For example, some respondents estimated that in the absence of government financing the risk premium would be 1-2% higher (as shown in Fig. 10).

Additionally, some interview respondents have stated that in the absence of government financing, some renewable projects would go below the hurdle rate required to kickstart the project. These policies may also lower the cost of capital indirectly by changing the debt structure of a project. The increase in revenue certainty from certain government financing policies allow projects to increase their gearing (share of debt to equity), and thereby reduce their cost of capital.

We add a note of caution, however, that the portion of survey respondents that flagged government financing impacted their cost of capital was less than 25% of the sample (3 surveys) and should not be considered a whole of market view.

Fig. 10. Reported impact to cost of capital in the absence of policy support, by policy scheme



Source: Oxford Economics Australia

2.3.3 Funding Accessibility and Global Competitiveness

The global financial market has become much tighter over the past 12-18 months due to higher interest rates and greater competition for capital. Persistently elevated inflation across most developed economies, including Australia, has prompted their respective central bank to aggressively raise policy rates. Global decarbonisation policies, including the US's Inflation Reduction Act (IRA), is expected to increase competitiveness in the capital

market. However, interview participants do not expect this to limit the availability of capital for Australian projects.

Nonetheless, the ability to access funds was not cited as a particular concern across most interview respondents. Feedback from interview respondents has been that Australia is generally seen as an attractive destination for overseas capital flows. Concerns over funding accessibility were generally cited for the domestic capital market. Specifically, some respondents are now looking to refinance overseas, which they previously had no exposure to.

The attractiveness of Australian energy investment is owing to the strong regulatory and prudential frameworks in place and greater opportunities. The Australian energy market is still growing compared to the US and the European markets, which are already well-established and dominated by their own banks. Consequently, this allows investors to seek greater returns and make substantial investments in the Australian energy market.

Funding accessibility may also differ by asset class. Interview respondents have cited an increase in appetite towards renewable and storage-related investment. This means that renewable projects, particularly those with relatively certain cash flow, are faced with a competitive capital market and can get offers from plenty of lenders. On the other hand, fossil fuel projects may find it more difficult to access capital.

Going forward, market participants do not expect policies such as the Inflation Reduction Act (IRA) to materially impact the cost of capital in Australia. They do expect, given the size of the IRA, for this to increase the attractiveness of US for capital flows. While this may imply the possibility of a higher upper bound to the cost of capital in Australia, this is not perceived to be a likely outcome

2.3.4 Applicability of WACC for Project Investment Decisions

The WACC approach is not always appropriate in reflecting an investor's view about the required returns on investment in the NEM. Several interview respondents have noted that the pre-tax real WACC is not necessarily used as the hurdle rate for renewable energy projects. The hurdle rate may be above the pre-tax real WACC due to the risk profile associated with a project and changes in the risk structure throughout the project cycle. As participants note, it also tends to be less volatile compared with the traditional WACC, as investors generally look past short-term macroeconomic shocks.[14]

Moreover, the cost of debt component of the traditional WACC formula requires a debt risk premium for the asset, underpinned by a credit rating. For renewable projects (particularly more nascent technologies that have a high degree of variability in risk profiles) this benchmark has been difficult to establish. As a result, some participants noted the move away from the traditional WACC in their project investment decisions towards internal hurdle rates. Some interview respondents have pointed out that the hurdle rate can be 1 to 3 percentage points higher than the WACC.

[14] This is consistent with findings from the Reserve Bank of Australia (RBA). More information is available here: https://www.rba.gov.au/publications/bulletin/2021/dec/why-are-investment-hurdle-rates-so-sticky.html

There are various ways that companies determine a hurdle rate. Some interview respondents account for risk by using the cost of equity as the main form of assessment when deciding whether to pursue a project. This method ensures that the investor is getting a return that is specific to a project and its various risks and is not affected by cyclical fluctuations in the cost of debt. This mechanically drives the hurdle rate above the WACC as the cost of debt is generally lower than the cost of equity. Meanwhile, other respondents mentioned that a premium is added to the WACC based on the type of investment. The premium can be driven by uncertainty in cash flow, the investment lifecycle, and the sale process's competitiveness.

Furthermore, some respondents have noted that the WACC may change due to variations in the debt-to-equity structure across the stages of development. The early stage of project development tends to require more equity financing due to higher exposure to risks such as construction risks. Consequently, this would raise the cost of capital. However, once the project becomes operational, it can secure more debt financing due to greater certainty in revenue and in turn reduce the WACC. Therefore, there may be timing risks around the stage of development that are not captured in the WACC but are captured in the hurdle rate.

APPENDIX

A.1 DEFINITION OF COST OF CAPITAL

The ISP uses the cost of capital to assess the costs against the benefits of all developments in its long-term modelling. This cost of capital is derived using the weighted average cost of capital (WACC) approach.

The WACC is defined in the National Electricity Rules (NER)[15] as:

$$WACC = k_e \frac{E}{V} + k_d \frac{D}{V}$$

where $\mathrm{k_e}$ = the expected rate of return on equity, k_d = the expected rate of return on debt, $\frac{\mathrm{E}}{\mathrm{V}}$ = the market value of equity as a proportion of the market value of equity and debt (which is $1 - \frac{\mathrm{D}}{\mathrm{V}}$), $\frac{\mathrm{D}}{\mathrm{V}}$ = the market value of debt as a proportion of the market value of equity and debt

A.1.1 Expected cost of equity

The expected return on equity is determined by the Capital Asset Pricing Model (CAPM):

$$k_e = r_f + \beta_e \cdot MRP$$

where $\mathrm{r_f}$ = the nominal risk-free rate, β_e = the equity beta, MRP = Market Risk Premium

A.1.2 Expected cost of debt

The expected cost of debt is determined by the benchmark credit rating and the corresponding observed market debt risk premium (DRP) above the risk-free rate.

$$k_d = r_f + DRP$$

where $\mathrm{r_f}$ = the nominal risk-free rate, DRP = Debt Risk Premium above the risk-free rate

[15] Australian Energy Regulator (AER): More information available on https://www.aer.gov.au/system/files/Final%20decision%20-%20Review%20of%20electricity%20transmission%20and%20distribution%20WACC%20parameters%20-%201%20May%202009.pdf

A.2 SURVEY APPROACH

A.2.1 Survey Design

The survey questions were developed by Oxford Economics Australia, with input from AEMO and the ISP Consumer Panel. To maximise survey engagement, the survey was limited to 10 questions comprised of multiple-choice and free-form responses. Participants were also informed that their responses are protected by applicable federal and state privacy and confidentiality laws.

The aim of the survey was to inform a pre-tax real WACC estimation and understand the main risks and drivers associated with the cost of capital estimates. Further interviews were also conducted alongside the surveys to provide a further understanding of these risks and drivers across various organisational types.

There were two main sections to the survey. The first section aimed to inform a pre-taxed real WACC and to understand the sensitivity around this figure. The respondents were required to answer the following questions:

1. What pre-tax cost of capital do you currently use for evaluating future energy asset investment? If multiple, please specify by asset type.
2. What is your assumed inflation rate for FY23, FY24 and long term?
3. What was your view of pre-taxed cost of capital 12 months ago?
4. What do you see as realistic upper and lower bound variation around your cost of capital assumptions selected in Question 1?

The second section aimed to understand the risks associated with the cost of capital. The questions focused on how various risk premiums are applied to the reported cost of capital, and the effect of various energy policies and subsidies on the cost of capital. The respondents were required to answer the following questions:

5. Which of these risks have the largest bearing on your cost of capital? What is the premium associated with this uncertainty?
    - Land acquisition risk
    - Planning risk
    - Construction risk
    - Operational risk
    - Merchant risk
    - Other risk, please specify
6. What is the minimum percentage of contracted offtake that you require for this project? Is this for energy output or capacity?
7. What is the length of your PPA agreement contract (in years, on average), if you have one for this project?
8. What is the risk premium added to your cost of capital (if any) for the follow risks?
    - Near term macroeconomic factors (e.g. recent interest rate moves)
    - Limited access in Australia to global capital following the initiatives such as the US IRA
    - No access to transmission and distribution network
    - Other risk applies, please specify

9. Do any of the following policies and subsidies impact your cost of capital assumptions? Please select all that apply. Please provide an estimate of the risk premium that would apply in the absence of these measures (i.e. how much higher would the cost of capital be if these measures were not in place)
    - Rewiring the Nation Concessional Finance
    - LRET
    - ARENA Funding
    - REZ Access Schemes
    - Are there any other policies that we have missed? If so please outline below with an estimate of the risk discount/premium

    - Note only 3 out of 13 survey respondents indicated these schemes had a direct impact to their cost of capital.
    - Within those responses, to the second part of this question on what premium would apply if these supports were removed, the responses were varied, ranging from 0.25% to 1% premium.

10. Is there anything else that you would like to add for consideration?

A.2.2 Survey Timeline & Participation

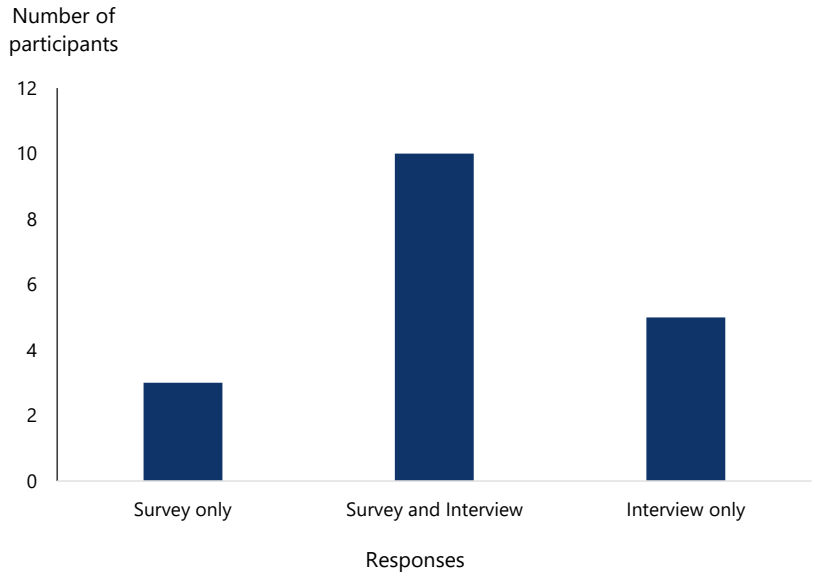
The survey was conducted over a three-week window. Participants were given one-week to return surveys and there was a two-week window in the project for interviews.

The survey was sent to 64 energy market participants across various stakeholder groups covering:

- Asset developers
- Asset owners
- Network service providers
- Lenders and investors
- Independent body

Of these, 13 participants took part in the survey, covering 28 WACC estimates based on the type of asset or technology and/or a portfolio of assets. Interviews were then conducted for 10 of these participants to contextualise the responses and obtain richer qualitative insight (Fig. 11). Furthermore, an additional 5 interviews were conducted for participants that did not provide a survey response to gain additional qualitative insights to support the survey findings.

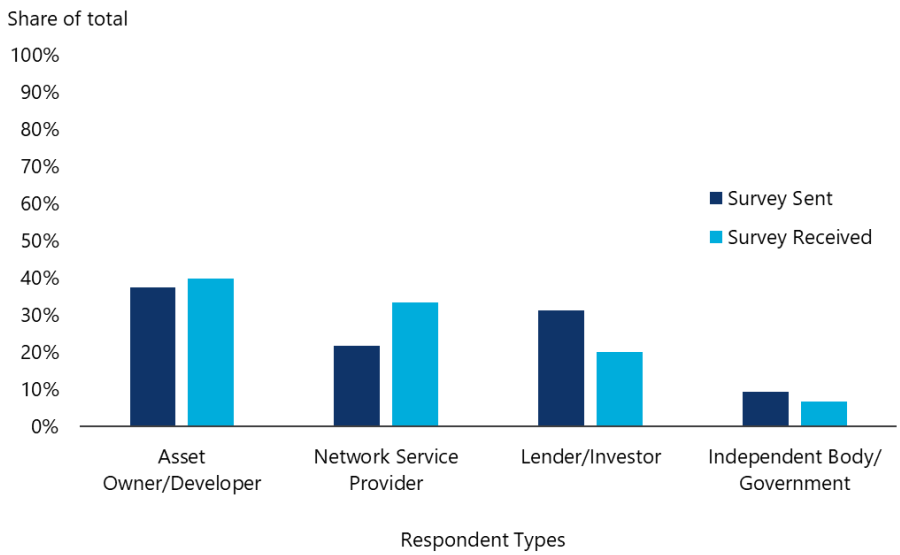
Fig. 11. Participants by type of participant



The overall engagement rate for this project was around 27% which we consider to be a solid engagement rate, against a very short survey window.

The distribution of respondent types broadly matched the distribution of participants that were originally sent the survey (Fig. 12). While the share of lender/investor respondents was slightly lower, two network service providers (NSPs) have highlighted in the interviews that their WACC estimates were either partially or fully informed by external banks. This suggests that the WACC responses provided by the NSP partly reflects the WACCs used by investor/lenders. Overall, the distribution of surveys received is not dissimilar from the distribution of surveys sent.

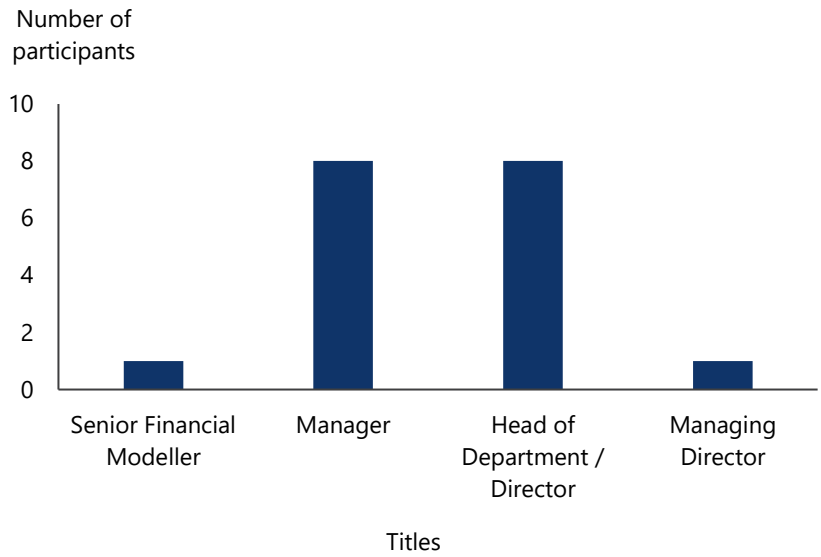
Fig. 12. Share of survey respondents by respondent types



Source: Oxford Economics Australia

The responses were also deemed of high quality as the survey respondents were the appropriate people within their respective organisations to provide a response to the surveys. These roles ranged from senior financial modellers to managing directors. Most of the participants were managers or heads/directors of their relevant departments, including corporate finance, and energy investment and development (Fig. 13).

Fig. 13. Number of participants by job titles



Source: Oxford Economics Australia

Overall, the exercise has produced rich and valuable insights into the cost of capital and various other considerations faced by the renewable energy investment market. It should be noted that while the key findings above provide a good view within the sample of participants, it does not necessarily reflect the full population due to the small sample size.

ABBREVIATIONS

Abbreviation	Definition
AEMO	Australian Energy Market Operator
AER	Australia Energy Regulator
BPS	Basis points
CAPM	Capital asset pricing model
DRP	Debt risk premium
IRA	Inflation Reduction Act
ISP	Integrated System Plan
LRET	Large-scale renewable energy target
NEM	National energy market
NER	National Electricity Rules
OEA	Oxford Economics Australia
PPA	Power purchase agreement
RBA	Reserve Bank of Australia
WACC	Weighted average cost of capital

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