



The Business of
Marine Energy

Oceania Room | Te Papa Tongarewa | Wellington

Economics of Renewables

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Introduction

- Renewable macro trends
- New Zealand investment environment
- Recent findings from NZWEA report
- Key investment considerations

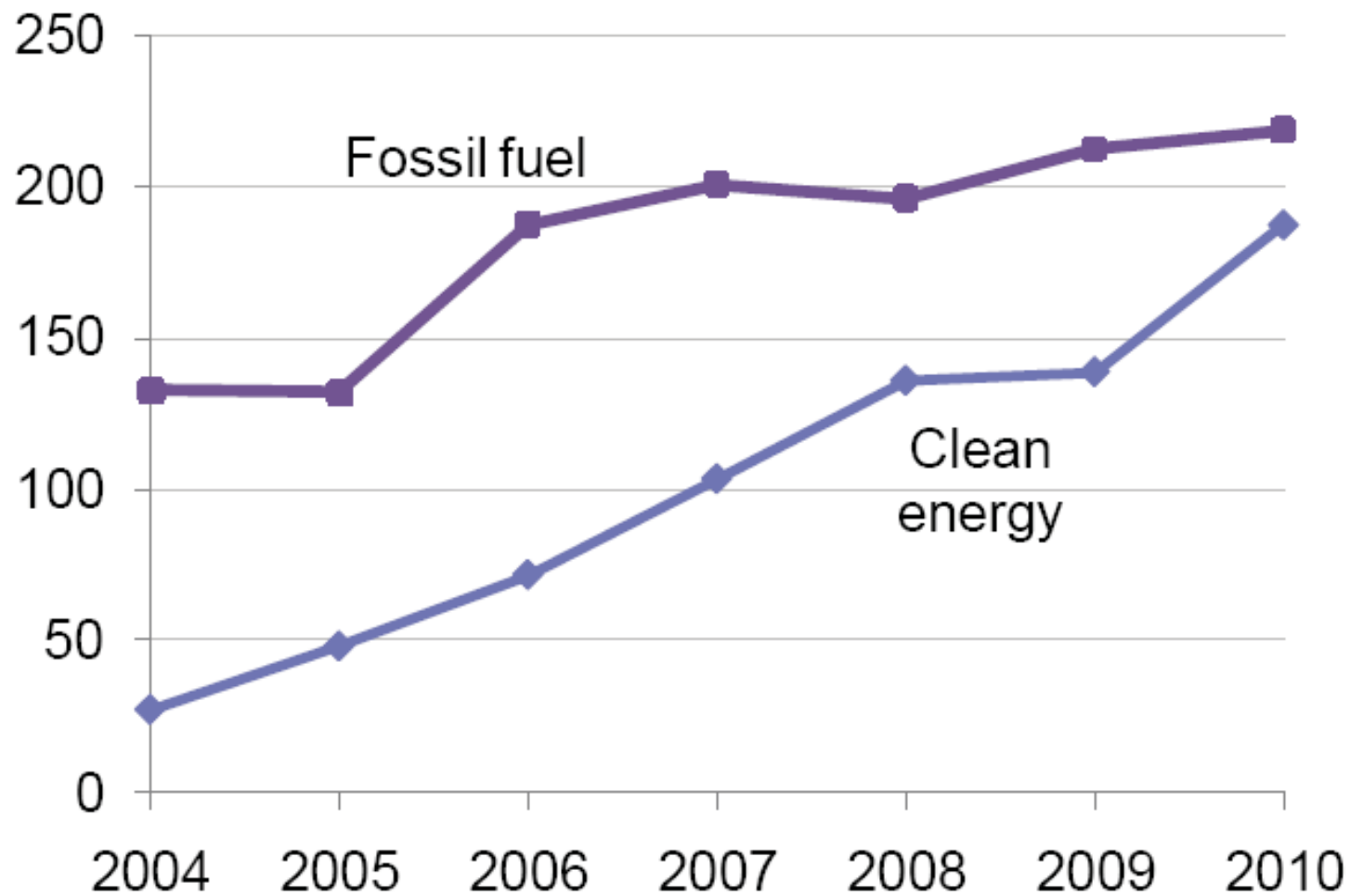
Renewable macro trends

The renewable energy sector is a complex and diverse market, driven by increasing global energy demand, positive regulatory change and the need to replace mature and declining energy sources

- Global investment in renewable energy was \$243bn in 2010
- Estimated to reach \$600bn by 2020
- Global energy demand is set to grow by 45% by 2030
- Significant investment in renewable energy will be required to meet this
- Global push to reduce dependency on fossil fuels, reduce carbon emissions, recycle and reuse waste streams
- Support in both Europe and the US is attracting significant investment in the renewable energy sector
- Growth and competition has driven down price of technologies

Renewable macro trends

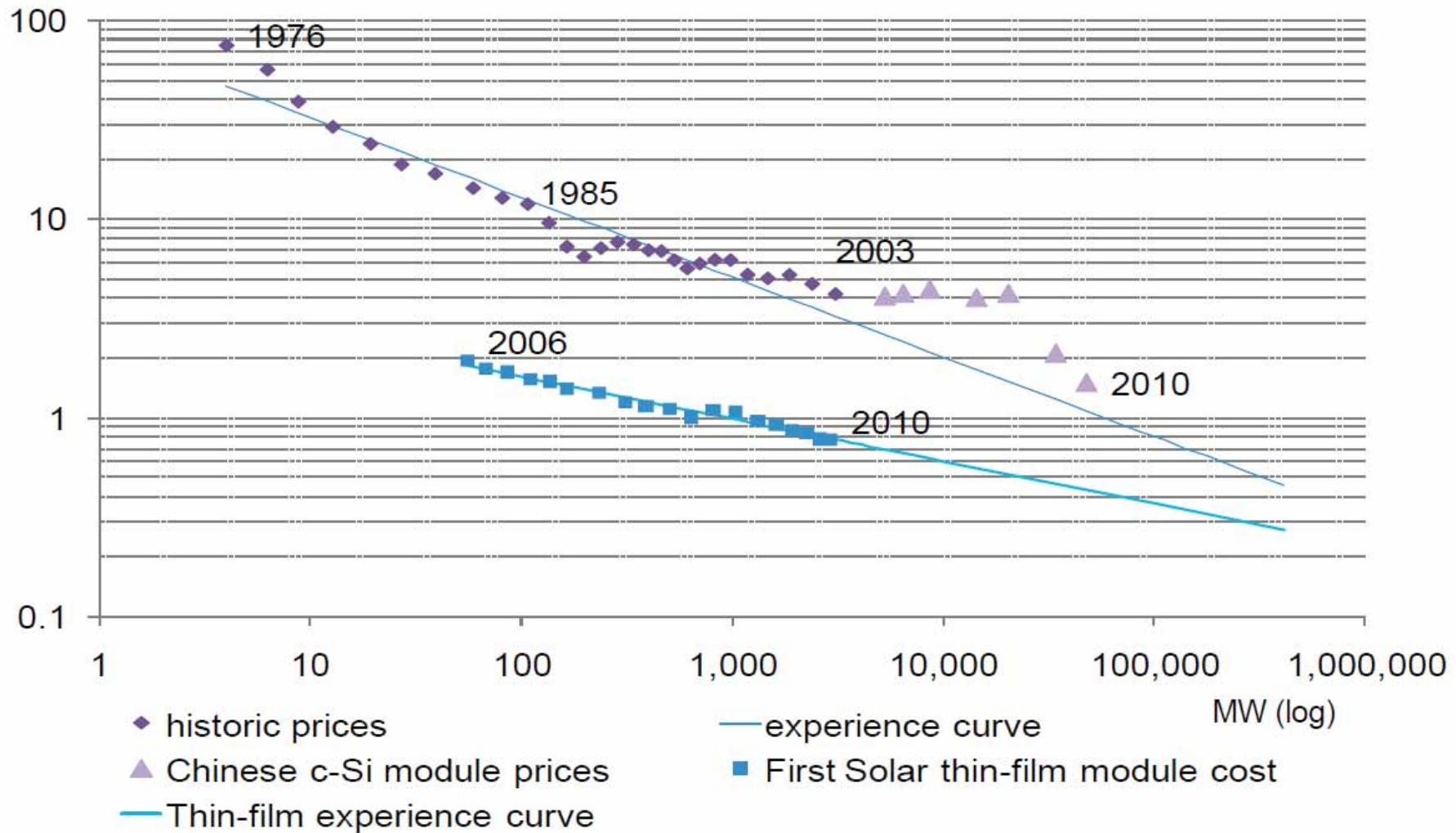
Clean vs. Fossil-Based Generating Capacity Investment, 2004–10 (\$Bn)



Source: Bloomberg New Energy Finance

Renewable macro trends

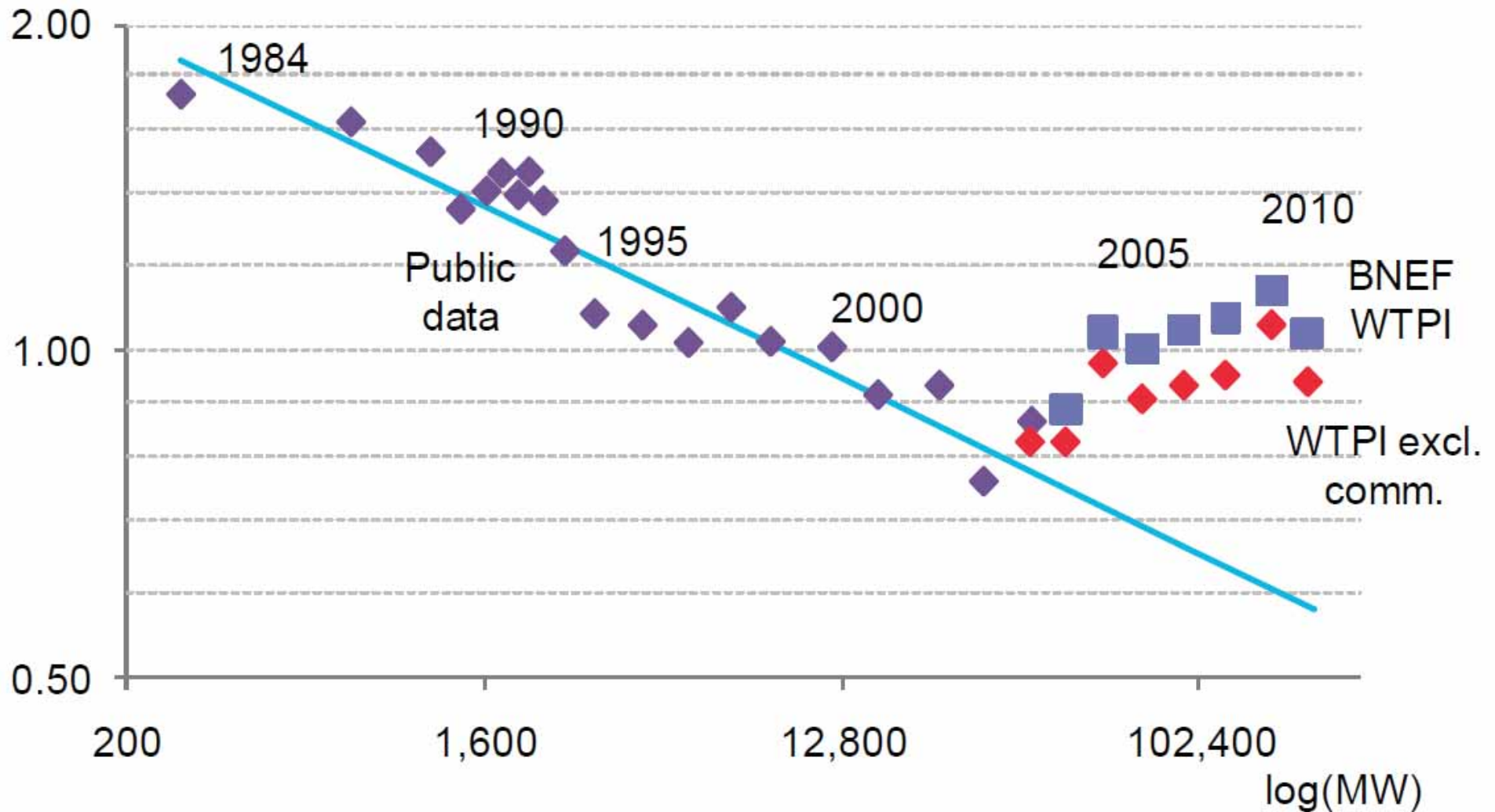
The PV Module Experience Curve, 1976–2010 (\$/W)



Source: Bloomberg New Energy Finance, FSLR Filings

Renewable macro trends

Wind Turbine Price Index, 1984–2010 (EUR M/MW)



Source: Bloomberg New Energy Finance, Extol, Lawrence Berkeley Laboratory

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New Zealand investment environment

The investment environment in New Zealand has important differences to most other renewable energy markets

- Subsidies have come and gone
- Strong natural resources
- New Zealand's ETS scheme
- There is no meaningful market or appetite for long term purchase contracts
- Vertically integrated market

Example of subsidy gap – raw electricity price

Subsidies have helped drive significant growth internationally

- UK Renewables Obligation offers significant incentives to developers of new technology
- Recent changes to RO banding is very attractive for Marine Energy

Incentive Example			
\$ MWh <i>1NZD = 0.45GBP</i>	UK	NZ	UK / NZ
Base electricity price	\$111	\$80	
Current ROC price	\$82	na	
Onshore Wind Farm Price	\$193	\$80	1.4 x
Marine Energy Standard (2 ROCs)	\$275	\$80	2.4 x
Enhanced wave - Scotland (3 ROCs)	\$357	\$80	3.5 x
Enhanced tidal - Scotland (5 ROCs)	\$522	\$80	5.5 x

Example of subsidy gap – adjusted for resource quality

New Zealand has world class resources

- These factors have assisted renewables in New Zealand to be constructed in the absence of subsidies

Incentive Example			
\$ MWh <i>1NZD = 0.45GBP</i>	UK	NZ	UK / NZ
Onshore wind farm price (incl subsidies)	\$193	\$80	2.4 x
Capacity factor	25%	42%	0.6 x
Gross Revenue	\$48	\$34	1.4 x

Recent findings from NZWEA Economics of Wind LRMC calculation

The raw levelised cost of electricity delivered from New Zealand wind investment to date is \$78 to \$105 MWh

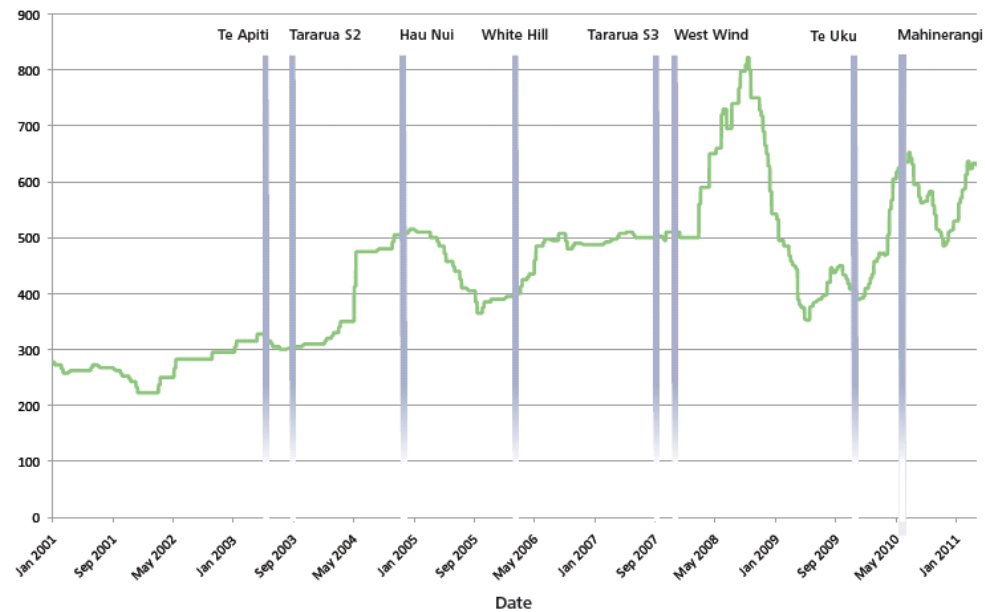
LRMC – Raw constructed cost



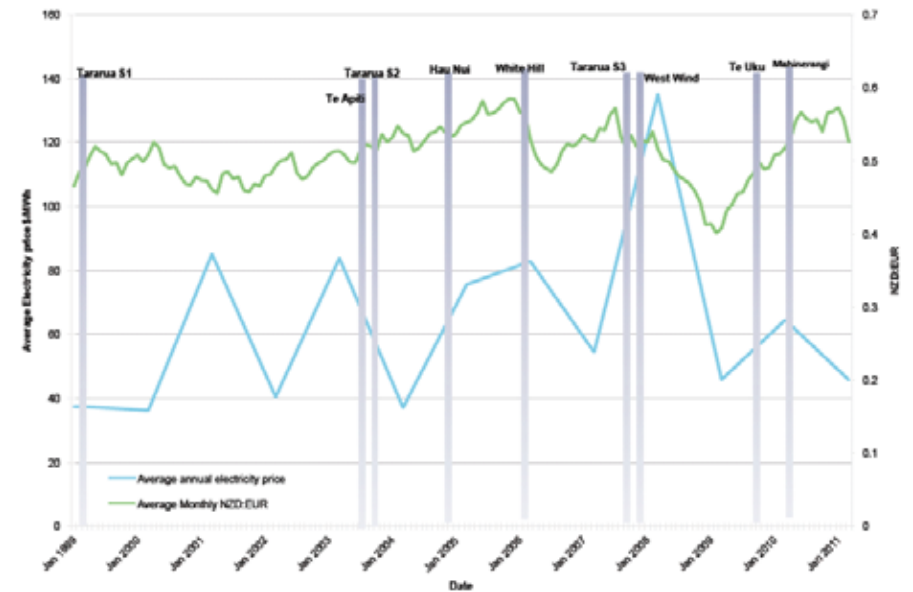
Investment considerations - timing

Most investments have been made above NZD:EUR 1:0.5 and steel prices below €500/tonne

Hot Rolled Coil Price Index



Average Electricity Price v Euro



Other investment considerations

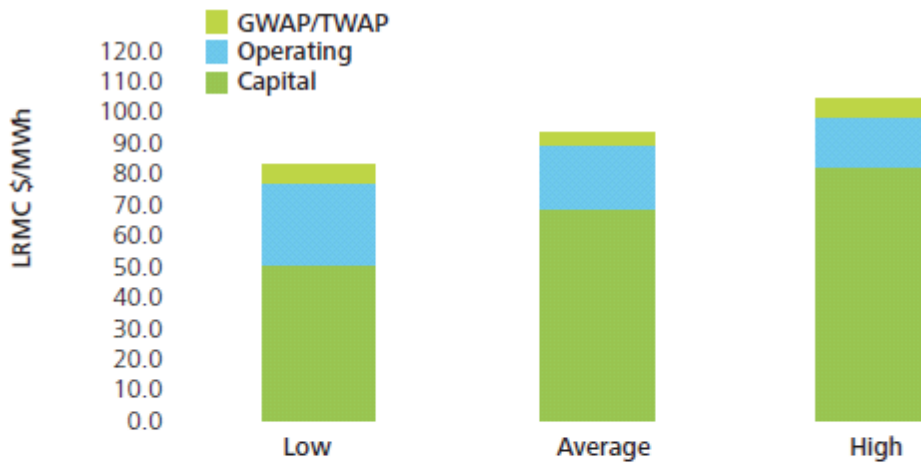
Developers consider a wide range of other factors in making investments in New Zealand

- Forward wholesale electricity price forecasts
- Terminal value
- Portfolio effects and benefits
- Tax benefits
- Hedge position / retail book
- Variable generation price discounts

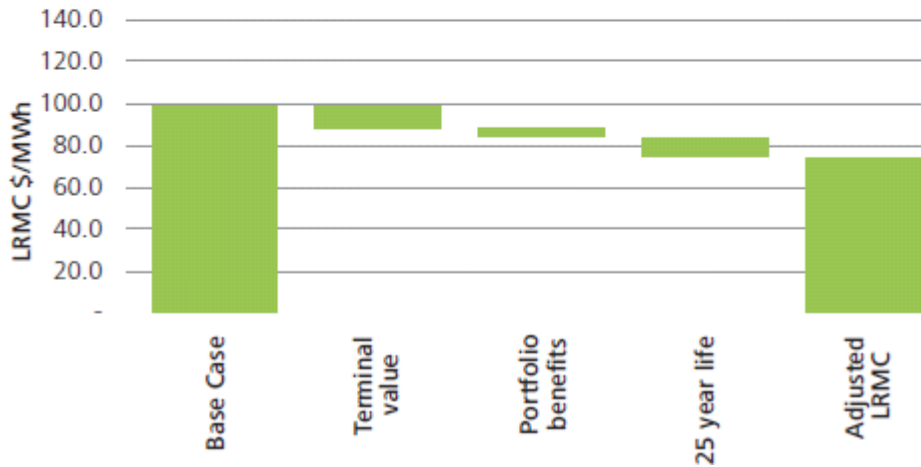
Investment case factors

... these can significantly affect project economics

LRMC – Adjusted for identifiable investment case factors



LRMC – Illustration of theoretical investment case adjustments



Summary

Timing is everything

- Economic investment is highly dependent on exchange rates at the time of commitment for imported technologies
- Investment is inherently more risky in New Zealand
- The global market is heavily dependent on subsidies
- Factors other than LRMC can drive investment decisions
- Investments are sometimes committed based on assumptions that wholesale prices will rise to support the economics

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