

PRICE DISCOVERY WITH 100% RENEWABLE ELECTRICITY SUPPLY

Prepared for Market Development
Advisory Group

27 July 2021

Who are we?



David Hunt

- Director at Concept Consulting for 15+ years
- 10+ years industry experience in executive/director roles



John Culy

- Specialist in energy and utility economics with over 25 years experience
- Expertise in hydro-based power system modelling, system security analysis, operation and planning



Dave Weaver

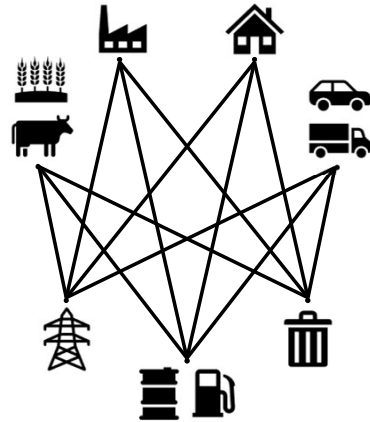
- Senior Consultant, Concept Consulting
- 13+ years experience



Luke Schwartfeger

- Analyst, Concept Consulting
- PhD in Electrical Engineering (University of Canterbury)
- Generation Zero 'Alumni'

Our experience



Whole-of-Economy
Modelling



NZ Battery



EVs and New Technologies

$$\frac{\text{MWh}}{\text{MW}}$$

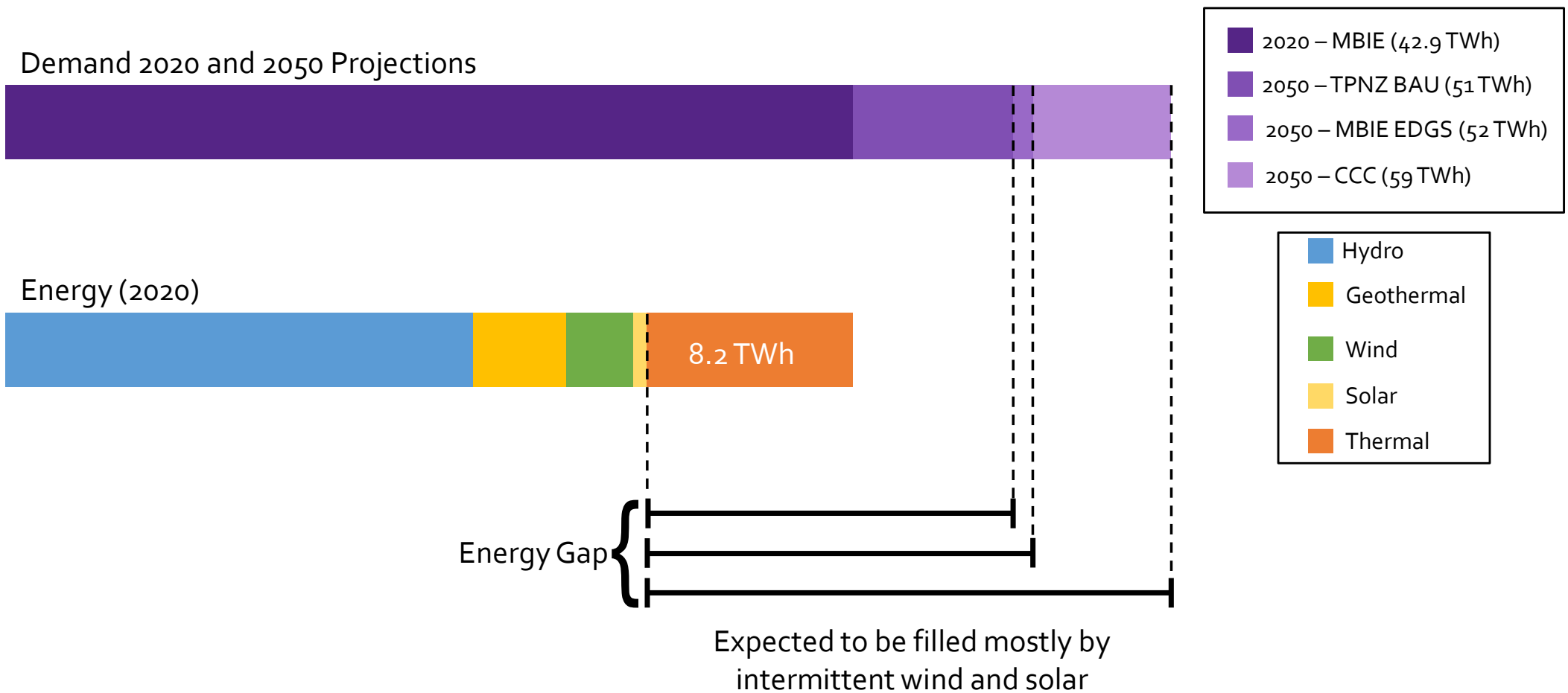
Energy and Capacity Markets



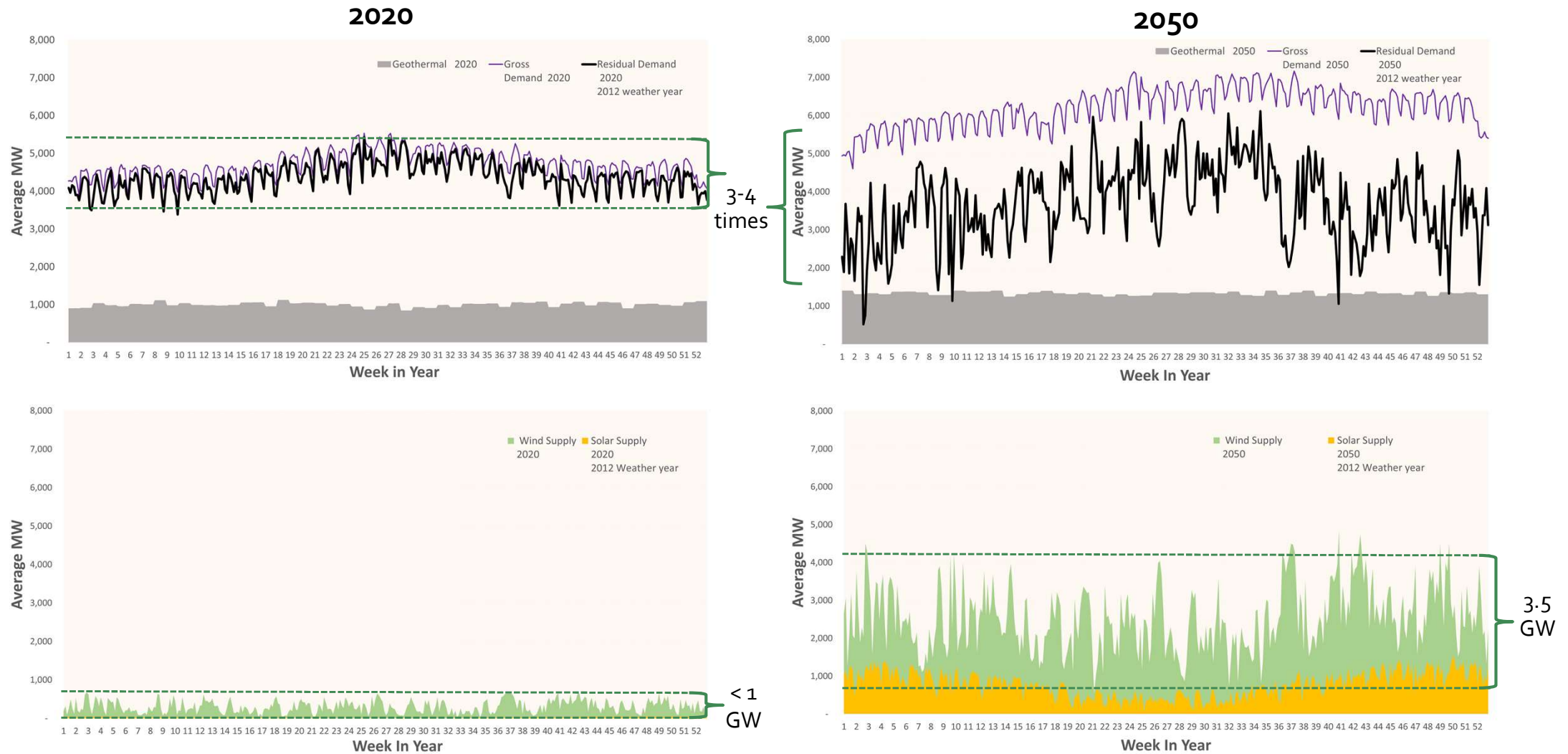
Hydrogen

Moving to 100% renewables will greatly increase the proportion of supply from intermittent sources

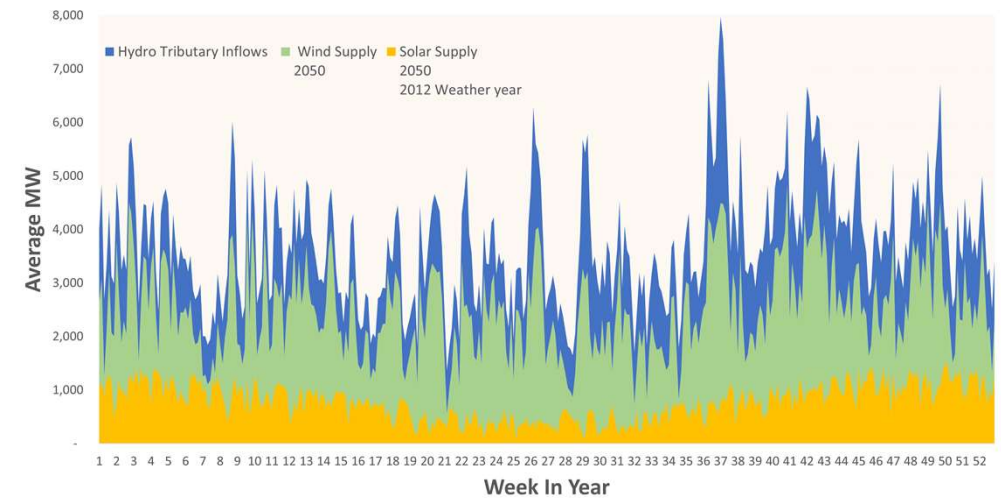
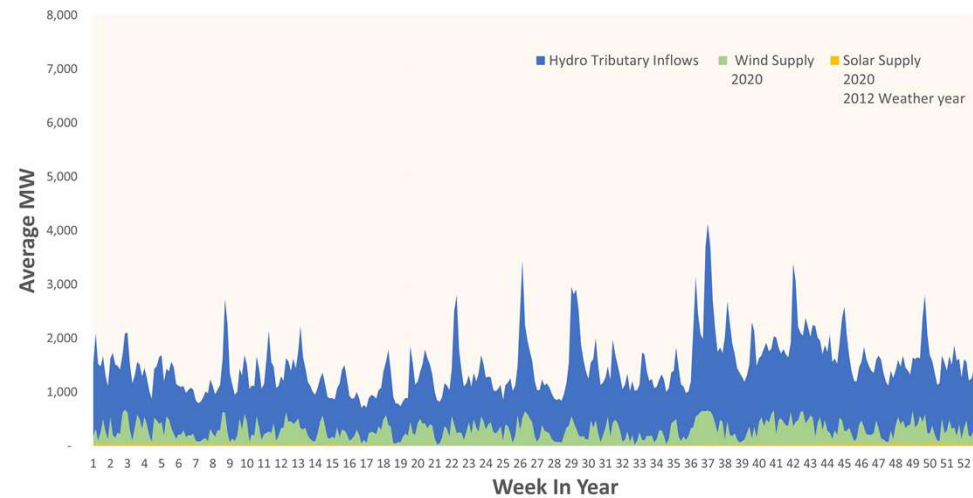
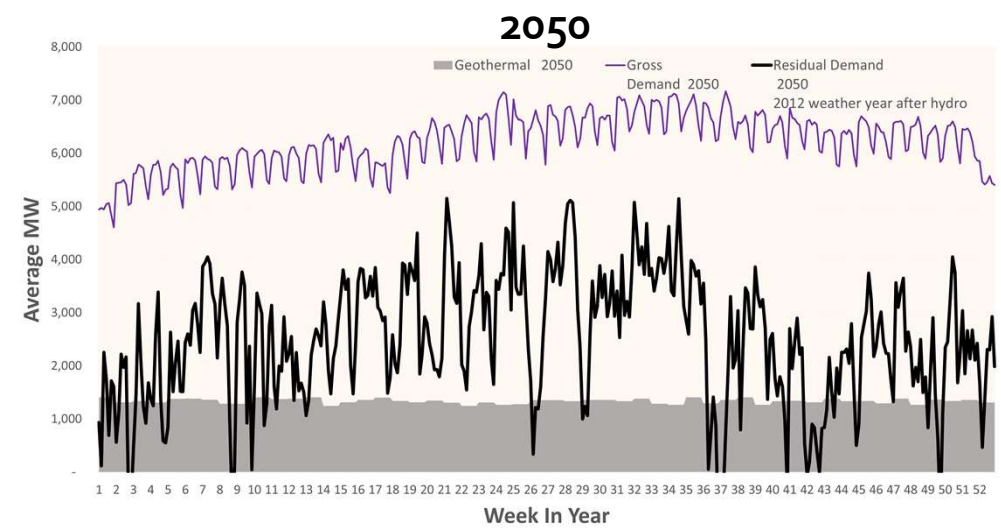
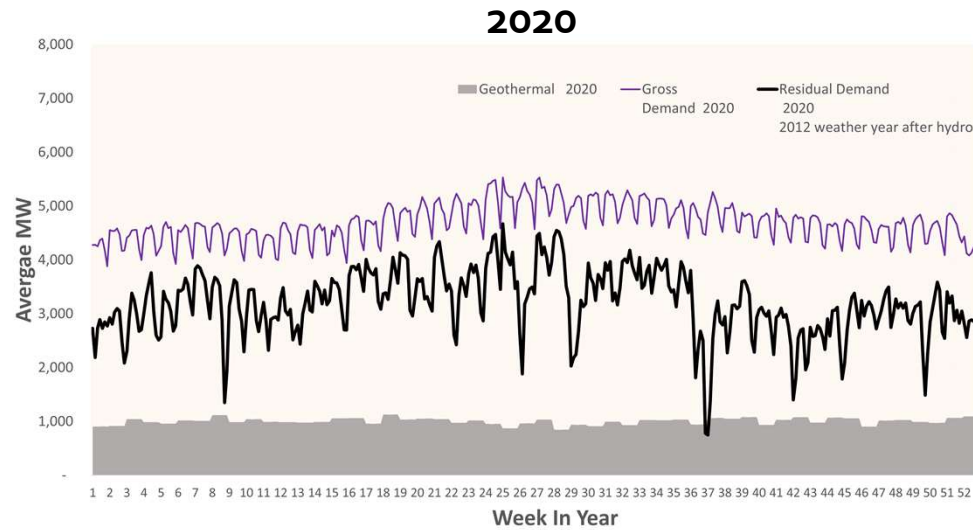
Energy



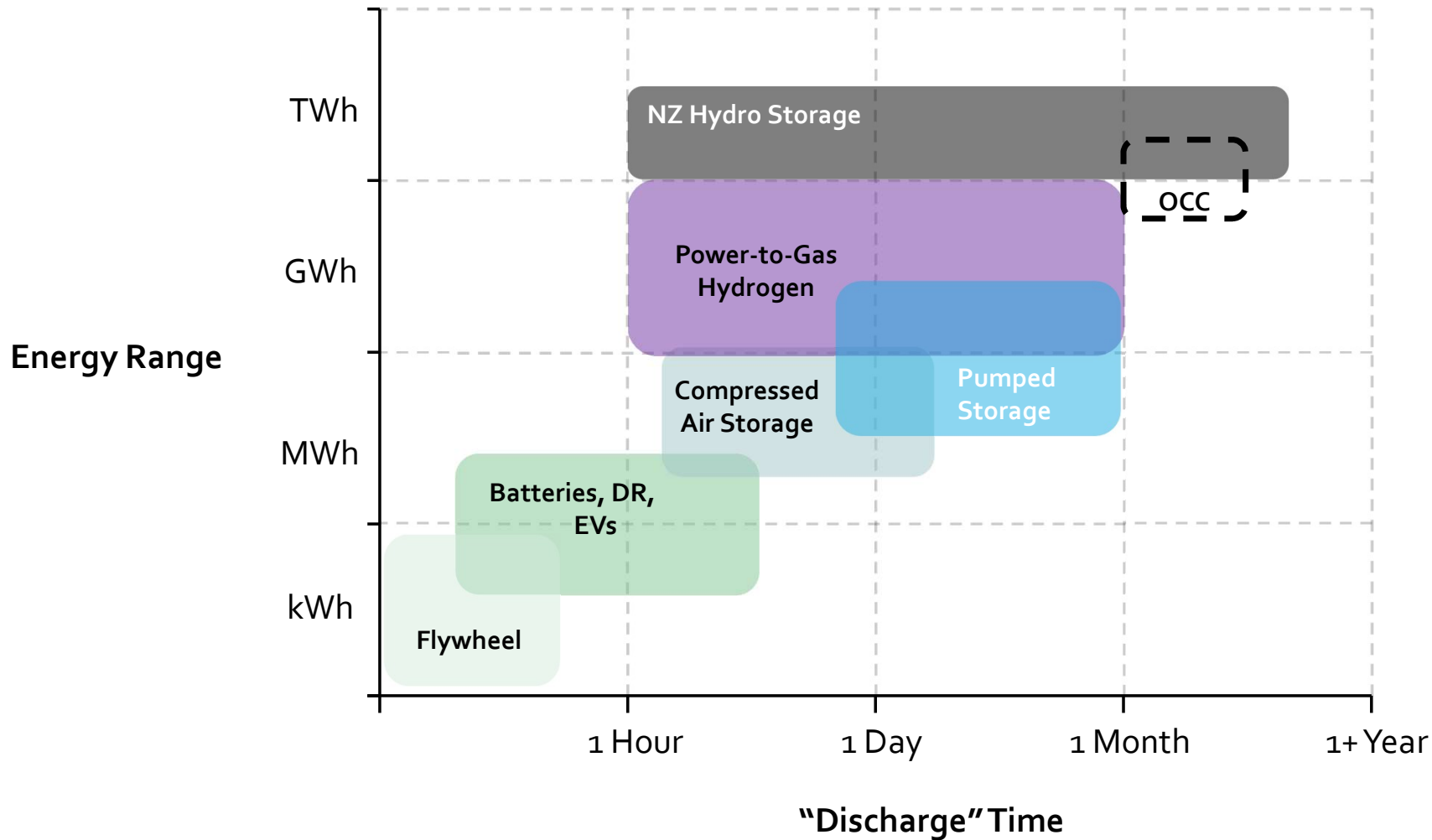
We face substantial increases in short run variability:



But we are used to dealing with weather variability:



Flexible energy resources are required to manage intermittency



We expect a mix of new intermittent generation and 'storage' resources to come onto the system

H₂



Wind



Solar



Batteries

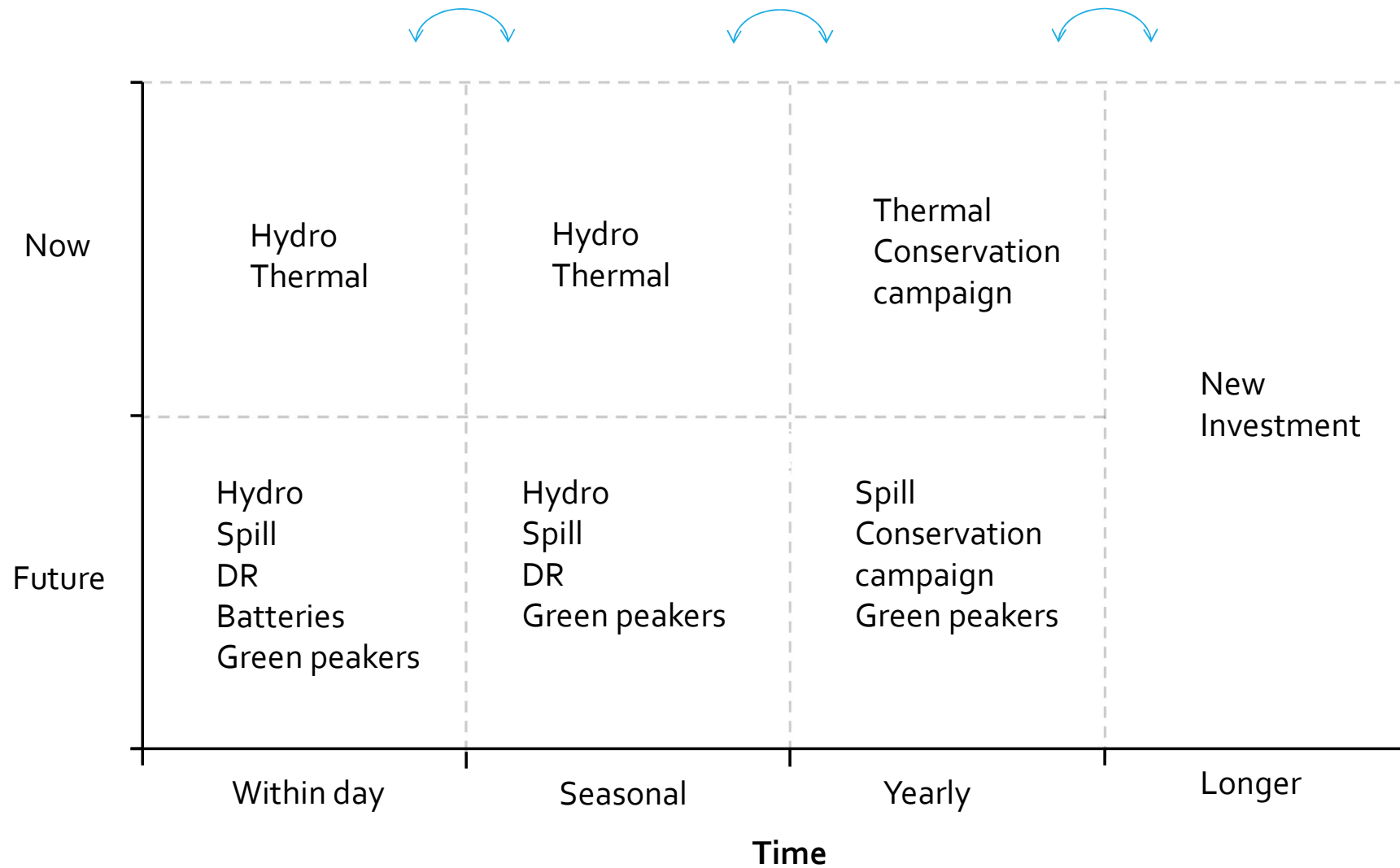


Demand Response



Compressed Air Energy Storage

Flexible resources will change over time



Transition to 100% Renewable involves many lumpy decisions with uncertainty



Huntly (Rankine)



Taranaki Combined Cycle



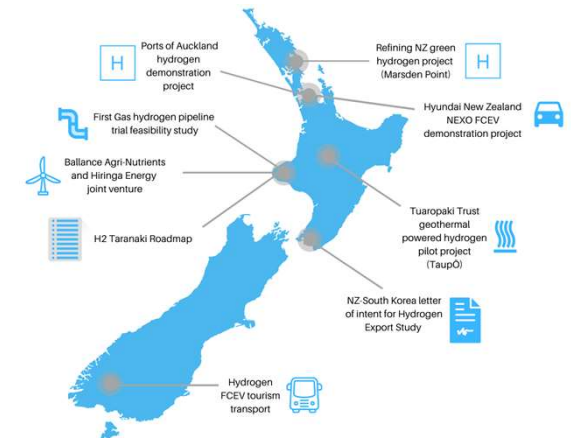
Tiwai Aluminium Smelter



Methanex Motunui Plant



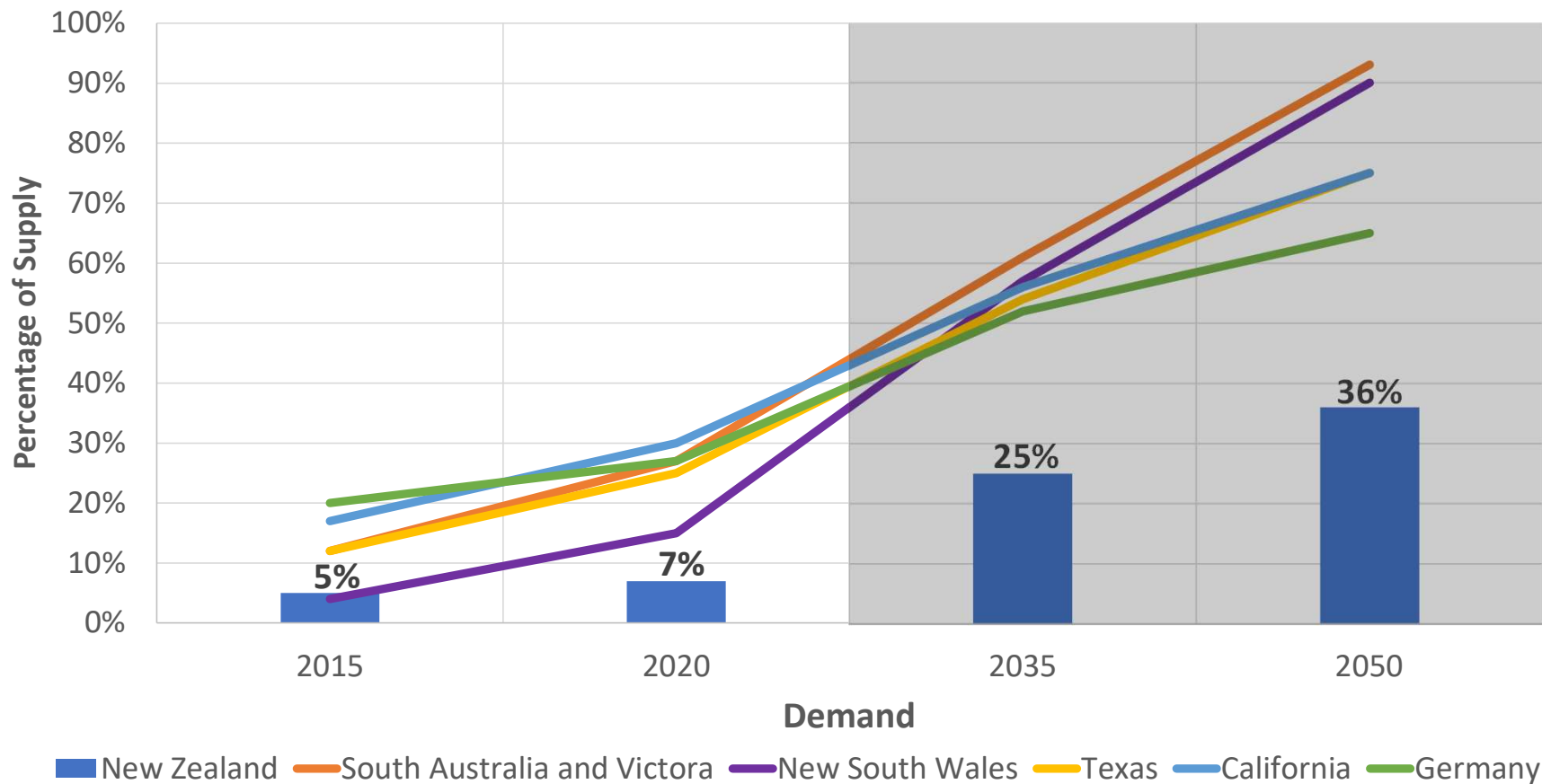
Pumped storage



Hydrogen

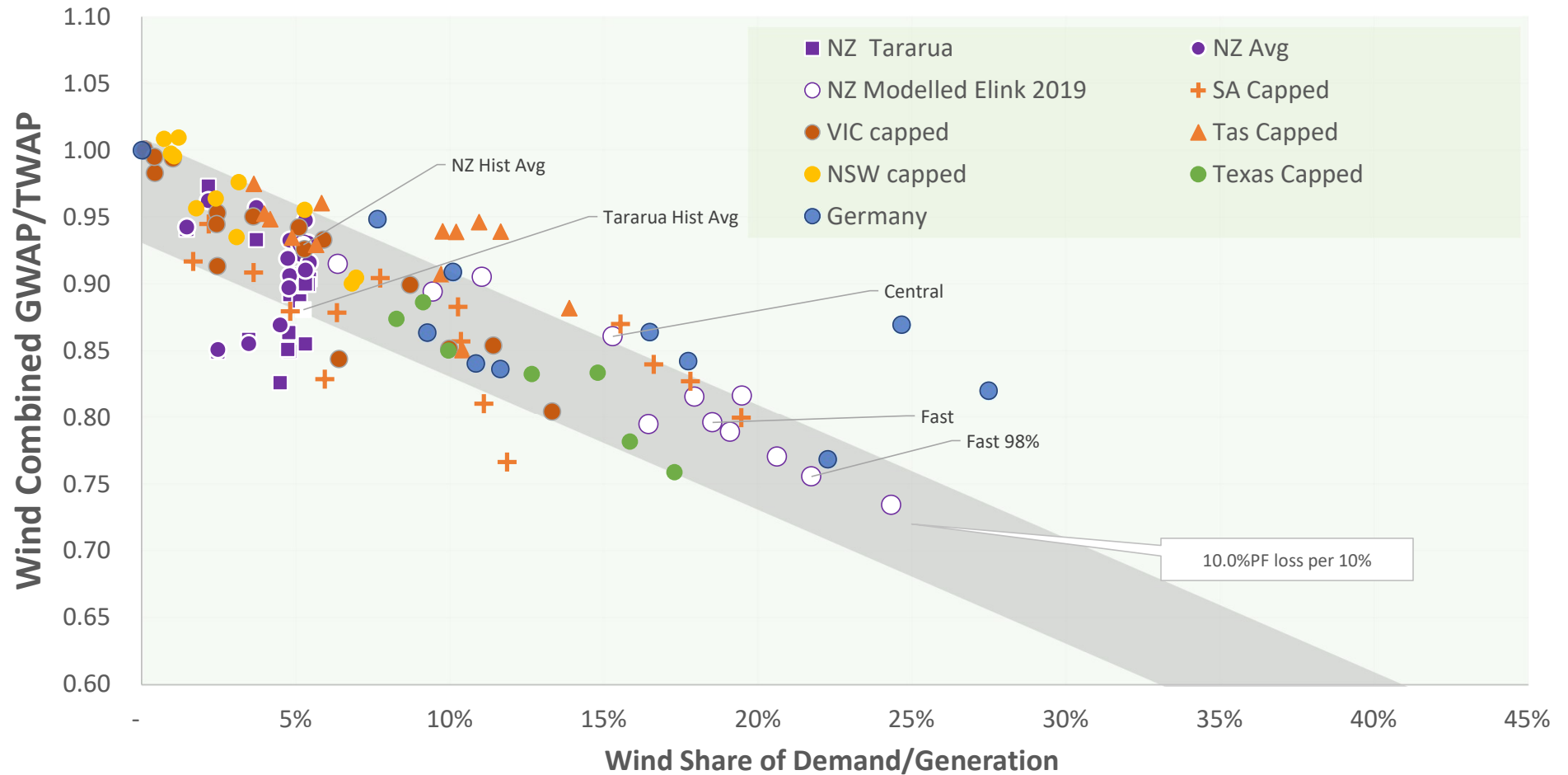
How NZ intermittent renewables compares to other markets

Intermittent (Wind, Solar) Proportion of Supply



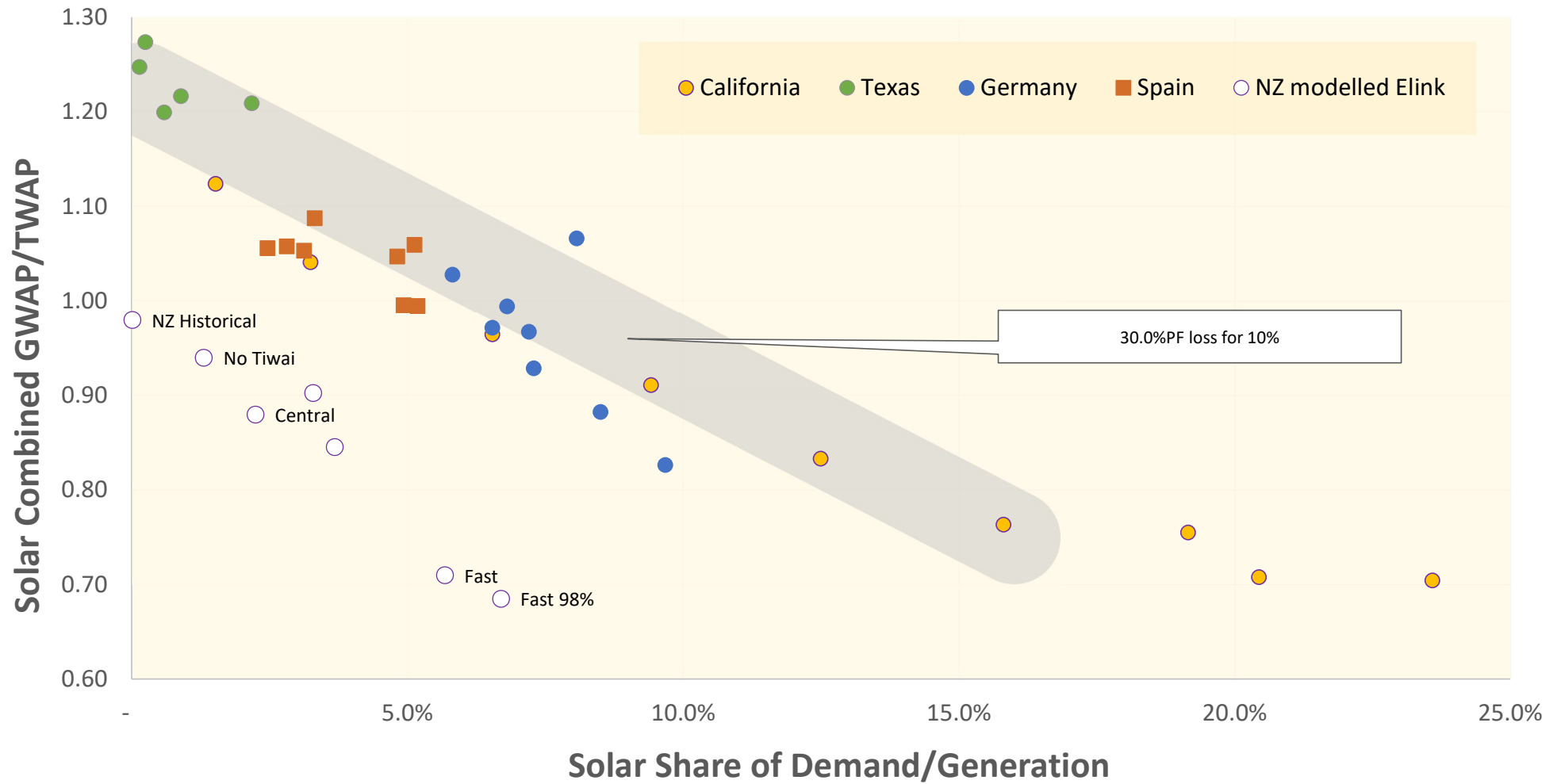
Highlighted region values are indicative projections

International experience of high wind penetration

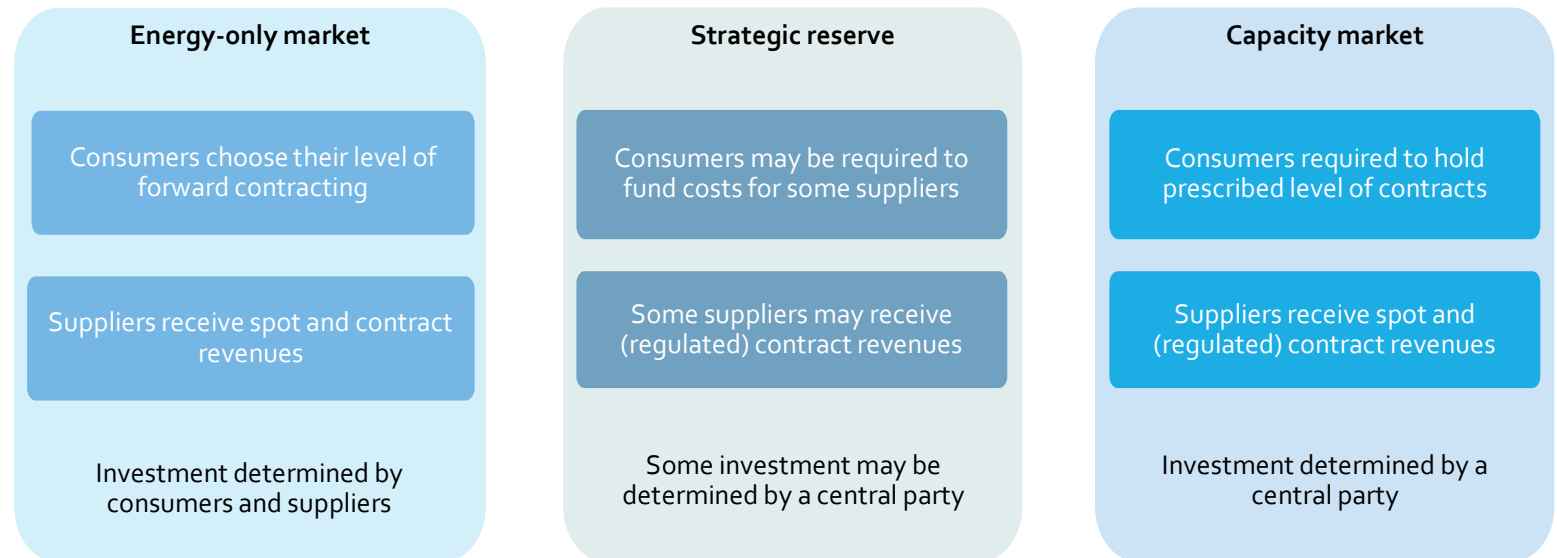


GWAP: Generation Weighted Average Price
TWAP: Time Weighted Average Price

International experience of high levels of solar penetration

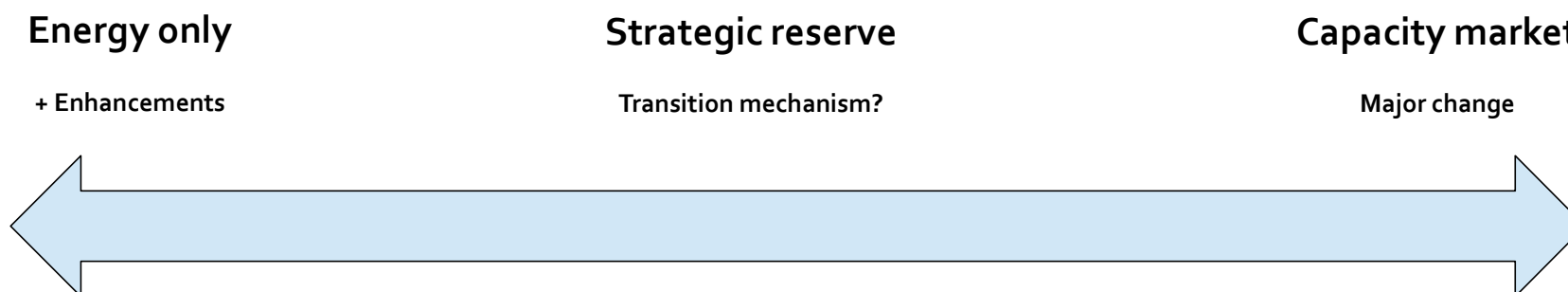


The high level decision is whether to change from energy-only market to a strategic reserve or capacity-market design



	Investment adequacy	✓?	✓?	✓ ✓
	Operational reliability	✓ ✓	✓?	✓?
	Cost to consumers	✓ ✓	?	✓
	Environmental	✓ ✓	?	✓ ✓

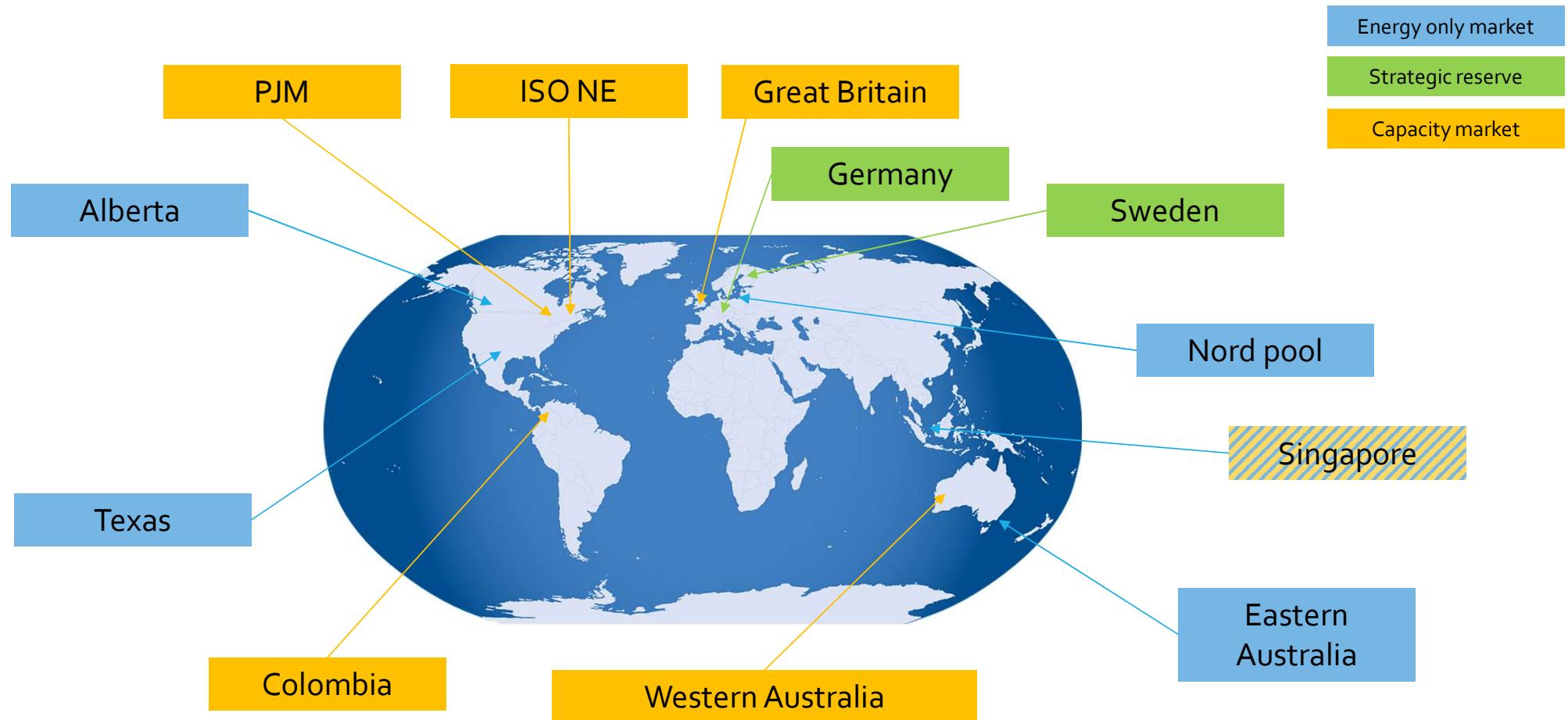
Our market design will need to evolve – the real question is the extent of change required



Decision factors

	Increased volatility	Moderate	-	Significant
	Lumpy decisions	Manageable	Significant	Significant
	Transition risk	Low	Moderate	High
	Cost to adopt	Lowest	Moderate	Highest

International experience provides useful lessons for NZ



We think MDAG should seek to better understand the key challenges, scope possible solutions and develop early warning triggers

1. Better understand likely challenges

Price volatility

- Better understand how NZ price volatility will likely evolve, both timing and magnitude

Lumpy decisions

- Undertake risk analysis to analyse lumpiness issues
- Identify early warning signs to monitor

2. Scope possible solutions/plans

Energy-only design enhancements

- Scope options, info, contracting, back-stops etc

Strategic reserve

- Scope design elements and lead-times
- Assess feasibility
- Develop contingency pathway and triggers

Capacity market

- Scope design elements and lead-times
- Is there a good international precedent?
- Develop contingency pathway and triggers



About Concept

For more than 20 years, we have been providing expert advice on policy, regulation, strategy and economics. We are energy sector specialists with growing expertise in carbon, telecommunications and water.

More information can be found at www.concept.co.nz

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