New Zealand wholesale electricity market: Fit for the future?

By David Hunt and Tony Baldwin
for LEANZ

8 May 2024

Speaking notes on previous slide:

Preliminary matters

- **Private capacity:** Presenting in a personal capacity – not representing any group, firm, agency or any other person
- **No media:** Not intending to say anything particularly newsworthy, but presenting to colleagues, not reporters
- **Style of seminar:**
  - **Relatively informal –** We will speak to key points and encourage questions.
  - **Mainly oral presentation** –Visual aids used as a backdrop where helpful to illustrate, particularly in the first segment. Kept text on slides to a minimum.
- **About the project:**
  - Duration – 2 ½ years (June 2021 to Feb 24)
  - For -- Electricity Authority
  - Pay tribute to **Steve Batstone** and **John Culy** – essential members of our secretariat
- **Additional slides:** A few slides have been added following the presentation on 8 May 2024. Those slides are marked "additional".
- **Supplemental or speaking notes**: In this document's PowerPoint format, we included various notes in the 'Notes' segment of the slide, which we spoke to in the presentation. However, the 'Notes' pages are not captured when the document is saved in PDF. So for the PDF version, we have inserted those notes either on the relevant slide or on a subsequent slide in a box shaded light blue (just as this slide supplements the previous slide).

About us

About David Hunt:
David has worked on a wide range of energy and infrastructure issues for public and private sector clients in New Zealand, Australia and Singapore. He combines rigorous economic analysis with strong practical knowledge and understanding.. David was previously Chief Executive of Contact Energy and before that worked for a large Australian energy sector participant. Prior to moving into business, David held senior roles at the NZ Treasury, including Economic Adviser to the Minister of Finance. David is deputy chair of the Accident Compensation Corporation, a director of Christchurch City Holdings Ltd and an associate at Concept Consulting Group

About Tony Baldwin:
Tony provides advisory and project management services to private and public sector organisations on commercial transactions, strategy, and regulatory policy. He has chaired or project managed a range of major projects, including recent reform proposals by the Electricity Authority's Market Development Advisory Group; the public float of Genesis Energy (and subsequent M&A transactions); 'unbundling' access to Telecom's local loop network; the deregulation and corporatisation of nine statutory producer boards; and restructuring the electricity industry in the 1990s. Before consulting, Tony was a member of the Policy Advisory Group in the Department of the Prime Minister and Cabinet, and a lawyer at Chapman Tripp in Wellington practicing in corporate and securities law. His details are at www.tonybaldwin.c

Role in presenting:
Consistent with the capacity in which they were invited to address LEANZ, David and Tony are making this presentation as independent consultants, not as representatives of the Market Development Advisory Group, the Electricity Authority, or any other firm, agency, group or person

Core questions

Looking forward to 2030 and 2050 --

- Likely physical changes in our electricity system?
- Impacts on the wholesale market?
- Need a wholesale electricity market ?
- If so, what changes are required?

Approach

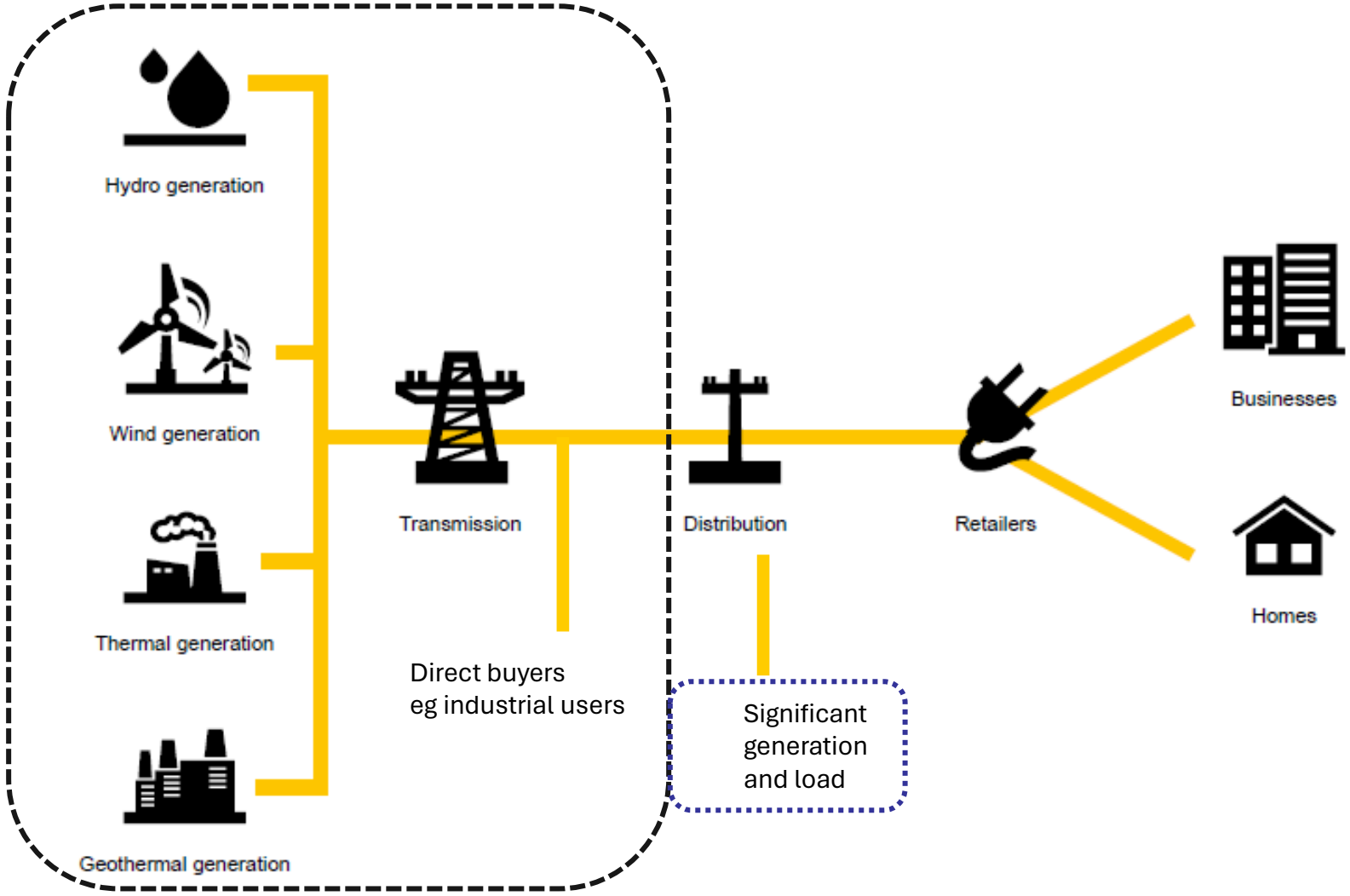
Speaking notes on previous slide:

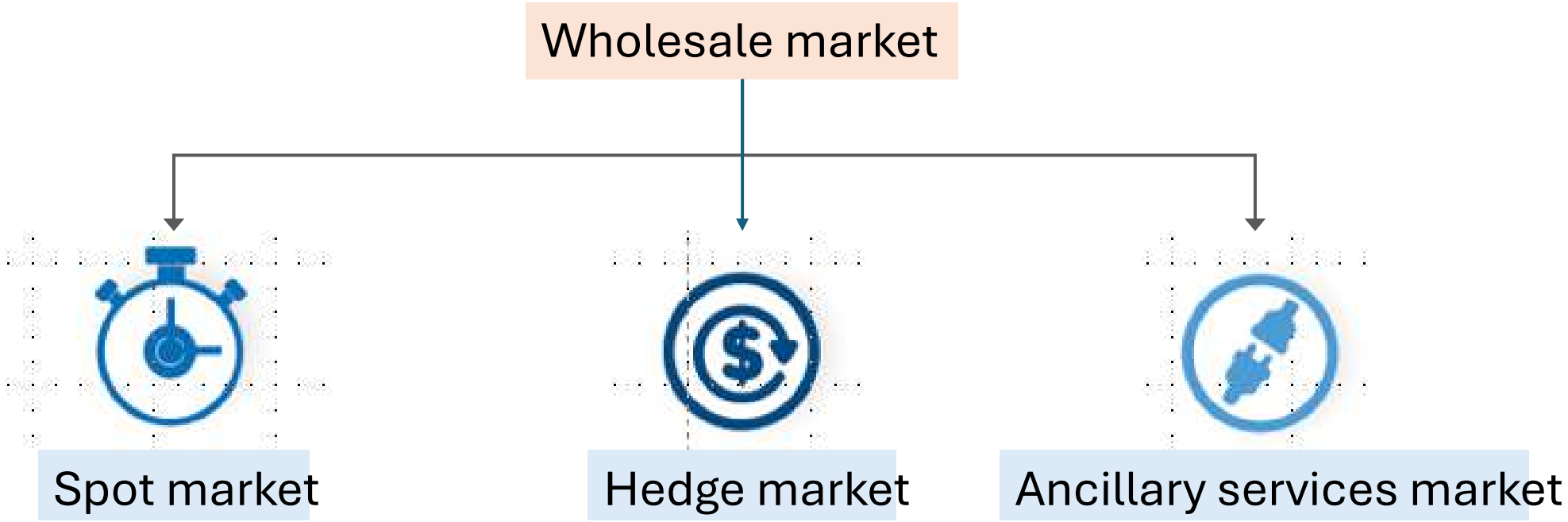
- Open-minded, rigorous, evidence-based
- Empirical – used simulation tool to test assumptions and scenarios
- Close engagement with stakeholders
- Extensive dialogue with regulators and experts in many countries – USA, Aus, USA, Canada, Norway, EU

Recap on current WEM

(quick high level outline)

Wholesale market

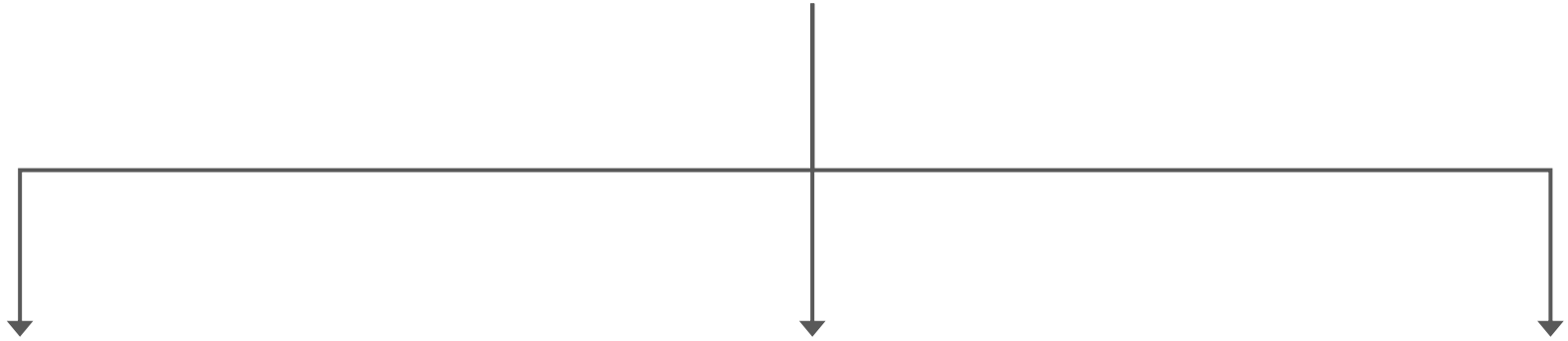




Electricity Industry Participation Code 2010

Electricity Authority

- Market Administrator



NZX

- Clearing Manager
- Pricing Manager
- Reconciliation Manager
- Wholesale Information and Trading Systems (WITIS) Manager

Jade Software

- Registry Manager

Transpower

- System Operator

Supplemental notes on previous slide:

Clearing manager ensures that industry participants pay or are paid the correct amount for the electricity they generate, or consume, and for market-related costs. (NZX)

Pricing Manager calculates the prices for each trading period, following trading day and publishes these before midday as “interim prices”.

Reconciliation manager ensures that industry participants are allocated their correct share of electricity generation or consumption.(NZX)

Registry manager oversees the Electricity registry - a national database of every point of connection on local and embedded networks to which a consumer or embedded generator is connected. (Jade Software Corporation)

Wholesale information system (WITIS) manager runs the wholesale information and trading system (WITS) used for the 24/7 buying and selling of spot market electricity. (NZX)

System operator co-ordinates electricity supply and demand in real time, in a manner that avoids fluctuations in frequency and disruption of supply. (TP). The system operator determines the optimal combination of electricity generators and reserve providers for each half-hour trading period. The system operator then instructs generators on when and how much electricity to generate, and manages any events that cause the supply-demand balance to be disrupted.

Spot market


‘Auction’ every half hour
0.8
0.6
0.4
0.2
0
GWh
Daily demand
3 May
06:00
(TP13)
12:00
(TP25)
18:00
(TP37)
4 May
Offers ‘stacked’ lowest to highest offer price
Each owner decides how much to offer and value
Offer price includes opportunity cost
genesis
Meridian
Mercury
contact
nova
+ others
Demand-side response
GEOTHERMAL ENERGY
HYDRO POWER

Supplemental notes on previous slide:

Each party decides how best to use their fuel – and how much to offer, when, where, and in what price bands –

Can offer different tranches of electricity from the same generation asset at different prices.

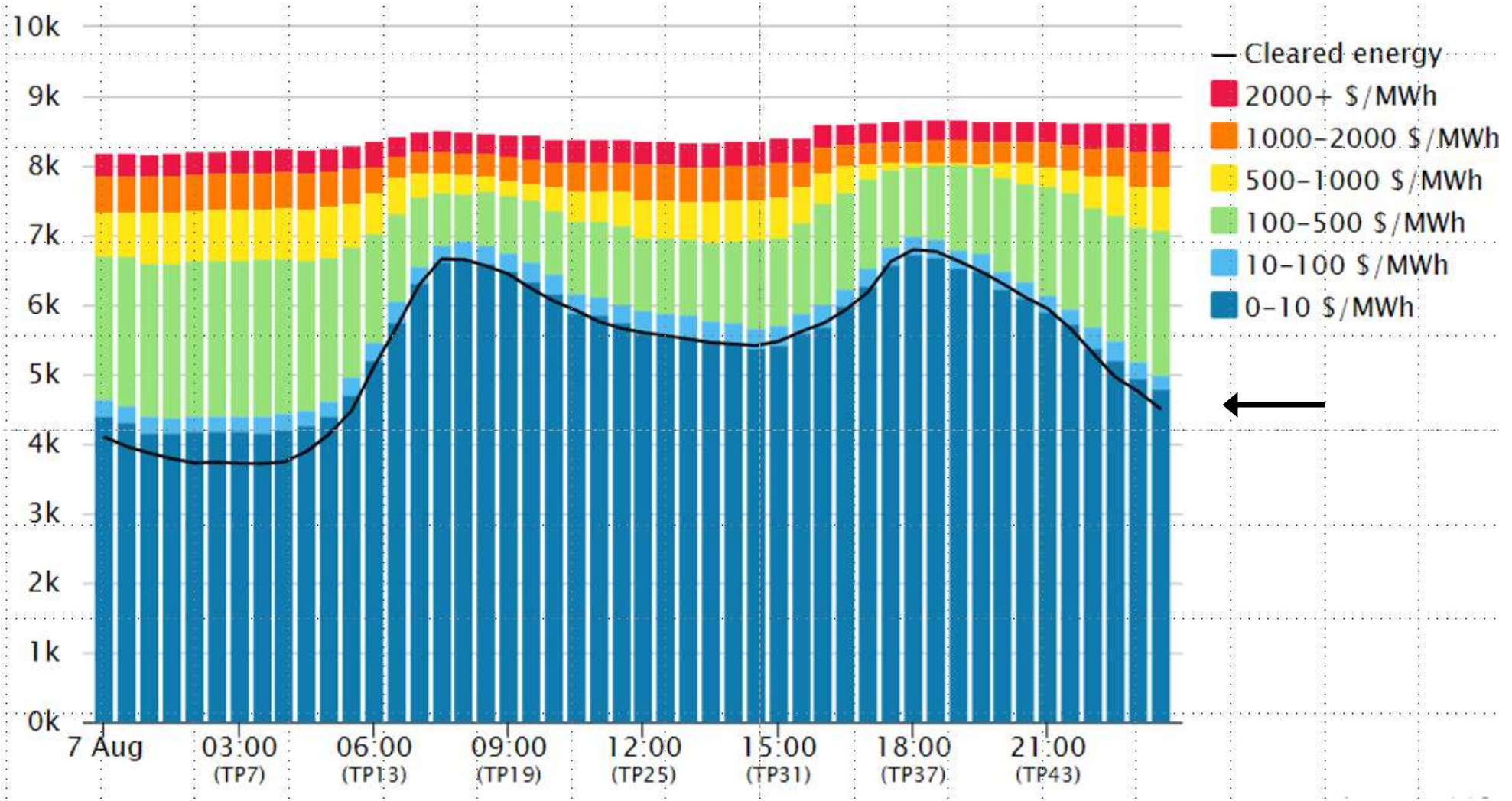
For fuel that can be stored, opportunity cost is key – value of electricity now compared to sometime in the future

Fair to say our spot market is world class

A little more detail:

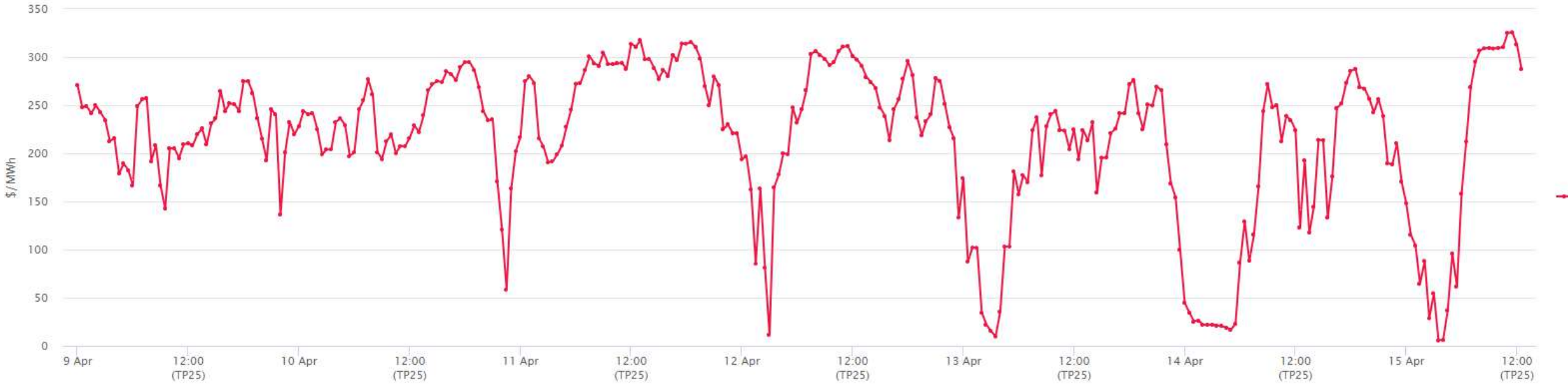
- Compulsory pool – all generation connected to the grid or above 10MW must be offered into the spot market
- Auction -- every 30 minutes (48 trading periods in a day).
- 248 notes – 52 injection, 196 exit points
- Generators can offer different tranches of electricity from the same generation asset (such as an energy source at a location) at different prices.
- Prices vary depending on supply and demand, and location on the national grid.
- Offers are first submitted 36 hours before a trading period.
- System Operator then publishes the lowest-cost combination of resources to satisfy demand and ensure a reliable supply in the trading period (factoring in capacity constraints).
- Offers and prices are refined leading up to “gate closure” when all offers have to be finalised.
- All offers are then ranked from lowest to highest cost to form “offer stack”
- Generation is then dispatched by the system operator to match real-time demand. The lowest offers were accepted and dispatched first, continuing up the list of offers, accepting and dispatching, until supply matched demand.
- The highest accepted offer is the “clearing price” (paid for all dispatched generation)
- Prices also vary by location, because of the costs of getting electricity from generators to consumers. Generally, prices are higher in locations that are further away from the main power stations (reflecting physical losses of electricity on the lines carrying the power to the grid exit point
- The system operator uses those bids, offers, a forecast of expected demand and a model of the available transmission system to produce forecast market prices for every trading period starting from one week ahead of 'real time'. These forecast prices are updated regularly to reflect changes in offer price and quantity, refinements in the demand forecast and changes in the grid configuration

‘Clearing price’ is the spot market



Spot prices are volatile

Example – 2nd week of April:
Spot price range is $326 to $6



Nodal prices (calculated for each 248 nodes)

Forward markets

Tool kit includes:

- Forward contracts:
  - Exchange traded hedges
  - Over-the-counter hedges
- New investment
- Retail 'book' (adjust level)

Current menu of hedging products:

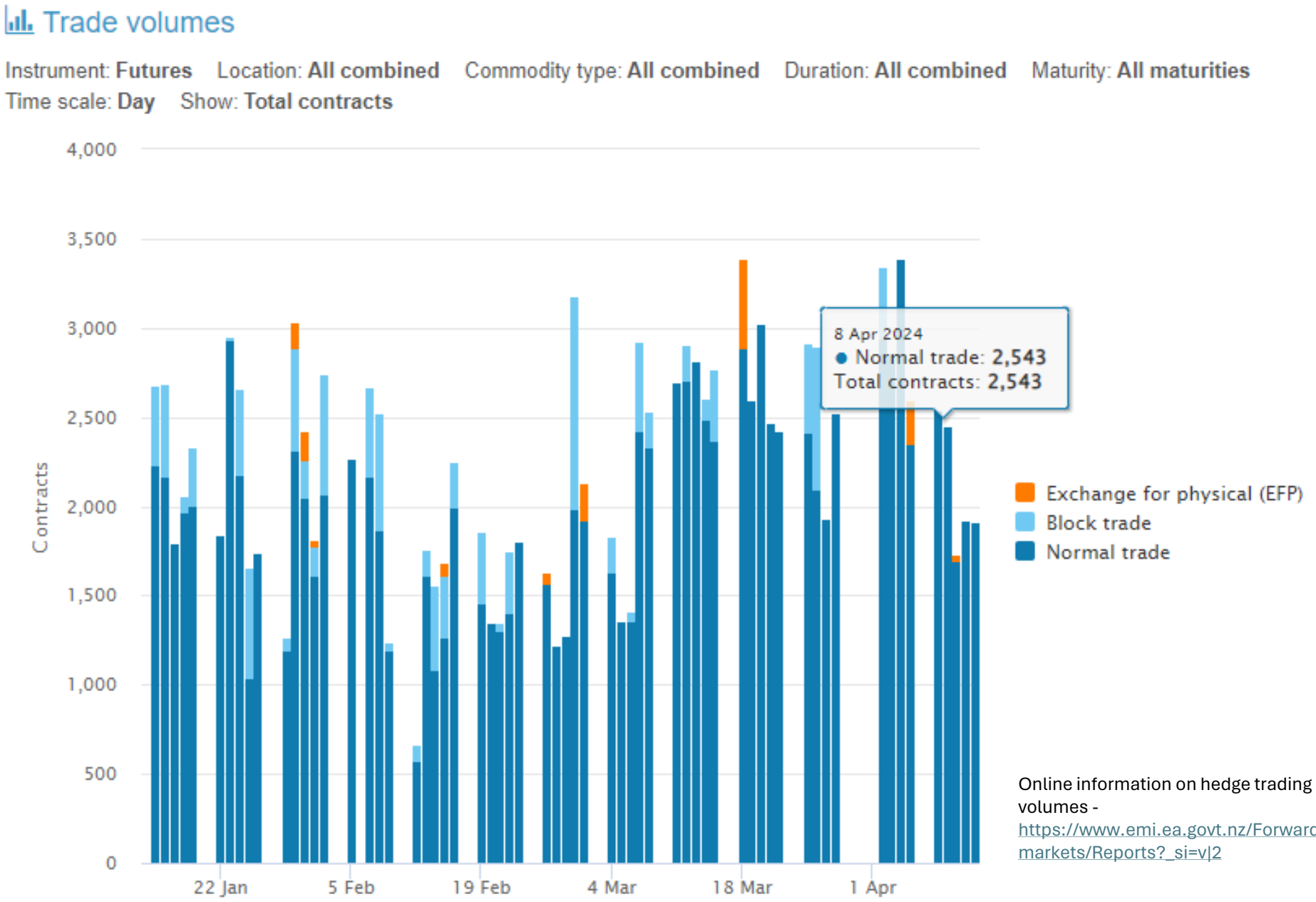
- Contracts for Differences (CfDs)
- ASX baseload futures
- ASX peak futures
- OTC "Super peak" contracts
- ASX options
- Swaptions
- Financial Transmission Rights

Speaking notes:

Our contracts market has **evolved markedly** over the last 20 years. Viewed by some international experts as one of the **most advanced** in the world. But the work is by no means done.

Crucially, hangs on:

- Clarity of incentives – each party accepting responsibility for covering its risks, and
- Availability of effective hedging tools



Online information on hedge trading volumes - https://www.emi.ea.govt.nz/Forward%20markets/Reports?_si=v|2

Forward price curve

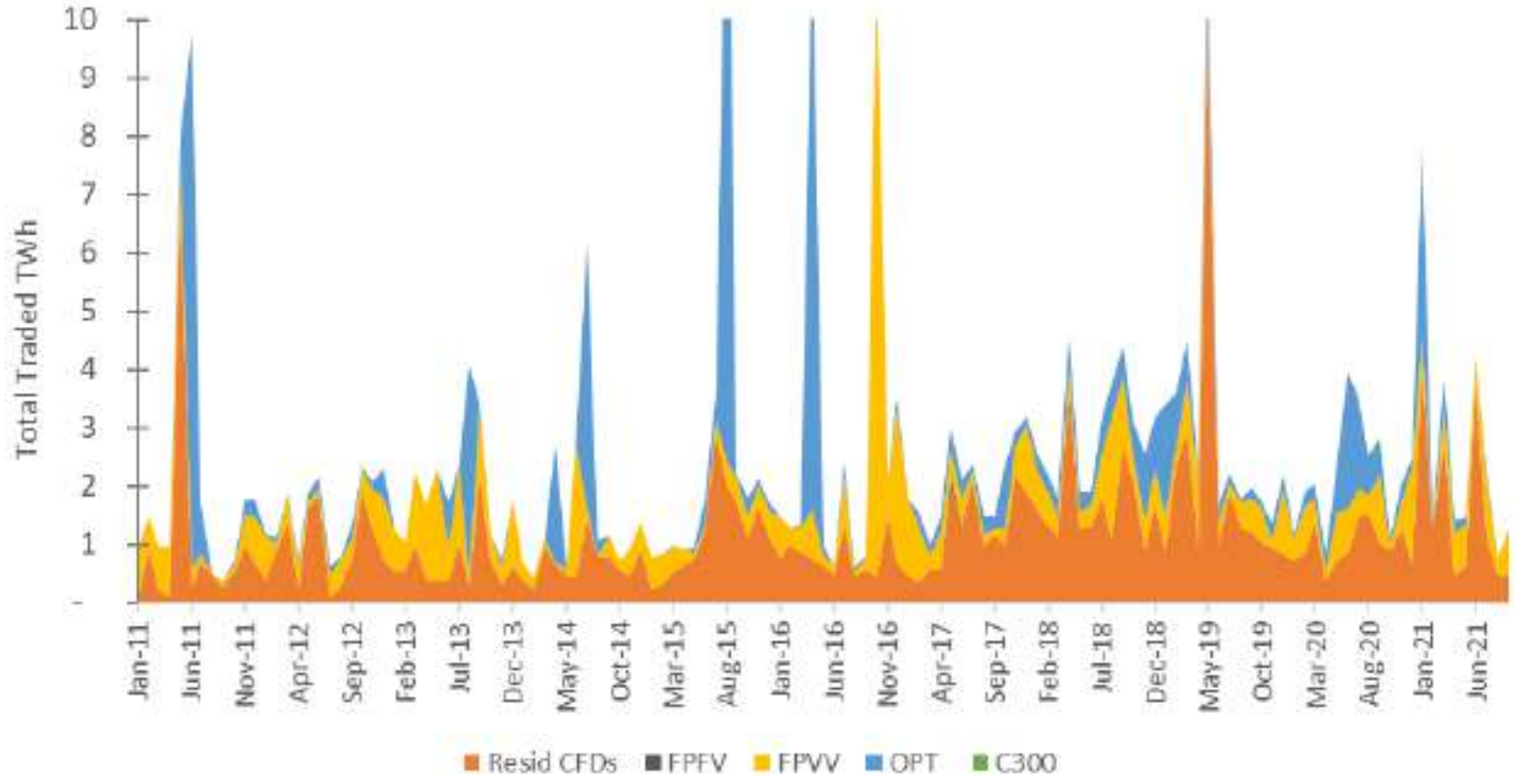
From www.emi.ea.govt
See - https://www.emi.ea.govt.nz/Forward%20markets/Reports?_si=v|2

Total market traded hedge market volumes for each month since 2011

(without gentailer ASX trades in baseload futures, presuming that the vast majority are market-making related)

Source: Batstone (2021)

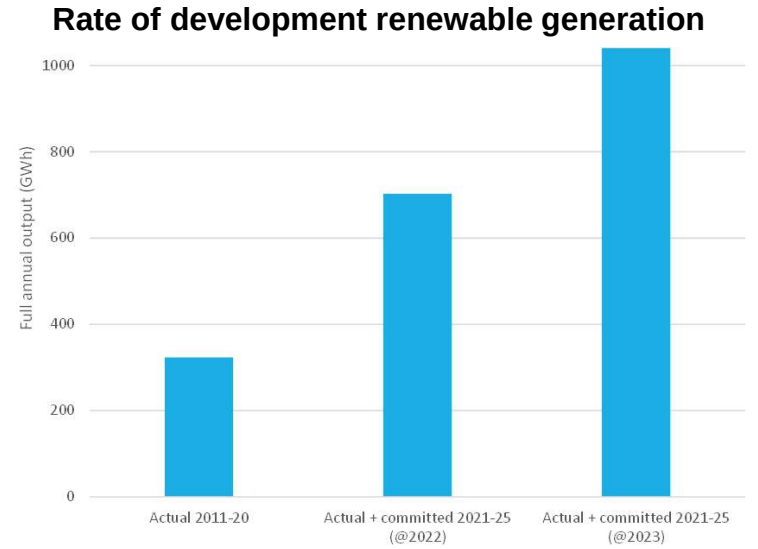
Speaking note:
Significant maturing and increasing sophistication in relation to the contracts markets among market participants in the last 10 years



New investment market

Forward prices sending strong signal to hedge and invest….

- In equilibrium, prices should settle toward cost of new supply
- Elevated signal while expansion lags -> stimulates investment



MDAG (2022), *Issues Paper;* Concept Consulting (2023), *Generation Investment Survey*

Additional slide

Supplemental notes on previous slide:

Until 2018, contract prices tracked relatively closely to the estimated cost of new baseload supply (albeit with fluctuations at times).

Contracts prices have been elevated since 2019. Contributing factors include:

- Increased uncertainty about costs of plant (especially wind and solar) in the next few years due to supply chains issues
- Increased uncertainty about construction costs due to tight markets for contractors and specialized equipment
- Increased uncertainty about the cost of firming intermittent renewable generation

New investment market *(cont'd)*

New connection enquiries dashboard

Additional slide

https://experience.arcgis.com/experience/97d4604079b545448280423f9269b9ea/page/Dashboard/

Ancillary services market

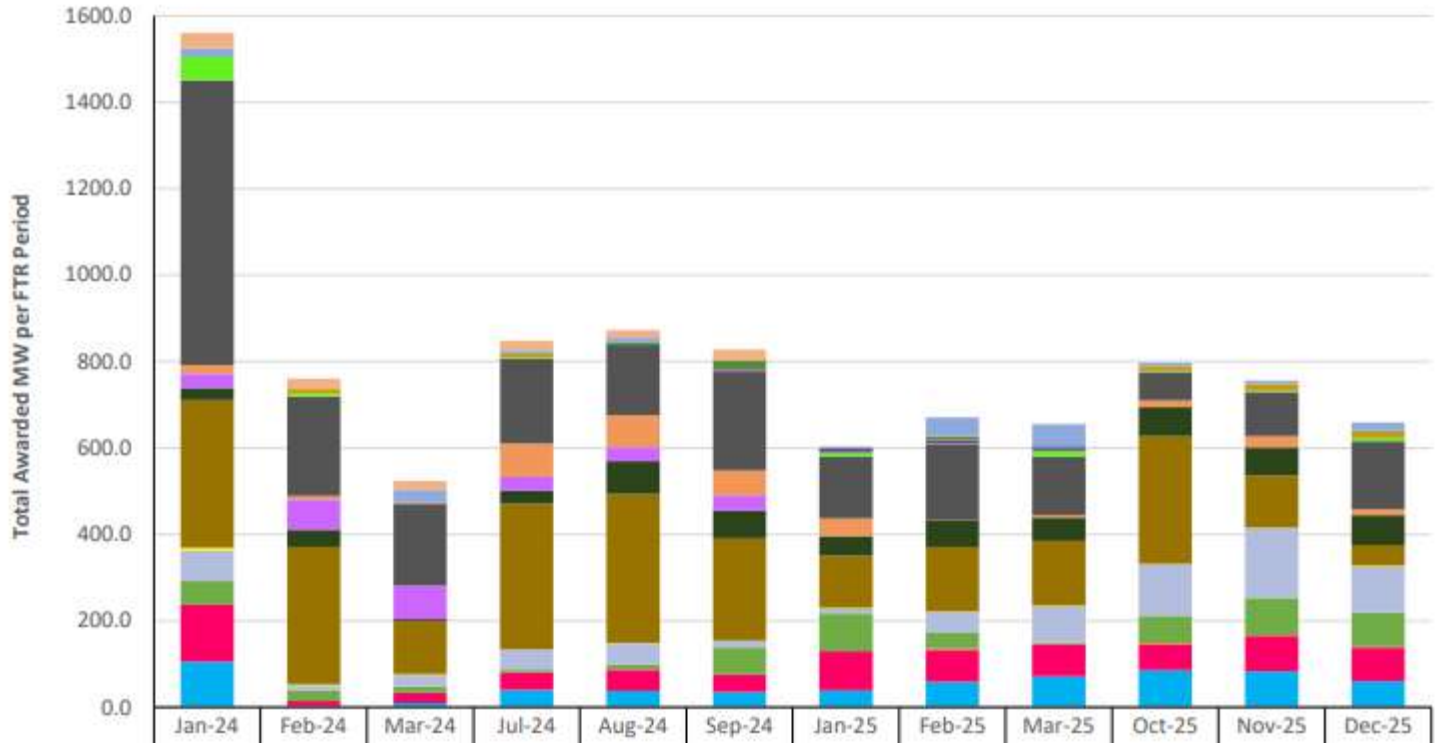
To ensure system stability:

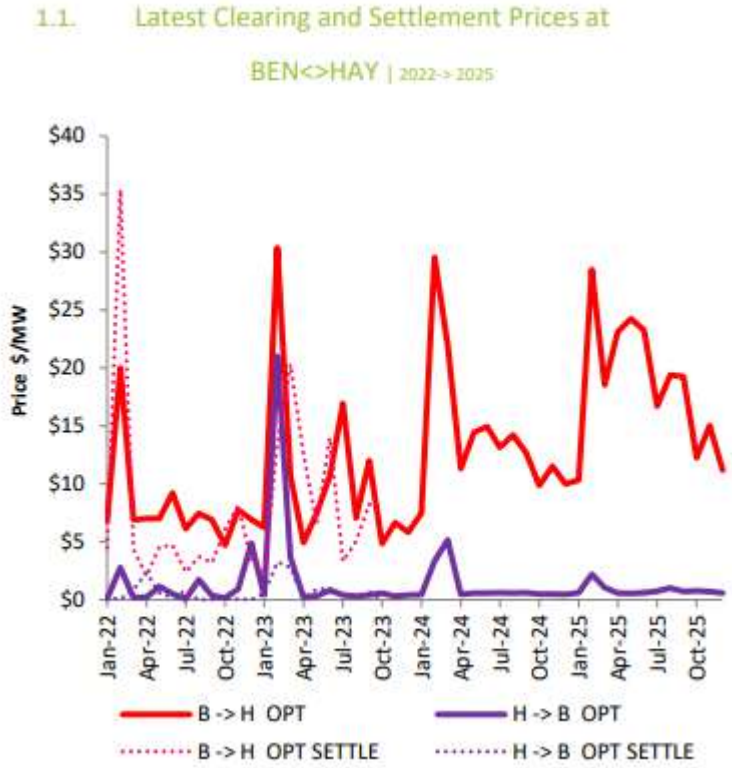
- Instantaneous reserve
- Frequency keeping
- Voltage support
- Black start
- Over voltage
- Extended reserve (AUFLS)

Reserves are co-optimised with active energy – lowest cost combination

Financial transmission rights (FTRs)

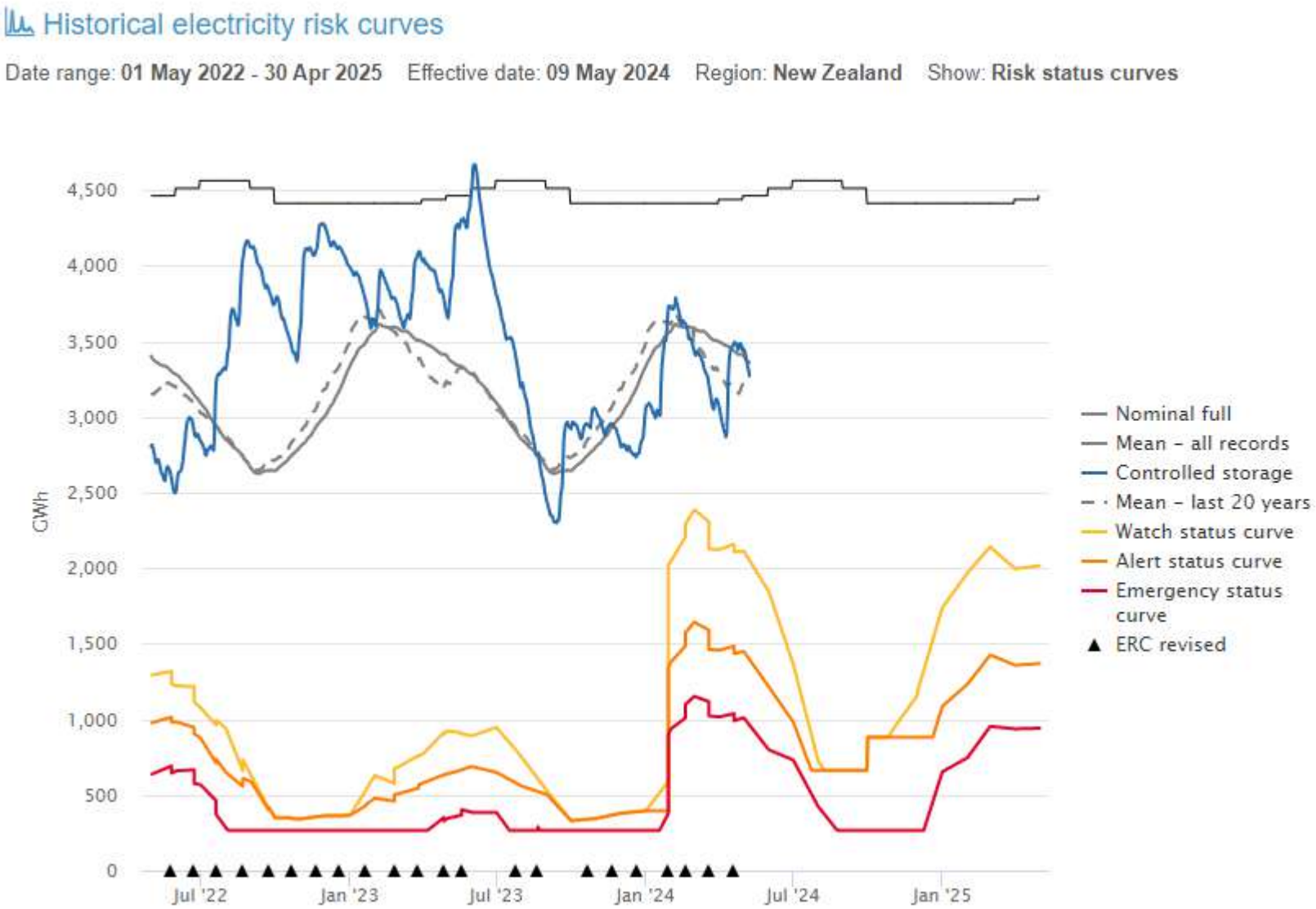
There were 112 FTR products available in DECEMBER 2023. These were a combination of the OTA, WKM, RDF, HAY, KIK, ISL, BEN & INV hubs (obligation and optional products). These FTR products were awarded as indicated below. A detailed summary of every awarded FTR can be found on the FTR register (www.ftr.co.nz/register).





Additional slide

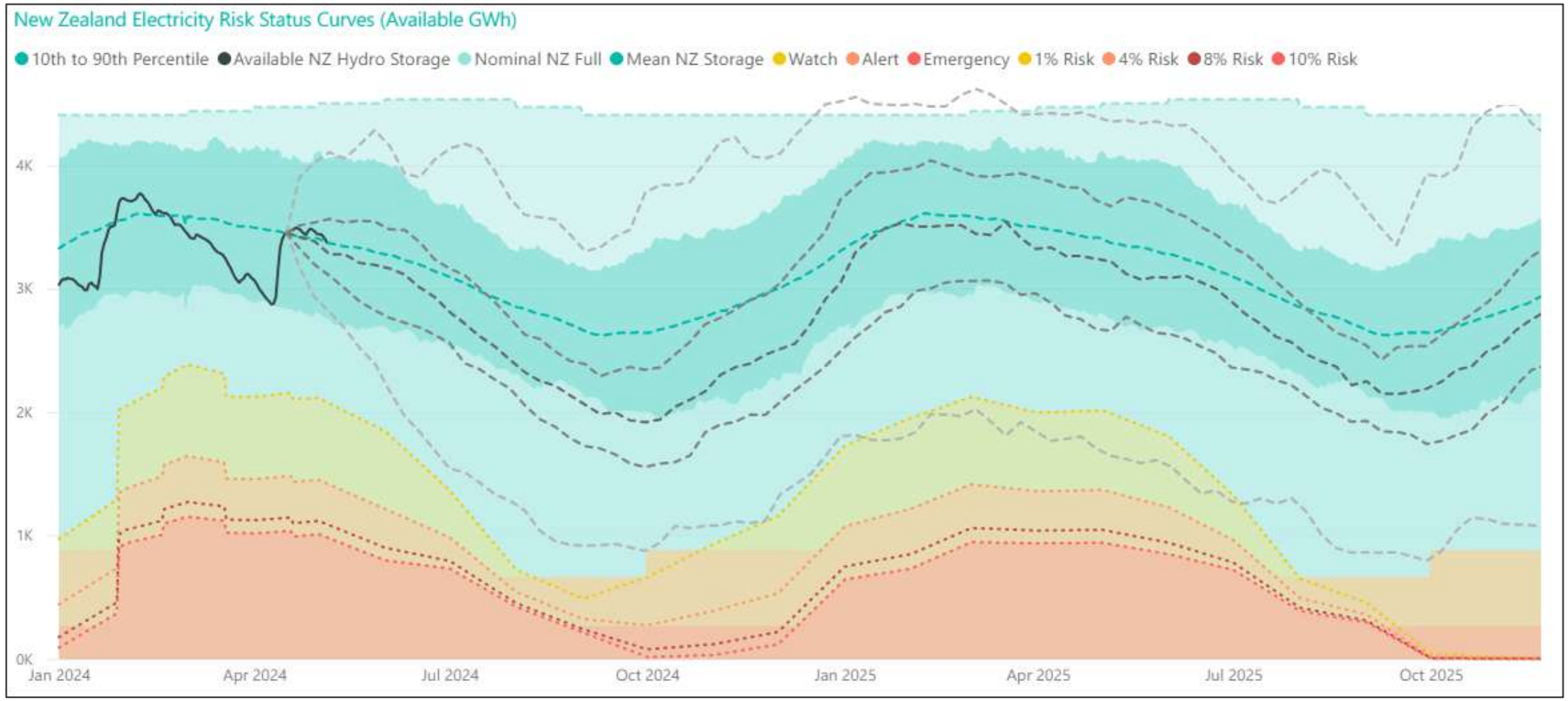
Monitoring security of supply



Additional slide

www.emi.ea.govt.nz/Environment/Reports?_si=v|2

Monitoring security of supply *(cont'd)*



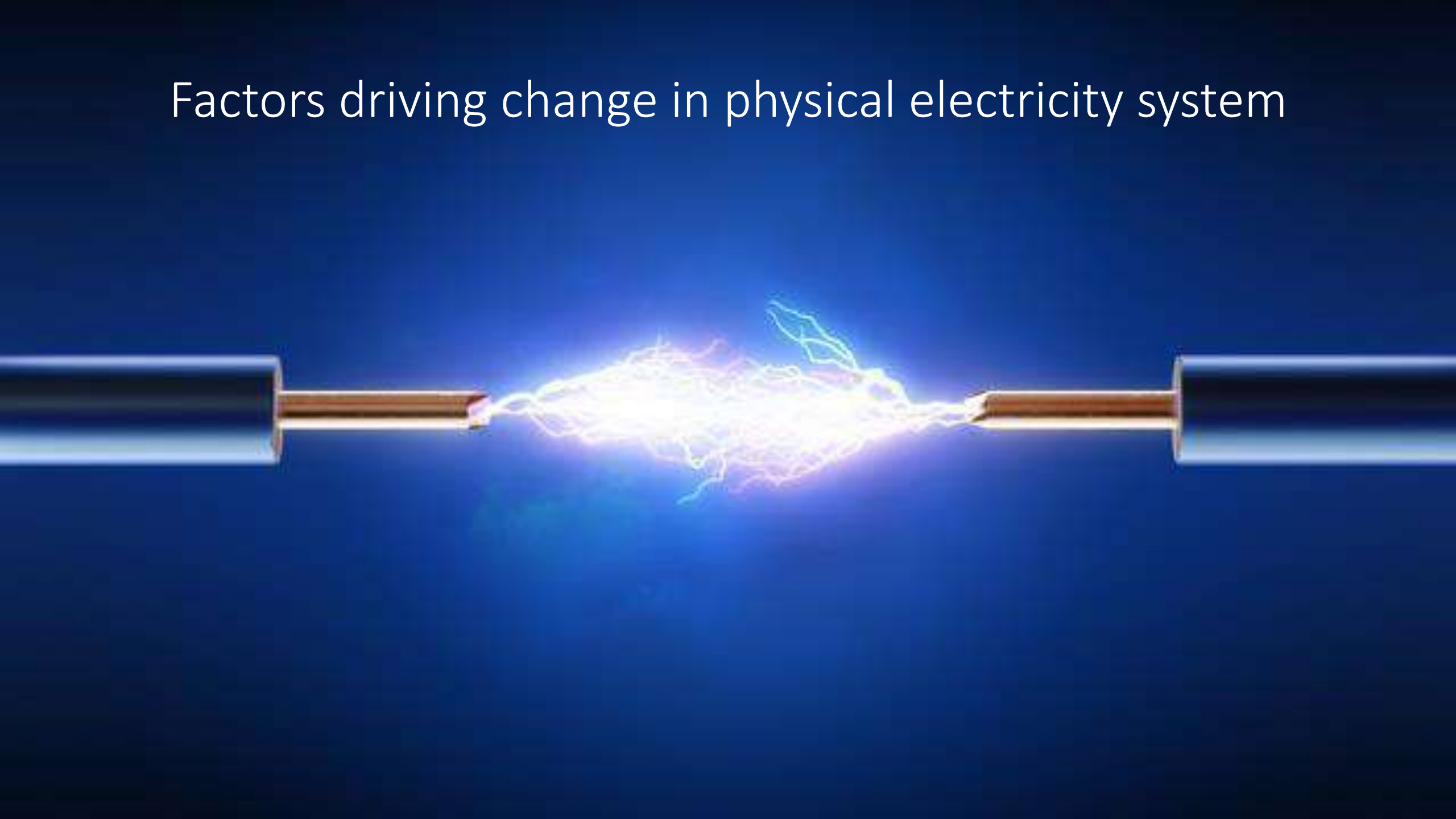
https://static.transpower.co.nz/public/bulk-upload/documents/MO%20Latest%20Update.pdf?VersionId=DY1Uzrg_GVSDqI47Juleh6tkfZ7FWTMc

System Operator's Weekly Report

https://www.transpower.co.nz/system-operator/notices-and-reporting/market-operations-weekly-report

More content in Weekly Reports
https://www.transpower.co.nz/system-operator/notices-and-reporting/market-operations-weekly-report

Factors driving change in physical electricity system

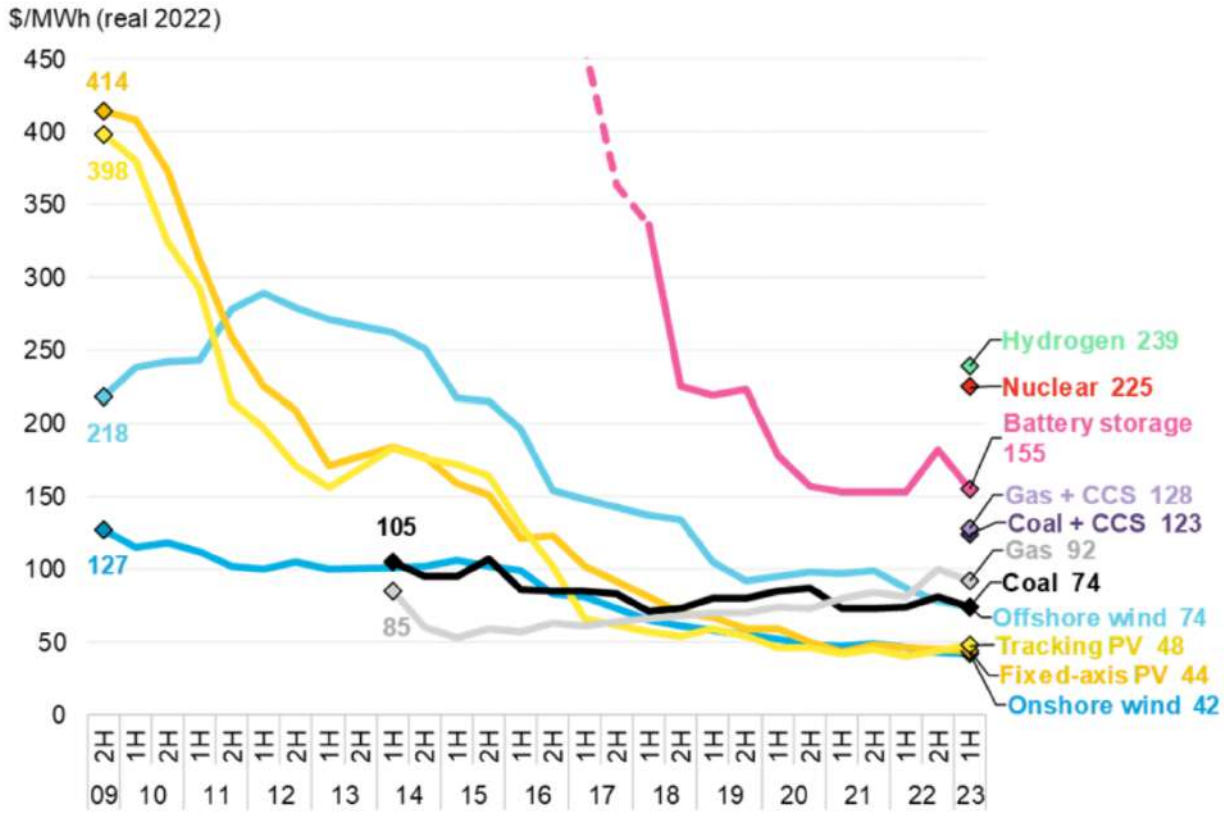


Cost of renewables has plunged…

…and cost of carbon is increasing

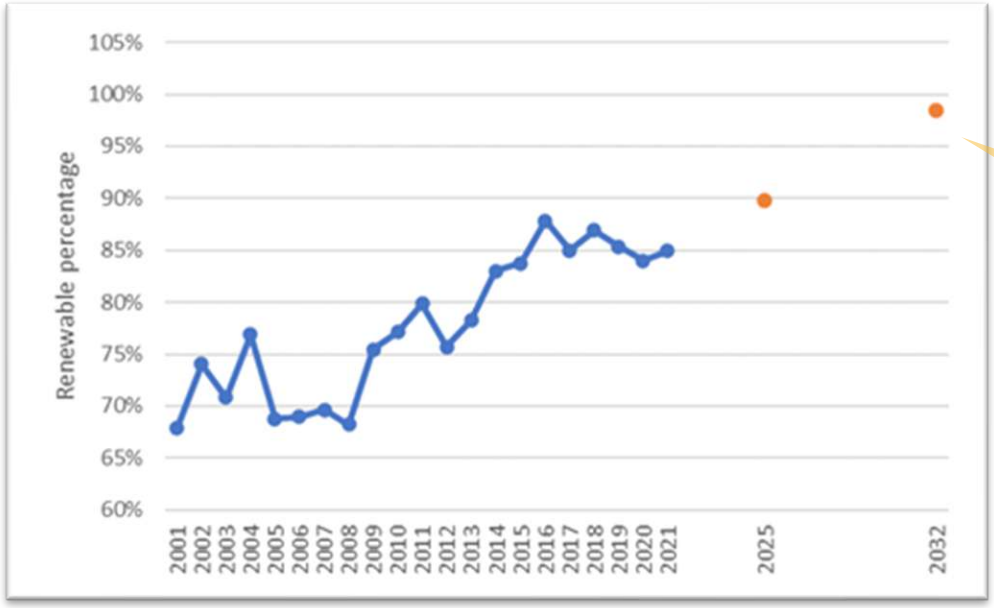
…making renewables more and more competitive

Global levelized cost of electricity benchmarks, 2009-23

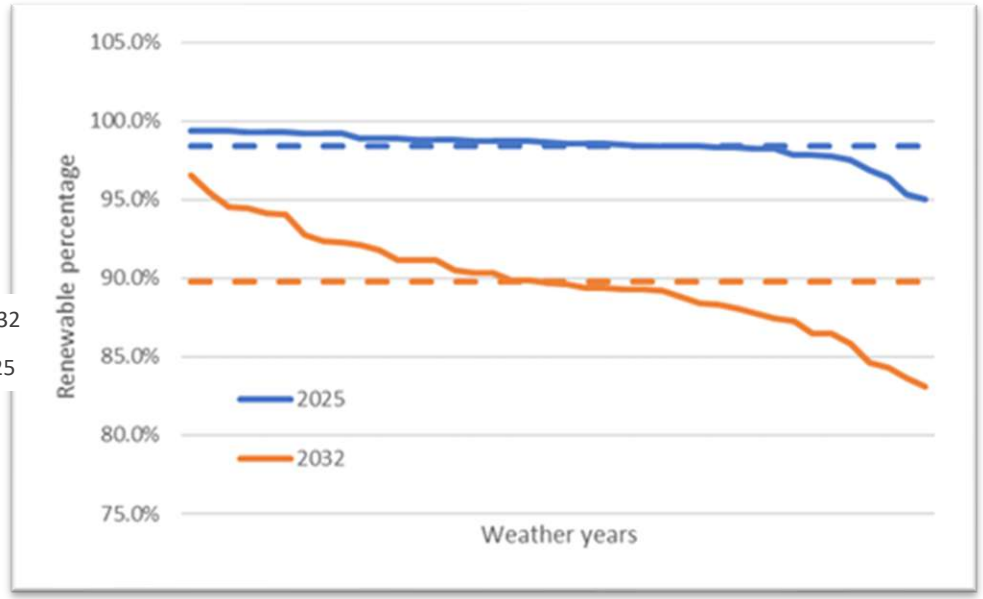


Source: BloombergNEF
https://about.bnef.com/blog/cost-of-clean-energy-technologies-drop-as-expensive-debt-offset-by-cooling-commodity-prices/

…thermals squeezed out



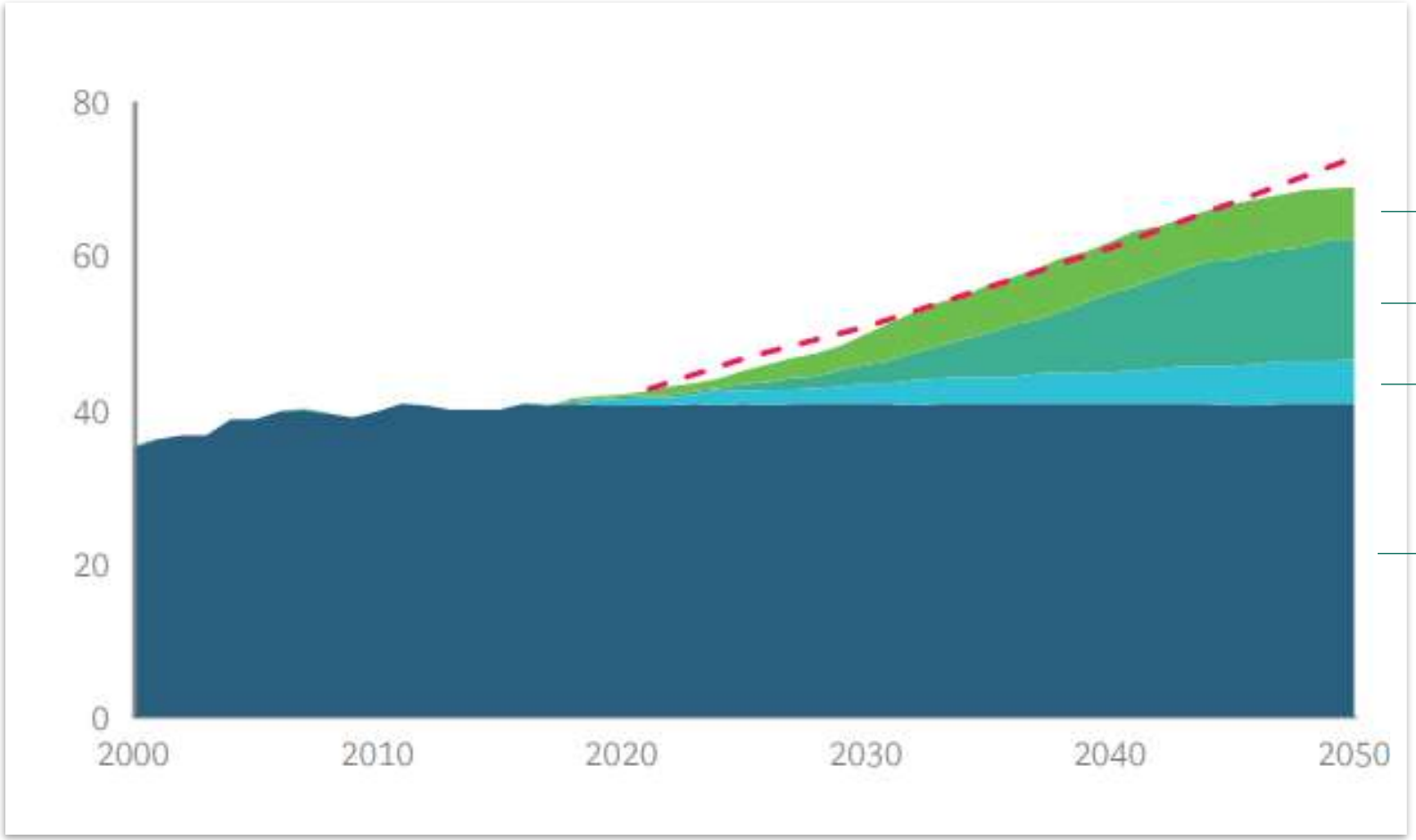
Renewables share ~98% by early 2030s



Thermal moves into back-up role for ‘peaking’ and dry-year firming

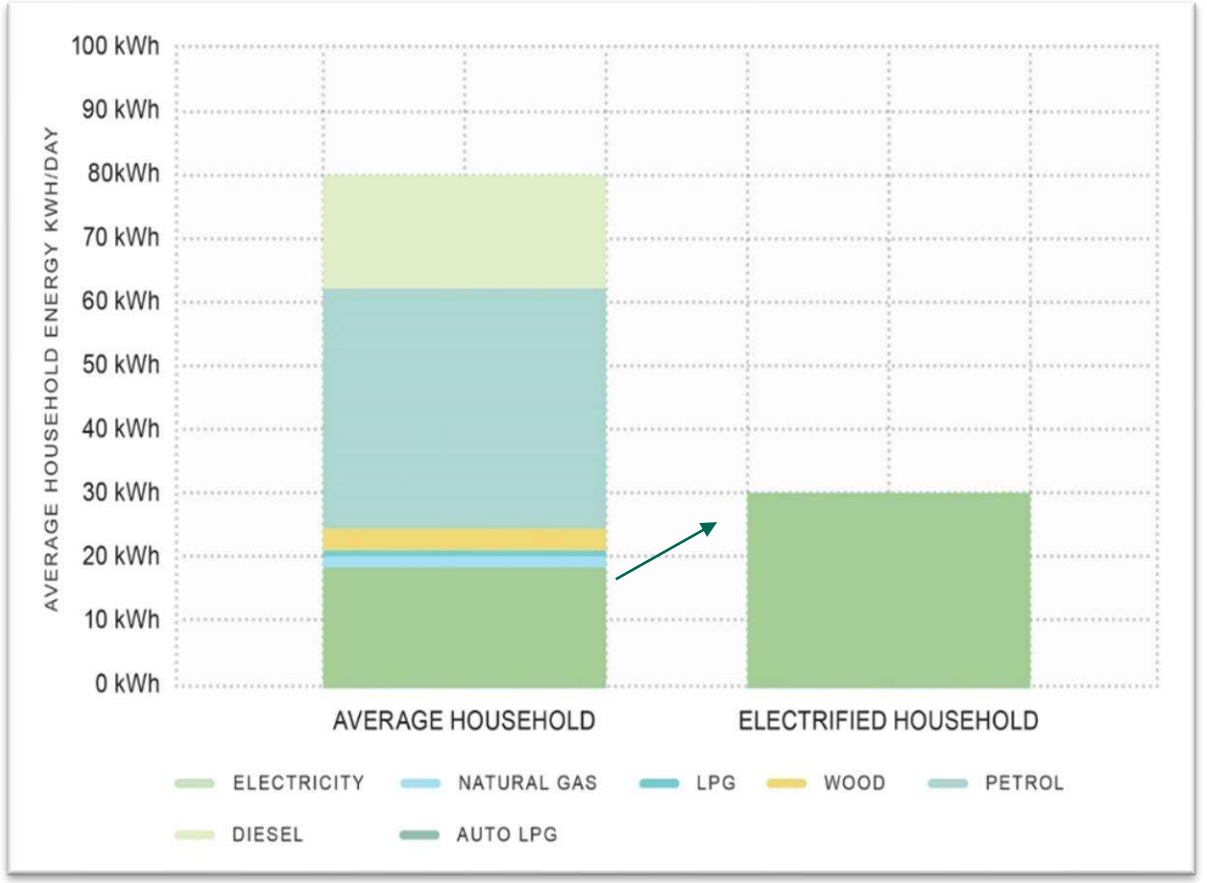
Concept – provisional analysis (2023)

Shift to electricity drives ~70% demand growth by 2050…



Transpower (2020) and BCG (2022), *The Future is Electric*

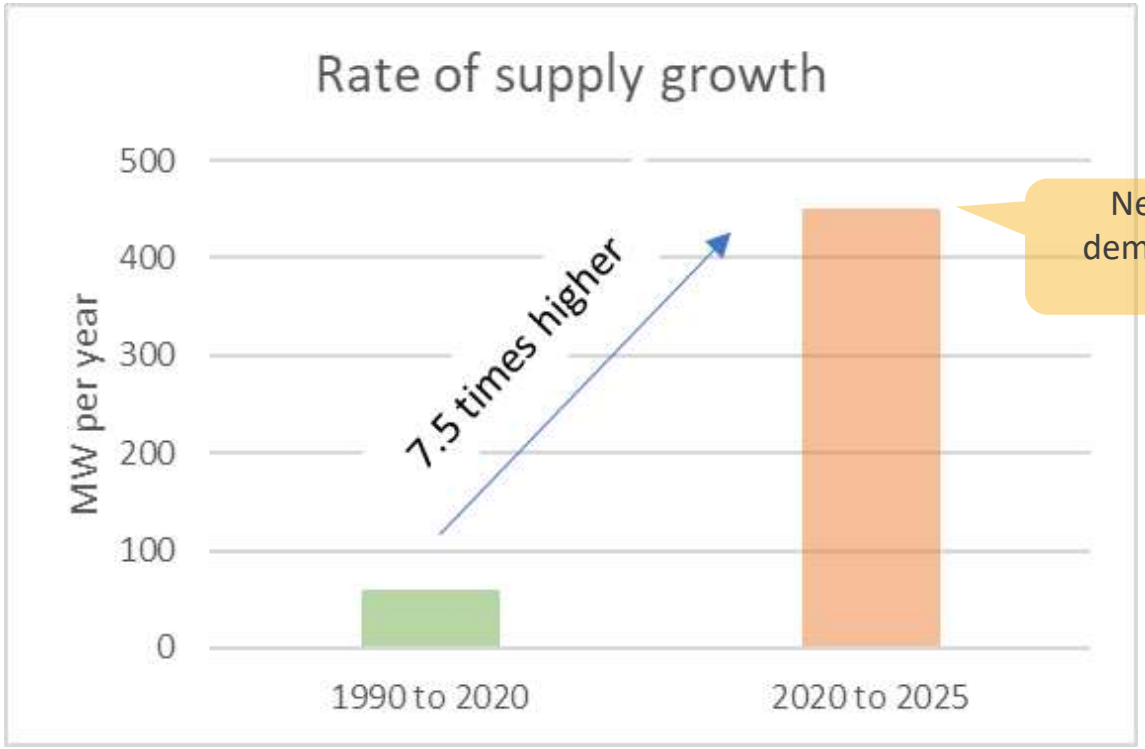
Households use less energy but much more electricity …



Productivity Commission (2022), *Rewiring Aotearoa*

Step change in investment…

- Huge mobilisation – capital, planning, equipment, works
- Estimated **$27-$37 billion** of new investment by 2050
- **2.5 times** the rate of renewable build achieved in the 30 years to 2020



Visualisation of MDAG observation

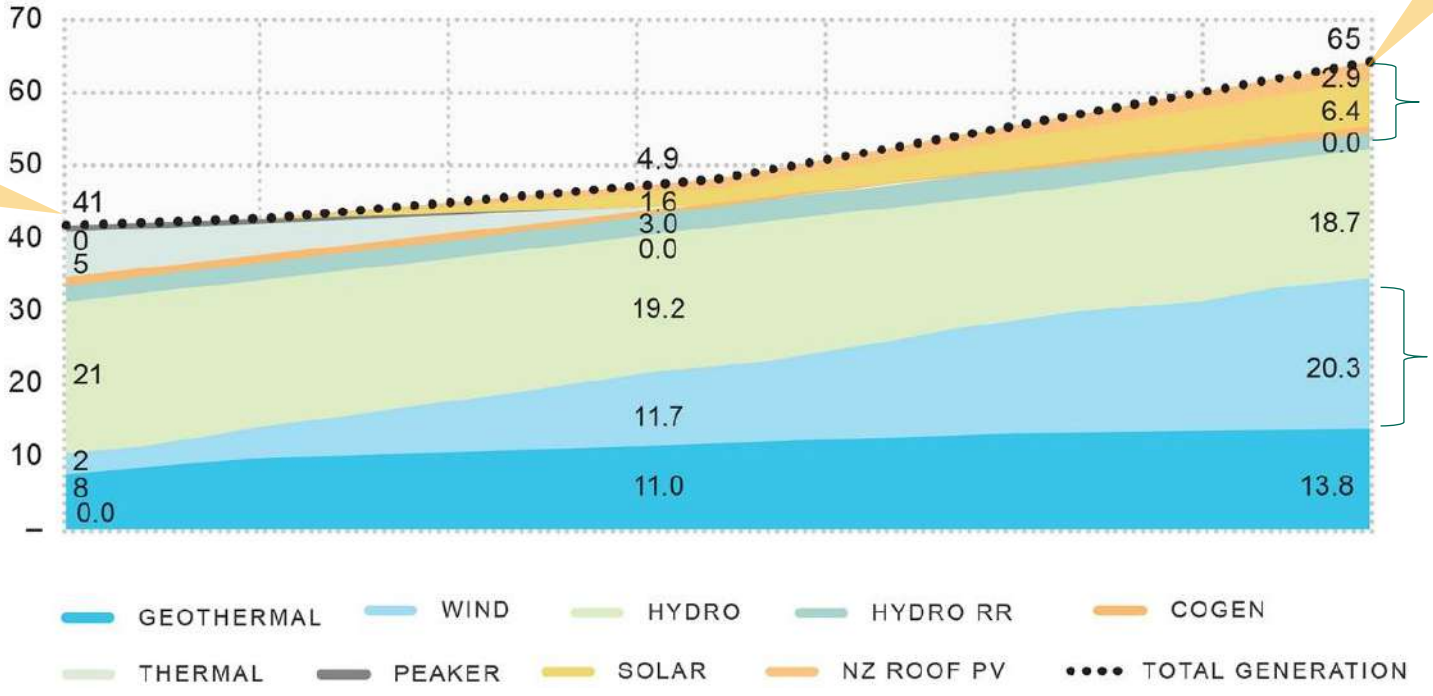
Dynamic efficiency is the big prize to be secured

New supply mainly solar and wind*

…entirely doable at a technical and technology level

Intermittent renewables reach **50**% of supply in 2050

Intermittent renewables reach **6%** of supply in 2020

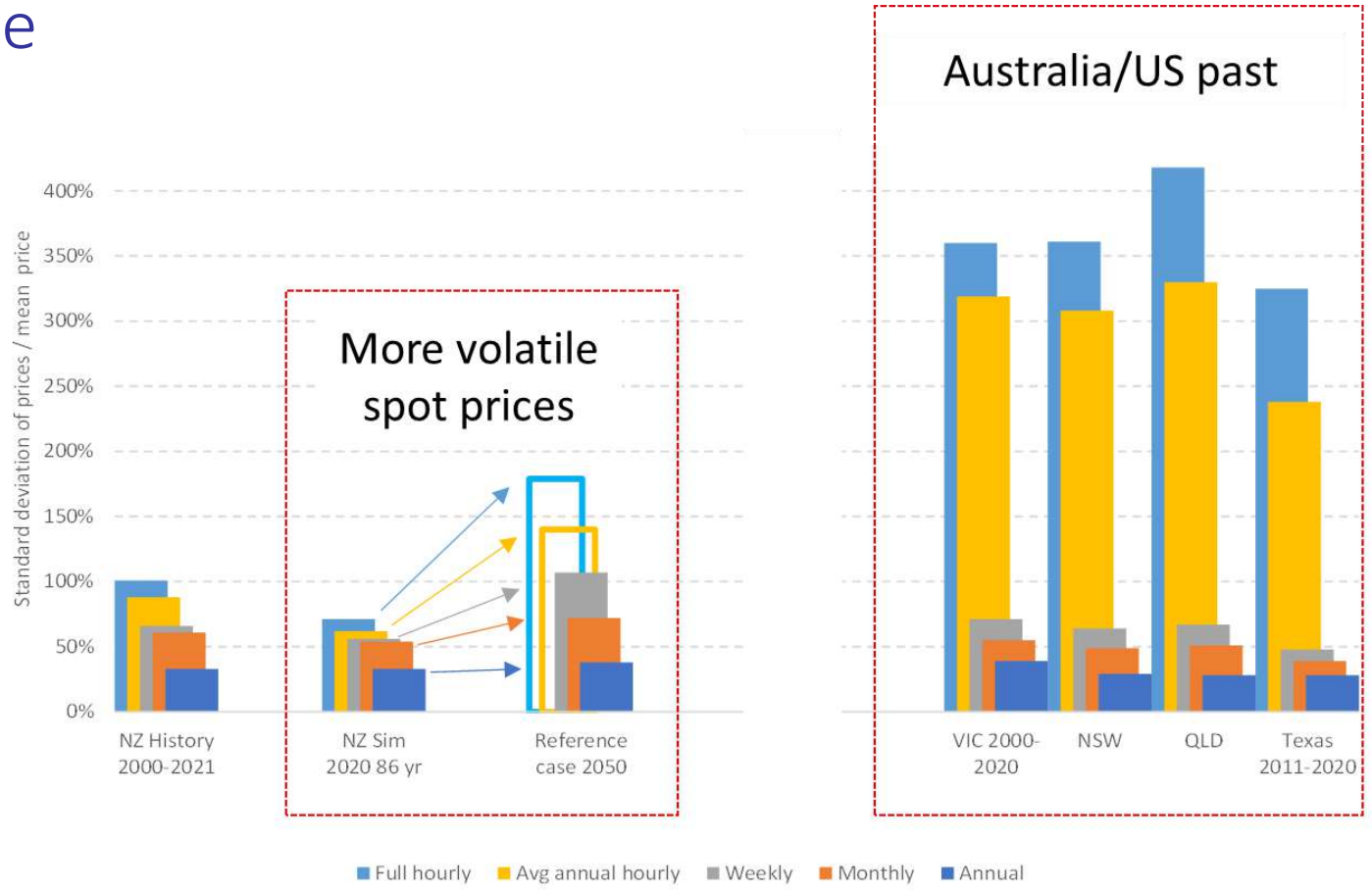


MDAG, projected energy demand (reference case)

* on current cost trends

More wind and solar will make spot prices more sensitive to changes in the weather –
-- so spot prices more volatile

- Volatility is not a “bad”
- Important for government not to intervene to alter accurate spot prices



Supplemental notes on previous slide:

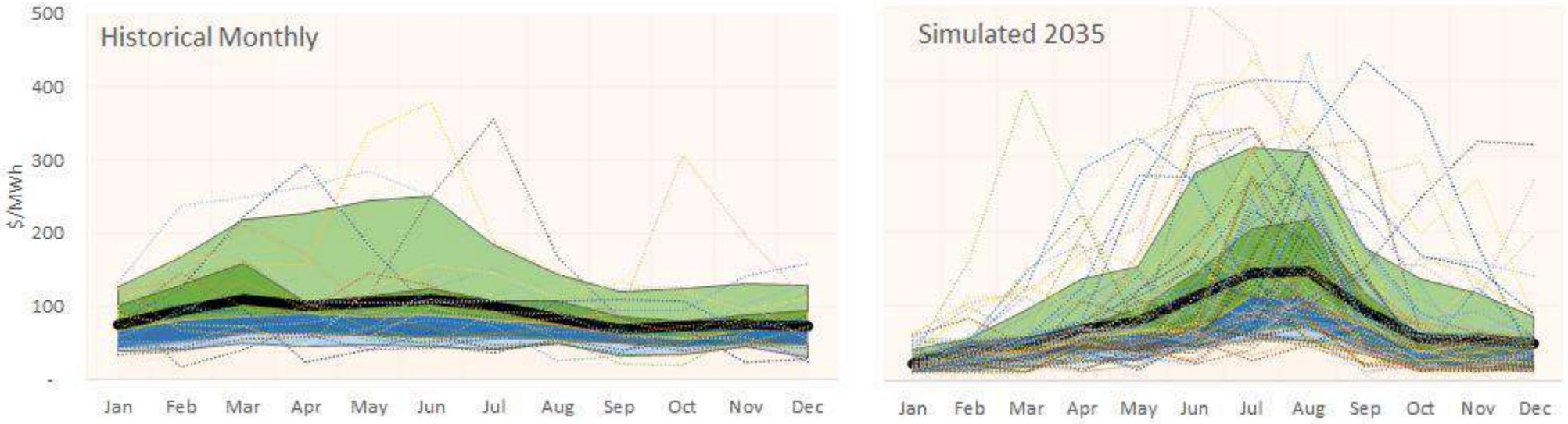
Volatility not a 'bad' –

- We should not try and mask the effect of weather on spot prices
- On the contrary, we want spot prices to signal real changes in the cost (value) of producing (or storing) another unit of electricity as physical conditions change.
- Important for government not to intervene to alter accurate spot prices
- need to make sure participants have access to the necessary tools to manage and mitigate increased spot price volatility

Political and public acceptance of increased spot price volatility is fundamental for wholesale market participants to properly manage their risks.

Volatility is caused by several factors – relatively inelastic demand; our long, stringy transmission network; highly changeable weather; large variations in hydro inflows; and step-changes in the cost of supply (across hydro, wind, solar, geothermal, gas, coal and diesel)

More seasonal variation in spot prices

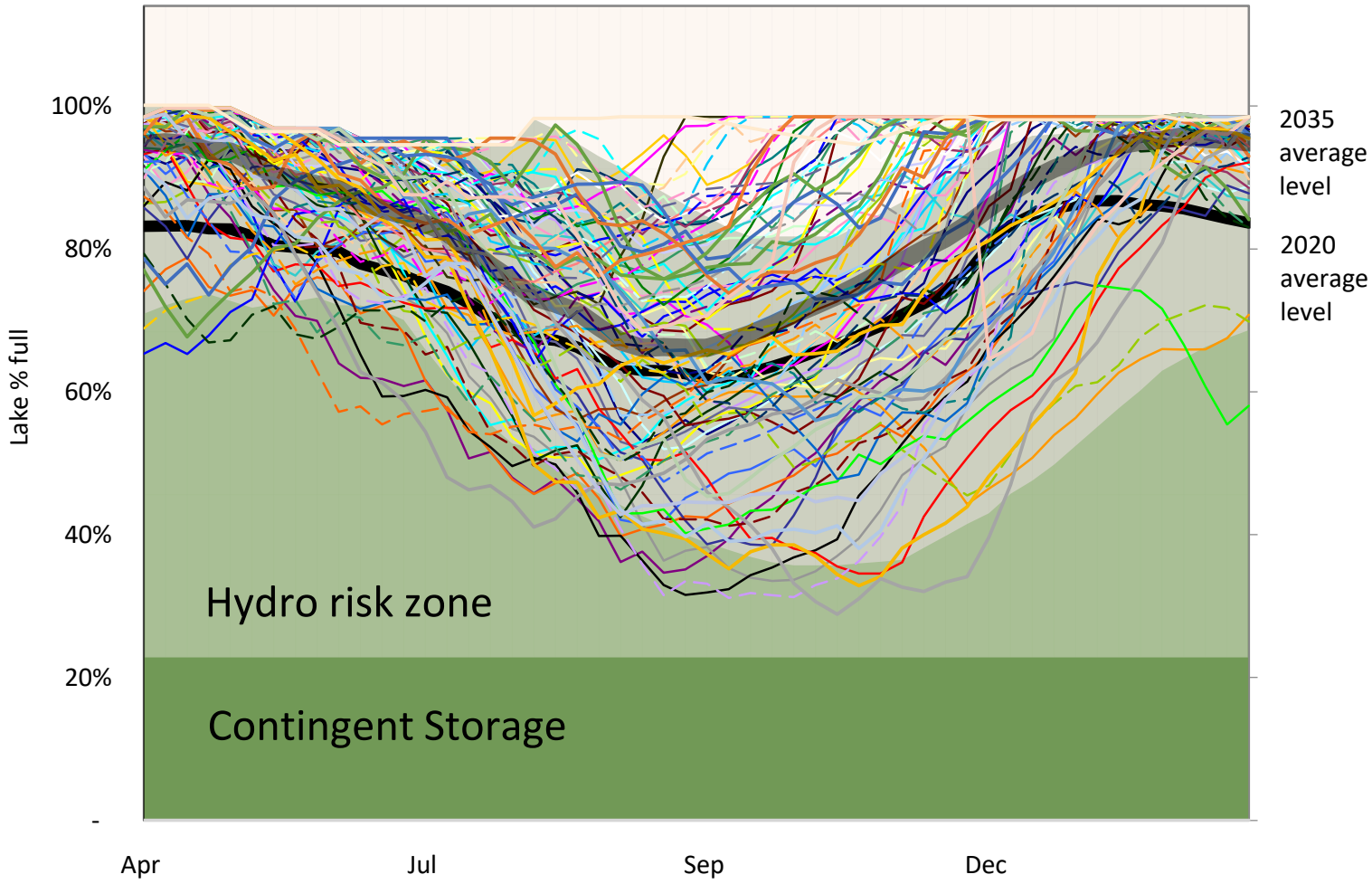


Seasonal price variation (monthly average prices)

Hydros become “shock absorbers”

Smoothing out a lot the short-term fluctuations

- Hydro storage levels rise on average – “fill up” (in April) for rest of year
- Storage trajectories largely trace the weather – less scope for short-term hydro management
- Hydro levels also more sensitive to the rates of new investment and demand growth

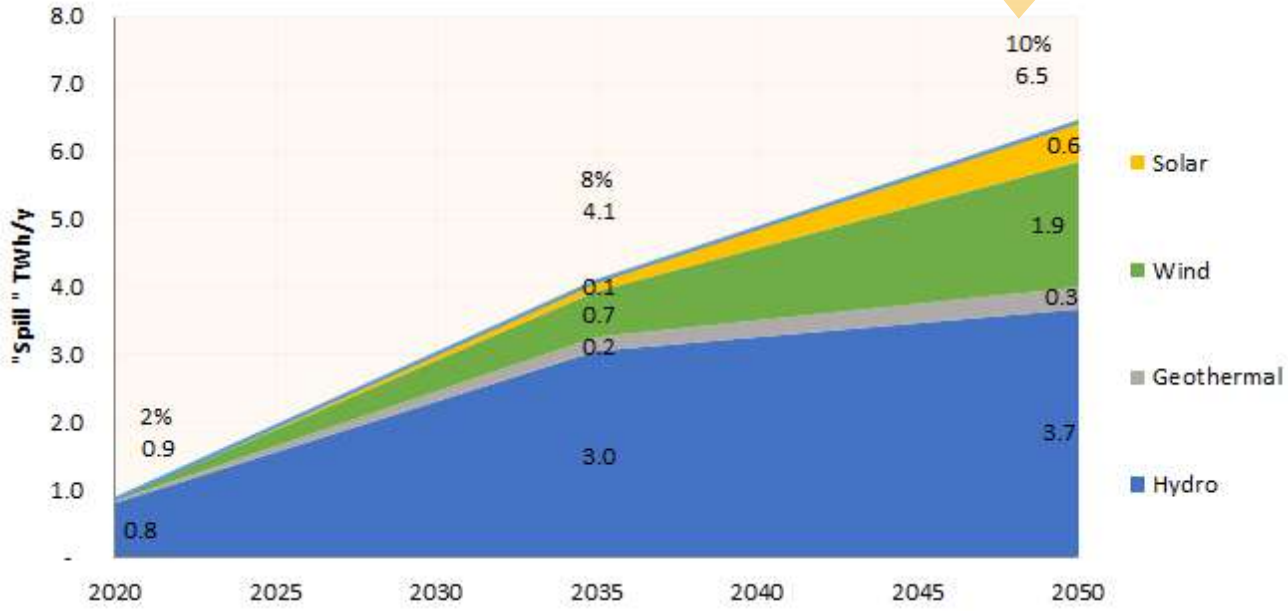


Simulated hydro storage trajectories 2035 reference case (starting April)

Increase in “spill”

- “Spilling” is not a “bad”
- Economically efficient (many alternatives with less spill are higher cost)
- For some stakeholders, this will be a major change in mindset.
- Change is really one of degree. Already spill thermal generation and network capacity

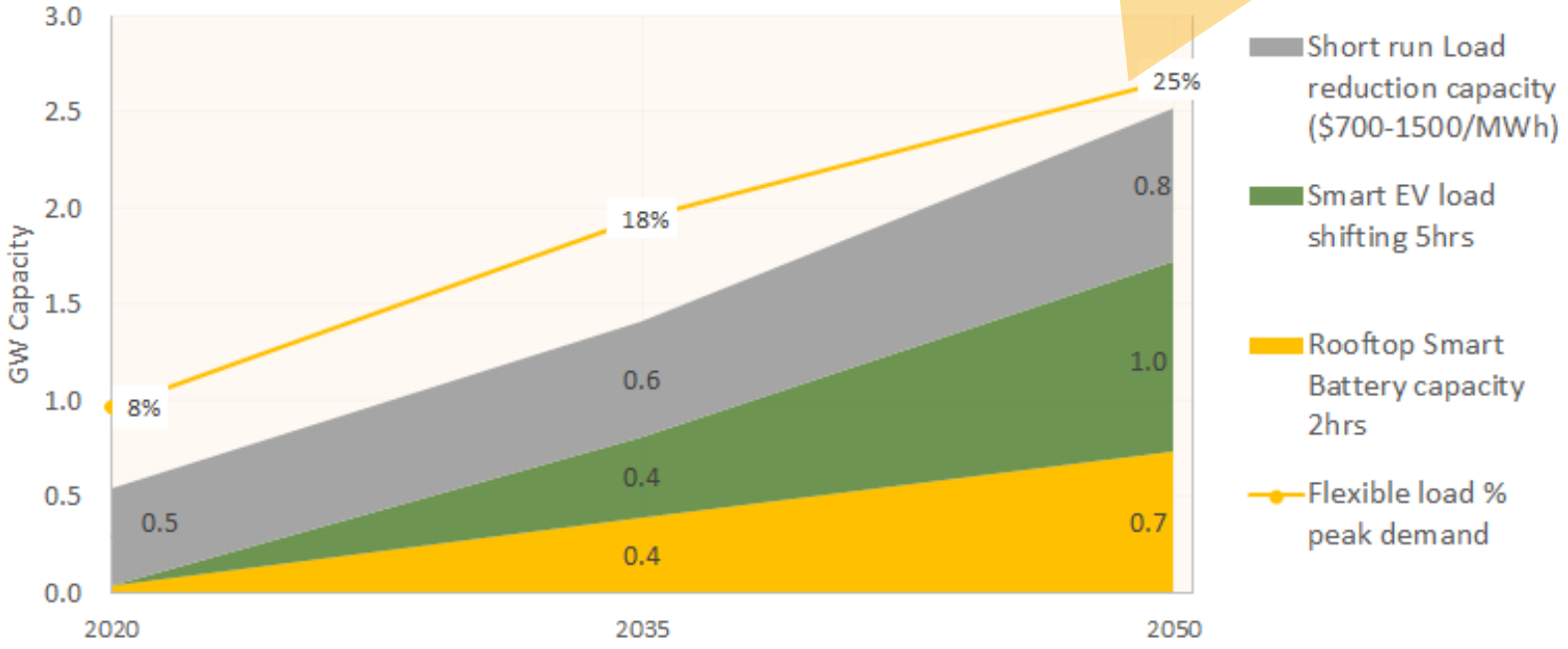
- Rises from **2%** of total generation in 2020
- To **8%** in 2035, and
- To **10%** in 2050



Increased flexible demand sources

Demand shifting and curtailment increases

- from circa **8%** of peak demand in 2020
- to circa **25%** by 2050.



Supplemental notes on previous slide:

- Technology changes in metering, sensors and data processing are making it much easier for consumers (or their devices) to actively vary their demand. It is imperative that the wholesale market design facilitates full engagement by consumers who want to reap the rewards from active demand response
- Big push around the world in energy-intensive industries
- Need smart meters to stop using ‘dumb’ profiles. [Opportunity is equivalent to nation-wide ‘ripple’ control]

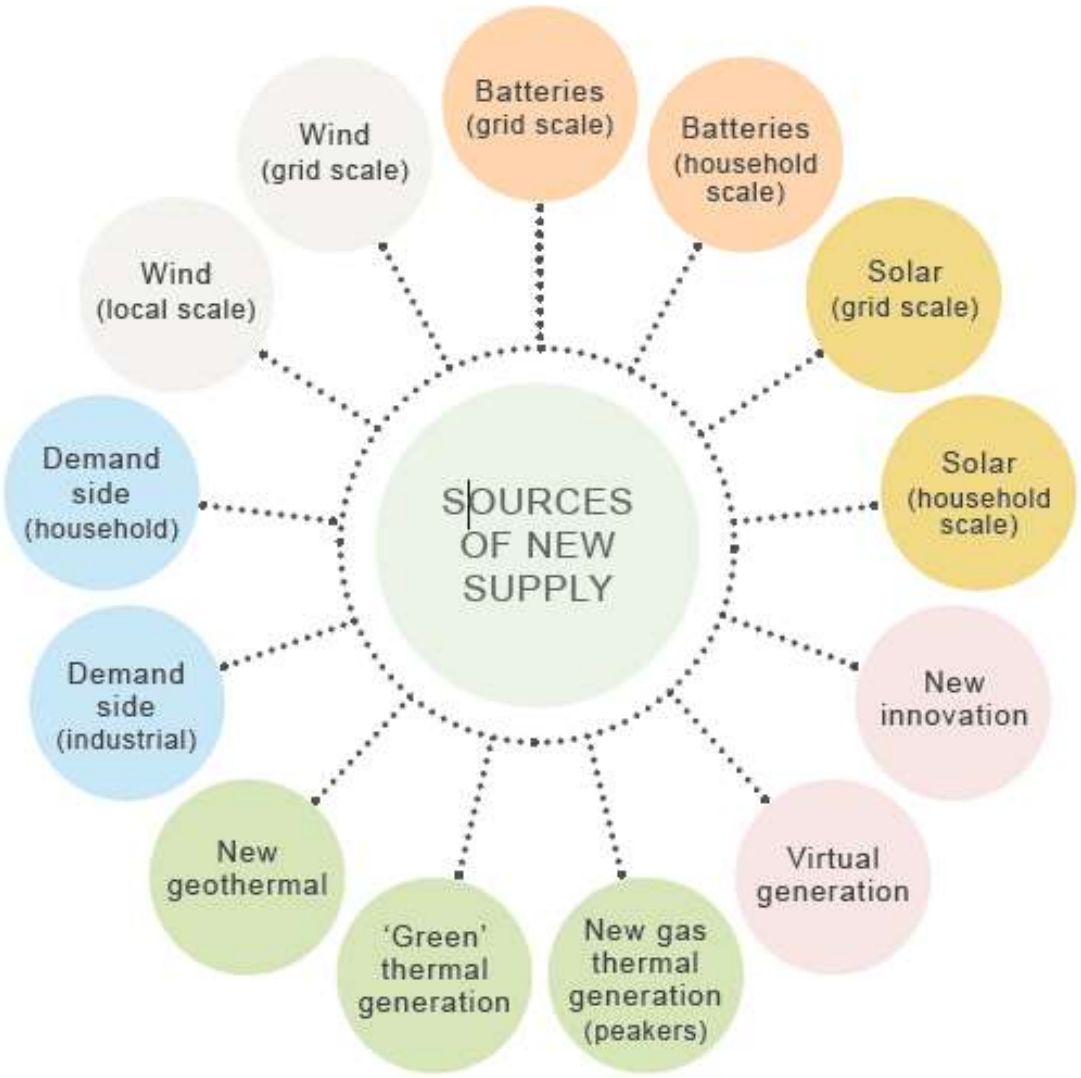
More dunkelflaute, less dry year problem

Speaking notes:

- Exposure to dry-year risk is likely to gradually reduce over time (but not disappear)
- Spill is likely to become a new source of longer-duration flexibility for the system, with the total level of spill declining in dry-years and vice versa
- ‘Dunkelflaute’ – German for 'dark doldrums' or 'dark wind lull' – batteries and peaking generation will become increasingly important

More diverse and dispersed sources of supply…

- Transpower estimates **3.9 million** distributed energy resources across the system by 2035
- Technology makes it easier for consumers to adjust demand to help balance the system



Supplemental notes:

Connected, digital devices offer *potential* for more granular control and coordination of flexible resources (hot water, EVs, heat pumps, batteries).

This brings risk (unpredictability, cybersecurity, cliff-edges) and opportunity (data, aggregation, optimisation)…

…to reduce GW/GWh and assist with operational coordination and (short term) energy security.

Still need tight operational coordination

Moving from a quartet to an orchestra

Supplemental notes on previous slide:

Big increase in the number of active participants on the system, as many more parties (and devices) connect to the system as suppliers, storage providers or flexible users. We liken this change to moving from a string quartet to a full orchestra. A conductor is needed to coordinate this orchestra, and the most practical solution is the spot market. But the spot market will need to work harder than before to provide the signals required to coordinate actions across the entire grid

Spot price is the ‘heart beat’ of the market

Competition in flexible supply ‘thins’

Speaking notes:

- Modelling and qualitative analysis
- Flexibility is the “secret sauce” in a renewables market
- Competition in flexibility services:
  - In short-term (< few days) – likely to strengthen (due to batteries)
  - In medium to longer term (> few days) – may weaken

We will rely much more on the hydro generation system for flexibility as existing fossil-fuelled generation winds down. This increased reliance on flexible hydro generation may significantly weaken competition in some key areas of the wholesale market.

We need to guard against that outcome and have measures at hand to address that risk if it appears to be crystallising

System and network operations more ‘neural’

Speaking notes:

With many participants making decisions –

More like a neural system than it is about a prescribed single investment

Need a new visibility on what is happening – how we gather data

Needs to be aggregated right up to the system operator

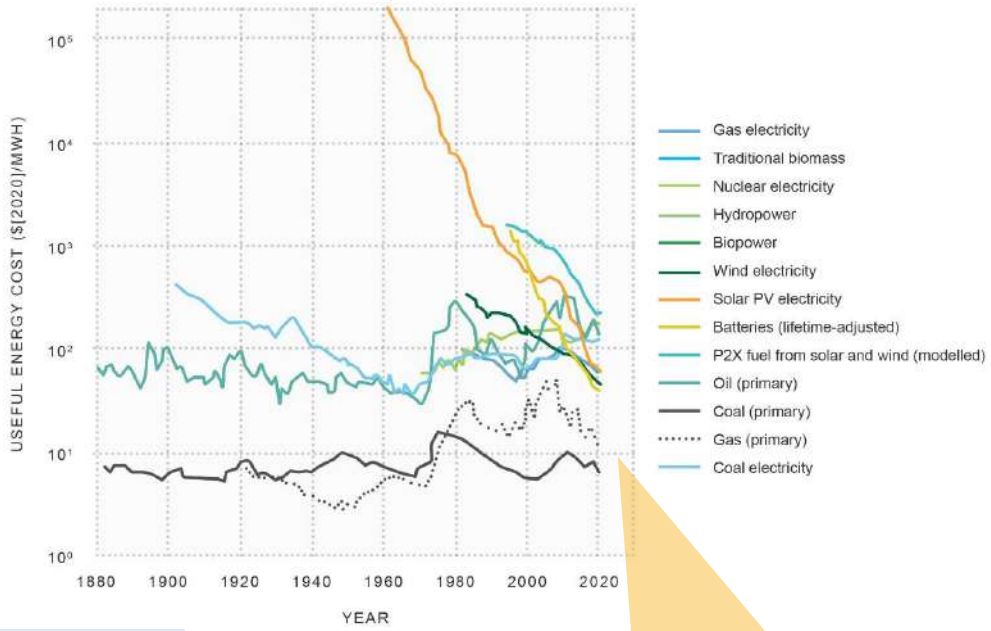
Market will need to reach into distribution networks

Speaking notes:

With increasing numbers of active participants and devices being located within distribution networks, new wholesale market tools/processes will be needed to enable tighter optimisation across the nation's electricity networks – irrespective of their classification as transmission or distribution assets

Capturing innovation is key

Few people predicted that the cost of solar PV would **fall by more than 90% since 2000**



…but no-one knows exact trajectory so impossible to pick the winning mix

Speaking notes:

Innovation in technology and business models is expected to accelerate as the world embarks on a quest to electrify much of its energy demand.

Innovation will drive costs and technology in ways we can't predict

It is vital to ensure that New Zealand's wholesale market arrangements remain open to technical and commercial innovations where these provide benefits to consumers.

Investment efficiency is the big prize

As Transpower's Chairman, Dr Keith Turner, put it:

> "We are dealing with many people making decisions, not just one…The market is a way of discovering the lowest cost price.
>
> When I was power planning engineer, there was one decision-maker about the future of our power system.
>
> Now we've got thousands of decision-makers and if someone finds an innovation, they're in there like a robber's dog – and that's fantastic".

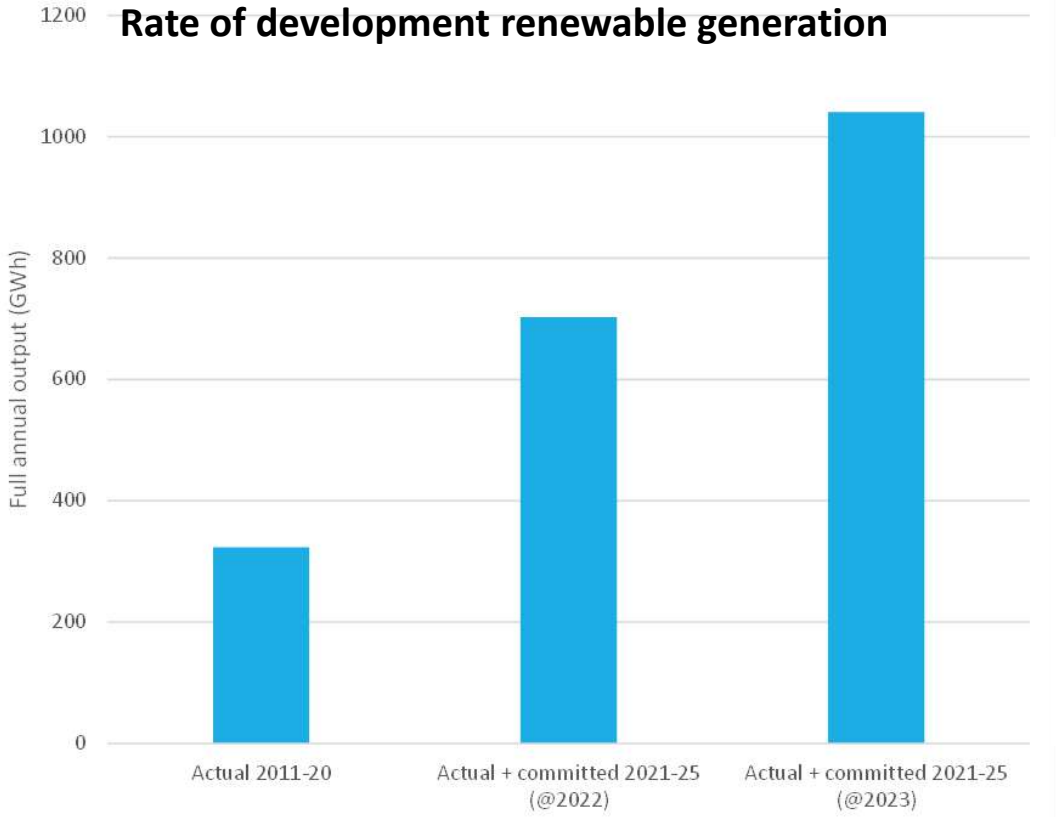
Speaking notes:

- Investment efficiency is the major 'prize' in the coming 30 years.
- Avoid wasting capital as we build a large quantity of new electricity capacity.
- Best achieved by competition among diverse parties finding their own capital.
- Decentralised approach allows greater choice over the type, timing and location of contract cover and new resource investment
- Results in greater investment efficiency and lower costs for consumers and the environment.

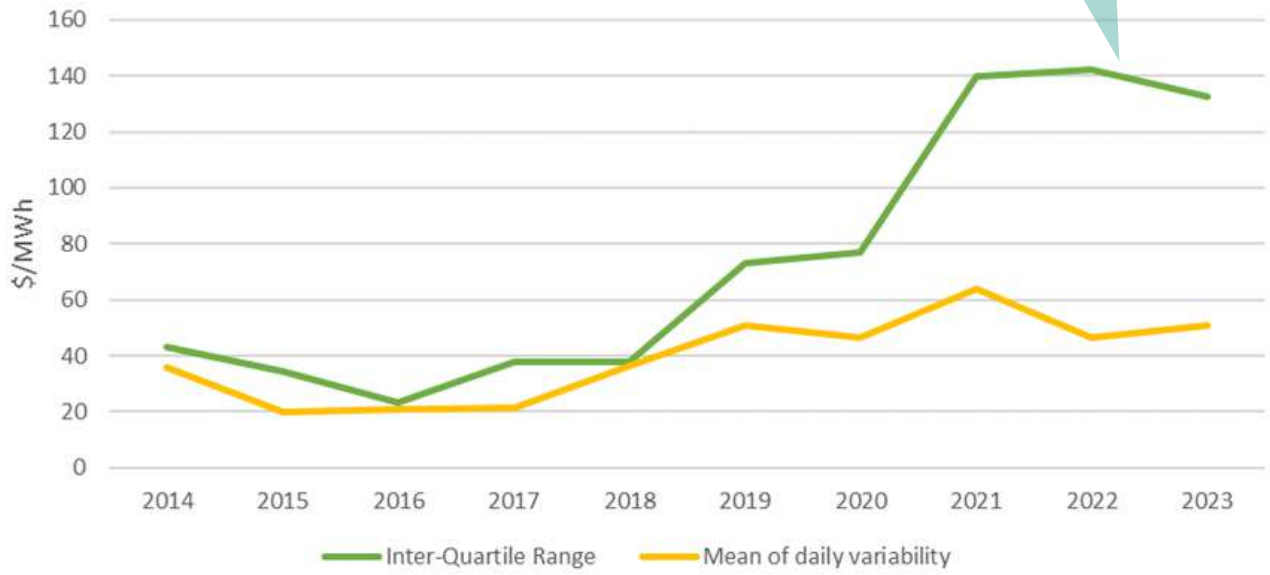
Future is already here

Fourfold differences across 24hrs becoming common

Rate of development renewable generation



Spot price volatility



Supplemental notes:

- Renewable generation rising -- now projected to reach around **94% by 2025** (compared to an average of 82% in the five years to 2021). Climate Change Commission – **96.5% by 2030** (some other more recent forecasts are even higher)
- Spot price volatility is already increasing

Do we need a market?

Policy objective

Reliably [+] meet

the next increment of demand for electricity

from the least cost source*

[+] With a level of reliability that reflects consumers' willingness to pay
* Factoring in outages, constraints and losses

Supplemental notes on previous slide:

Clearer expression of statutory objective – s.15, Electricity Industry Act 2010:

"to promote –

- competition in,
- reliable supply by, and
- the efficient operation of –

the electricity industry for the long-term benefit of consumers"

Interpreted by the Authority in 2011 to reflect underlying economic efficiency drivers

Recent court cases considering statutory objective: Nova (2023, Court of Appeal); and Manawa (2022, High Court)

At any point in time

Goal of lowest possible source applies looking ahead –

- five minutes
- half hour
- day
- week
- season
- year or beyond

What we mean by a ‘market’?

- A platform for processing information and coordinating actions
- to enable many different buyers and sellers of electricity,
- managing their own risks,
- responding to competitive pressures and accurate price signals,
- to continually looking for ways to serve their current and potential customers more effectively than their competitors.

Better solutions displace less efficient solutions

Built for a different era?

Speaking points:

Designed 30 years ago for a system dominated by a handful for large generators producing electricity to meet relatively inflexible demand, where prices and market revenues are tied to generators' opportunity costs, which have been strongly influenced by the cost of fossil fuels burned in thermal plant.

Now facing a step-change in how we need to produce and deliver electricity, not only in retiring fossil fuel thermals and building a huge amount of new renewables with low variable resource costs, but also in demand-side participation, which will be ever more important and in the way the lines networks will need to operate (less directional and more 'neural').

And to boot, we need this to happen with a reasonable degree of certainty to ensure that the imperatives of decarbonisation are achieved within a relatively definite timeline.

Among wider stakeholders, there is an understandable intuitive scepticism about whether the wholesale electricity market is capable of (or likely to be best at) delivering these outcomes – a sense that somehow the fundamentals of the basic electricity market will have to change so that there is more direct coordination, so that there is a 'plan' for make the step-change happen properly.

We understand this intuition, and we have carefully considered alternatives.

Alternatives?
Degrees of centralised risk management

Speaking points:

Centralised approaches come in various forms (such as capacity mechanisms. Their common features include:

a) A single party determines when investment will occur via its projection of demand and assessment of existing supply capabilities.

(b) A single party strongly influences the mix of investment, via its determinations about how each resource will 'count' toward meeting future demand. For example, it will determine the deratings to apply to wind generation in different locations for their relative firmness, and the degree of firmness that will be accorded to different types of demand response capability.

(c) Investment costs (and sometimes operating costs) are recovered from consumers via a levy or compulsory contracting arrangement.

Why market (decentralised) is preferred

Supplemental notes on previous slide:

Four key reasons:

First, a central body or small group of people simply can't see the full range of possible options for meeting the next increment of demand – it's a key difference in the combined field of vision and information.

Second, decision makers in the centralised approach have weaker incentives to minimise costs. This is because they do not directly bear the cost of poor decisions

Third, there is a tendency towards over-investment with centralised approaches. This is because of the asymmetry of incentives on central decision makers – under investment "visible'; over investment not 'visible'. So central decision makers tend toward over-procurement –

> 2016 survey of capacity mechanisms by Professor Frank Wolak found:
> "experts generally contend that the capacity markets have achieved the goals of providing the required reserve margin, but in an economically inefficient way [and] these costs appear to be mainly due to a higher reserve margin than would be economically optimal."

By contrast, in a decentralised (market) approach, the timing of investments is determined not by the forecast of a central agency, but by the proponents risking their capital with better information about each specific option and with stronger incentives to make cost-effective decisions (i.e. prospective developers and their customers).

> In the 30 years of our market, there is no evidence of under-investment in capacity. On the contrary there has been an increase in security margins

The f**ourth** reason for favouring decentralised approaches is that we think they are better suited than centralised approaches for renewables-based systems. The underlying reason is that centralised approaches work best with technologies that have relatively standardised and well-established performance characteristics such as thermal stations.

By contrast, it is hard for centralised decision-making processes to properly assess the future supply contribution of technologies whose performance is naturally heterogeneous. For example, the supply contribution of solar and wind generation will differ between Northland and Canterbury because of differing solarity and wind patterns. Equally importantly, the firm supply contribution from any single renewable facility will depend on what else has been built on the system because of diversity effects.

The importance of these heterogeneity and diversity effects will grow as the renewable share of supply increases over time. For example, Professor James Bushnell, a leading US expert, has written that:

> "As resources become more diverse, the challenge of forecasting their value for reliability months and years in advance greatly increases."

Capacity mechanisms come from, and are strongly influenced by, culture and politics. Capacity mechanisms tend to be based around thermal-dominated systems and in response to historical challenges, but not so well suited to the nature of innovation and opportunity in the coming years.

Pragmatism rather than philosophy

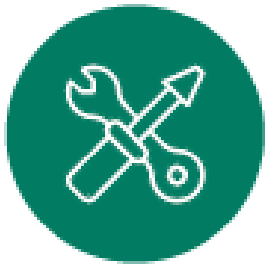
"Households prefer cats that are best at catching mice, irrespective of whether they are black or white"

possibly coined by Deng Xiaoping (1904–97).

Implications of physical system changes for wholesale market design

‘Pillars’ of a well-functioning wholesale market

Accurate Pricing
(price discovery)



Tools
(to manage risks)

Competition

Public Confidence

By competitive process, revealing the lowest cost (price) of producing an extra unit of electricity in any interval of time at a given location

[Marginal pricing, not averaged or ‘administered’]

Supplemental notes on previous slide:

Accurate prices

If spot prices are not accurate, it will lead to poor operational decisions which will raise costs and/or cause reliability problems. For example, it could mean electric vehicles are charged during peak demand times, which increases the amount of new generation (and network infrastructure) that needs to be put in place. And this in turn will increase costs to consumers and the environment.

Suppressing spot prices or giving parties a 'soft landing' for failing to properly hedge their exposure to spot prices tells parties they don't have to properly manage their price risk, which has the flow on effect of both reducing the amount of capacity, energy and/or demand-side response available to cover periods of shortage and mucking up the timing and choice of new investment to meet new demand

Accurate contract market prices are also critical to coordinate decisions over longer periods – such as whether to use or conserve discretionary resources (like hydro storage or potentially curtailable demand) and when to invest in new supply or demand response capability.

Tools and incentives to manage risk – include physical options (e.g. an ability to increase supply or reduce demand) or financial arrangements where parties contract with others who can manage the underlying risk at a lower cost.

Competition –

- Competition among market participants to provide the best solution to meet demand such that no party has the means and incentive to exercise significant market power.
- Market power becomes **significant** when its exercise would have a net adverse impact on economic efficiency, which includes productive, allocative and dynamic efficiency. This concept is reflected in Electricity Industry Participation Code 2010 at cl 13.5A.

Public confidence:

(i) Confidence among wholesale buyers and sellers that the high prices (in times of scarcity) make sense (which means confidence in the structure and rules of the market, including the sufficiency of competition);

(ii) General public and political acceptance that volatility and high prices in the wholesale market are, in fact, in the best long-term interest of consumers, and that measures to 'soften the landing' for unhedged participants can trigger a vicious circle of undermined investment incentives and higher future prices;

(iii) Confidence among consumers and politicians that investment will be timely and competitive; and

(iv) Confidence in the rule maker and rule making process to create an efficient platform for processing information and coordinating actions among many electricity suppliers and consumers.

Achieving public and political confidence) is highly influenced by whether there is accurate pricing, risk management tools and competition

In short, public confidence relies on the market delivering reliability at lowest cost, and this public confidence (as a virtuous circle) enables accurate price signals (even when very high), which in turn drives incentives in the market to manage risk and invest in new supply

‘Pillars’ drive spot, contracts and new investment markets

Primary coordinating tool is a dynamic, locational-based, marginal arising from security-constrained economic dispatch

Implications

Huge increase in demand
(50%+ by 2050)

→

Contract market must provide clearer and more timely signals about investment needs

Implications *(cont'd)*

Implications *(cont'd)*

Implications *(cont'd)*

Thermal closures may reduce competition → Proactive measures needed to safeguard competition – especially for flexible supply

Implications *(cont'd)*

Technology enables demand side flexibility → Market rules must make it easy for consumers to reap benefits of providing demand side flexibility

Implications *(cont'd)*

Transmission grid no longer the sole market 'space'

Need to 'connect' widely dispersed energy devices on networks to wholesale market

Implications *(cont'd)*

Technology enables demand side flexibility

→

Market rules must make it easy for consumers to reap benefits of providing demand side flexibility

Implications *(cont'd)*

Higher price volatility/ transition challenges → Market needs to maintain public/political confidence – underpins the dynamic that delivers reliability

Conclusion:

We need WEM 2.0

Any changes must fit our context

Recognise our unique physical characteristics (including lack of any grid interconnection)

And we already have many features that overseas jurisdictions are looking to put in place – e.g.

- Nodal pricing
- A common price
- Relatively uncapped spot prices

Recommendations for WEM 2.0

Integrated package of recommendations.

Accurate Pricing
(price discovery)

Tools
(to manage risks)

Competition

Public Confidence

All measures contribute to all four pillars.

Grouped by the ‘pillar’ to which it contributes with more emphasis (or with a higher profile).

Details of recommendations set out in Chapter 9 of MDAG’s final report
www.ea.govt.nz/documents/4335/Appendix_A2_-_Final_recommendations_report.pdf

Accurate pricing

Short-term forecasts (R1)

Hedge market transparency (R2)

Demand-side flexibility (DSF) activity monitoring (R3)

Pricing to optimise distribution investment (R4)

Price-driven secure distribution dispatch (R5)

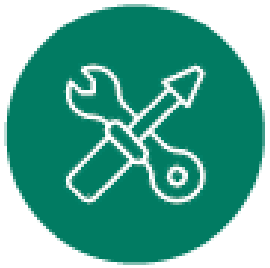
Scarcity pricing parameters (R16)

Information on development pipeline (R17)

Sunset profiling (R18)

Network capacity in DSF dispatch (R19)

Consumer awareness of DSF (R20)



Tools and incentives for risk management

New reserve product (R6)

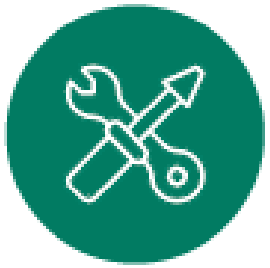
Stress testing (R7)

New flexibility products (standardised) (R8)

Contract process disclosure rules (R9)

DSF interface systems and protocols (R10)

FSR Project as it relates to demand-side flexibility (DSF) (R11)



Competition

Competition dashboard (R12)

Virtual disaggregation – high level outline (R13)

New flexibility products (standardised) (R8)

Essential to upgrade price discovery for flexible supply –

- as a risk management tool but also
- as a check on market power

Backstop measures if annual stocktake shows competition problems

Public confidence

In addition to previous measures:

Governance of FSR project (R14)

Seasonal outlook report (R15)

Monitoring and enforcement of Code (R21)

Information programme for opinion-makers (R22)

International experts (R23)

Supplemental notes:

Public and political confidence is highly influenced by whether there is sufficient competition and whether tools for managing spot risk are properly available, which support efficient new investment and, in turn, adequacy of supply. In this regard, the other measures recommended in this paper are fundamental for delivering public and political confidence in the wholesale market. The measures outlined below are focused on improving public information and understanding, working in conjunction with those other measures.

Demand-side flexibility

Recommended measures intended to enable market price signal to activate DSF when it is a lower cost option than generation – See Appendix A of MDAG's final report

Speaking notes:

Like generation, demand-side flexibility is a:

- 'Resource' for matching supply and demand, and
- Tool for managing price risk.

Our approach to DSF fits within, the common framework we are applying to all other aspects of the wholesale electricity market.

Urgent implementation required

Further information in Chapter 9 of MDAG's final report
www.ea.govt.nz/documents/4335/Appendix_A2_-_Final_recommendations_report.pdf

Speaking notes:

Major programme of work.

Provided guidance on priorities and how to implement (eg co-design with industry in some cases)

Important for market participants to support implementation – a well functioning market entirely consistent with the longer term interests of their shareholders.

Thank you

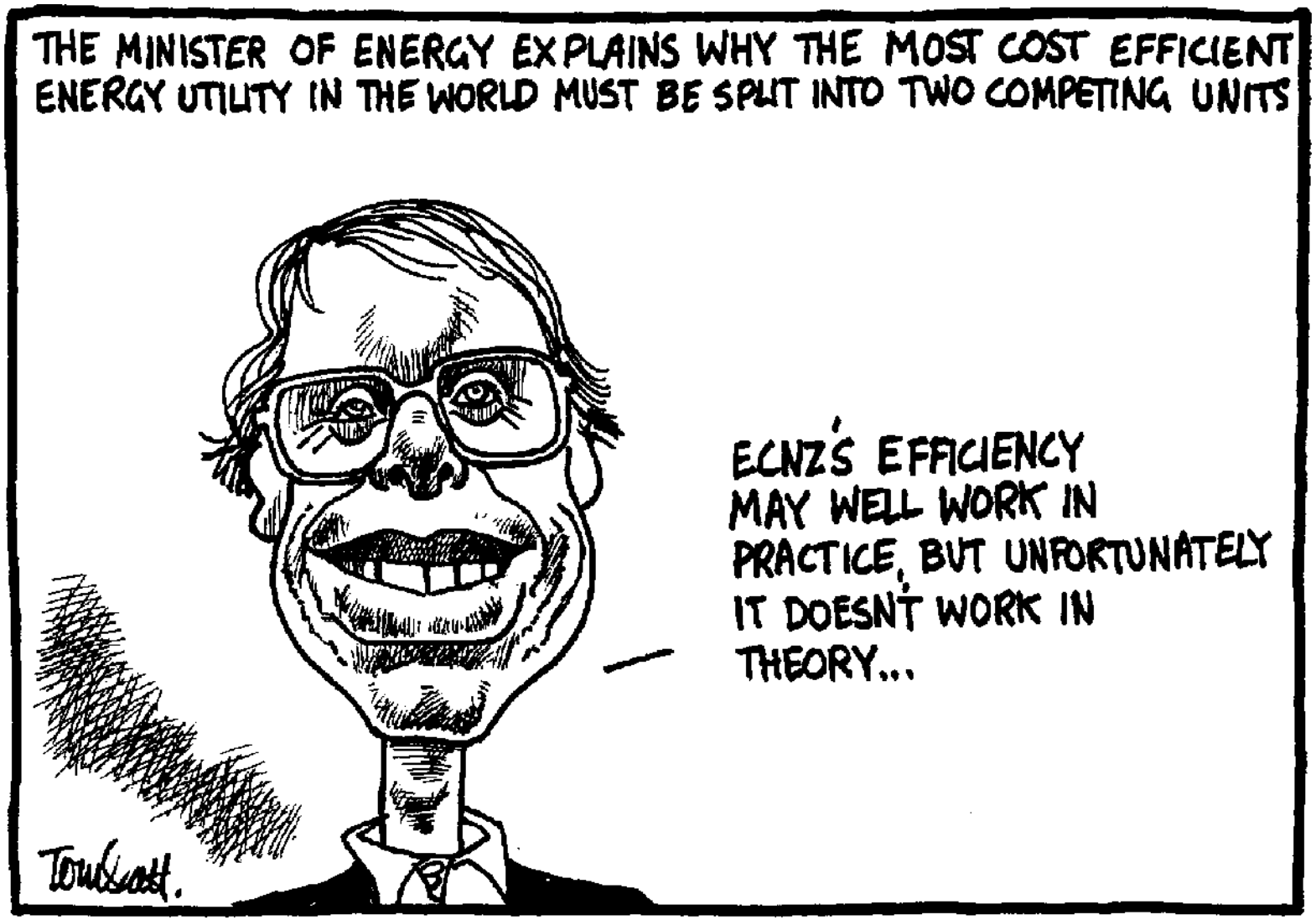
Supplemental

Historical sentiment

"…the mischief lies in the idea that electricity can be marketised...a benevolent, efficient state monopoly would be preferable." (Jane Clifton, in the Listener, May 2003)

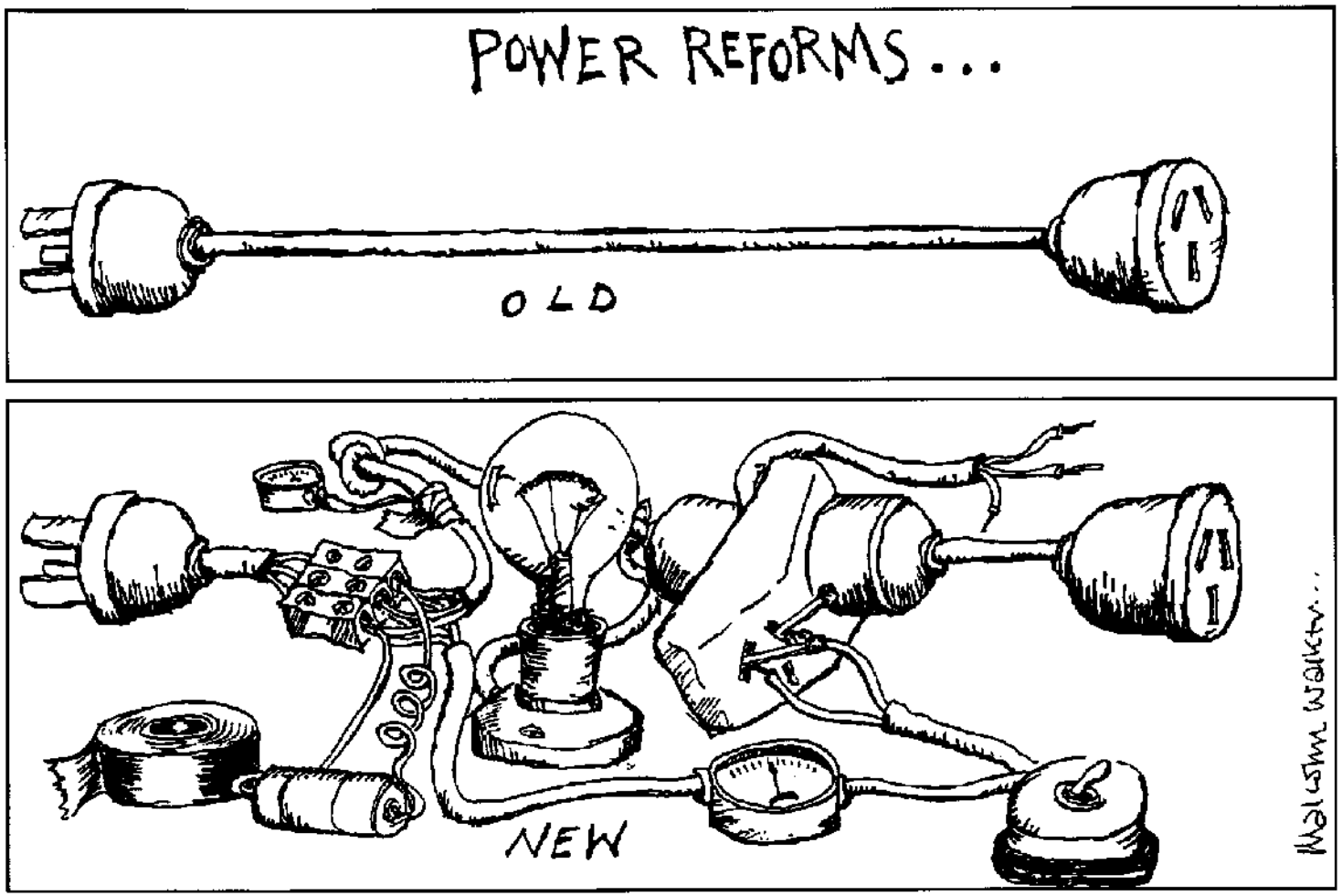
Speaking notes:

We sense that this sentiment is still at large – further emphasising the importance of the 'public confidence' pillar outlined earlier



Minister of Energy, Doug Kidd
Tom Scott cartoon – Dominion, circa 1996

Speaking note:
This idealised notion of ‘all-wise’ monopoly is still lingers.



Dominion newspaper
(either 1996 or 1999)

Outcomes under market compared to pre-market period

Contrary to claims in 1990s opposing a market approach, compared to the pre-market period (ECNZ and earlier):

- Water is used more efficiently
- New investment is more efficient
- Security of supply (reliability) has improved

(Among other key metrics)

Additional slide

Slide added to capture points made orally in presenting the slides in person

Market clearing price or pay-as-bid pricing

At present, generators place their offers into the ½ hourly spot price auctions.* The offers are ranked in price order the last one needed to satisfy demand sets the market clearing price. This means all generators receive the same price in each half-hour auction.

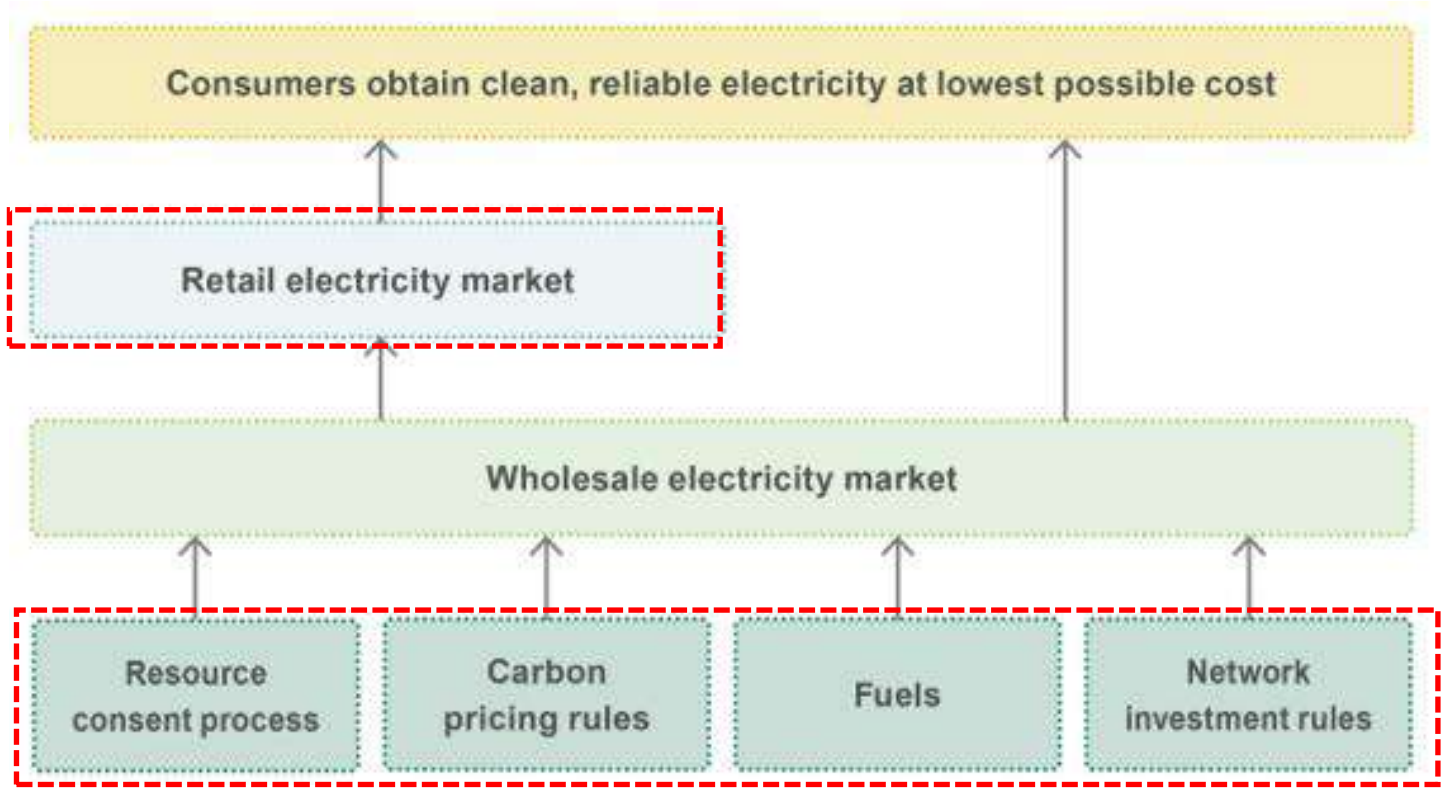
If generators were paid their offer price, rather than the clearing price, they would increase their offer to their best guess of the clearing price, and some lower cost generators may not be dispatched. This would result in higher overall costs for consumers and society as a whole. The current system encourages competitive generators to offer at their actual marginal cost, no matter how low it is, and this benefits consumers.

Paying generators their offer price would also significantly harm 'must run' renewable generation. Under the current system, they offer at low prices to ensure they are dispatched when they have energy (sun, wind, water) that can't be stored. If paid at their low offer price, rather than the clearing price, they would not recover their fixed costs (like cost of capital) over time, and this would seriously deter new investment in intermittent renewables. Their alternative of offering in at higher price (to recover their fixed costs over time) would put them up the 'merit order' and mean that they were not dispatched more often, and this would result in inefficient "spilling" of renewable fuels.

The core role of the wholesale market is to keep the lights on for the least cost, both in the current trading period but also in the coming week, month, year and decade. Marginal pricing will create the best outcome both now and across all other periods in the future.

After adjusting for the effects of transmission losses and constraints.
For further explanation, see Electricity Authority, "The Economics of Electricity", 4 June 2013, paragraphs 7-15

Other key factors



Supplemental notes on previous slide:

While the wholesale market is a central piece of the overall electricity picture, the success of New Zealand's electricity system in a renewables-based world also depends on several other key factors:

(a) **Resource consenting** processes for generation, energy storage and network infrastructure must enable the timely and efficient build of new infrastructure, otherwise supply may not keep up with rapidly growing electricity demand.

(b) **Carbon pricing** rules need to be clear and predictable, as they are the primary tool to drive decarbonisation decisions within the electricity sector and across the wider economy.

(c) **Fuel sector** arrangements have a critical influence on electricity generation costs and reliability. It is vital that the policy frameworks for both fossil and green fuels recognise the critical role these fuels play in the electricity sector.

(d) **Network investment rules** need to support the timely development of the national grid and distribution networks, while also safeguarding the interests of the consumers who ultimately pay for those investments.

(e) **Retail market competition** must be effective to ensure consumers fully benefit from the opportunities available in the future electricity system