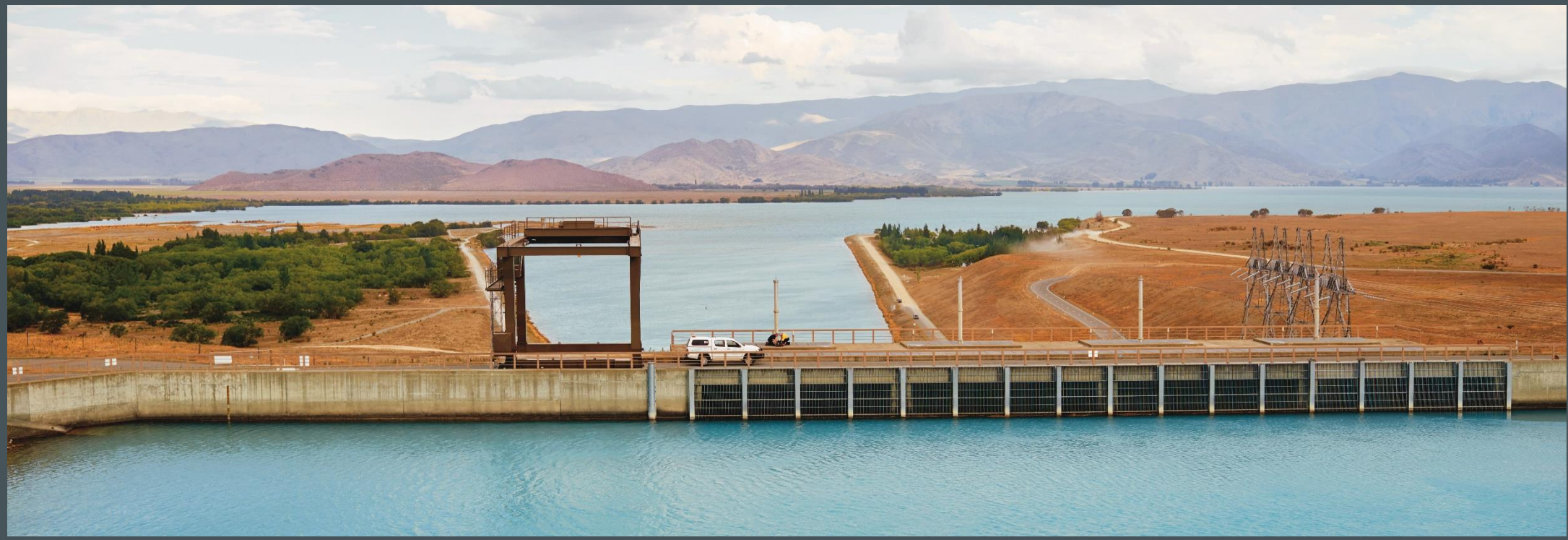
INTERIM CLIMATE CHANGE COMMITTEE (ICCC)

ELECTRICITY FORUM – 2 AUGUST 2018



PURPOSE OF THE DAY

- An opportunity to begin engagement to advance the transition to a low emissions energy future
- Share perspectives and modelling
- Why you?

WHAT IS THE ICCC AND WHAT IS ITS ROLE?

- An INDEPENDENT Ministerial Advisory Committee appointed by the Climate Change Minister with the agreement of Cabinet. Members appointed by Cabinet.
- Members were appointed because of their personal expertise and ability to provide independent, strategic assessments of climate change issues. They will not act as advocates or representatives of a particular interest or sector group.

ICCC ROLE

- Provide independent evidence and analysis on TWO KEY QUESTIONS. Outputs to be passed to the Climate Change Commission to inform its recommendations.

COMMITTEE MEMBERS

- Chair - Dr David Prentice
- Deputy Chair - Lisa Tumahai, Kaiwhakahaere/Chair, Ngāi Tahu
- Dr Keith Turner
- Dr Jan Wright
- Dr Harry Clark
- Dr Suzi Kerr

ICCC TERMS OF REFERENCE

Two key questions

1. How surrender obligations could best be arranged if agricultural methane and nitrous oxide emissions enter into the NZETS.

2. Planning for the transition to 100% renewable electricity by 2035.

THE SCOPE OF WORK

- After careful consideration of the Terms of Reference, the ICCC advised the Minister of our scope of work around the two questions…

OUR AGRICULTURE WORK SCOPE AS ADVISED TO THE MINISTER

- We will deliver evidence and analysis on ways of delivering efficient emission reductions in the agriculture sector that are consistent with the Government's objective for a just transition.
- We will consider the full suite of options that could deliver those reductions. The New Zealand Emissions Trading Scheme will be a key but not the sole focus of our work.

OUR ELECTRICITY SCOPE AS ADVISED TO THE MINISTER

We will deliver evidence and analysis on the likely options, costs and practicality of how New Zealand can move toward 100 percent low emission electricity by 2035. In answering this we will consider the whole of the electricity system including:

a) Technological and systemic changes in electricity supply, as well as challenges in real time reliability and grid security

b) Changes in electricity demand. Changes across the transport system and fuel substitution in the industrial sector, to lower emissions, have the potential to fundamentally change future demand for electricity.

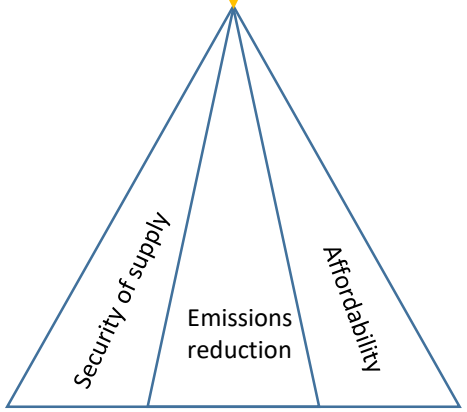
While the terms of reference do not explicitly mention these two sectors, we will consider possible system changes in these sectors explicitly, as far as this would influence overall electricity demand and supply. This will encompass analysis of options to accelerate electrification of those sectors.

Electricity Inquiry – identifying key questions

As at 26 July 2018

How are decisions made about our generation mix?

How do we find the balance?



Economy

Energy sector

Electricity sector

Supply…

matters because generation investments are crucial to enabling emissions reductions, and reliable and secure electricity.

Demand…

matters because it is a driver of investment that presents challenges and opportunities for managing the transition.

Institutions and regulatory framework

Minimise emissions

Behaviour…

matters because of its impact on supply and demand - decisions of consumers (big and small) and market players are based on multiple factors.

Technology…

matters because it: changes our energy sources, how and why we use energy, and rates of innovation and uptake are uncertain.

What changes will we see in demand (e.g. transport and process heat)?

What opportunities are there to manage demand?

What influences decisions consumers and market players make?

What could change in terms of major users?

What technologies are relevant and how will they facilitate the transition?

What solutions do they provide, and what issues do they create?

ICCC TIMEFRAMES

- May – September: Requirements gathering and relationship building
- October – November: Testing with key stakeholders across NZ
- December – January: Iterating as a result of feedback from test phase
- February – March: Retesting with key stakeholders across NZ
- March – April: Finalising evidence and analysis as a result of retesting.

Handover to the Climate Change Commission

INTERFACE WITH THE ZERO CARBON BILL

- This Bill is intended to define a new 2050 emission reduction target consistent with the international goal of reaching net zero emissions in the second half of this century. The Bill will also propose to establish an independent Climate Change Commission (the Commission).
- The Interim Climate Change Committee is the precursor to the proposed Climate Change Commission.

OUTLINE FOR THE DAY

- Schedule for the day
- Expect about 20 minutes of question time
- Housekeeping
- Quick round table of introductions

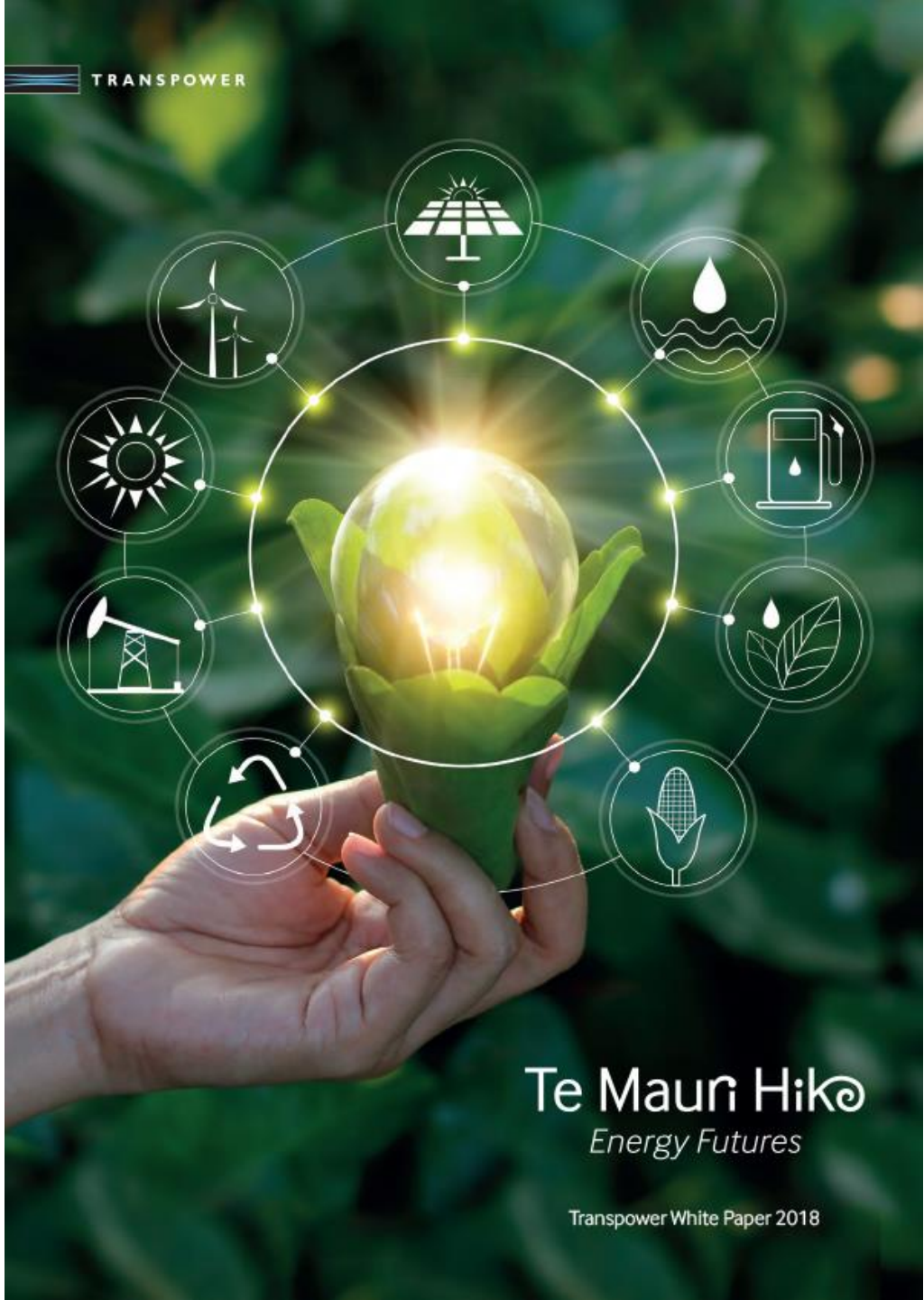
ALISON ANDREW

TRANSPOWER

Presentation to an Electricity Forum for the Interim Climate Change Committee

ALISON ANDREW

CHIEF EXECUTIVE



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Energy Futures

An opportunity - and a challenge

- **The future of energy in New Zealand can be transformed in the next 30 years**
- **To the benefit of our economy, our environment and our customers**
- **There will be significant challenges along the way**
- **Success will depend on planning, innovation and the flexibility and ability to innovate of New Zealand's engineers**

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Why we believe a transformation is coming

- **Our view has become much more optimistic from just three years ago**
- **From a gradual forecast decline in electricity demand from the grid to a doubling of demand by 2050**
- **Increasing consensus and confidence around the shape of the electricity sector out to 2050**
- **Giving increased clarity and direction to our industry as to how we need to start delivering it**

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DEVELOPING A VIEW OF THE FUTURE - DEMAND

Scenario	Disruptv. climate change* avoided?	World remains integrated?	Future tech adopted?	High-level Story
NZ Inc	✓	✓	✓	A bright global situation with future technology but more climate change impacts. NZ takes a strong stance towards meeting climate change commitments and encourages industry development.
Vibrant Haven	✓	✓	✓	Similar to Base Case but with global climate, economic and security uncertainty growing more strongly and making NZ seem like a safe haven for people and capital. Electricity demand grows more rapidly.
Mobilise	✓	✓	✗	Similar to Base Case but with a technology stall that inhibits the world's ability to mitigate climate change with advanced technology. Instead, consumption must reduce. Electricity demand grows more slowly.
Struggling alone	✗	✗	✗	Disruptive climate change develops, world systems dis-integrate and future tech is not available. Some isolated, lower tech, safe havens struggling. Drivers of electricity demand reduce dramatically.

*__Disruptive climate change__ is experienced when our way of life is challenged by the state of the environment. It could come about as a consequence of triggering a series of adverse climate feedback loops or tipping points that leads to "abrupt" climate change or as the result of steady temperature and impact growth.

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DEVELOPING A VIEW OF THE FUTURE - SUPPLY

	Amount of dist'd solar?	Peakers retired?	Main source of new util. gen?*	High-level Story
Clean NZ	**Medium**	**Yes**	**Wind**	A continuation of current trends which sees a large increase in distributed solar generation, the eventual retirement of our coal and gas peakers, and new utility geo and wind being provisioned to meet demand growth
Peakers Permitted	**Medium**	**No**	**Wind**	Similar to Base Case but with gas generation retained and built as a means of ensuring security of supply during the winter and a dry year
Mass Solar	**High**	**Yes**	**Solar**	Similar to Base Case but with much more distributed solar generation driven by advances in nano-technology which reduce cost and increase capacity
Big South	**Medium**	**Yes**	**Hydro**	Similar to the Base Case but with a much larger proportion of the new utility generation provisioned in the South Island and as hydro

*Excludes geothermal which is developed under all scenarios as the most attractive baseload generation source

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THE BASE CASE SCENARIO

Demand

	Disruptv. climate change* avoided?	World remains integrated?	Future tech adopted?	High-level Story
NZ Inc	✓	✓	✓	A bright global situation with future technology but more climate change impacts. NZ takes a strong stance towards meeting climate change commitments and encourages industry development.

Supply base

	Amount of dist'd solar?	Peakers retired?	Main source of new util. gen?*	High-level Story
Clean NZ	Medium	Yes	Wind	A continuation of current trends which sees a large increase in distributed solar generation, the eventual retirement of our coal and gas peakers, and new utility geo and wind being provisioned to meet demand growth

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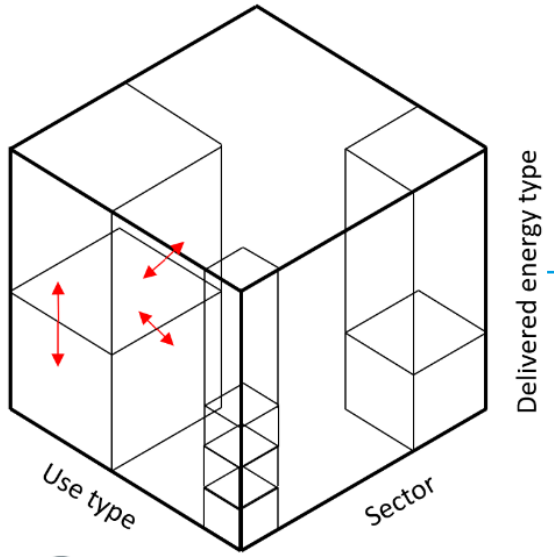
High-level approach to estimating NZ electricity demand

Apply the 80/20 rule and focus on the big demand "bricks"



UNDERSTAND DRIVERS OF THE BIG BRICKS

- Sector growth
- Use type mix
- Delivered energy type mix
- Efficiencies of delivered energy types

Estimate impact on drivers by future by decade

- Research into uncertainties
- Min-max analysis and judgements
- 2020, 2030, 2040, and 2050 demand estimates
- Testing with experts

Decompose estimates by region, by time and by sector

Regional breakdowns:
New Zealand
North Island and South Island
By region

Temporal breakdowns:
Daily
Interseason
Yearly

Sector breakdowns:
Primary
Industrial
Commercial
Residential
Transport

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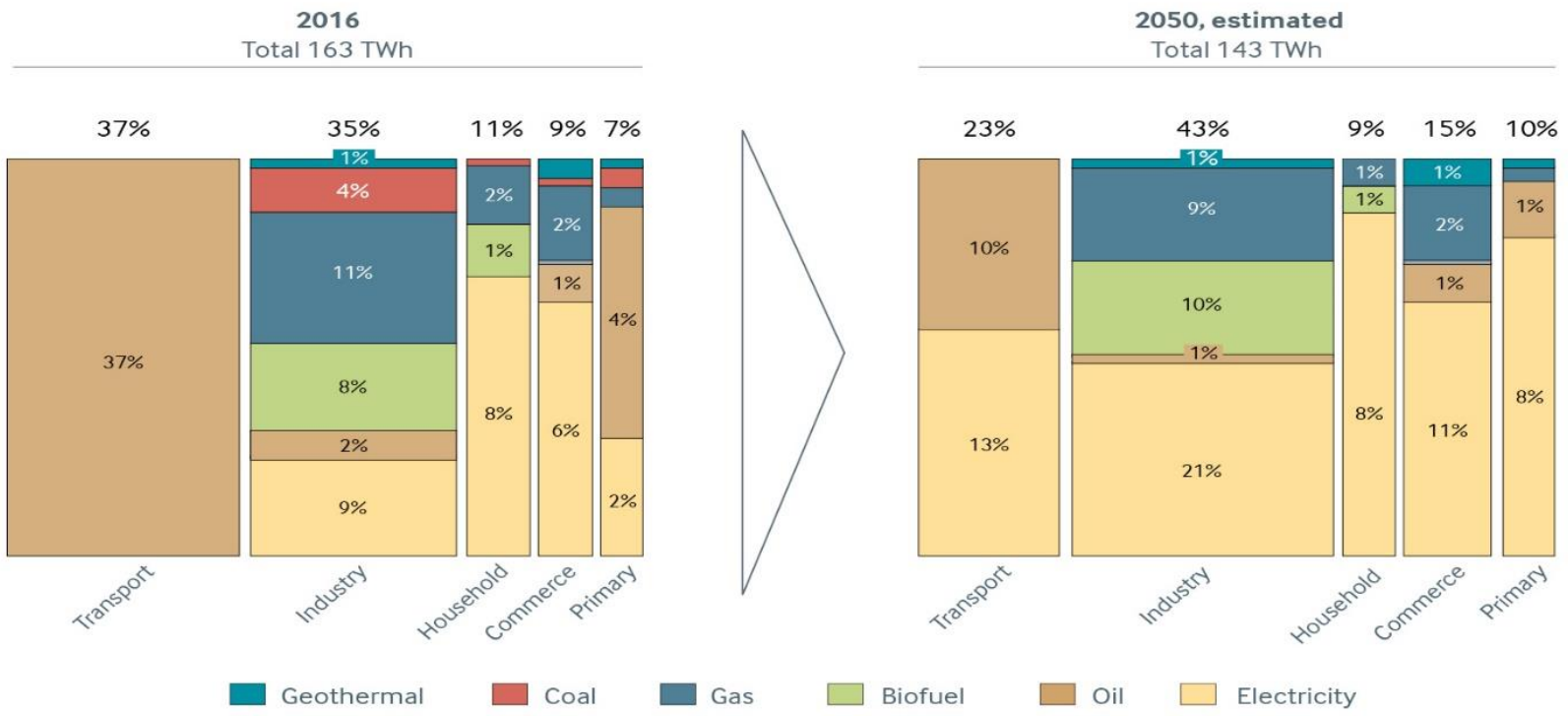
What will drive the transformation?

Exhibit 8: **Estimated delivered energy demand share by type and sector**



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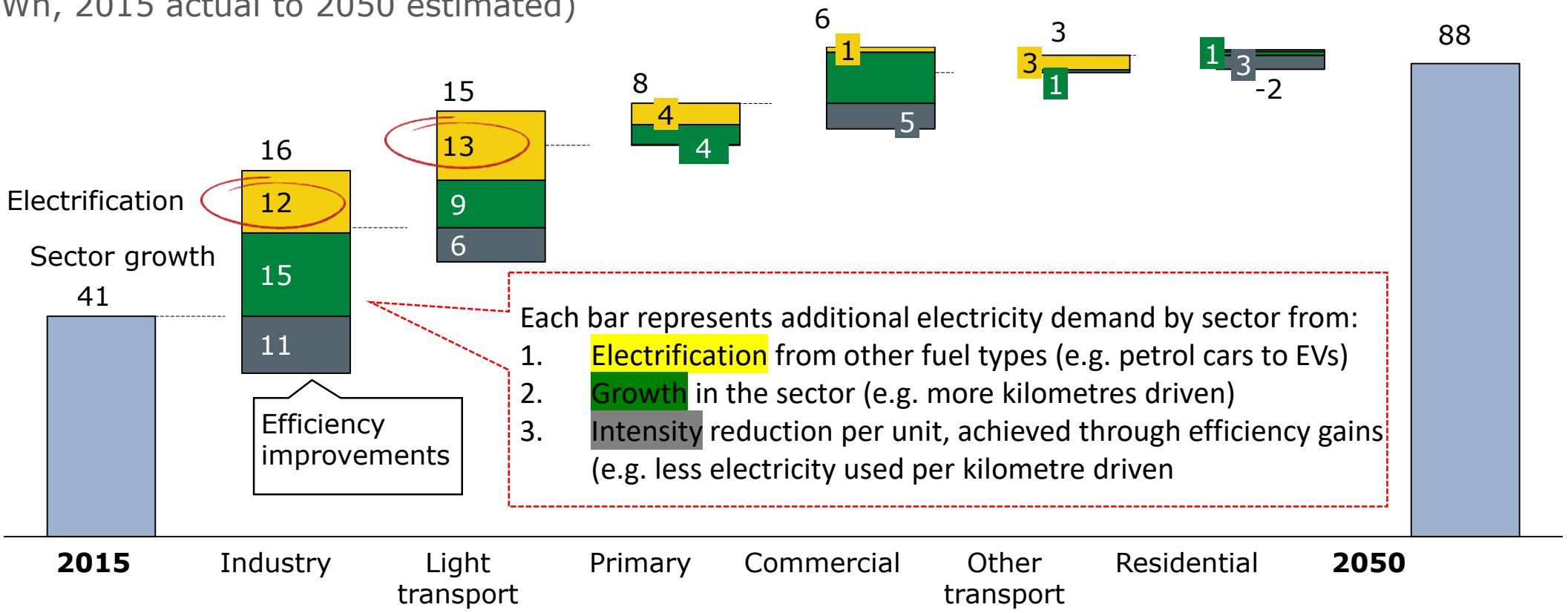
The increase is driven by electrification and economic growth, and partly offset by efficiency improvements

Decomposition of electricity demand growth

(TWh, 2015 actual to 2050 estimated)



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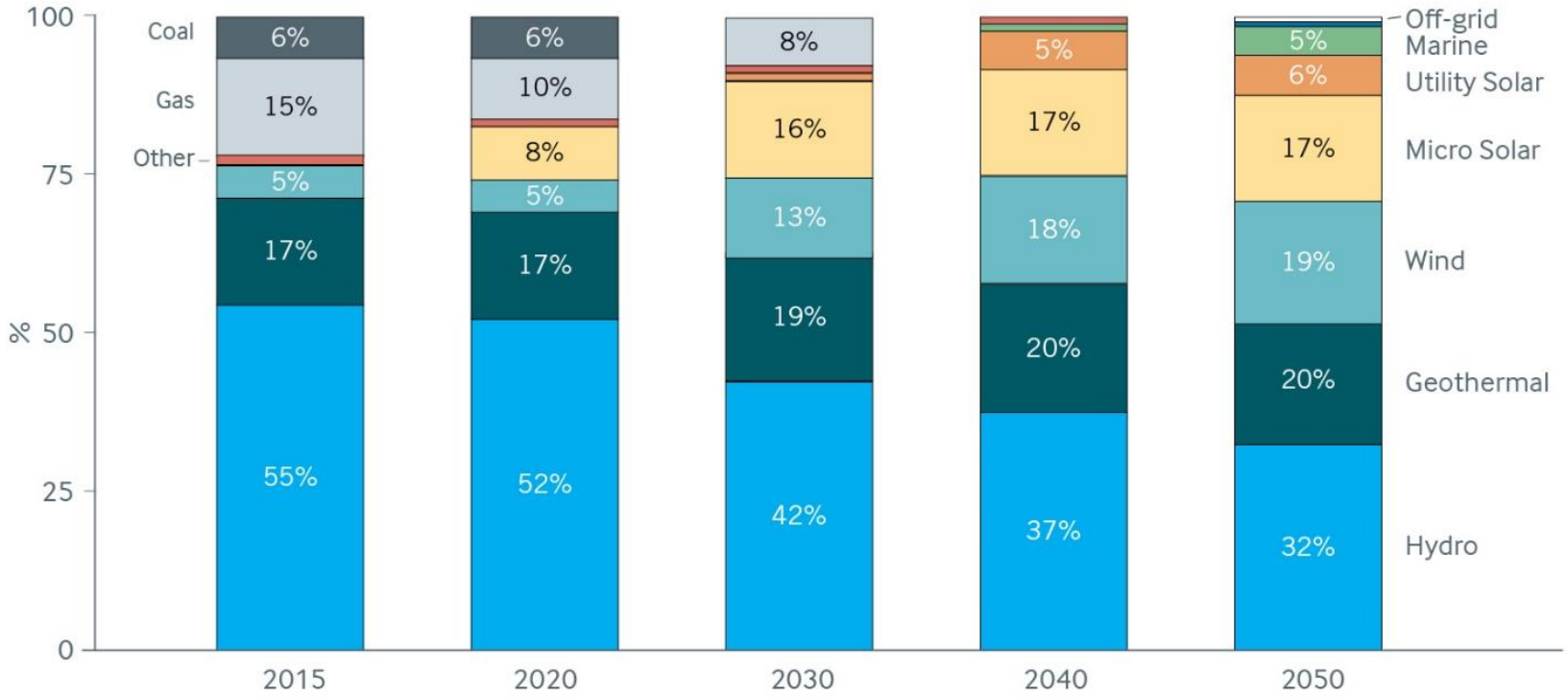
The shape of our industry in 2050

Exhibit 11: **Composition of New Zealand's electricity supply portfolio by generation type – 2015 to 2050**



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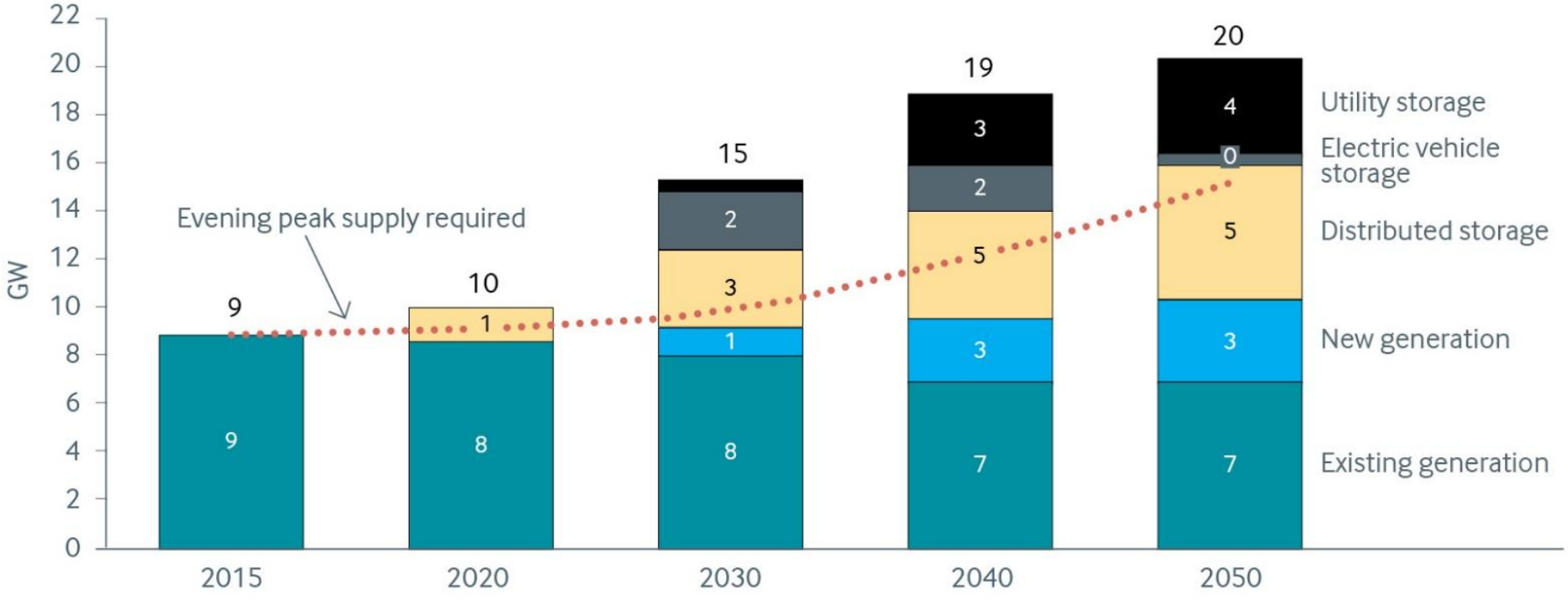
If the opportunity is clear, so is the challenge

Exhibit 12: **Estimated winter evening peak supply required and supply**



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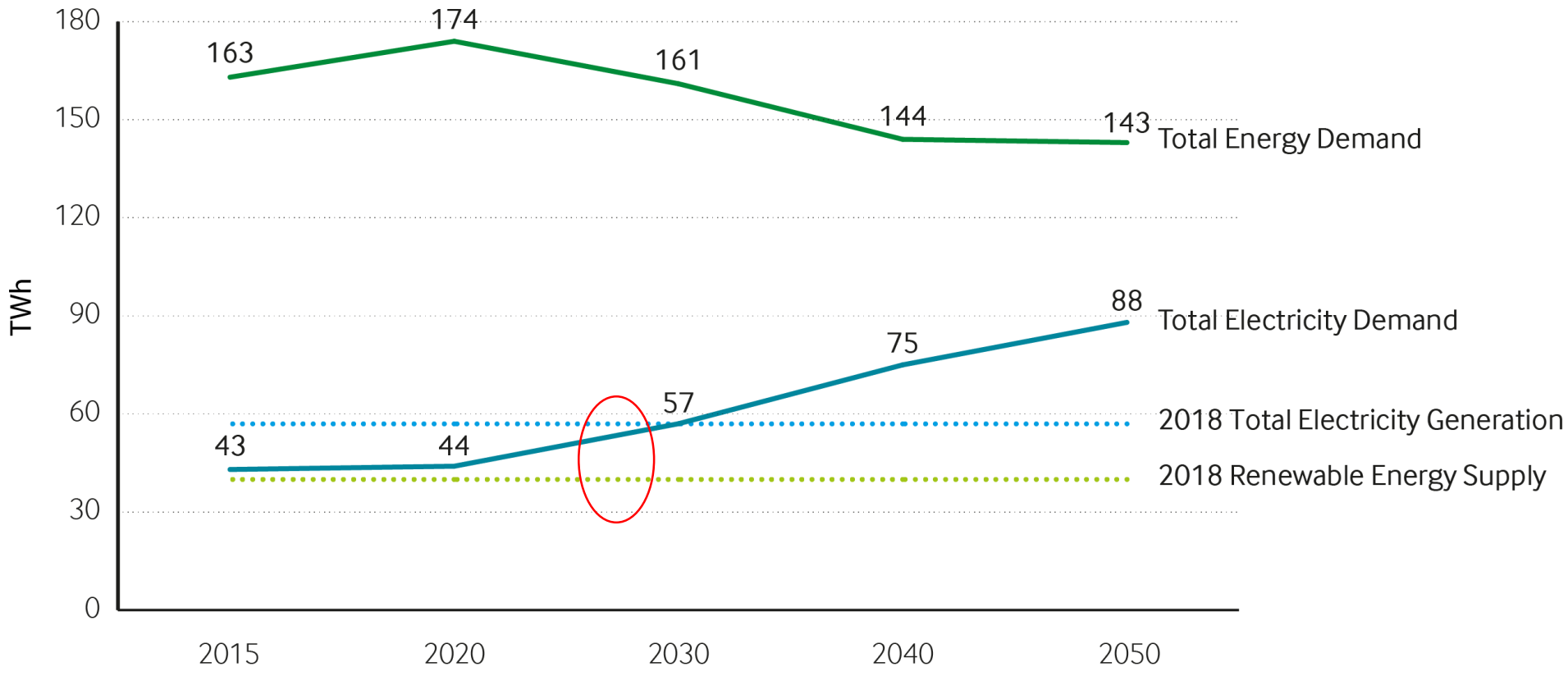
The peak challenge without peaker support



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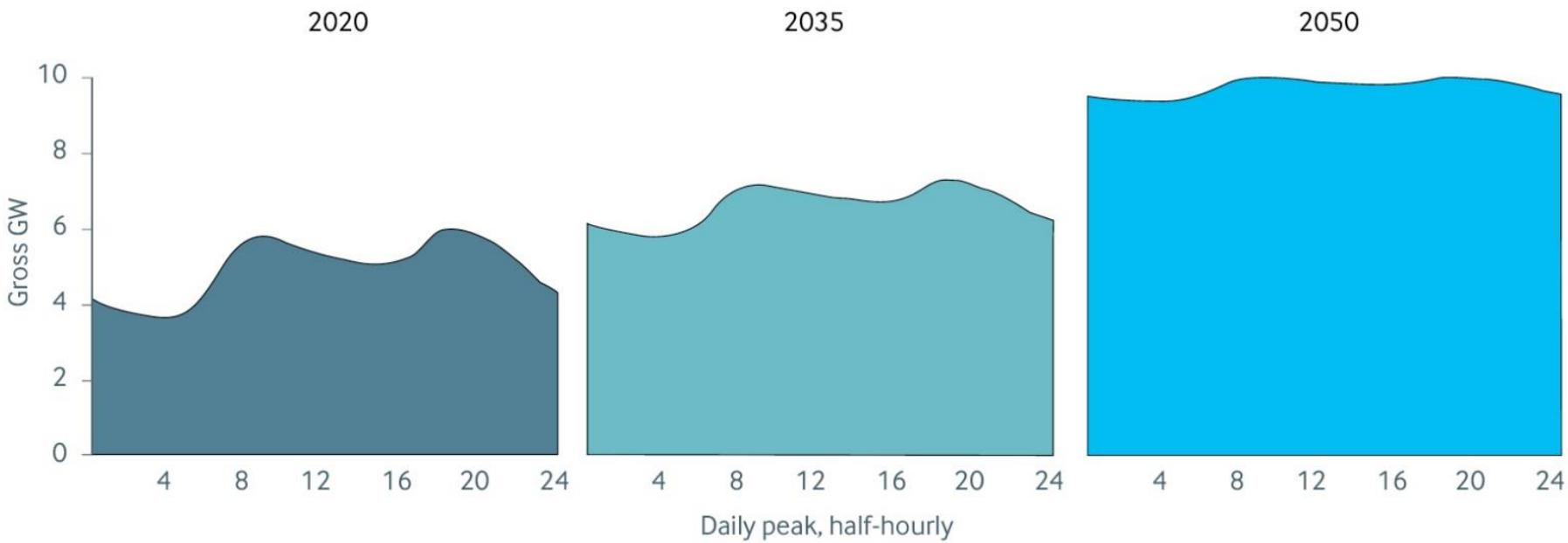
The peaks will be larger but smoother

Exhibit 5: **Average daily winter load profile estimated**



Note: Analysis based on average winter day, not the most "peaky" day of the year.

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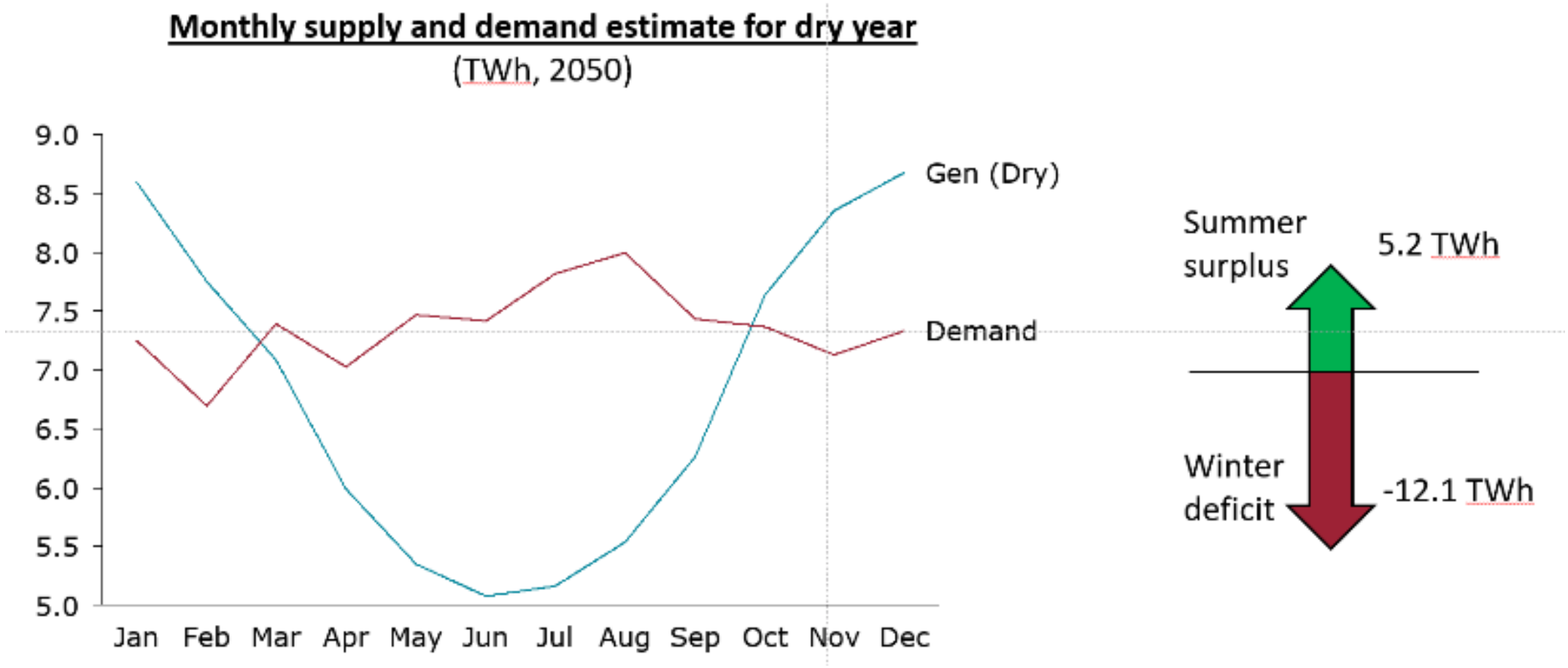
A growing deficit



Investment, policy, innovation will be critical

Exhibit 16: **Estimated additional connection requirements by 2050**

Generation type	Installed capacity (MW)	Avg. MW/project	Number of projects
Wind	4670	126	37
Hydro	798	40	20
Geothermal	1455	73	20
Marine	1000	100	10
Utility solar	1370	152	9
Total	9293	97	96

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Regulatory settings need to change to enable a decarbonised future

- Network pricing models need to adjust to send the right investment signals to encourage appropriate renewable investment
- Multiple regulators at every level of the electricity supply chain – need to be streamlined and sized appropriately for the specific regulatory tasks
- Current distribution model does not encourage appropriate investment in asset health and systems that are required to ensure distribution networks can handle greater demand and manage growing multi-directional complexity.
- RMA model is ill suited to a world where we must move quickly to solve demand and dry year issues. Particularly in the areas of:
    - consenting for new projects and reconsenting for existing plant
    - Policy and planning for investment

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7 points for a sustainable energy future

1. Utility investors must be prepared to invest in renewable generation
2. Households and businesses must be prepared to contribute as sources for distributed generation and storage
3. Pricing policies and signals must encourage renewable energy supply growth
4. New Zealand must find a solution to the growing winter and dry-year supply deficits
5. Networks must evolve to handle greater demand and manage growing complexity in the power system
6. Skilled people must be trained and retained to deliver the future electricity system
7. A collaborative, staged approach must be taken to realise the most efficient move to a sustainable energy future

DENNIS BARNES

Discussion with the Interim Climate Change Committee

Dennis Barnes, CEO Contact Energy

2 August 2018

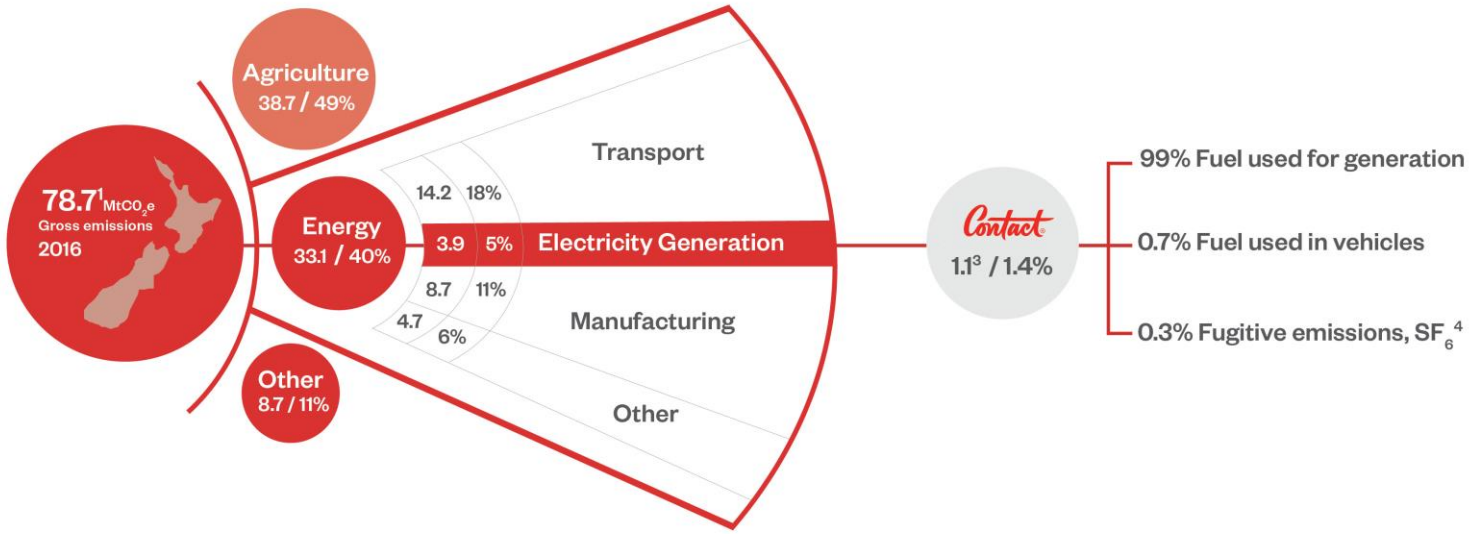
The ICCC has asked five questions

1. Are the Government's objectives for the (electricity) sector achievable?
2. Will a focus on a low emissions energy future get us there?
3. How might this be achieved?
4. What might be done to ensure it is achieved?
5. What does the ICCC need to take into account?

….the talking points that follow are not strictly limited to the two questions that the Minister has set the ICCC

1. Are the Government's objectives for the sector achievable?

The sector has evidenced its capability in delivering lower carbon electricity

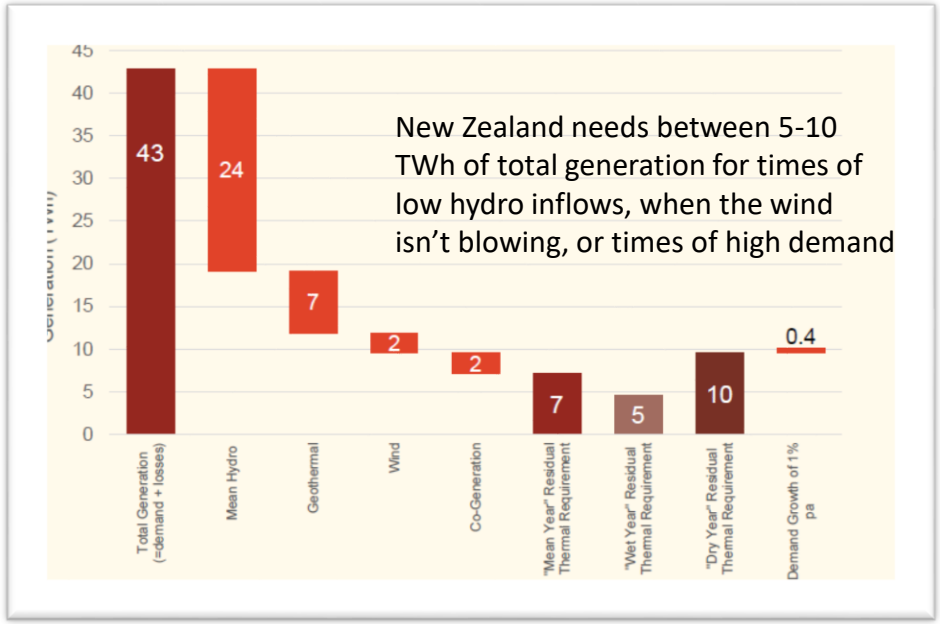


Note all emissions expressed in MtC02e and all percentages are based on total gross New Zealand emissions.
[1] Extrapolated from MFE, emissions figure for Energy (33.1MtC02e), NZ Greenhouse Gas Inventory (1990-2016), Snapshot April 2018.
[2] Energy sector breakdown sourced from Productivity Commission Low Emissions Economy Issues Paper, August 2017.
[3] Contact Energy emissions, FY16, sourced from Annual Report, FY17
[4] SF_6 is used to insulate high voltage switchgear.

- Contact's emissions are 53% lower (FY17 vs FY12) largely due to move from gas to geothermal. This is not just a Contact story
- The industry has achieved below WACC returns (UBS report 31 July 2018)
- Further electricity and energy decarbonisation will be capital intensive, irrespective of whether it is centralised or decentralised

1. Are the Government's objectives for the sector achievable?

At times balancing the system will be more challenging and <u>could</u> be costly



Dry sequences occur quickly in N.Z., often over a short period.

New Zealand's ratio of hydro storage to demand is comparatively quite small; in Norway hydro storage will meet demand for a number of years whilst NZ's total storage will only last for several months.

- Increased renewables are likely to be intermittent but there will be more diversity, supply and demand
- May be expensive relative to other decarbonisation opportunities
  - Contact's modelling suggests exponentially higher costs above 93% renewable but observable technology gains move this inflection point higher

2. Will a focus on a low emissions energy future get us there?

We are convinced that the conversation needs to be at the energy, not electricity, level

- Electricity is an enabler of a low carbon future, not the problem
- The intersection of electricity and energy will be complex
  - Centralised thermal plants run at low capacity factors, any immediate increase in demand may use this latent capacity
  - Energy decarbonisation will be distributed
- The transition will occur at times of major maintenance and contracting decisions
  - This is equally true for energy decarbonisation as it is for thermal plants
  - The next decision points on thermal plant could be sooner than envisaged
    - Taranaki Combined Cycle has 4/5 years of life remaining before spending $50m and any closure/extension decision will be made 2 years in advance

3. How might this be achieved?

Three key elements

1. Stable policy framework
    - Direction of travel is important, certainty is elusive and can have unintended consequences
    - Frequent politically motivated sector reviews create instability and undermine confidence
2. A well funded and independent authority fuelling fact based economy wide debate
3. Market based mechanisms

4. What might be done to ensure its achieved?

Alignment and communication across multiple many interested parties and agencies

- Cross party support
- Co-ordination across multiple government policy areas
- Be adaptive, technology will continually offer opportunities
- An economy wide, internationally linked Emissions Trading Scheme
- Adopt globally recognised frameworks and methodologies
  - Contact is a signatory to the Science Based Target Initiative (SBTi) and complies with the Task Force on Climate related Financial Disclosures (TCFD)
  - A New Zealand marginal abatement curve, recognising the imperfection in this methodology, may be a useful policy prioritisation tool

5. What does the ICCC need to take into account?

Many things

- Decarbonisation is a supply and demand question
  - The recent offshore exploration ban seems to have considered supply only
- Less informed or biased business, societal and political commentary
  - Costs
  - Transitionary effects, e.g. what if there is more spill?
- The blurring of the lines between natural monopolies and markets, and what that means for regulation
  - The current wholesale market will need to evolve
- Long term budgets are important but technology will continually offer opportunities
- Capital markets confidence

The ICCC has asked five questions

1. Are the Government's objectives for the (electricity) sector achievable?
   - Yes, but the objective should be subordinate to the decarbonisation of all energy
2. Will a focus on a low emissions energy future get us there?
   - Yes, and we are a capable and well funded enabler of decarbonisation
3. How might this be achieved?
   - Through stable policy, informed debate and a markets first approach
4. What might be done to ensure it is achieved?
   - Co-ordinated effort
5. What does the ICCC (and Commission) need to take into account?
   - Many things

FRASER WHINERAY

Towards Energy Freedom

Presentation to the Interim Climate Change Committee

Mercury

2 AUGUST 2018

Presentation for discussion

WHAT IS THE RIGHT QUESTION?

ENERGY FREEDOM

↓

ENERGY (NOT ELECTRICITY) TRILEMMA

↓

WHY GET TO 100% RENEWABLE ELECTRICITY?

↓

HOW TO GET TO 100% RENEWABLE ELECTRICITY

THE FUNDAMENTALS (WHICH CANNOT BE TAKE FOR GRANTED)

WATER FREEDOM ✓

FOOD FREEDOM ✓

ENERGY FREEDOM ✗

- Electricity ✓
- Gas ✓
- Liquid petroleum (+ derivatives) ✗
- Coal ✓

MANY INTER-RELATED PIECES

Policy / Announcements

> 100% renewable electricity (in an average hydrological year) by 2035

> Net zero carbon emissions for New Zealand at 2050

> Offshore oil and gas ban on new exploration

> NZ joins Powering Past Coal Alliance committing to phasing out coal for electricity generation (by 2030)

> Genesis to close Huntly rankines by 2030

> Meridian's supply contract with Tiwai ends 2030

> Transport policies

Reviews

> Productivity Commission review into Transitioning to a Low Emissions Economy (April 2018)

> Interim Climate Change Committee

> Climate Commission

> Electricity Pricing Review

JOINING THE PIECES

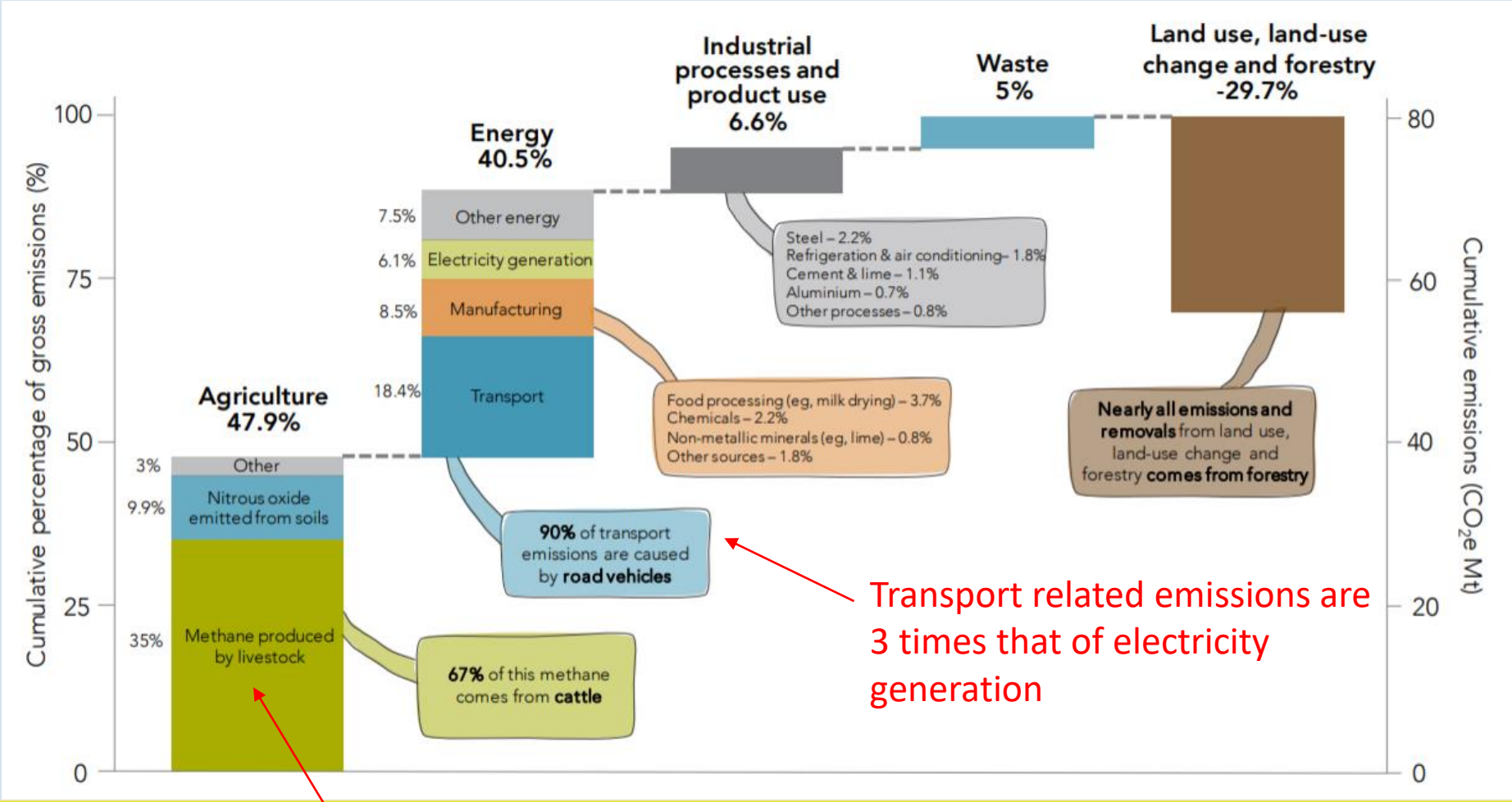
> Electricity the solution not the problem

> Productivity Commission estimates an additional 50% in electricity generation (20TWh) is required by 2050

> Transport electrification and process heat the low hanging fruit for emissions reduction

> We have only limited time and resources

TRANSPORT A KEY OPPORTUNITY FOR EMISSIONS REDUCTION



Transport related emissions are 3 times that of electricity generation

Emissions reduction currently highly challenging in Agriculture

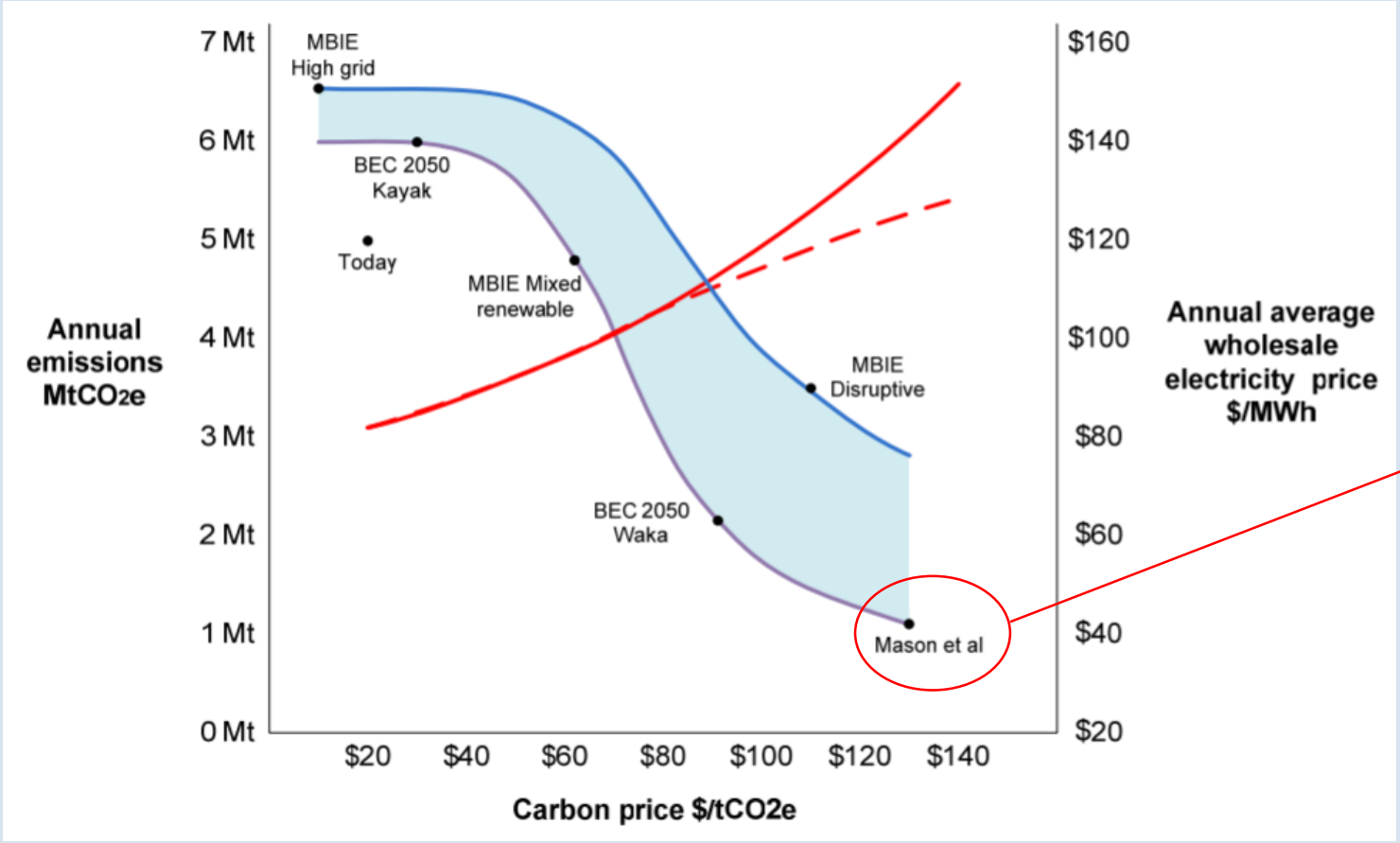
Source: Productivity Commission

AIMING FOR 100% RENEWABLE ELECTRICITY MAY LEAD TO MORE EMISSIONS FOR NZ

"If reducing emissions from electricity generation significantly increases the cost of electricity, this could delay the electrification of other sectors where the reductions are potentially larger. The cost of reducing electricity emissions is therefore material not only for the effects on electricity consumers, but also for effects on the overall efficiency of emissions reductions across the economy"

Source: Productivity Commission Report pg 321

NOT FEASIBLE TO REDUCE GROSS ELECTRICITY EMISSIONS TO ZERO

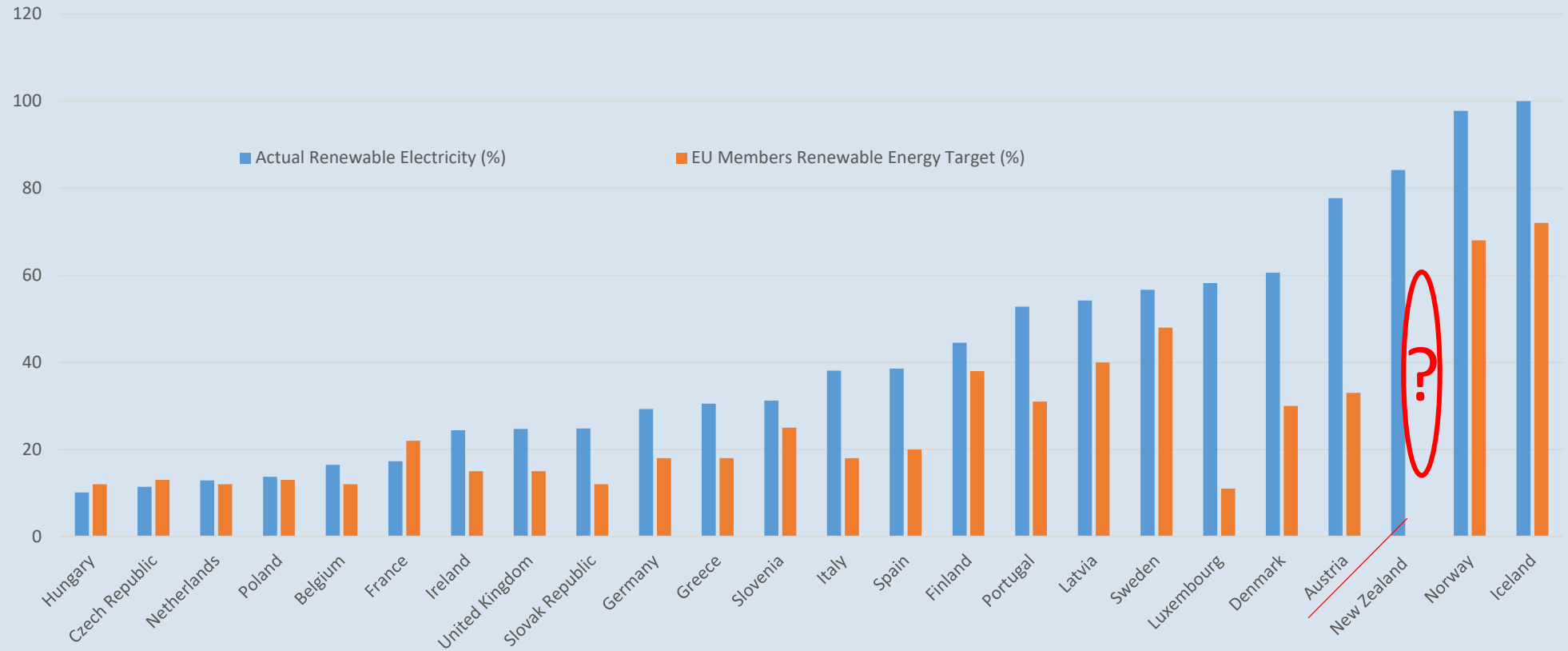


Even the most aggressive scenario still required thermal generation for dry year risk

Substantial increases in consumer costs from partially loaded renewables

Source: Sapere (2018) Transitioning to zero net emissions by 2050: moving to a very low-emissions electricity system in New Zealand pg 121

WE ARE MISSING SOMETHING…



WE NEED A RENEWABLE ENERGY TARGET

Source: IEA Renewables Data 2017 / Eurostat
EU members target an average 20% share of their gross final energy consumption (includes electricity, heating and cooling and transport) to come from renewable sources by 2020

RENEWABLE ENERGY TARGET BETTER FOR NEW ZEALAND

- Support from major customers (MEUG)
- What would 100% renewable electricity change for us?
  - Norway and Iceland there already
  - What marginal benefit does it provide these countries?
- However, good to have a challenge to see what shakes out
- Converting that into policy requires the whole system to be considered and at least a post-it note of maths

CARBON

> Beware erroneous price assumptions that lack dynamism on both supply and demand

> New Zealand's largest carbon reduction (2005-2014) delivered by the market naturally through geothermal investment

> We do not have the human and financial capital in the time window to do anything but our best

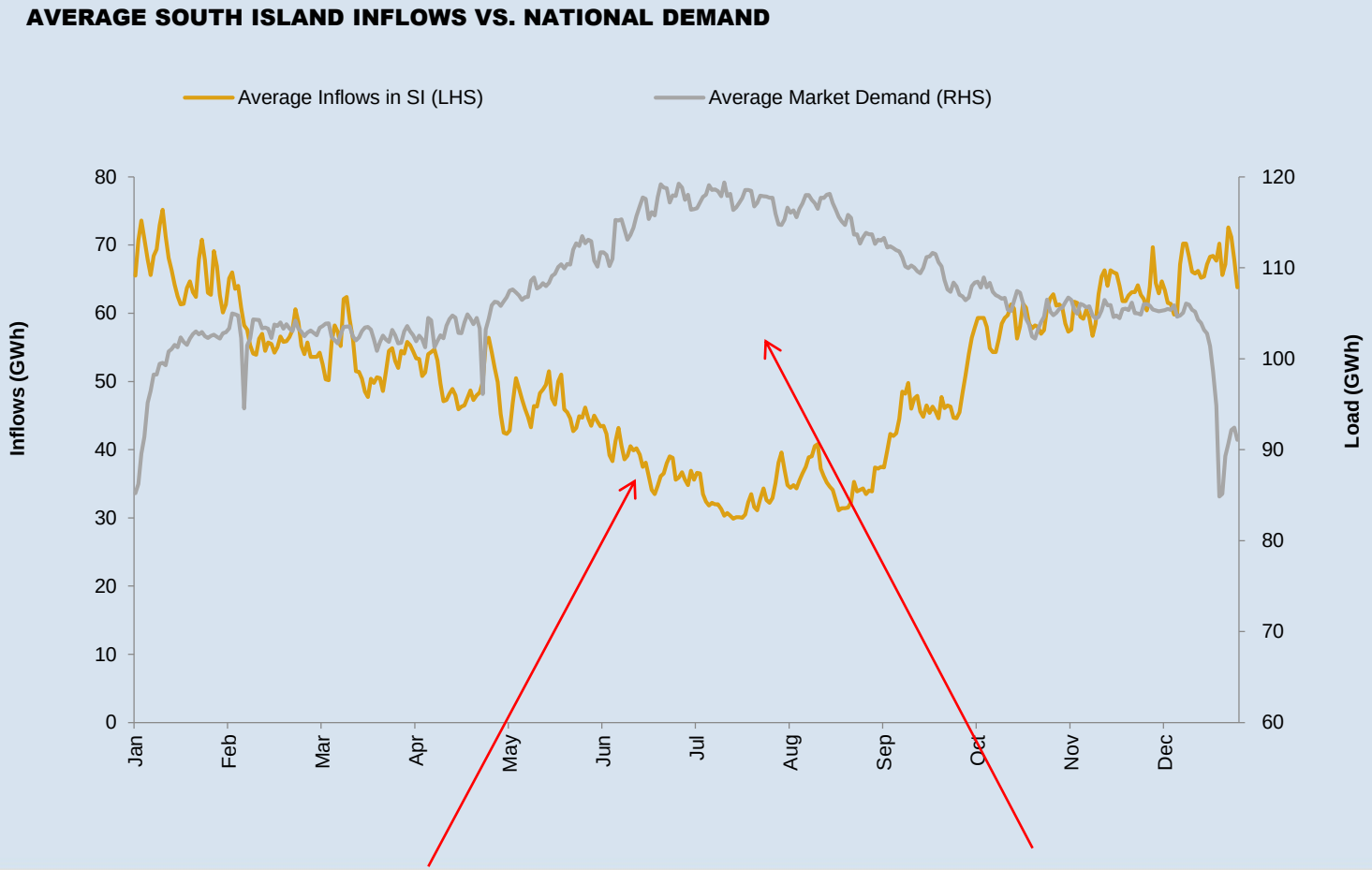
> Every little bit does NOT help

> Mercury is carbon negative

> Systems thinking and disruption not intra-company

> Window dressing won't do for either energy or carbon; it demands scientific rigour

DEEP ENERGY STORAGE IS A UNIQUE REQUIREMENT



South Island inflows reduce in winter as water is locked away in snow

Snow driven gap between demand and supply is why storage is needed in hydro dams as well as currently non-renewable “hydro firming” generation

Current deep storage options

<1TWh	~~Coal storage Huntly 2030 Old plant~~
<1.5TWh	Gas storage
4TWh	Water storage in hydro dams – needs firming in

AVOIDING NON-RENEWABLES FOR DEEP ENERGY STORAGE

Storage:

> Expanded hydro storage (circa 50% or 2 TWh) or more (over long term)

> Batteries ($2 trillion)

Supply / Demand Mix:

> Surplus renewables though over development + variable large user/export

> Doubling power prices to justify partially loaded renewables (not palatable for consumers/country)

> Subsidising last parts of renewability (will lead to atrophy in current plant and system security e.g. UK/Aus)

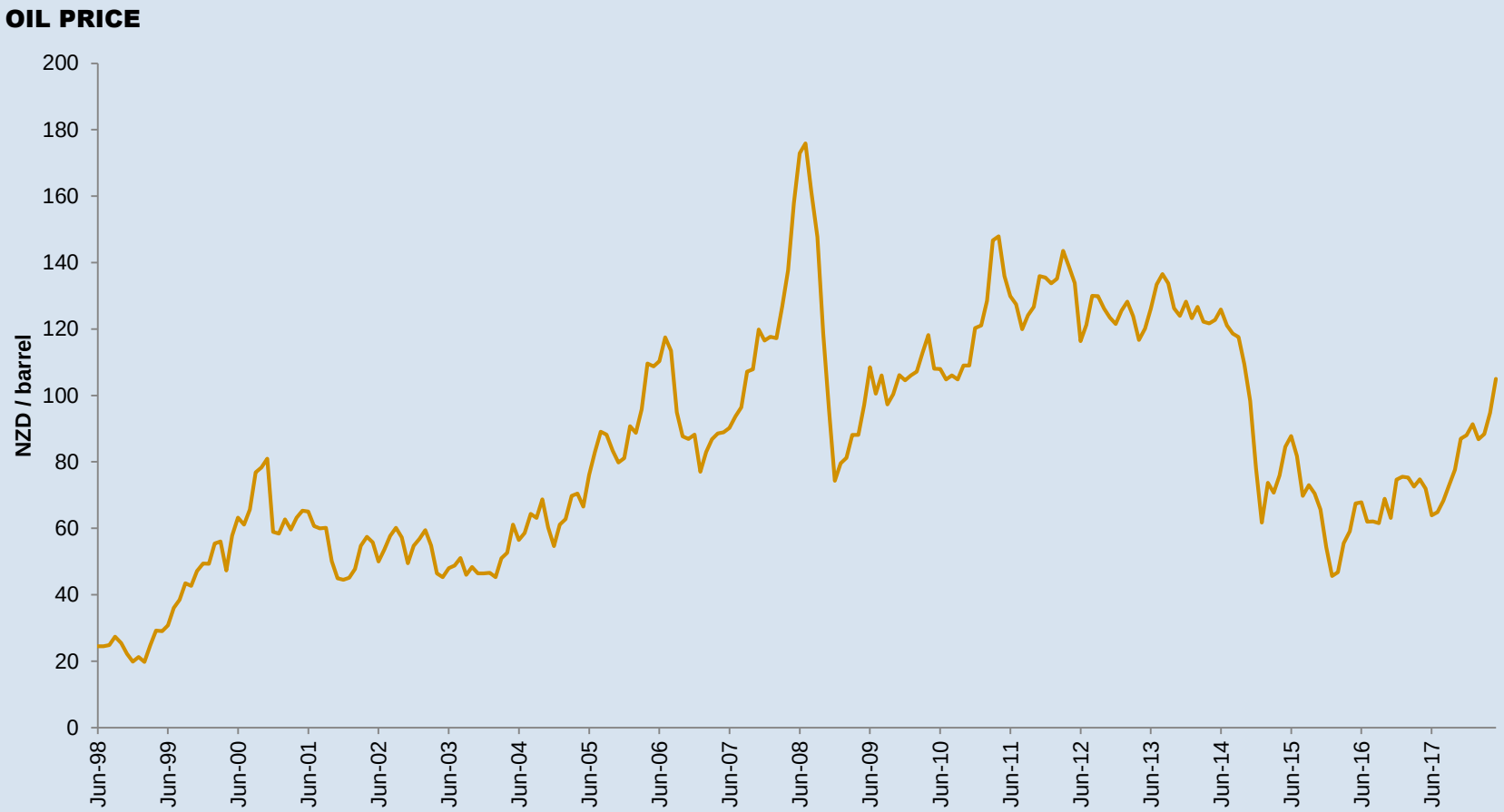
> Flexible demand side (2-3 months), not about peaking but firming

Change target:

> 100% renewable electricity in **wet** years still need non-renewable firming – but what fuel best? Let market decide

> Above 92% will require partially run renewables (in wet years), NB Tiwai

VOLATILITY OF OIL PRICES



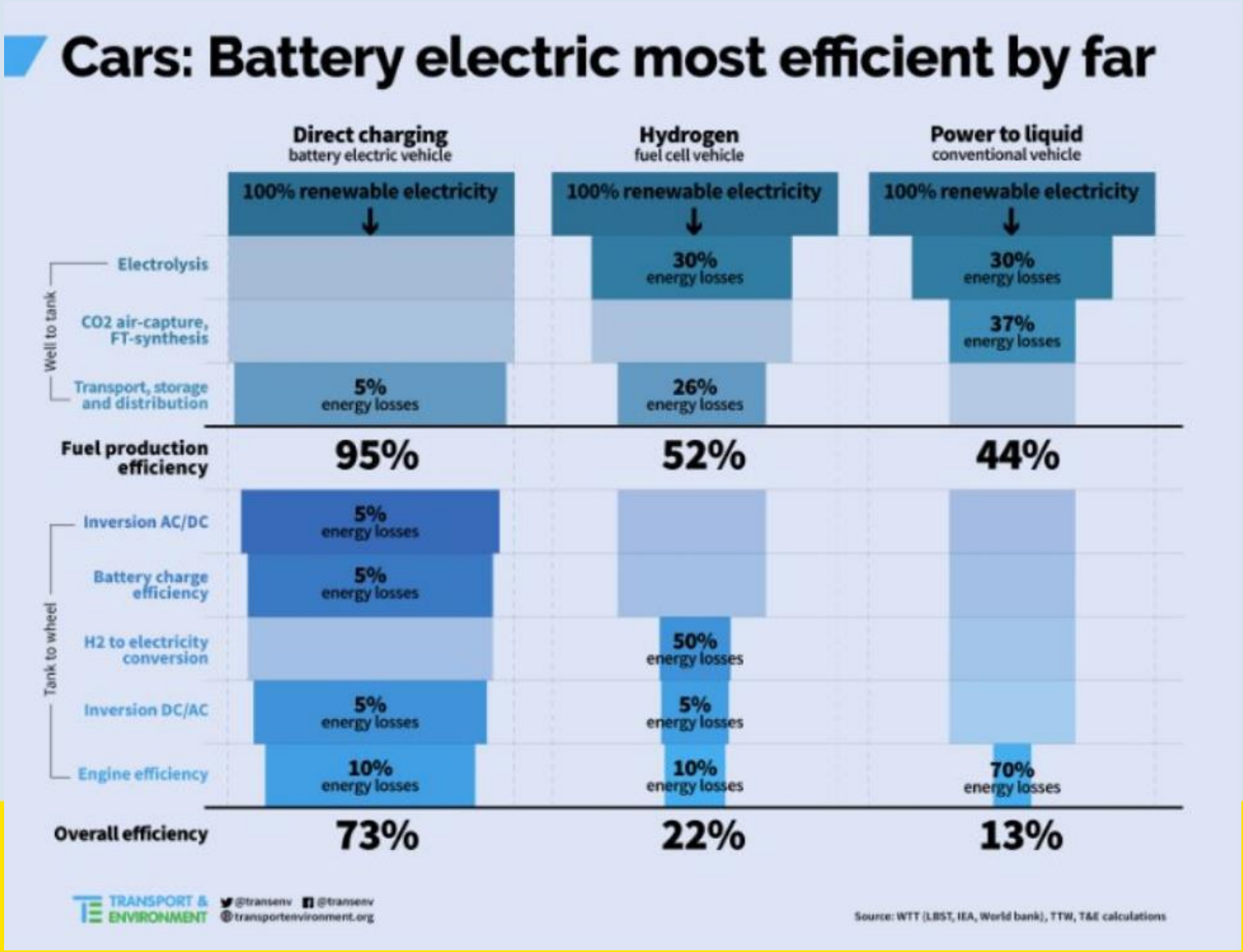
ALTERNATIVE TRANSPORT FUELS (CAR FLEET)

	Electricity	Hydrogen	Biofuels
Delivered cost	0.3$/ℓ	>>$2/ℓ	>$2/ℓ
Renewability	100%	100%[1]	5%
NZ Scalability (fuel availability)	Already consented	Electricity consented[2]	<10% of fleet

[1] Assumes H_2 from renewable electricity

[2] Wire to wheel losses through hydrogen >75% which will require multiples more generation than an EV solution e.g. 20+ TWh vs 7 TWh. Insufficient generation currently consented.

ALTERNATIVE TRANSPORT FUELS



MARC ENGLAND

Decarbonising electricity

The role of the electricity market in addressing climate change
Genesis Energy's insights

About Genesis Energy

— The most integrated energy management company in New Zealand

HUNTLY
948
Peak Capacity/MW

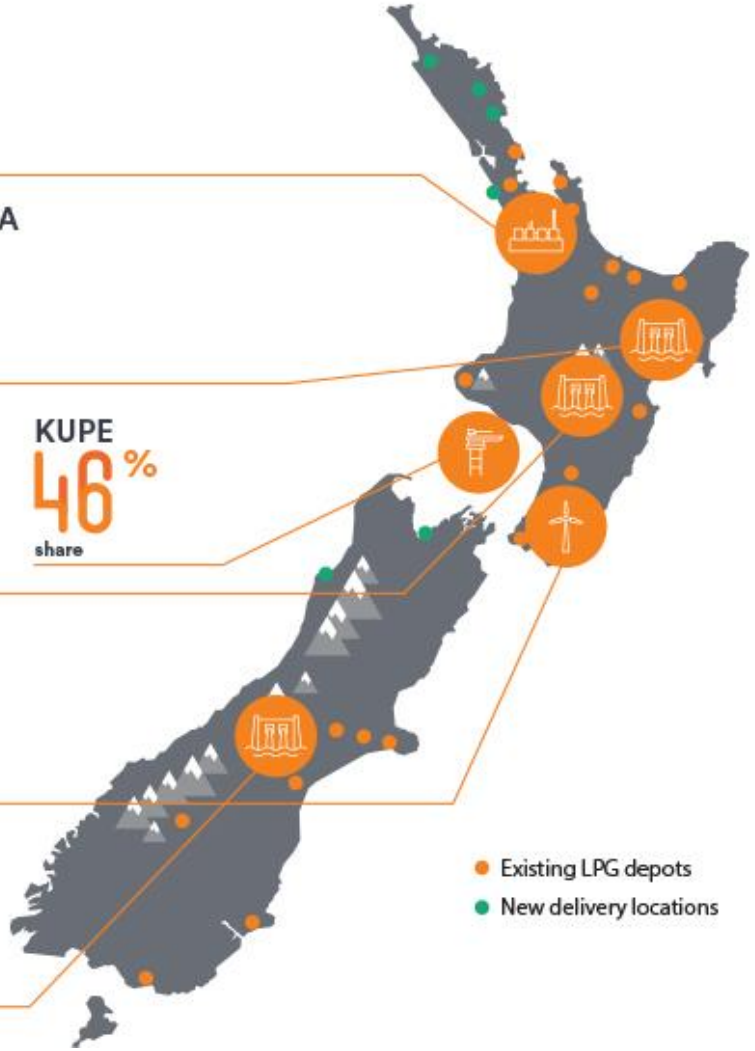
WAIKAREMOANA
138
Peak Capacity/MW

TONGARIRO
362
Peak Capacity/MW

KUPE
46%
share

HAU NUI
8
Peak Capacity/MW

TEKAPO A&B
185
Peak Capacity/MW



510,630
customers

- 25% electricity market share
- 38% gas market share
- 19% LPG market share

1.3
products per customer

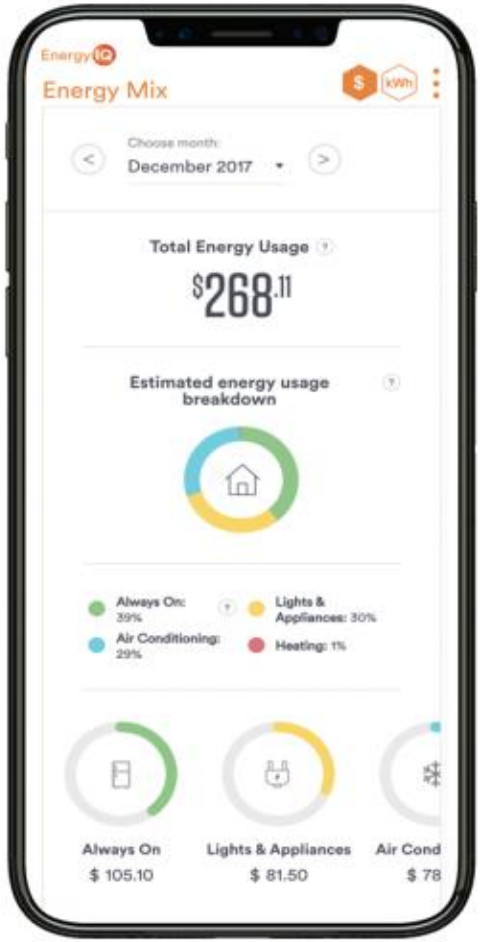
PURPOSE:
reimagine energy to put control in our customers' hands

Information is power

— Energy Management will put control in our customers' hands

Electricity Forecast

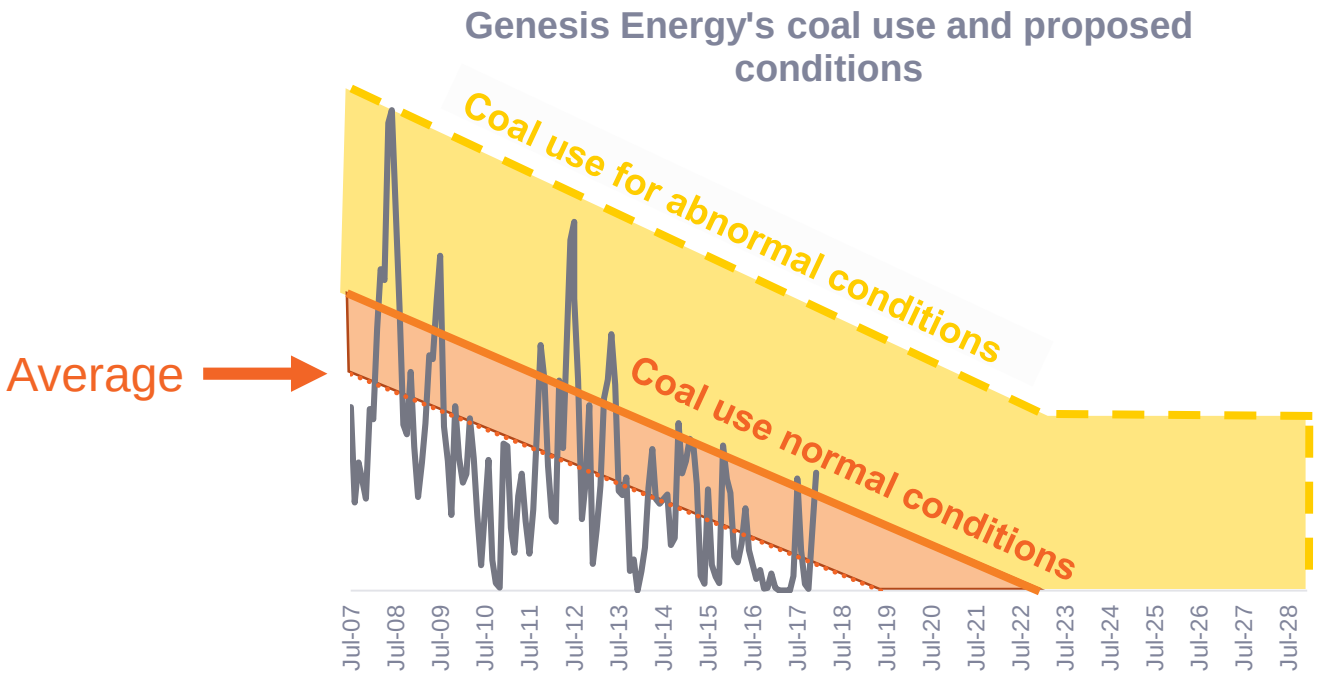
Home Comparison



Energy Mix

We are transitioning out of coal

— A ten year window forwards and backwards points to exit



Since 2008

50% In the past ten years Genesis has halved our emissions

80% cut in coal used

500 MW of thermal generation has been retired since **2012**

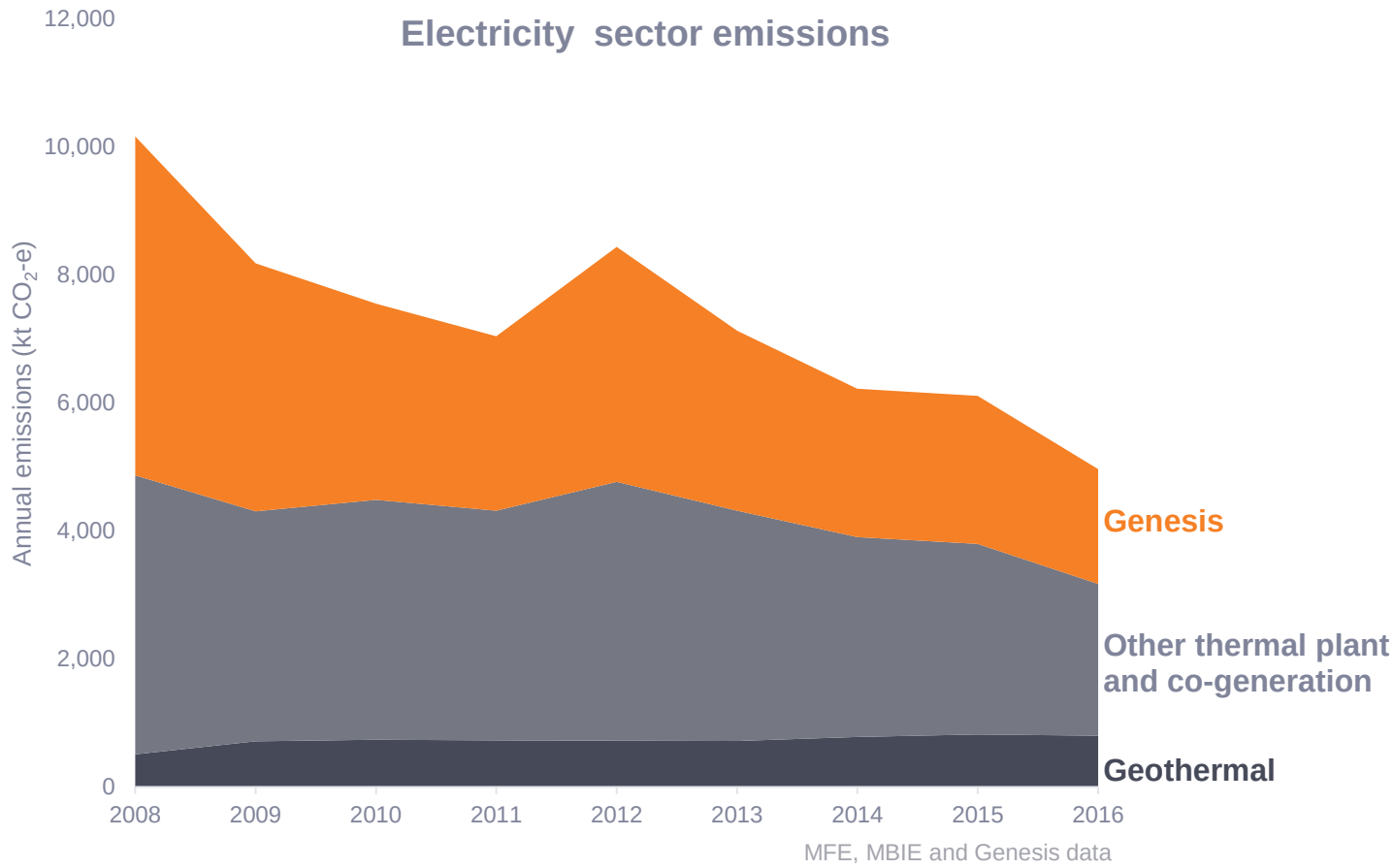
Coal phased out in normal conditions by **2025**

Intention to exit coal by **2030**

but a replacement for its role in the market will be needed

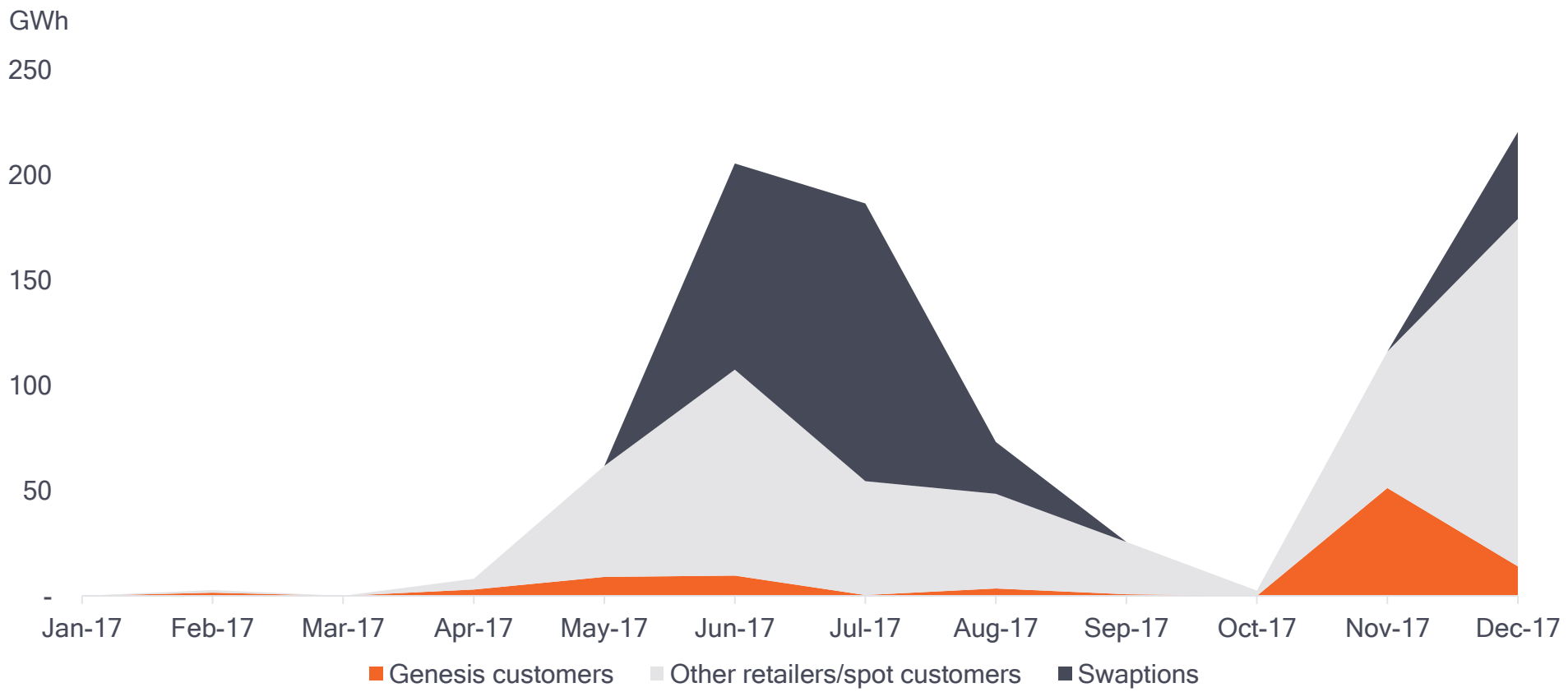
Carbon market is working for electricity

— The electricity sector is decarbonising due to existing commercial drivers



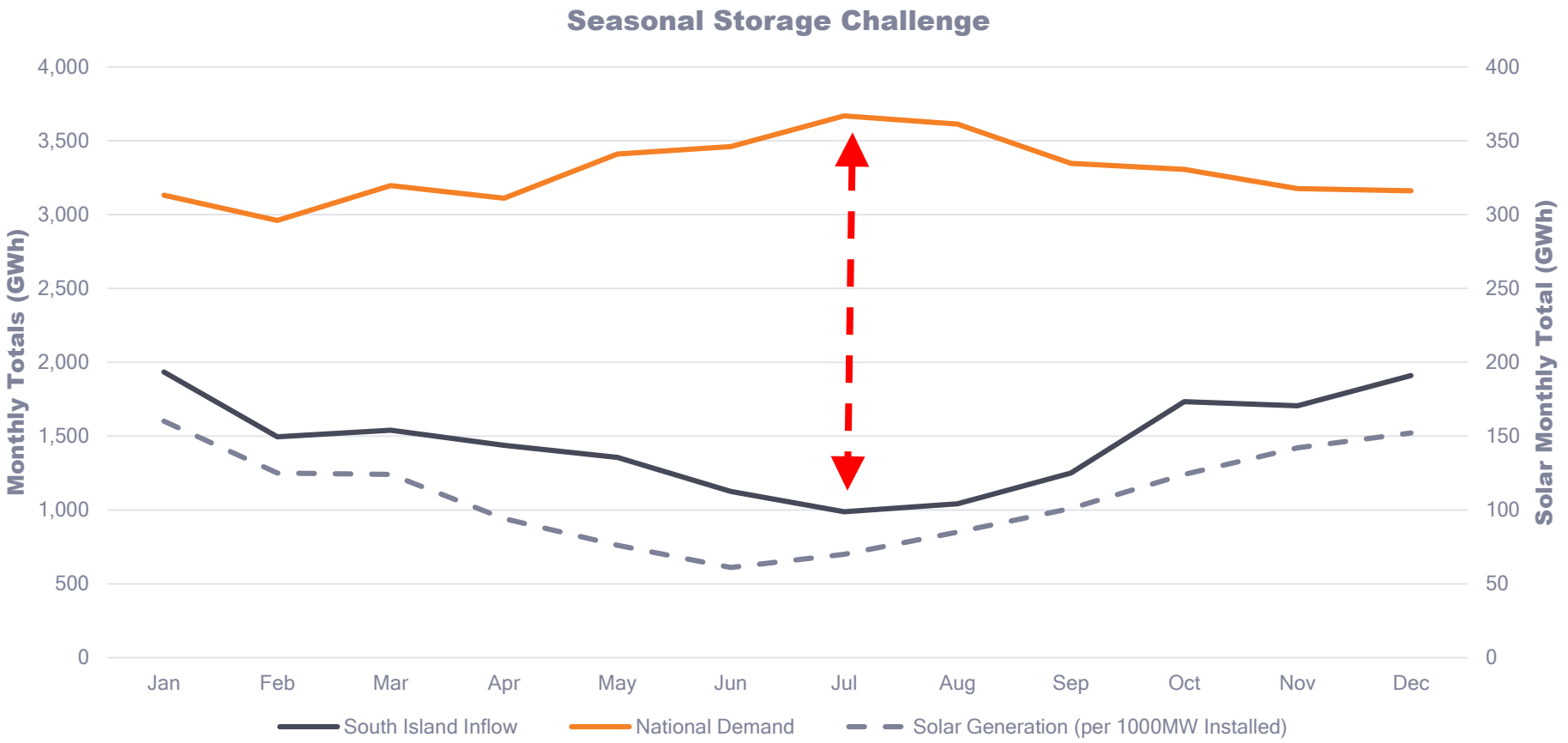
Most Rankine output is not for Genesis customers

— The need for the market is greater than the need for our customers



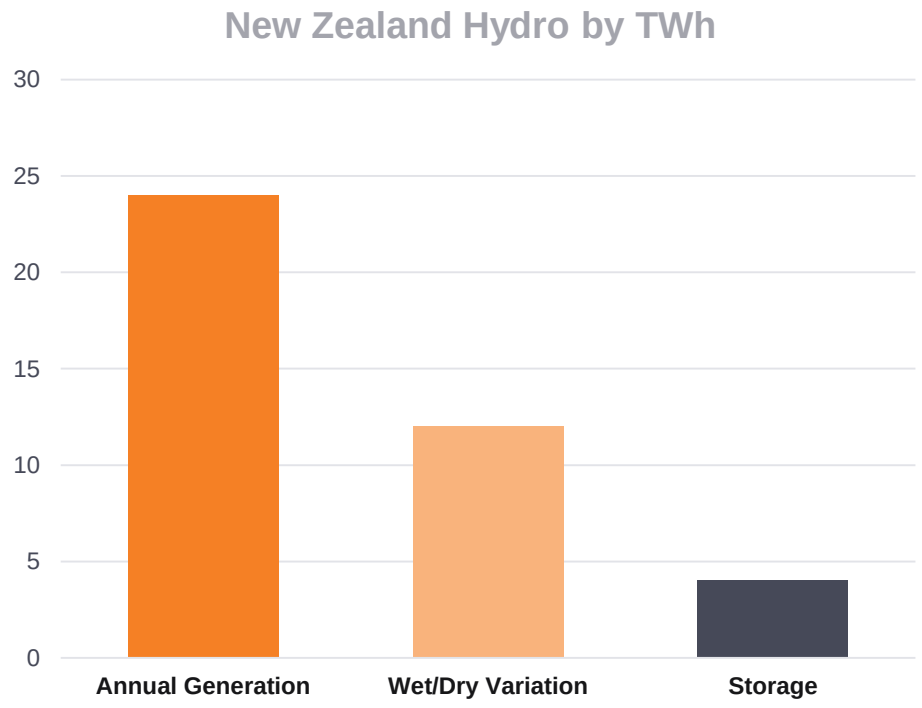
Seasonal demand challenge

— Demand is highest in winter, when southern inflows are the lowest

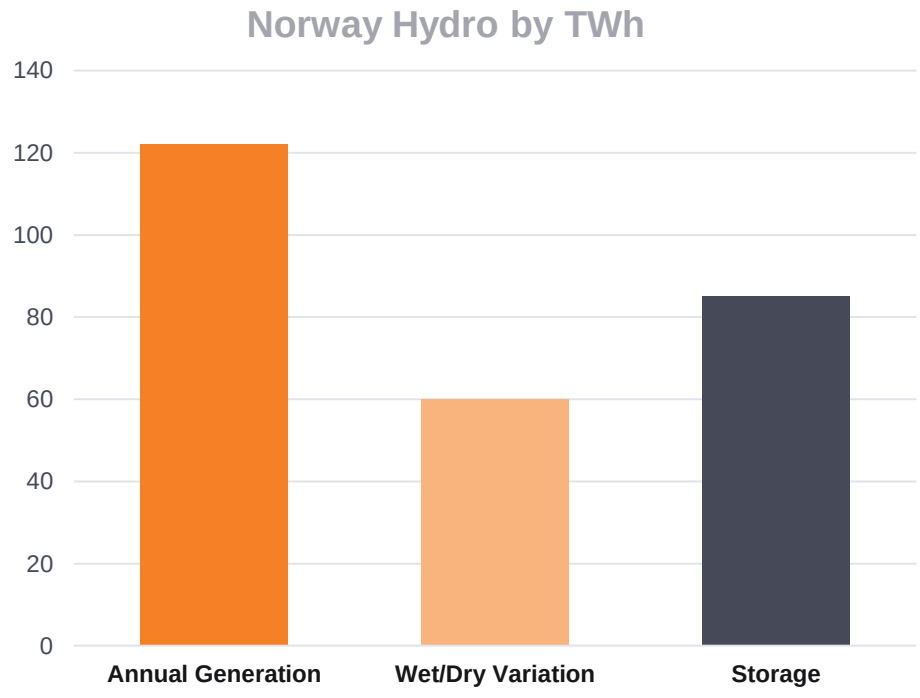


NZ’s hydro storage is too small to manage droughts

— Even with 4 times the relative storage, Norway still only 98% renewable



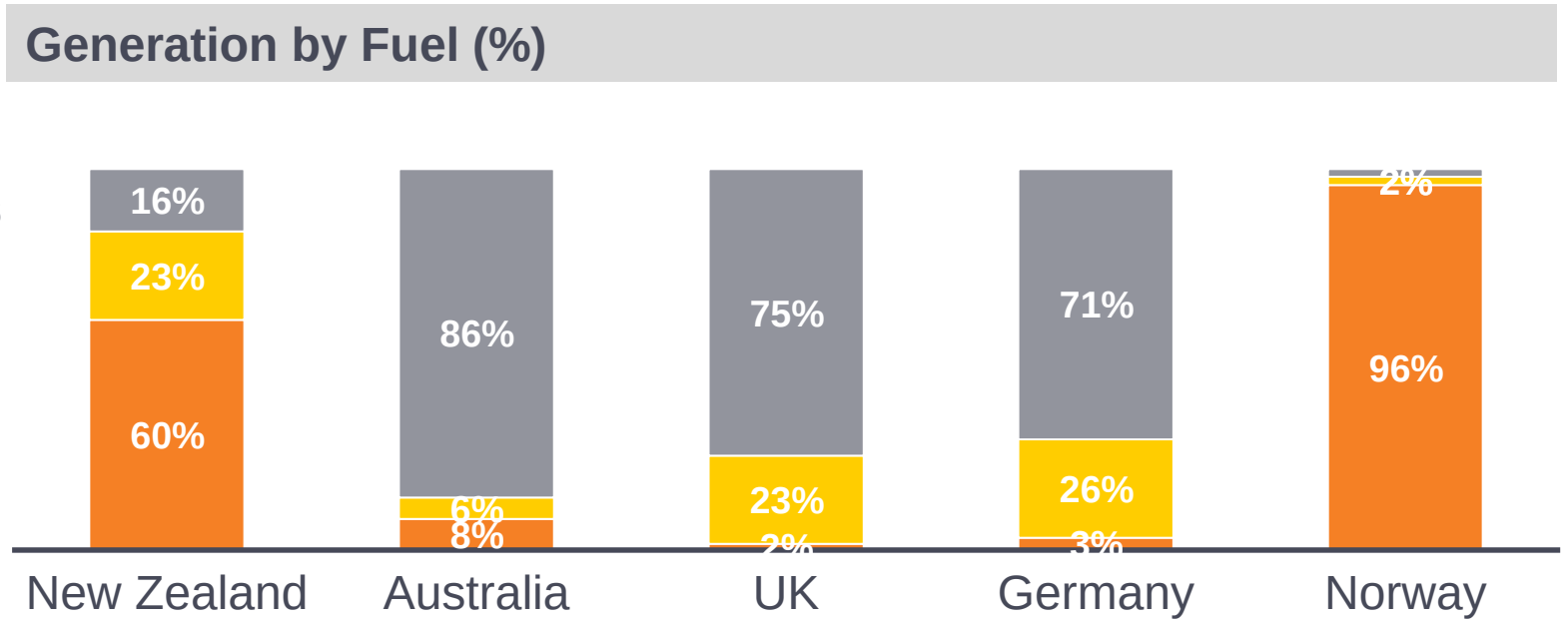
NZ has 2 months hydro storage (85% renewable)



Norway has 8 months hydro storage (98% renewable)

NZ's wholesale electricity market is unique

— Hydro domination creates seasonal, not daily, risks

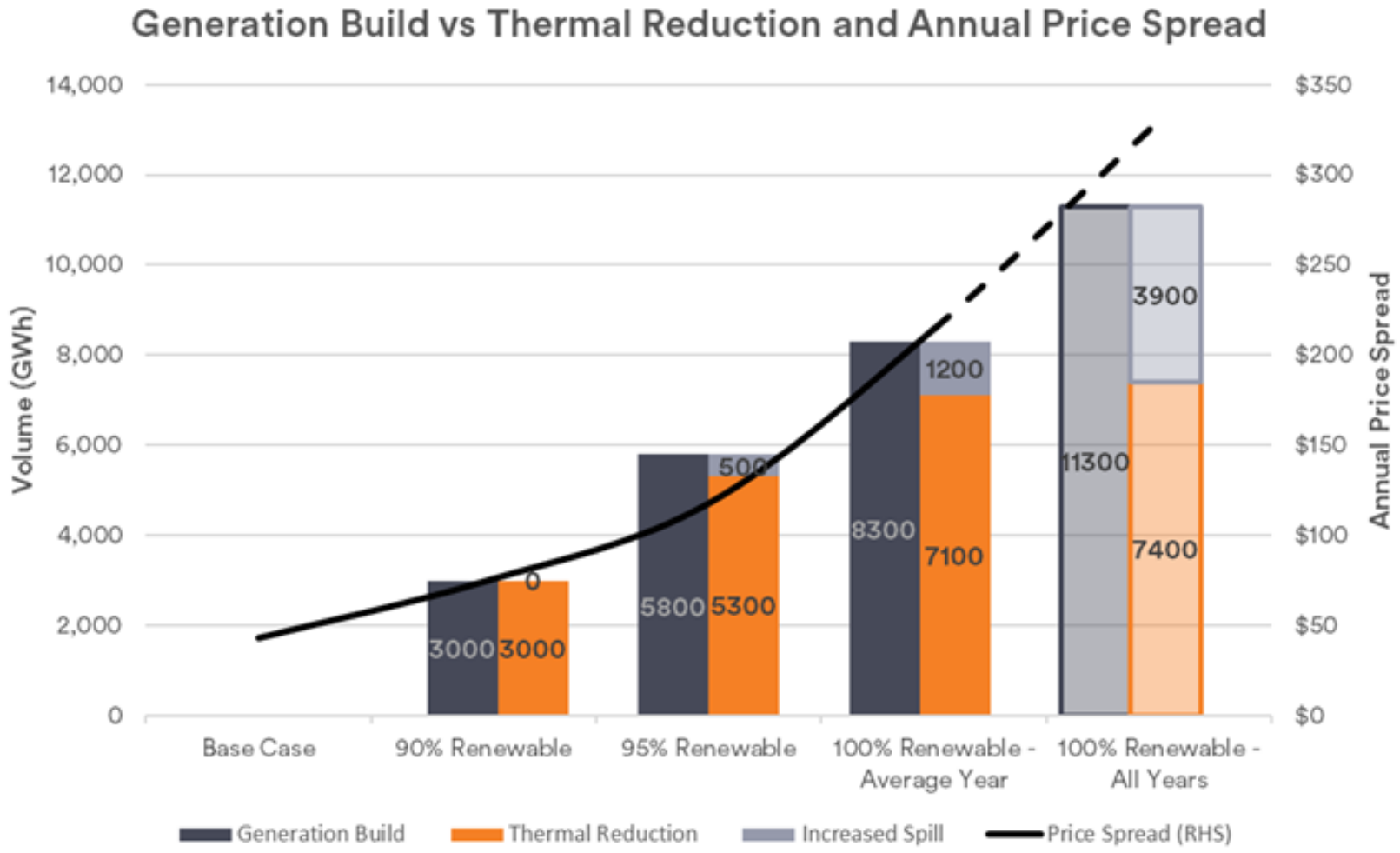


Key challenge	Seasonal & hydrology	Daily swing	Daily swing	Daily swing	-

* CY2016 NZ, Germany, UK ,Australia FY2017, Norway 2015. Sources: MBIE 2017, AER 2017, DBEIS DUKES 2017, AG Energiebilanzen 2017, IEA Norway 2017 Review

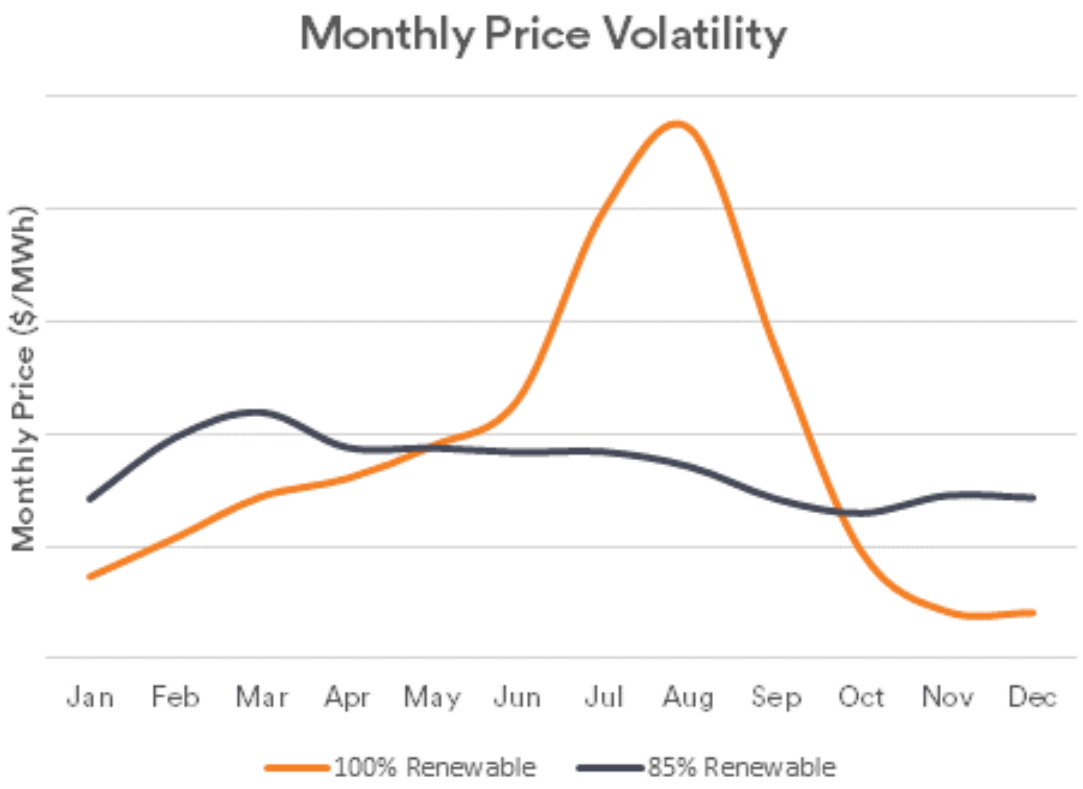
High renewable energy will spill energy

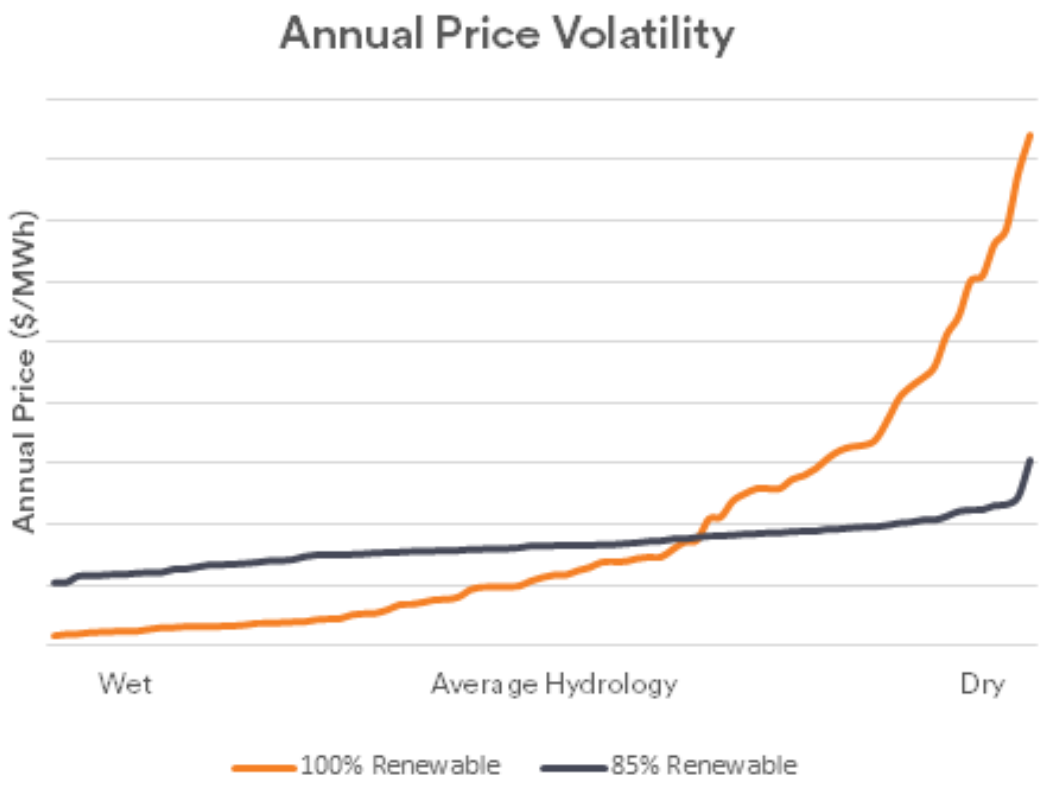
— When does the current market structure start to break down?



High renewable penetration will have challenges

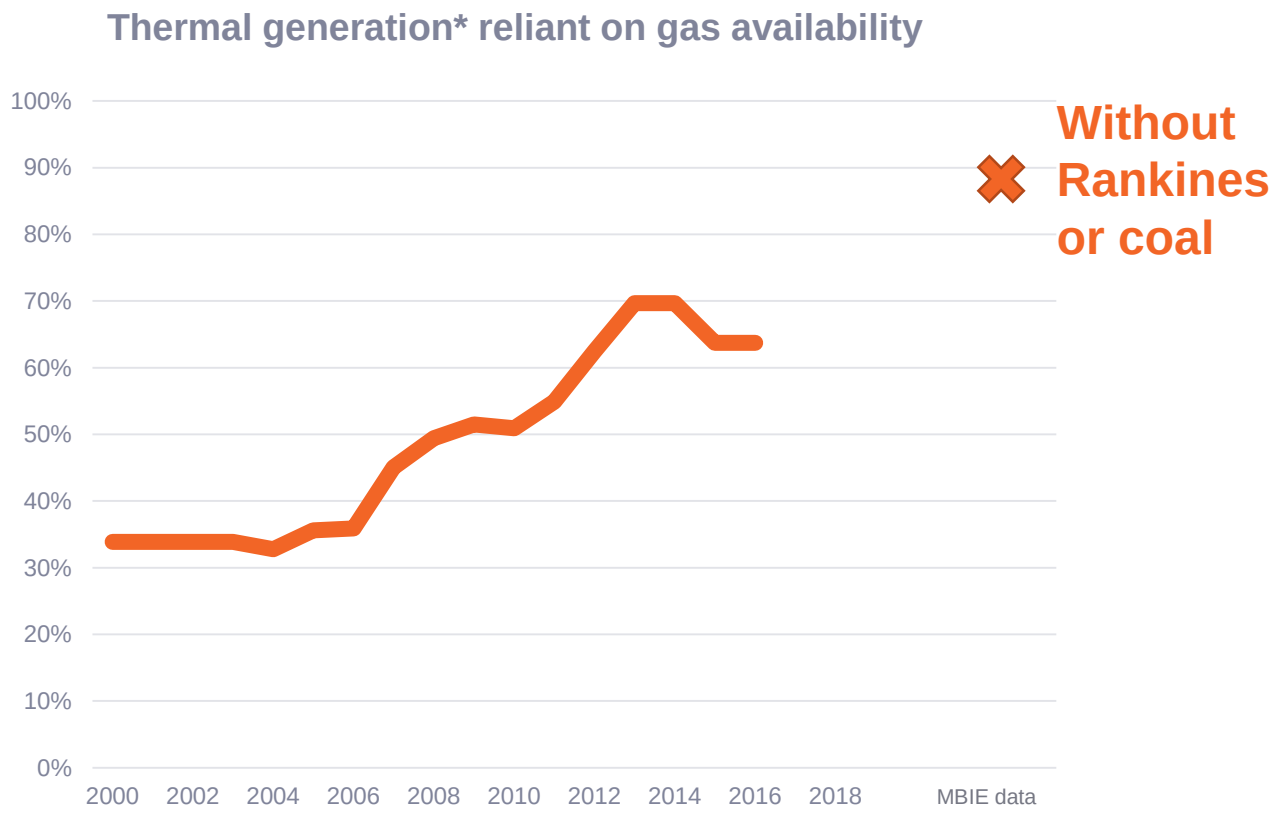
— Price rises 20% on average and becomes much more volatile





Fuel concentration has risk

— **With falling fuel diversity, the electricity market is becoming more exposed to gas availability**



* Excluding co-generation

Reaching 100% exposes risks and challenges

While other countries take early steps toward renewable electricity, NZ is nearing the summit

There are known challenges that could jeopardise our transition if ignored or where new technology or market solutions could help discover a path that others could follow

Dry year support is the hardest to provide

— None of the emerging technologies will help address this problem

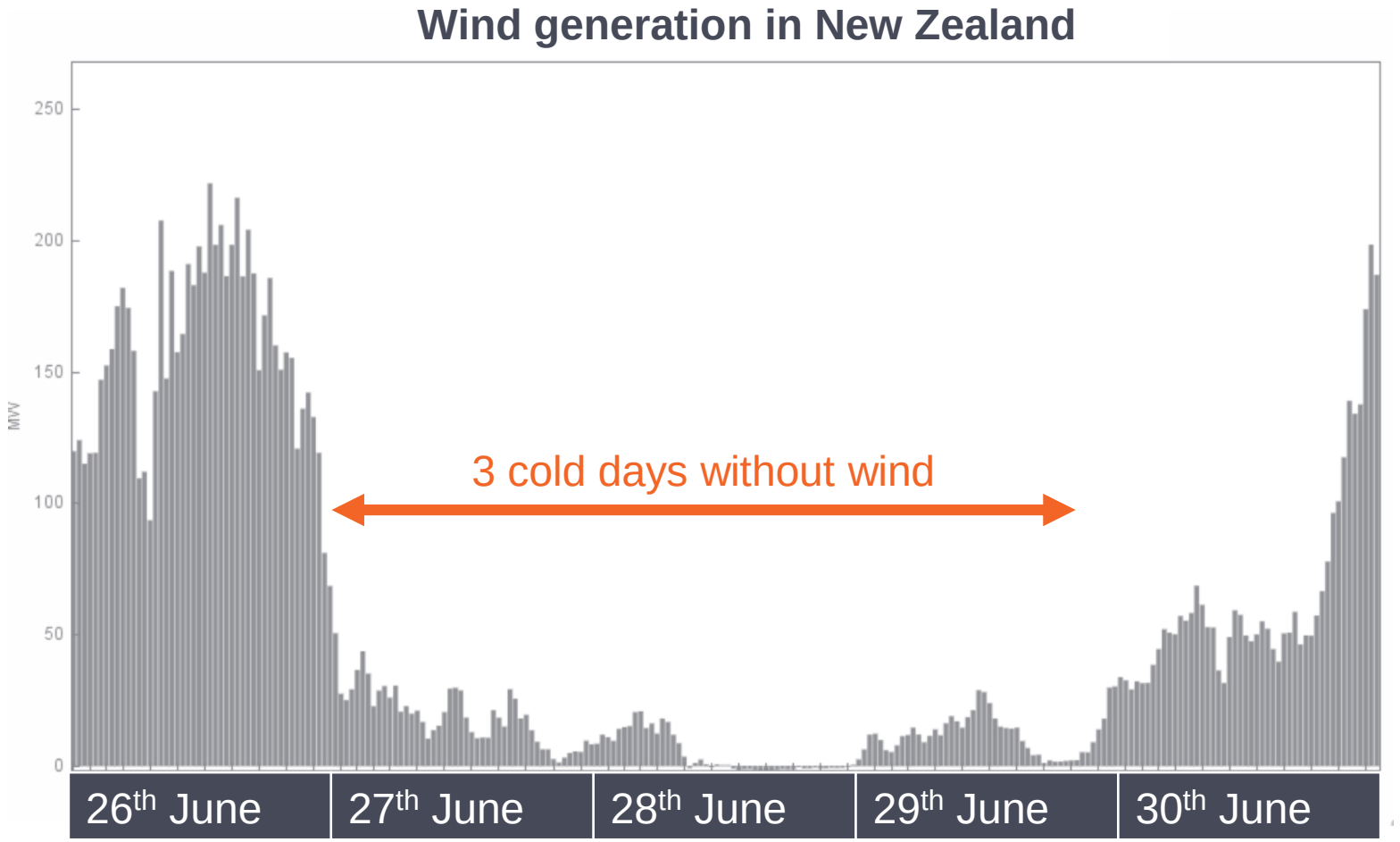
Generation Role	Thermal (Gas OCGT)	Thermal (Gas CCGT)	Thermal (Coal)	Hydro	Geo-thermal	Wind & Solar	Batteries
Baseload Runs 24/7	○	●	●	●	●	○	
Daily Flex Can turn it on/off (or up/down) for a few hours	●	○	●	●			●
Weekly Flex Can turn it on/off (or up/down) for a few days	●	●	●	●			
Dry Year Support Has fuel storage to run in droughts (c. 3000 GWh)	○*	○*	●				

● Always ○ Sometimes

* Requires flexible gas (e.g. large scale gas storage)

More wind will mean greater demands on storage

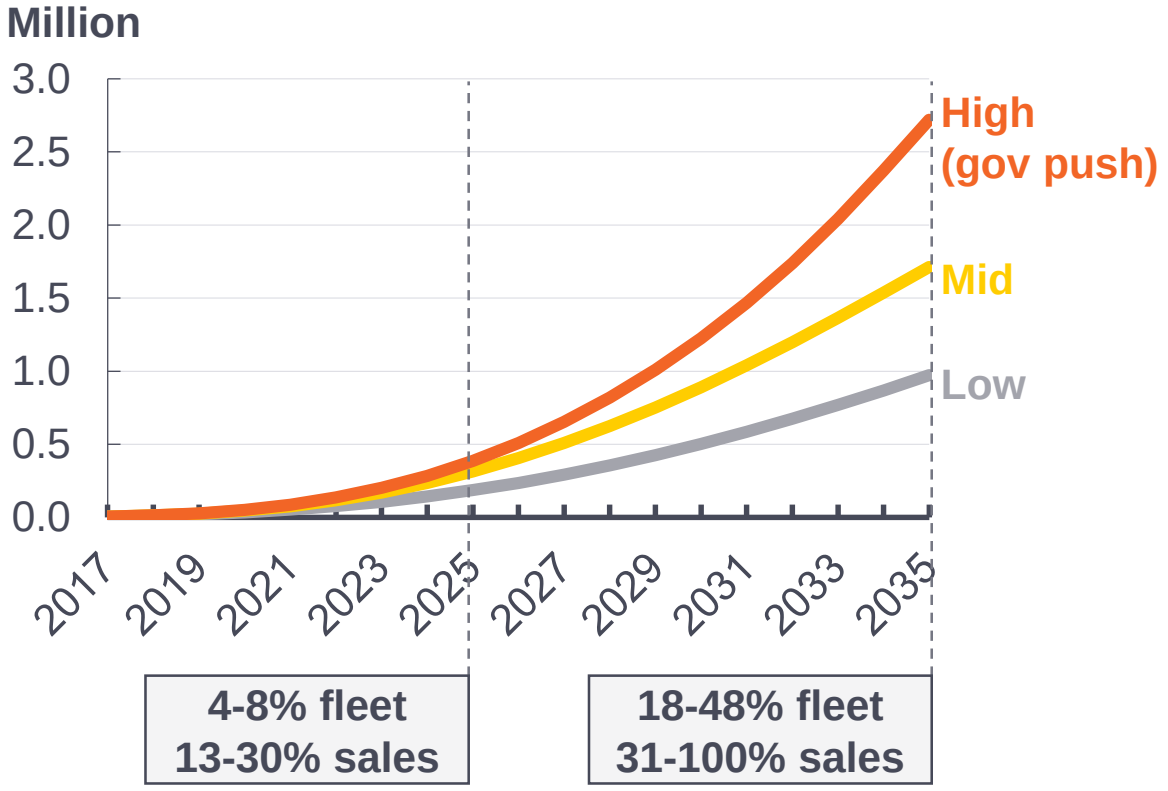
— New Zealand wind farms often experience similar weather conditions



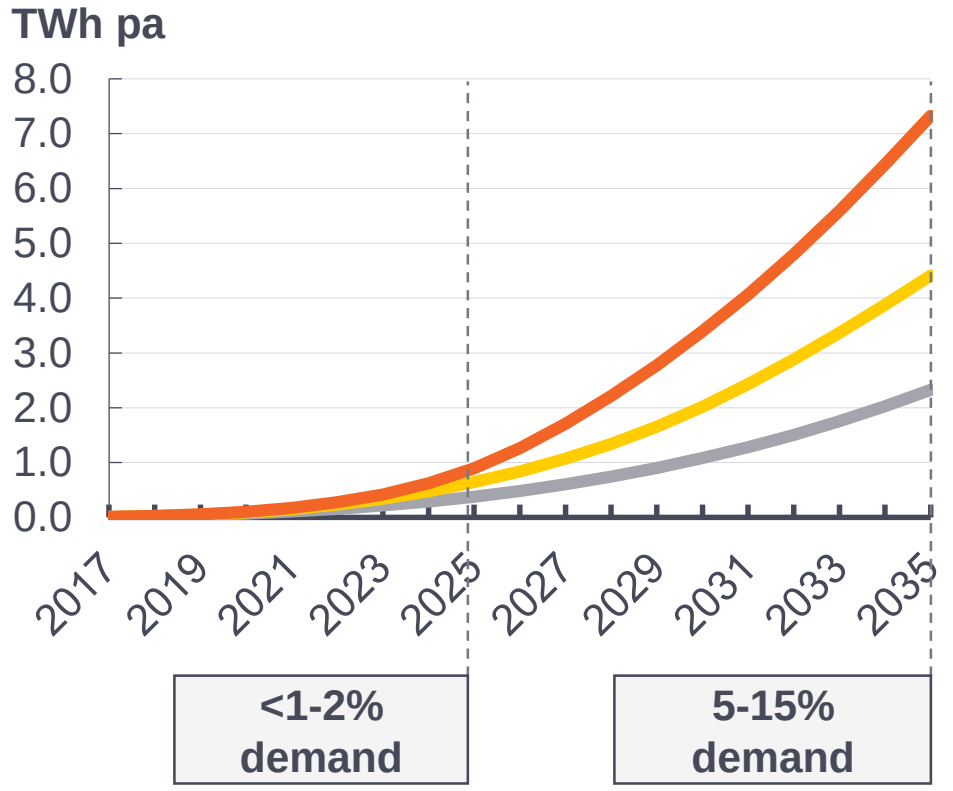
EV have a significant impact long-term

— 2025 impact is small even with fast growth

Uptake - EV fleet*



Generation*



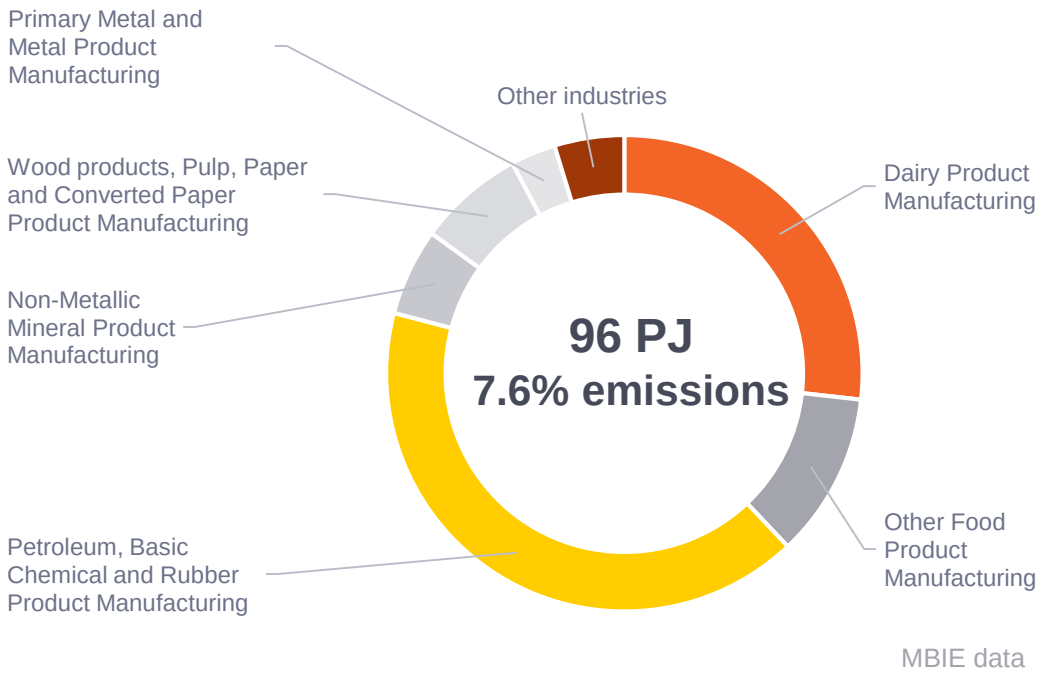
* Increased sharing & automation will reduce fleet size but increase utilisation – two impacts will likely offset for outcome for generation. Utilisation for EVs may be higher vs petrol due to the much lower fuel costs

** Seasonal – net zero. Offsetting: winter poorer battery performance, wet weather makes car work harder but driving hours tend to be higher in summer

Electrifying heat requires low cost electricity

— Industrial customers will have to build a commercial case to change fuels

Industrial fossil fuel use for energy (excl. transport and mobile machinery)

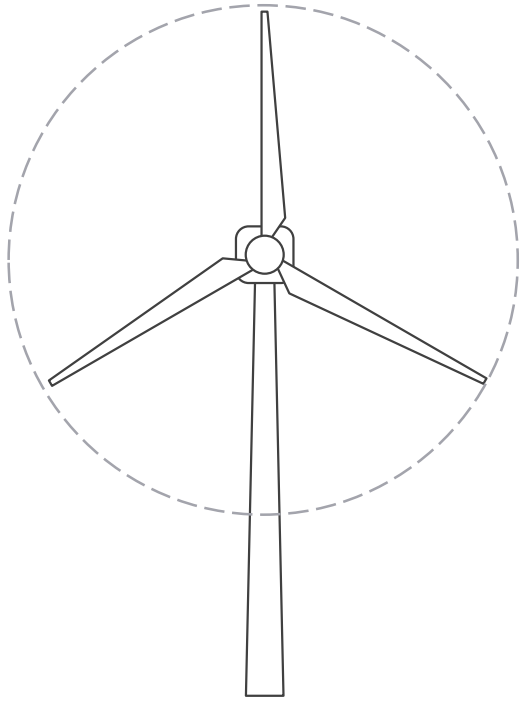


MBIE data

Efficiency adjusted wholesale Energy costs

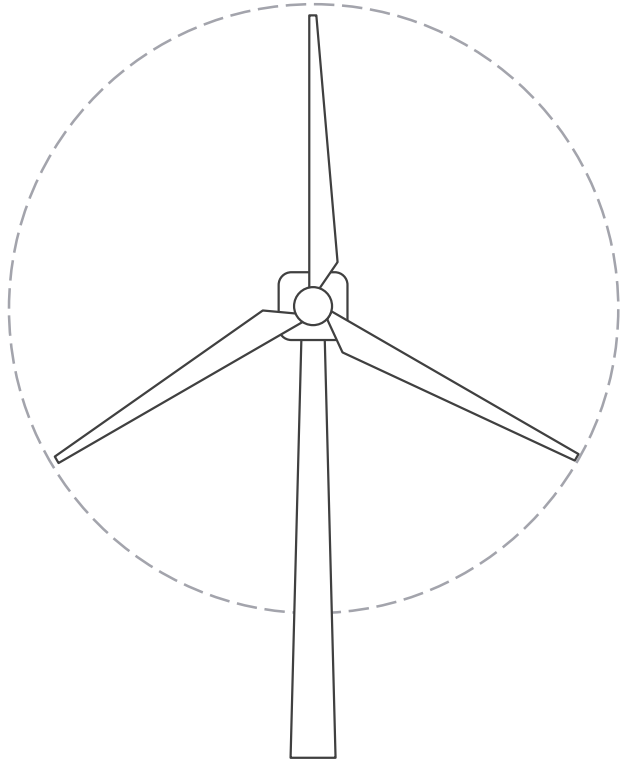
Technology is changing

— **Existing consents may not be the best options, developing as is may lead to suboptimal projects**



2011
90m diameter average

Average turbine diameter has increased 20%*



2016
108m diameter average

* Source US DOE, 2016 Wind Technologies Market Report, wind farms starting commercial operation in the US

860 MW

30,000 ha

>35km from end to end

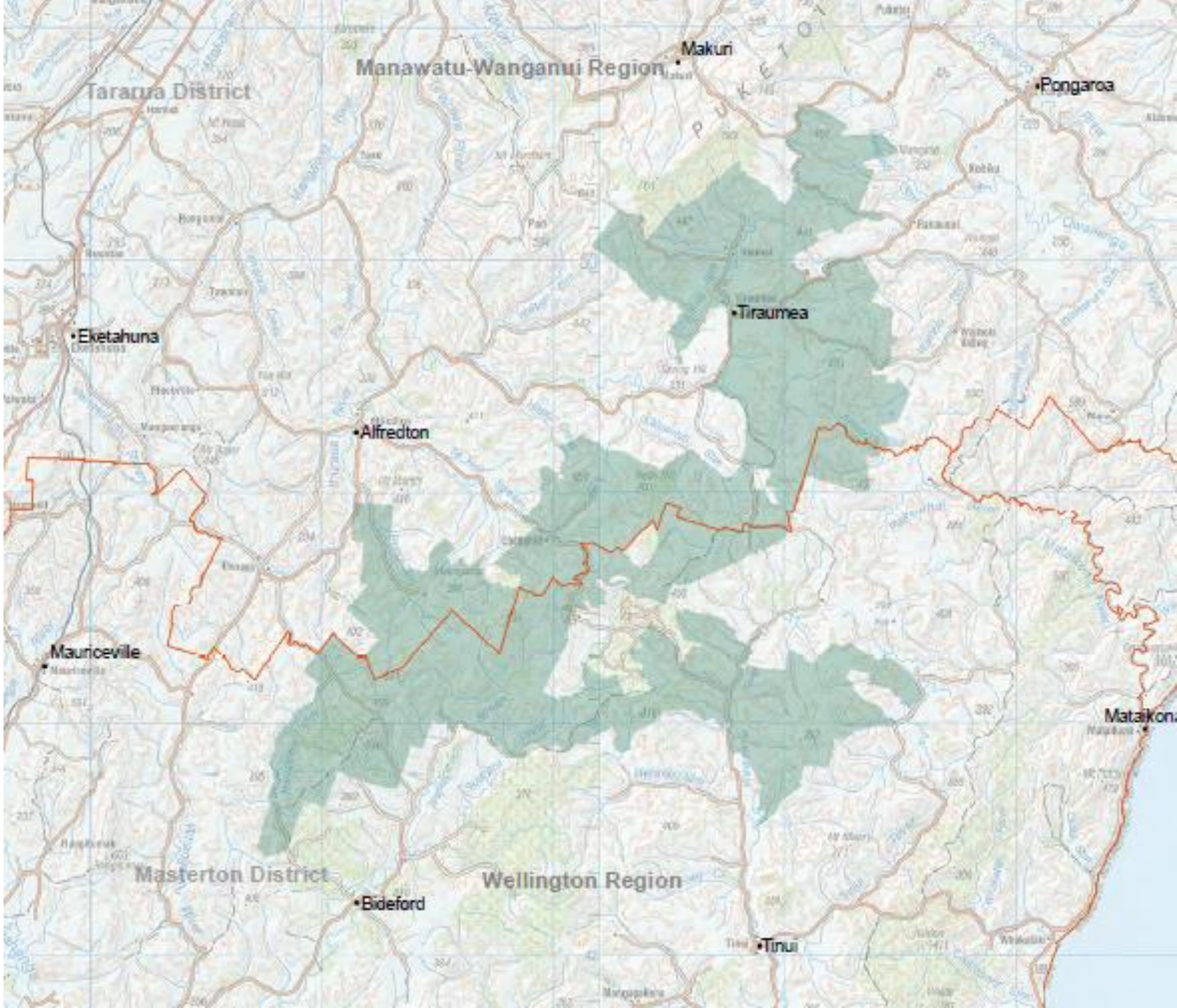
27 Landowners

2 Regional councils

2 District councils

400 consent conditions

2011 technology and consents lapsing soon



Renewable energy will have an impact

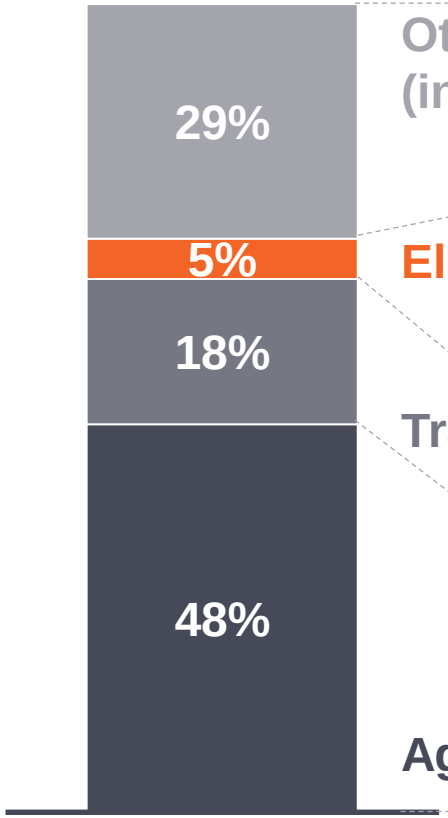
The national-local trade-off

— Renewables get national support, but local communities want their amenity maintained

	Renewable generation	Thermal generation
National impact	Low impact Carbon neutral	Large impact Carbon emitter
Local impact	Large Impact Not in my back yard	Low Impact Local economy benefits

Decarbonisation path can have many parts

— Need to assess which are best for NZ



Other (incl. industrial)

- Fuel switch - reduce/exit coal in industrial (Fonterra electrification)
- Reduce ETS subsidy for trade-exposed

Electricity

Supply

- Reduce/exit coal ⇨ gas, renewables, batteries
- Reduce/exit gas ⇨ renewables, batteries

Demand

- Reductions (Tiwai exit, efficiency, solar, EM, DR, peak pricing)
- Growth (Electrification e.g Fonterra, heating, industrial, EV's)
- Reshape Daily (EV's, solar, batteries, EM, DR, peak pricing)
- Reshape Seasonal (Fonterra, heating/cooling, peak pricing, climate)

Transport

- Tighten minimum specifications
- Incentivise EVs vs ICE

Agriculture

- Include in ETS ⇨ incentivise carbon reduction innovation

Decarbonisation potential solutions

* Source: MBIE 2015 carbon emissions data

New Zealand’s electricity is a strength, be careful

— Be wary of the unintended consequences of intervention

Partnership is needed. Unachievable targets will undermine co-operation.	Review the 2035 renewable electricity target. Consider in the wider context of energy use in New Zealand
Stable electricity sector needed to decarbonise larger carbon emitters.	
Solutions to seasonal energy storage are needed.	Support development of solutions for seasonal energy storage
More renewable energy will be needed.	Reduce barriers to renewable energy consents


genesis

NEAL BARCLAY

OUR 100% RENEWABLE ENERGY CHALLENGE

meridian

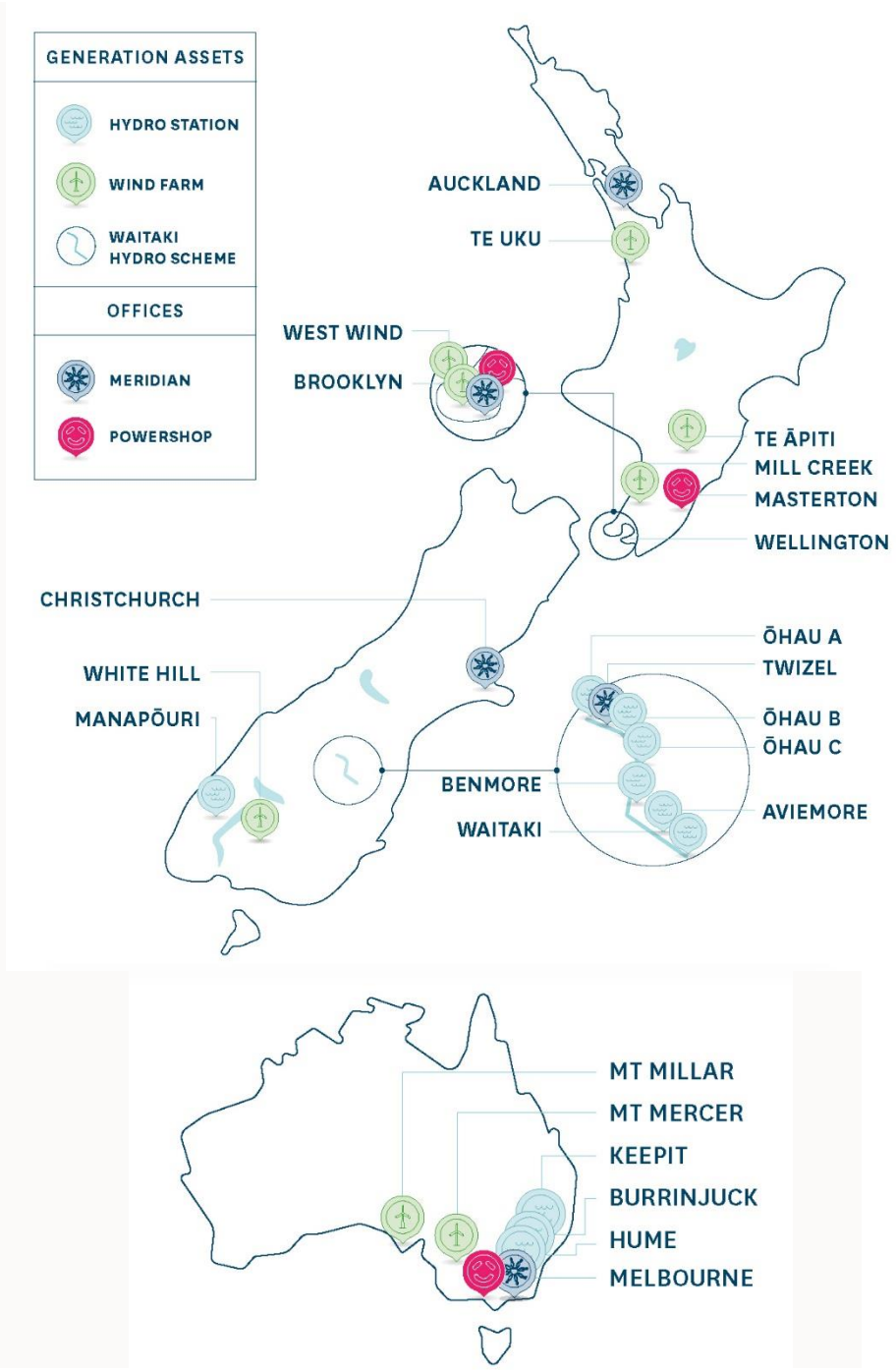
About Meridian

- Meridian is the largest generator of electricity in New Zealand and produces this from 100% renewable wind and hydro sources:
  - 7 hydro stations – 6 in the Waitaki chain; and Manapouri.
  - 5 wind farms.

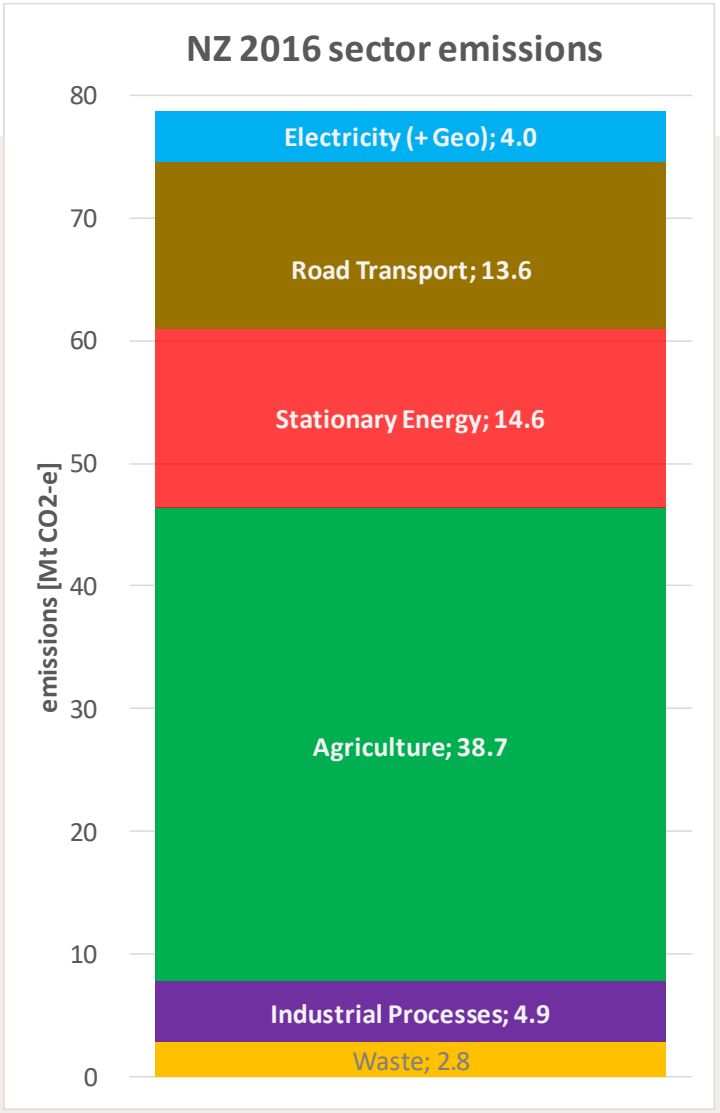
- Meridian and its subsidiary Powershop supply electricity to upwards of 290,000 customers across New Zealand.

- In Australia, Meridian owns two wind farms and has Power Purchase Agreements with three more. In NSW, we've recently purchased three hydro stations. Our subsidiary Powershop supplies electricity to around 100,000 customers.

- In the UK, Powershop's franchise supplies around 25,000 customers. Flux Federation – Meridian's Wellington-based software development business – supplies the platform for the Powershop businesses worldwide and is looking to expand further.



New Zealand's emissions challenge.



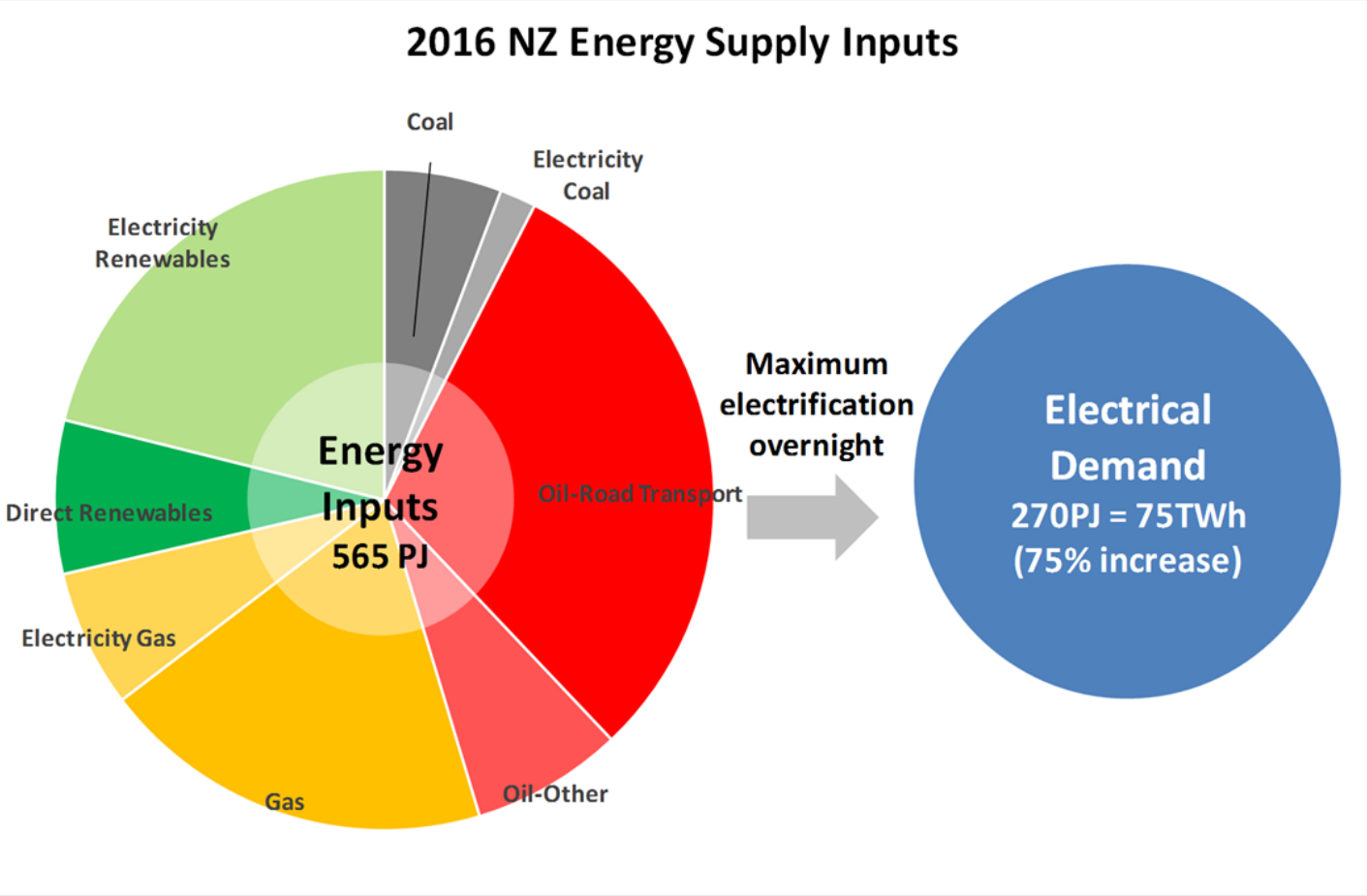
Massive opportunity for the electricity system to help the wider energy system to decarbonise 41% of current NZ emissions (32Mt CO2e).

"The energy trilemma"

We need do this while :

1. Managing the environmental footprint of the power system
2. Ensuring costs remain reasonable
3. Making sure the lights stay on

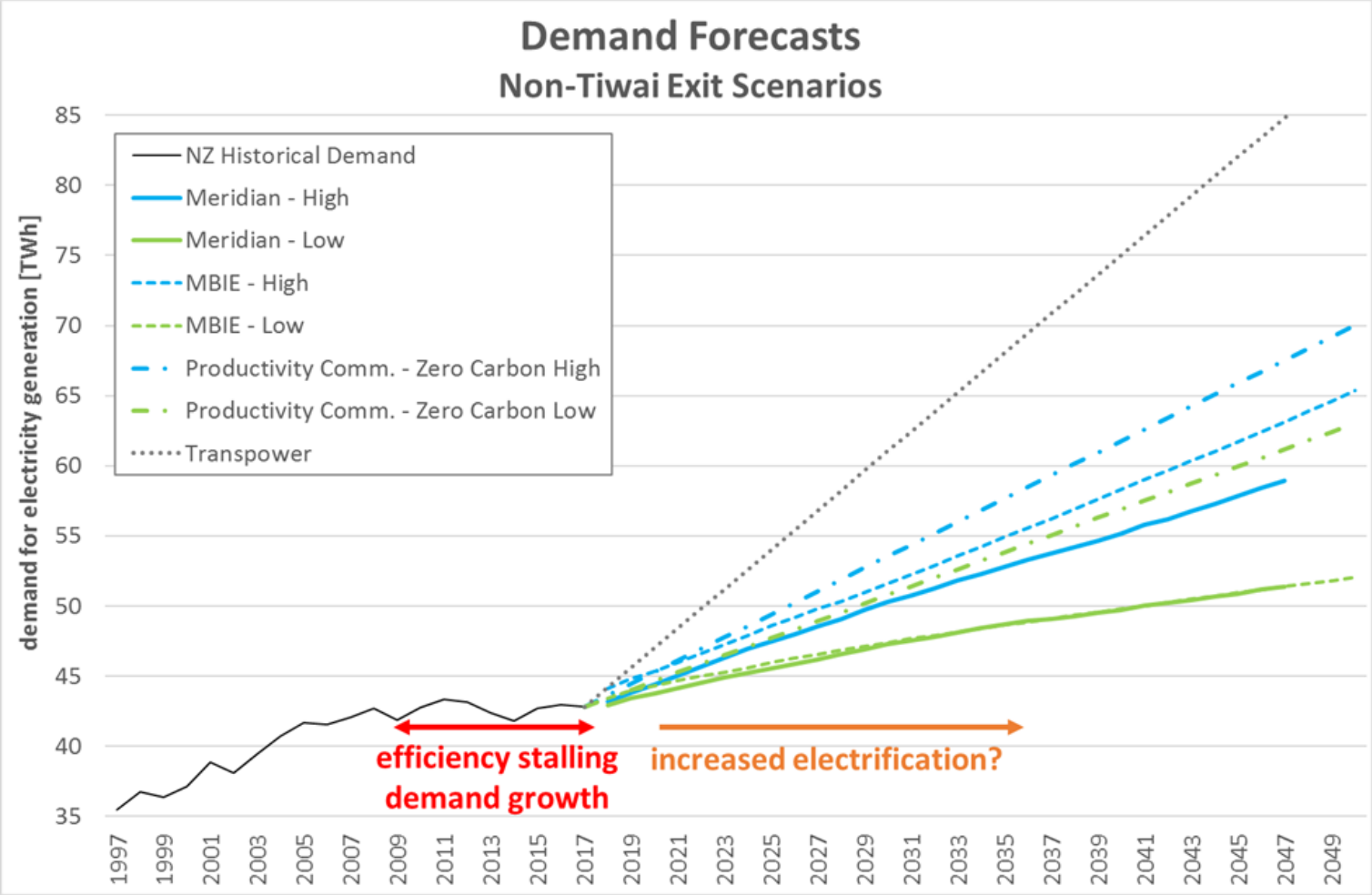
Can electricity help to decarbonise our economy?



Decarbonising the NZ energy system has the potential to increase (overnight) demand for electricity by 75%.

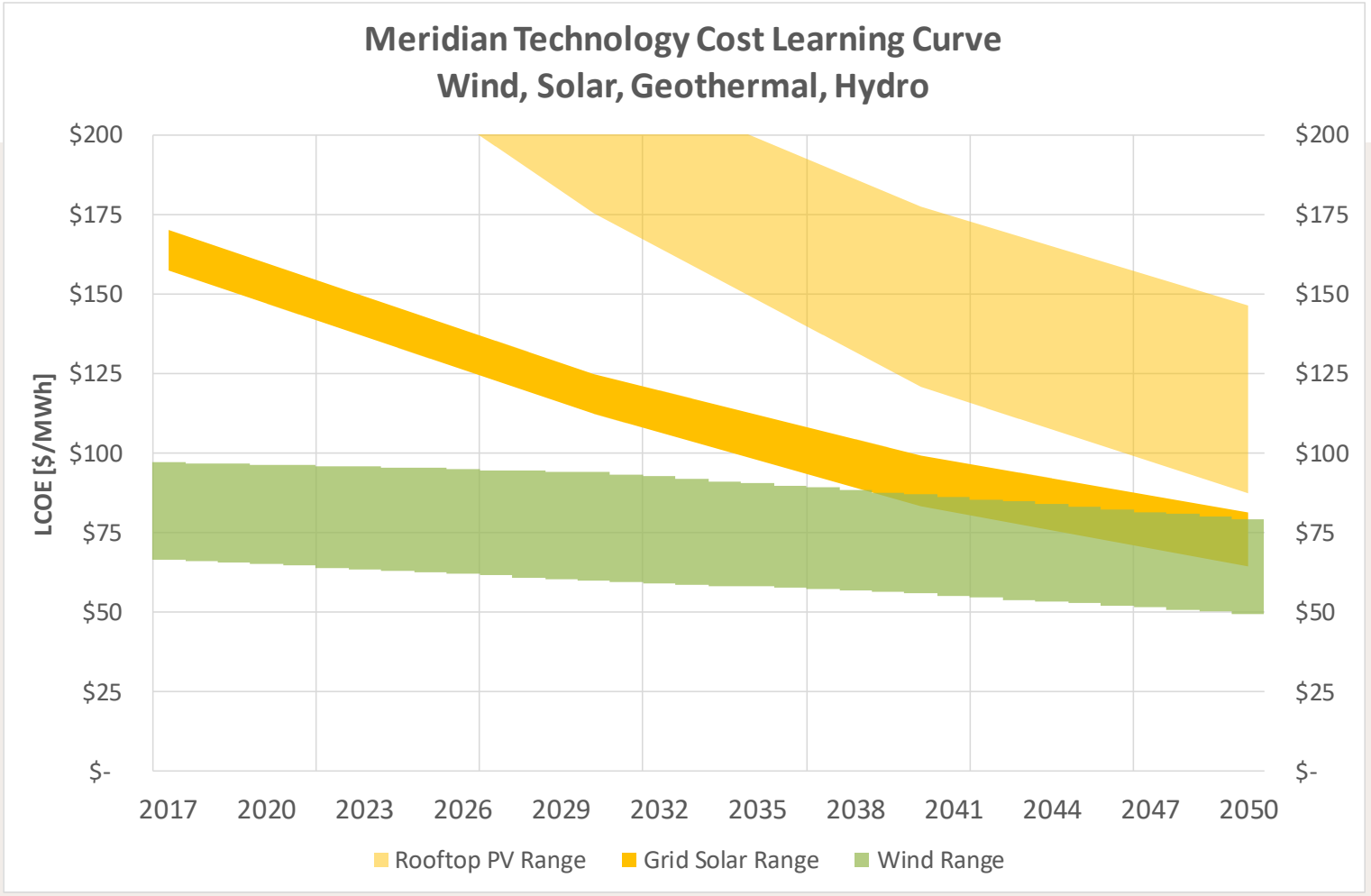
PHYSICAL POWER SYSTEM

There are different views on demand.



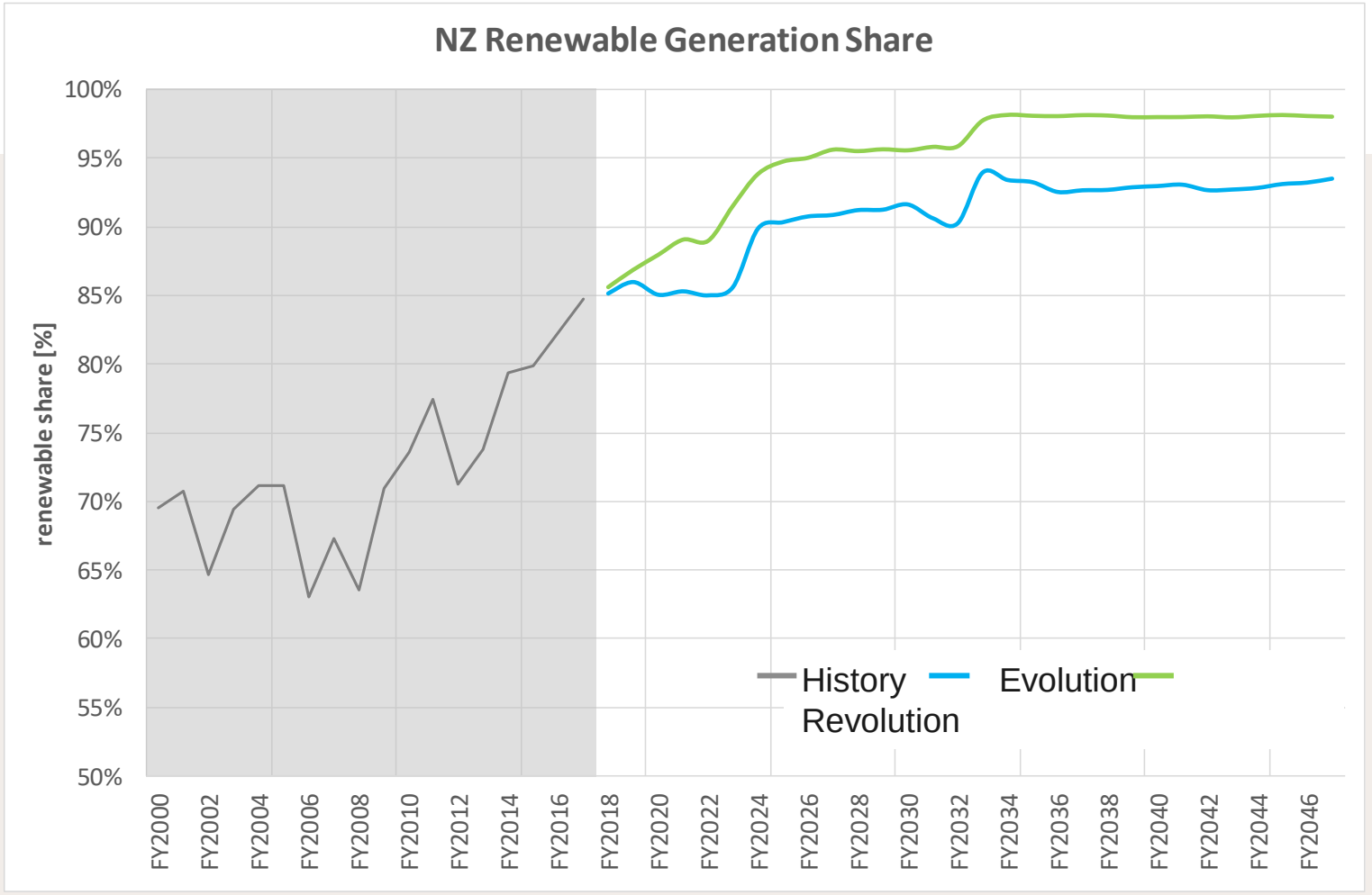
Despite these different perspectives, we will have a better idea as to *which* future we are in as it unfolds.

Lower costs will help.



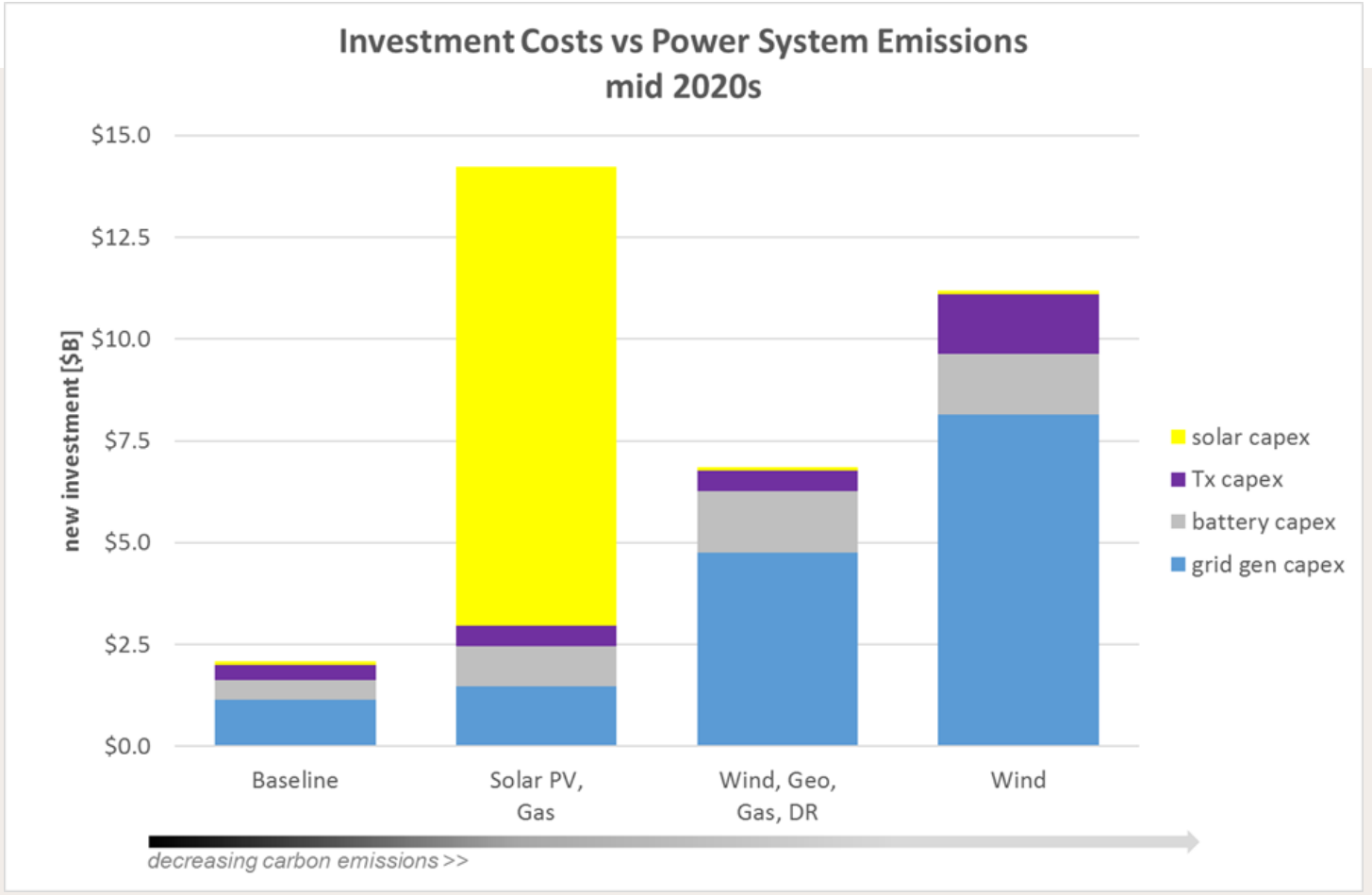
Falling costs will help encourage commercially and economically rational investment in renewables to meet evolving demand needs.

How we view the electricity future.



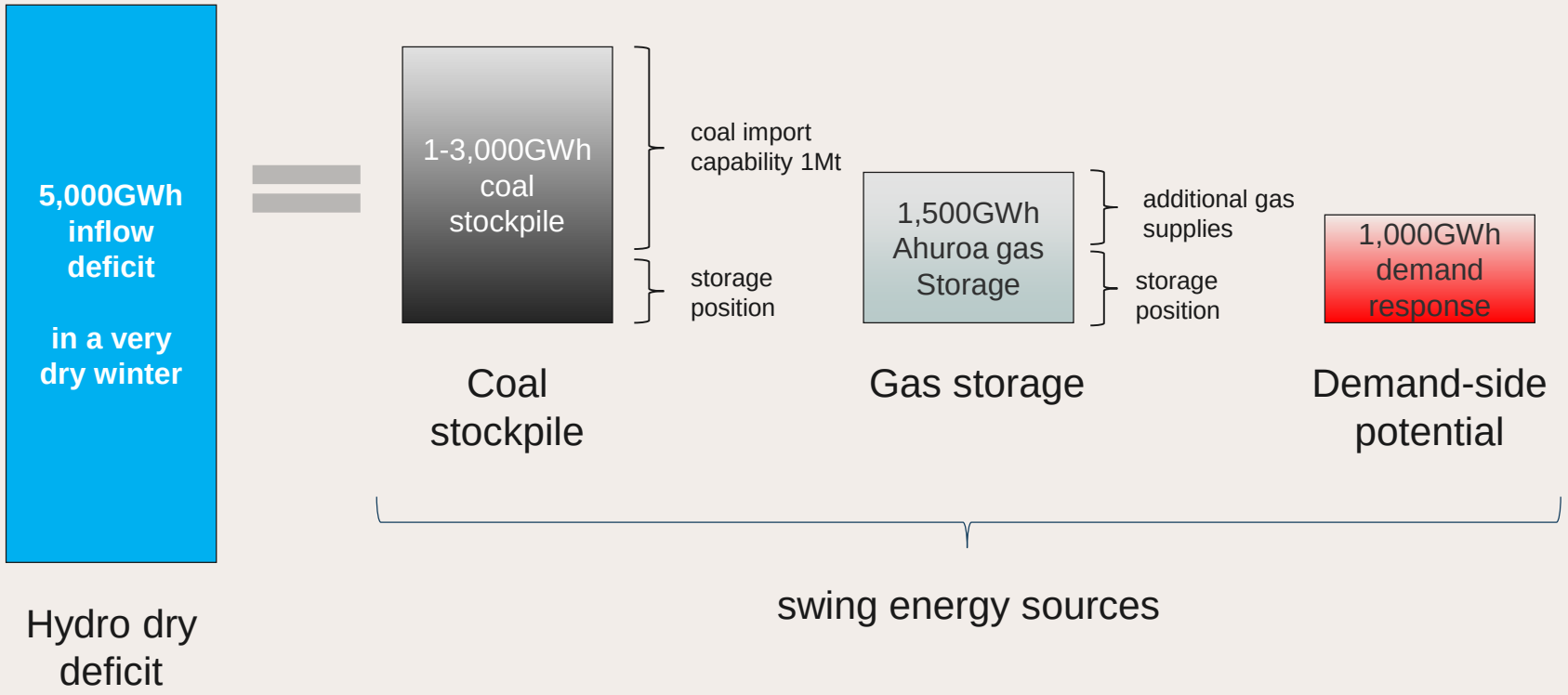
Our analysis shows that the power system is able to satisfy demand growth and is likely to become increasingly renewable over time as the remaining large thermal plants close.

But, we must remember the energy trilemma!



The cost of removing carbon from the power system alone can be large – especially if we push too hard, too early OR back the wrong solution.

New Zealand will still need to address the dry-year challenge.



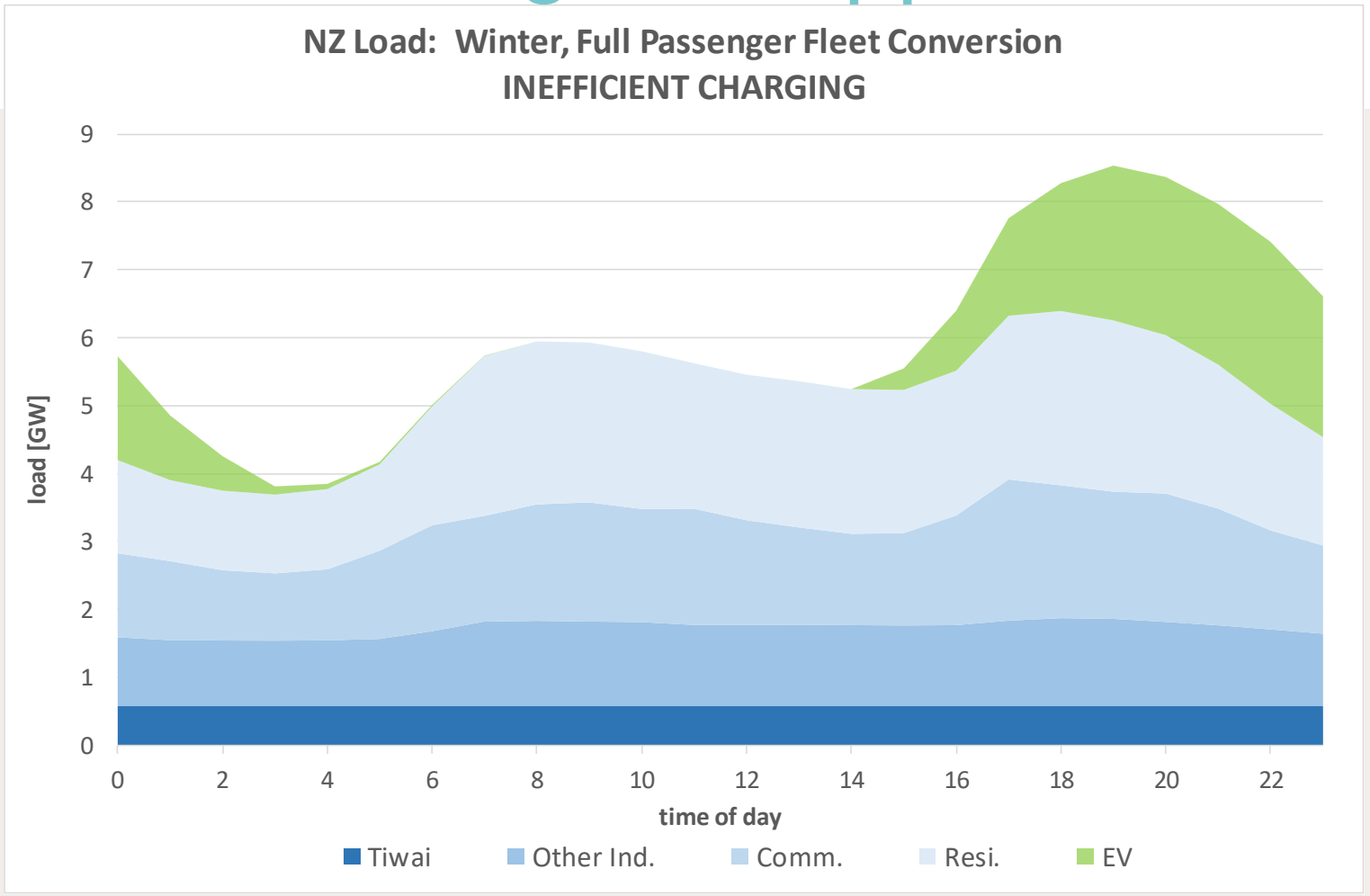
The Rankines (+ coal stockpile) currently contribute valuable storage during low inflow periods. Solving the “swing energy” problem in a dry year will be key to decarbonising NZ.

Renewable hydrogen and ammonia.

Source: Renewable NH_3

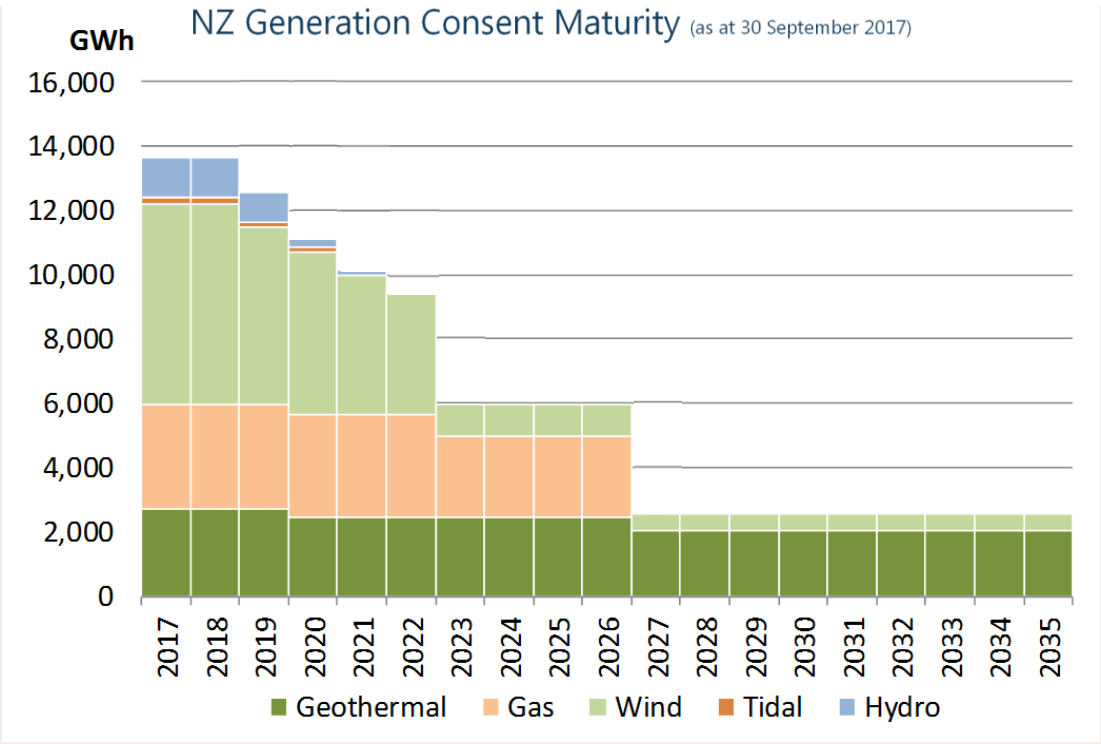
Two ammonia tanks hold 80,000 tonnes equivalent to ~250GWh of electricity

Consumer decisions will create both challenges & opportunities.



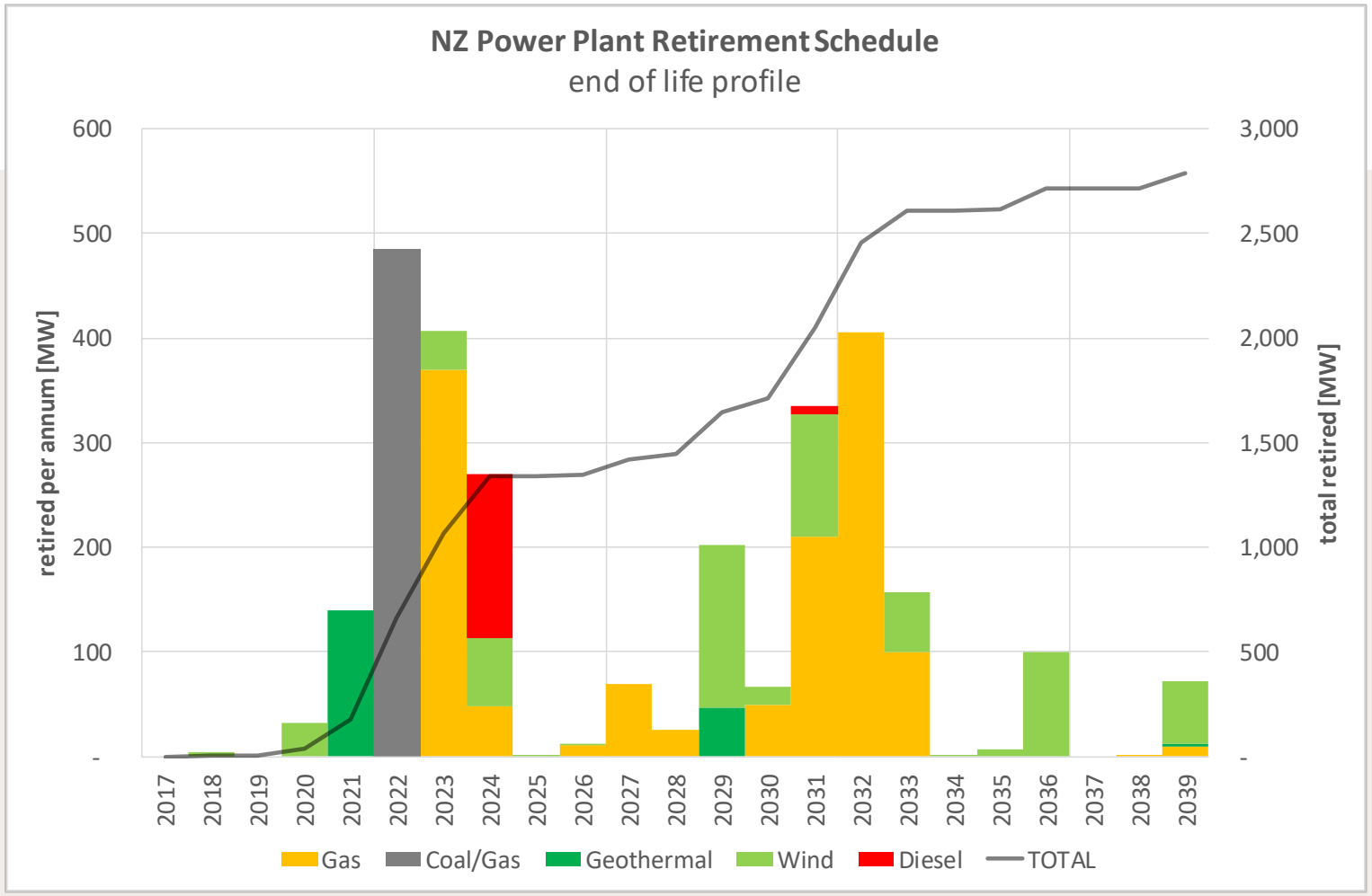
Consumer demand for new technologies will change the shape of load.
Some consumers will become active in the NZ decarbonisation story.

New Zealanders will be a big part of this journey.



To achieve this level of decarbonisation, there will be trade-offs.

Retirement of existing plant.



Existing thermal and renewables closures are inevitable in the future. New build will be required to replace plant as well as meet demand growth.

ELECTRICITY MARKET

PARTING THOUGHTS

Questions.

meridian

PETER CALDERWOOD

NZ Carbon Future

An overview of Trustpower's Views

Global context - energy and decarbonisation

Decarbonisation:

- Clean energy (particularly renewable) has a key role to play in global response to climate change
- Policy has a critical role to play

Global trends in the energy sector:

- Huge investment in variable wind and solar generation
- Decentralised participants
- Supportive regulatory frameworks

The key global energy challenges will be:

- Energy access and affordability
- Flexibility to assimilate variable generation into existing power systems
- Keeping the lights on

Trustpower's views

- Supportive of the work being undertaken by the Government to set a long-term commitment to a low emissions, carbon-resilient economy.
- Consider that policy certainty and stability is crucial for investors.
- Policy certainty is crucial for investors, and stability crucial for sound economy.
- Important that NZ provides the best policy settings in order to attract global capital required to fund investments in long life assets related to climate change.
- Important that existing renewable generators are not restricted (i.e. water access and RMA restrictions) given anticipated important role of electricity sector during transition and to ensure ability to meet any target level of renewable generation at least cost.

The outcomes of other work that is currently underway will be important

- Final recommendations of the Productivity Commission will be an important input into the design of the Bill.
  - Further consultation on the design of the Bill should be undertaken once these are available
- The interim Climate Change Commission's work to plan the transition to 100% renewable electricity (in a normal hydrological year) by 2035 is also relevant.
  - The costs and benefits of the "target" need to be considered, including implications for energy affordability and security

Some key matters to consider prior to finalising the Bill

- Bi-partisan support on important foundational aspects of the Bill would provide greater investor certainty;
- Sequencing of events during the transition is important;
- Ensuring other dimensions of the energy trilemma are taken into account when making environmental policy decisions also important; and
- There should be a mandated role for the Climate Change Commission in ensuring a cohesive policy response to climate change.

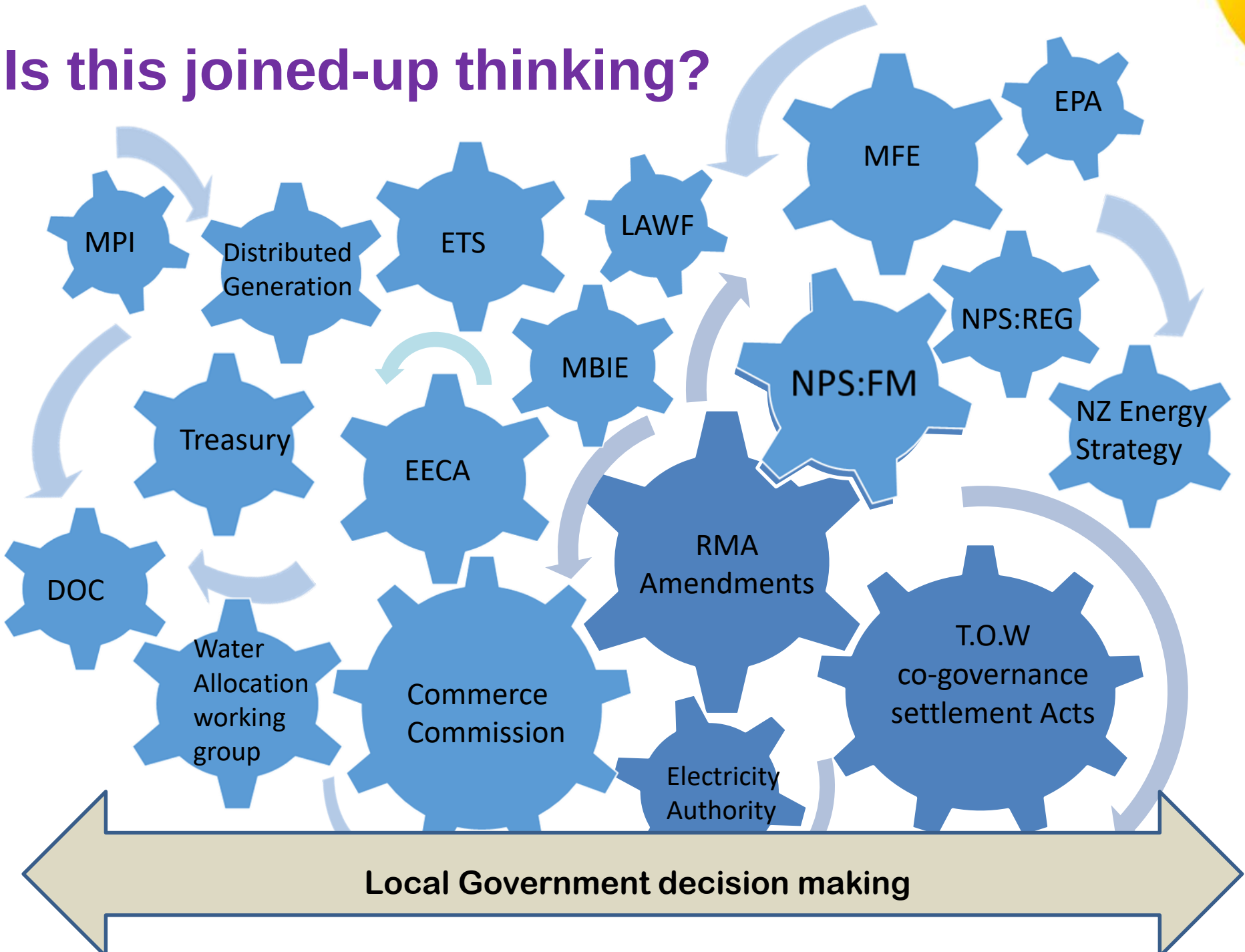
It is also useful to be conscious of:

- What is happening internationally when designing the new environmental policy arrangements;
- The role of the ETS within the broader climate policy context and the need for international connection; and
- The value of distributed generation during the transition.

Hydro offers NZ resilience and flexibility
It creates the possibility of a fully renewable future…

… but this value is being eroded through disjointed policy and regulation

Is this joined-up thinking?



Government Departments

- Energy & Resources
- Climate Change
- Environment
- Economic Development
- Primary Industries
- Infrastructure
- Treasury / Finance
- Conservation
- Foreign Affairs and Trade

Who owns the climate change agenda?

Government agencies	Climate Change functions
Ministry for the Environment	Whole of government climate change policy
Environmental Protection Agency	Manages ETS
Ministry of Transport	Leads work on biofuels, EVs, alternative technologies
Ministry for Primary Industries	ETS policy development, CC adaptation, research activities
Ministry of Business, Innovation and Employment	Energy policy, research into carbon capture, energy information and modelling
Energy Efficiency and Conservation Authority	Promotes Energy Efficiency and conservation, and the use of renewables
Ministry of Foreign Affairs and Trade	NZs long term climate change negotiations
Treasury	Economic perspectives of climate change policy
Department of Conservation	Policy advice on conservation issues
Local Government Authorities	Required to have regard to climate change

How does policy get delivered?

Official documents, policy statements, regulations, Acts	National Policy Statement on Freshwater Management
	National Policy Statement on Renewable Electricity
	NZ Coastal Policy Statement
	National environmental standards
	Energy Strategy
	RMA
	Statutory planning documents
	Existing GHG emissions reduction targets
	Emerging policy directions
	Water Conservation Orders
Engagement	Public hearings, submissions
	Community-led meetings / collaborative processes
	Co-governance processes
Recourse	Decisions on energy, water or environmental matters
	Decision on limitations on participation in collaborative processes

Support for goal of Joined up Thinking

- The benefits hydro contributes to meeting Climate Change objectives have previously been overlooked in decisions relating to water use
- Delivering energy security, reliability, and flexibility is becoming more difficult for hydro operators, and may have to be met by fossil fuels instead.
- Also risks increased costs to consumers

Support for Joined-up Action

- Ensure CCC can co-ordinate cross-departmental policy direction and delivery.
- Revise NPS:REG to match objectives
- Pay close attention to the impacts associated with many levers that will force a shift in business behaviour and economic outcomes.
- Allow for flexibility – future tech, agility, responsiveness.

WRAP UP – KEITH TURNER