



Meridian.

Aotearoa/NZ: *The Future Energy System*

Power without the carbon

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(with thanks to Grant Telfar)

Disclaimer

Any and all views expressed are my own and do not necessarily reflect the views of Meridian.



Goal: Balance the Trilemma

Balancing the 'Energy Trilemma'

Source: WEC

Energy Security

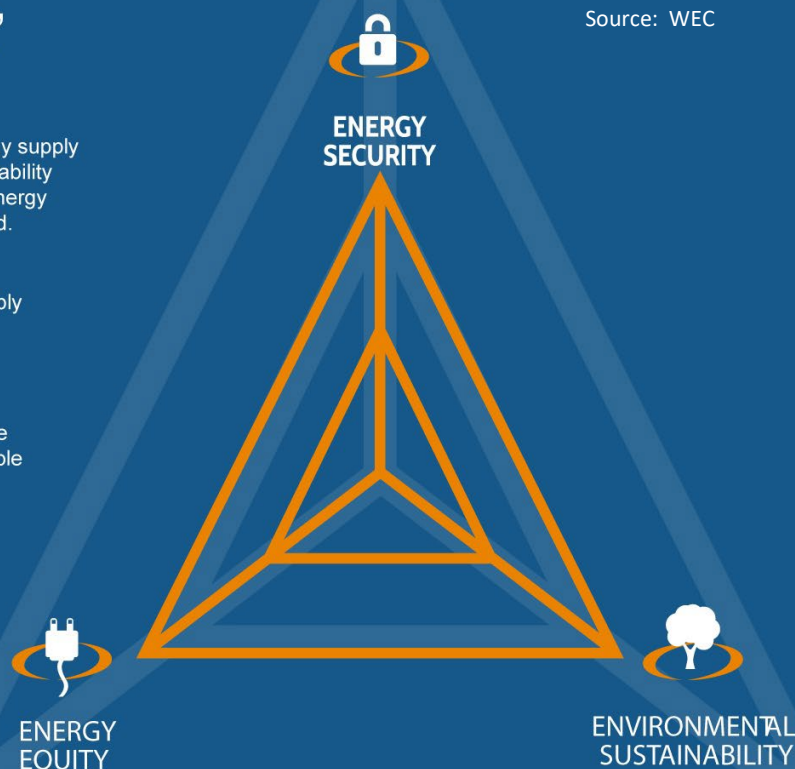
The effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of energy providers to meet current and future demand.

Energy Equity

Accessibility and affordability of energy supply across the population.

Environmental Sustainability

Encompasses the achievement of supply and demand side energy efficiencies and the development of energy supply from renewable and other low-carbon sources.



Trying to improve and balance *all* needs

Today, balance is maintained via regulated, energy-only, efficient market mechanisms and supporting policy

Policy objectives:

- Efficient prices
- Competition
- Secure delivery of services
- Light-handed market regulation
- RMA compliance
- Alleviating energy hardship
- Fostering innovation
- Carbon reduction
- 100% renewables (or close to)

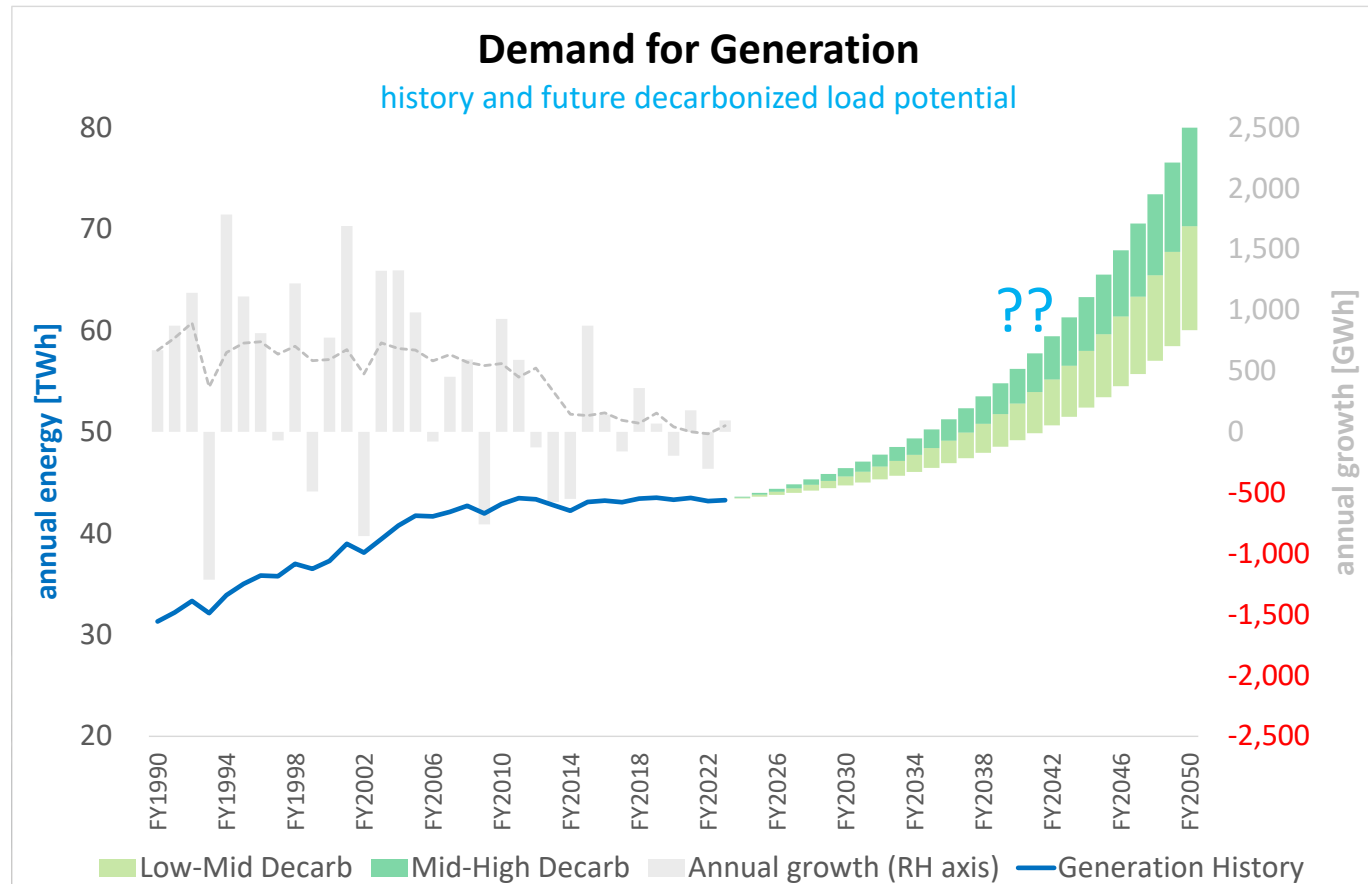
priorities can change

Goal: Long-run energy needs & decarbonisation

Exactly how much new generation is needed, and especially *when* it needs to turn up is not always clear

After a long period of nothing much, a *lot* now has to happen – in the face of investment uncertainty for capital assets that, once built, last 30+ years

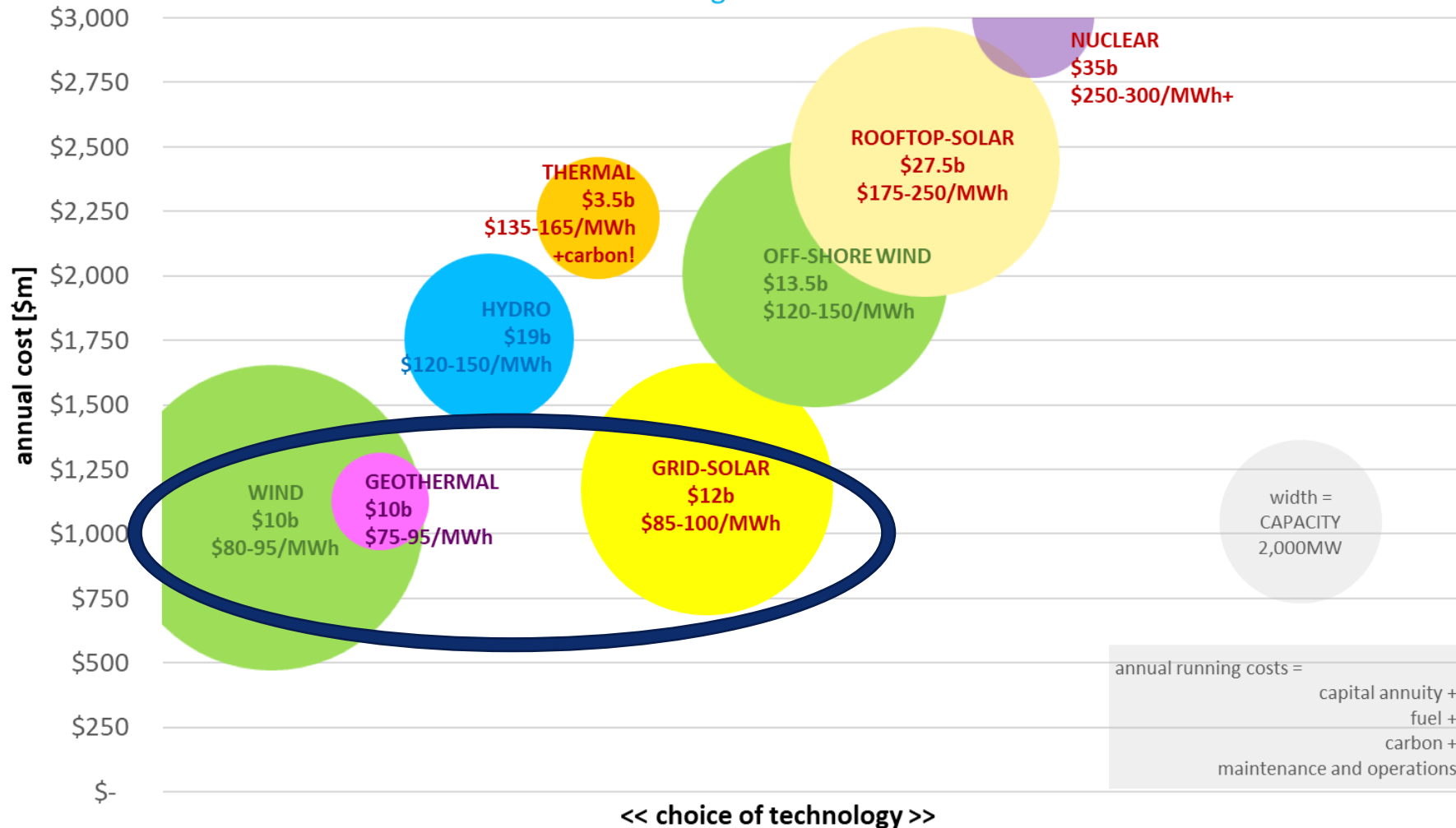
- a hockey-stick of needs:
 - it's coming but exactly when?
- uncertainty makes some anxious:
 - wait –or– go hard now?
- the best approach for NZ is to maintain balance
- the power market is designed to find the right balance:
 - multiplicity of views
 - capital efficiency
 - security overlay,
 - ETS costs influencing supply and demand



Challenge #1: Secure more green electrons

Source: Meridian

New Zealand new generation *potentials* & costs
 to get to 100% renewable target PLUS modest decarbonisation
 = 14TWh new generation needed



NB: this is a sort-of now-until-2030ish view – commercial realities may differ!

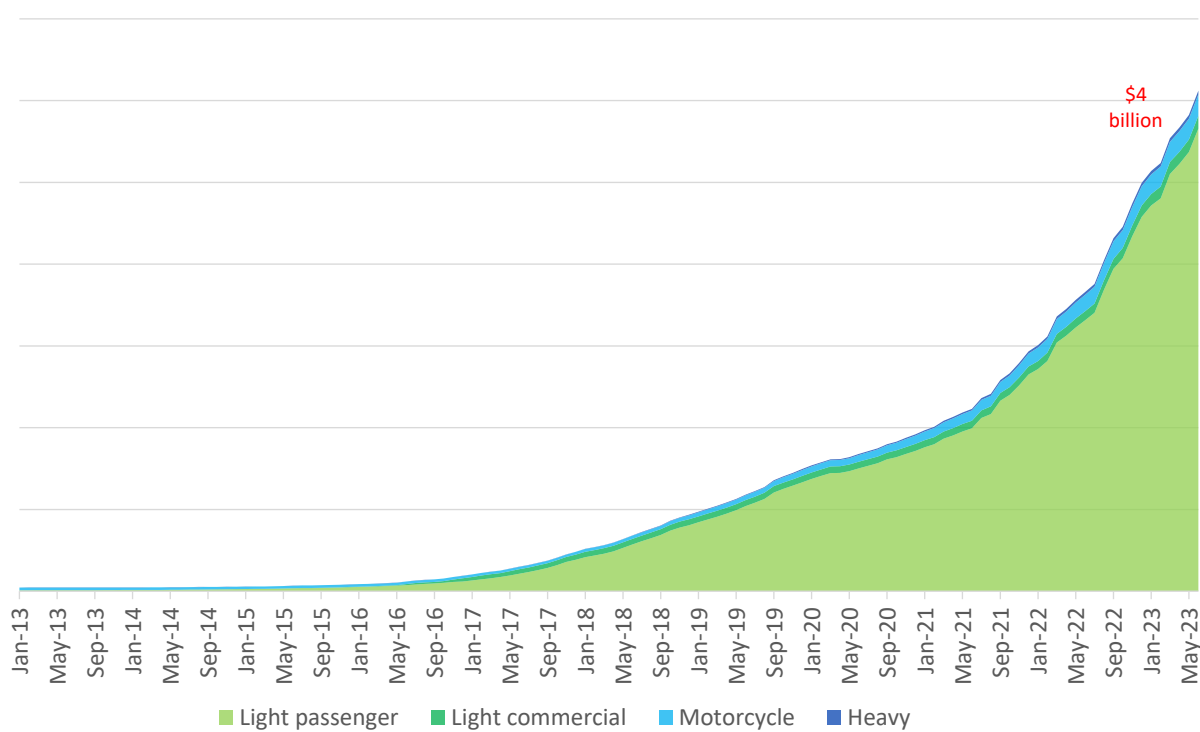
*potential resources for some technologies may be many times larger, and/or off the chart

Recent power system activity

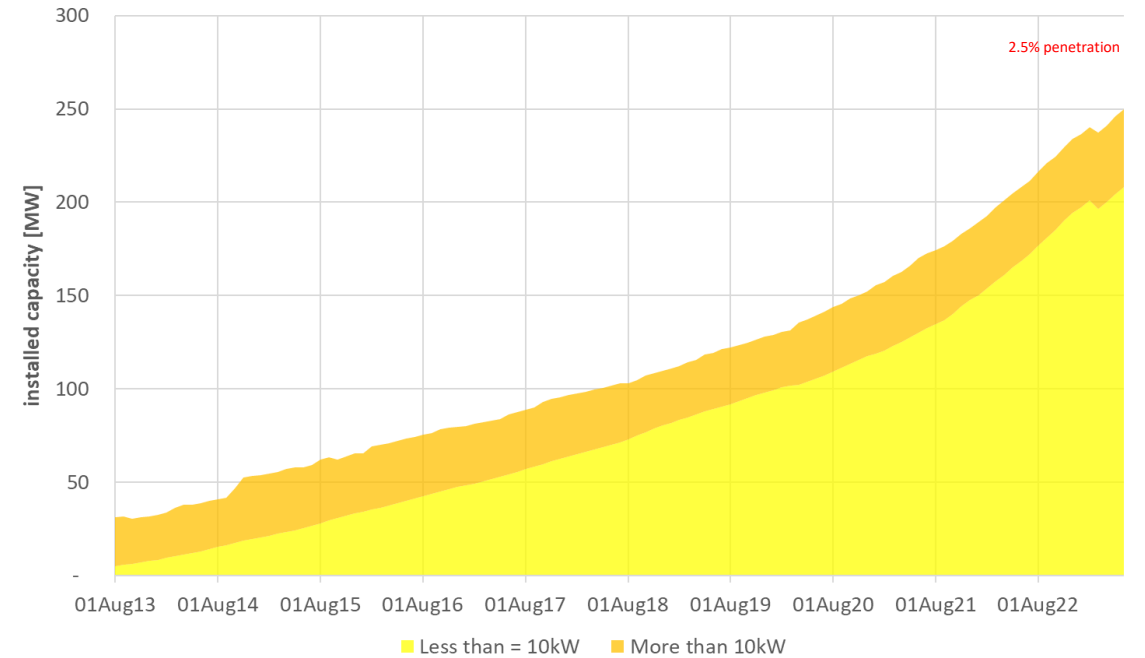
Consumer-led technology change is occurring and accelerating; complements grid activity; a long way to go

Residential batteries: ~15-20k installed today, increasingly co-located with solar

Battery Electric Vehicle Registration
120GWh annually & 1.3% of total fleet: 4,800,000

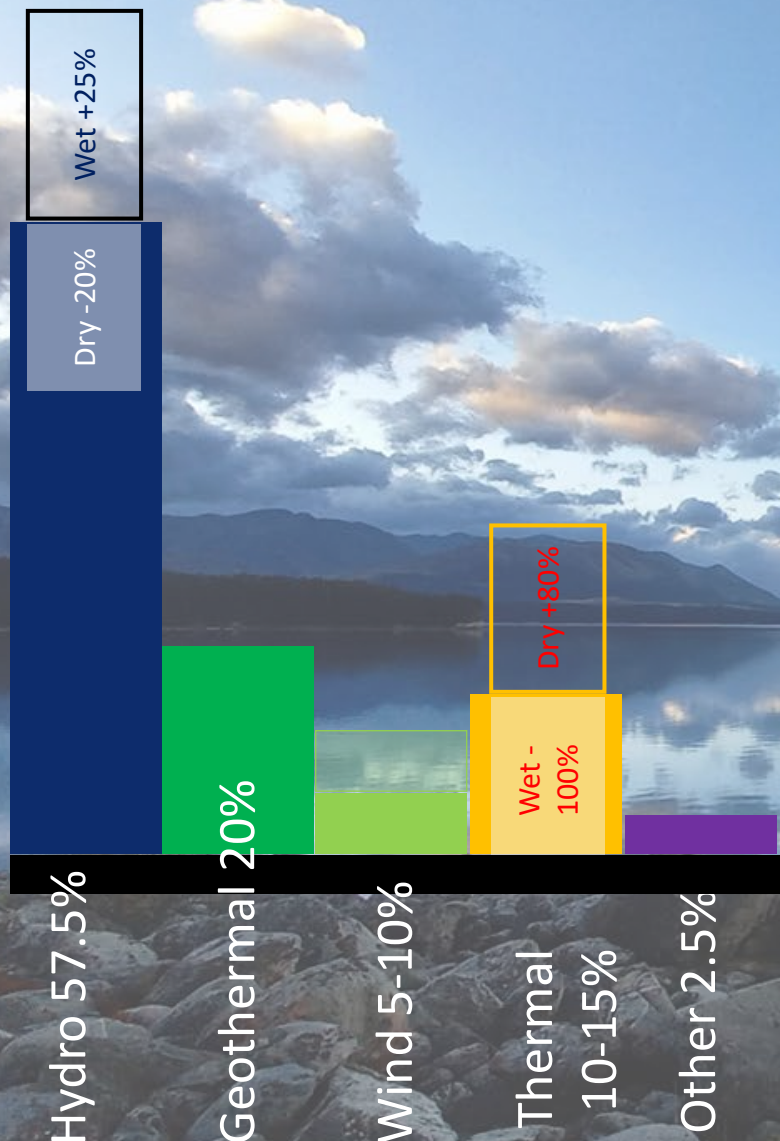


Distributed Solar Installation
@Jun2023: 48,500 ICPs & 350GWh annually

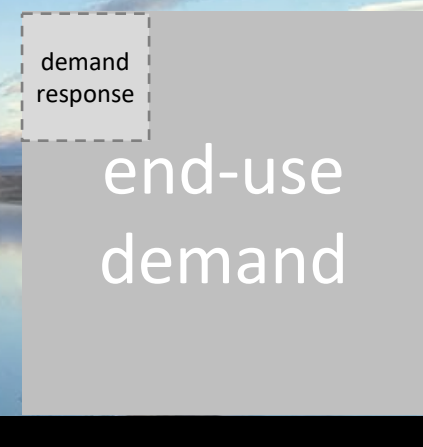
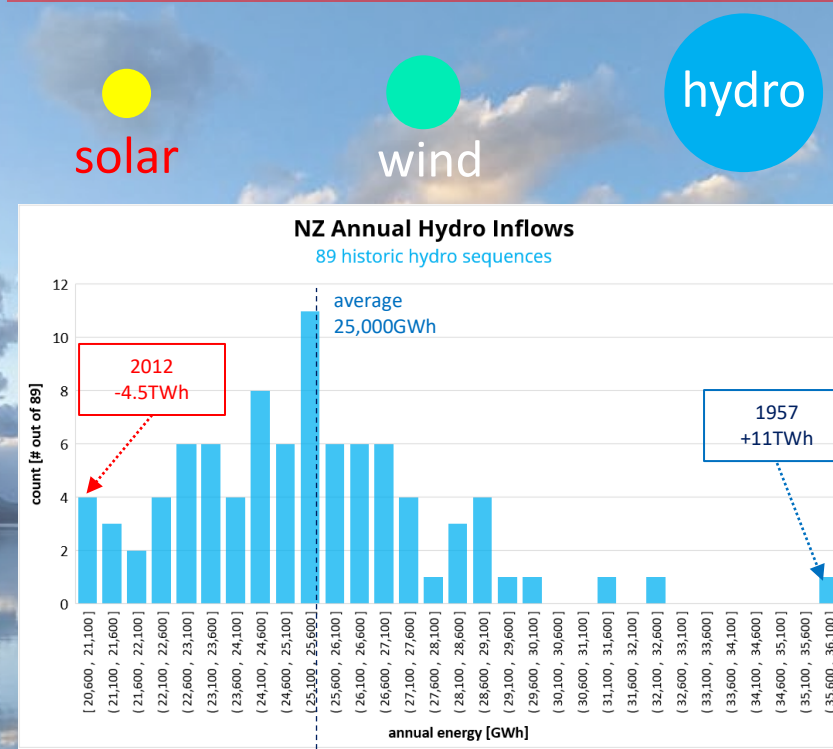


Virtual power plant – demand side response at the consumer level – is occurring but early days

Challenge #3: Balance seasonal energy security ('dry-year' problem)



<< scale of 2035 dry-year deficit >>



Source: Meridian

Challenge #4: Delivering power

Transpower's view:

"Meeting the Whakamana i Te Mauri Hiko base case will involve a sustained high volume of investment and construction in the sector, as well as action from consumers"

- By 2035 70 new grid connections (40:30 supply:demand)
- 10 -15 large grid upgrade projects
- ... plus other technical grid support services (voltage, power quality, etc...)

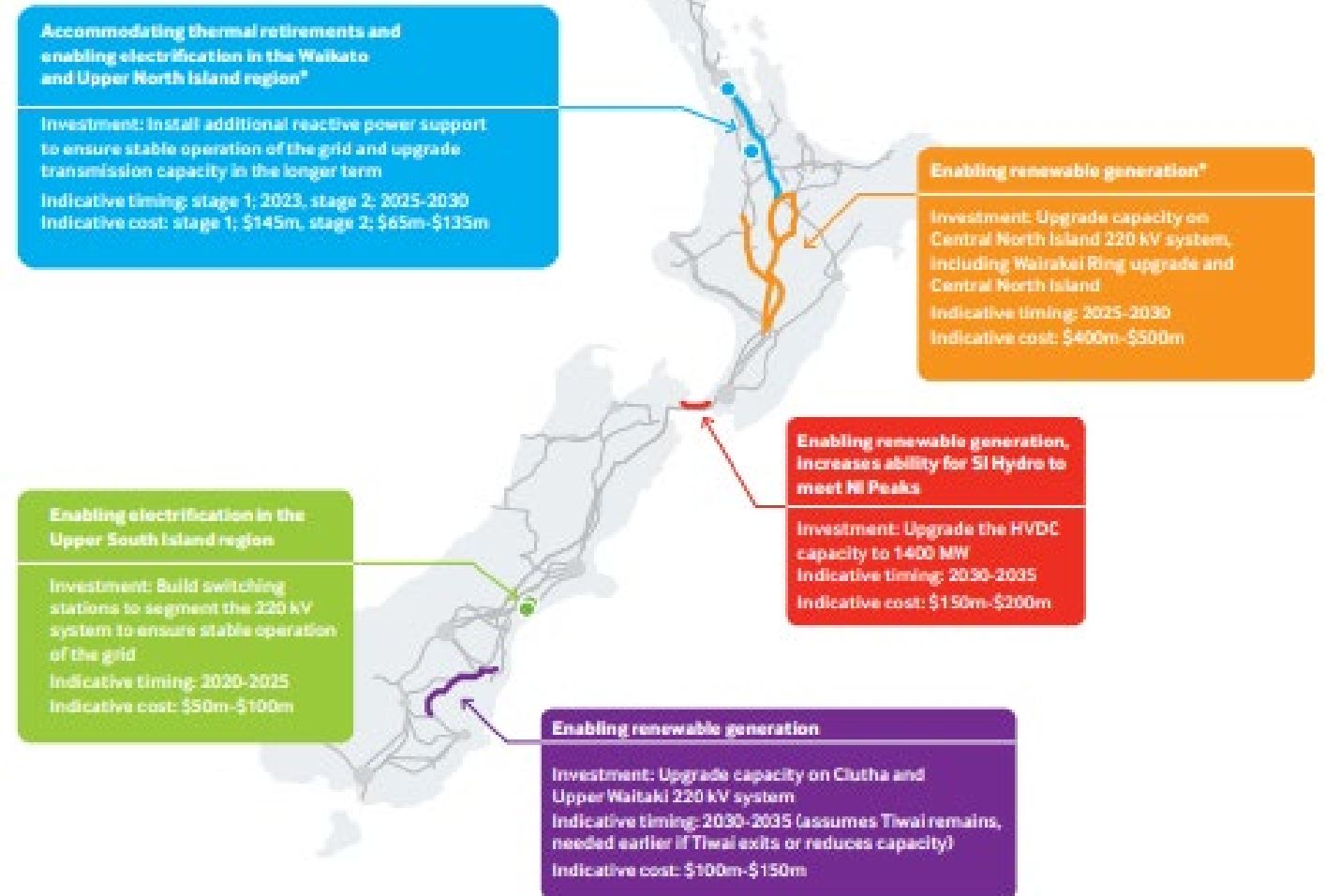
Significant challenges for other local lines providers too:

- Distributed behind-the-meter challenges from BESS, rooftop-solar, BEV charging, smart load, ...

Figure 17: Interconnection project descriptions and locations

* Requires two interconnection investments

Source: Transpower, TMH



Source: EA, 2018

Challenge #5: Support and enable outcomes



Policy:

- clear goals and tools
- avoiding 'time inconsistency'
- legislative and planning consistency
- environmental balance

Power system:

- lines augmentation
- lines operation
- ancillary services
- co-ordination and co-operation

Decarbonization initiatives:

- motivation
- innovation
- eliminating road-blocks

Technology:

- falling costs
- manage commodity crunch and supply chain pressures
- grid vs behind-the-meter
- new technologies: BESS, transport, V2G, active demand engagement, ...

Commercial:

- actions not words
- adaptive: new business models, new technology, consumer centric

Public:

- tikanga
- local and national buy-in
- needs need to be met!

Recent power system activity

New generation needed; intermittency & flexibility management needed; dry-years; commercial solutions are emerging

Power System Flexibility

- Ara Ake/solarZero:
 - VPP peaking product



- Contact
 - Glenbrook deal



- Meridian
 - Tiwai Point dry-year
 - Ruakākā grid-scale BESS
 - Boiler conversion and dry-year flexibility
 - Large-scale dry-year response possible



New generation:

- 6TWh committed;
- 4TWh likely by 2027



New generation PPAs:

- Growing PPA interest
- New for NZ



New demand, C&I decarb PPAs:

- Turitea --> Amazon data centre
- Te Huka --> Netflix data centre
- Solar Bay --> Ryman Healthcare
- Fonterra --> testing market
- ...

Aotearoa/NZ: The future power system

Power system analysis and economics from numerous studies are clear:

- NZ can have a reliable, 100% renewable, power system – or close to it – by 2035, with low prices driven by rapidly falling costs of existing, new, and emerging clean technologies
- Significant decarbonized energy from the wider economy can be accommodated

Commercial investment opportunities abound. We see no evidence that a direct central ‘command and control’ approach would deliver superior results for NZ.

BUT ... there are some extraordinary challenges that need careful co-ordination:

- The level of planning uncertainty over the next 30 years is astonishing
- The scale and pace of investment required will be a significant increase on the past
- The future power system will echo today’s, but volatility will be endemic and security may look and feel different
- New technologies and the demand-side of the market have a pivotal role
- The transition away from today’s power system is likely to be untidy from time to time

