TRANSPOWER

The National Grid

Energy Economics Summer School

February 2024

Joel Cook

Agenda

1. Transpower and its roles
2. Planning and investment
3. Net Zero Grid Pathways

Transpower and its roles

1 Generation
Generation companies generate power from wind, thermal, hydro and geothermal. They sell the power they generate on the electricity market. Emerging distributed generation includes electric vehicles, batteries and solar photovoltaic.

2 New grid connects
As New Zealand moves to electrify its economy, Transpower is receiving more requests to connect to the grid. This includes new generation such as solar and wind, as well as new industrial demand.

3 Transmission
Transpower transports high voltage electricity from where it is generated to distribution companies and some large directly connected customers.

4 Industrial customers
A few major industrial companies receive their power directly from Transpower.

5 Substations
Substations reduce the voltage at the point where electricity is delivered to distribution companies – our customers.

6 System Operator
Operates the wholesale electricity market and manages system security.

7 Distribution
The lower voltage electricity is transported by distribution companies to homes and businesses throughout New Zealand.

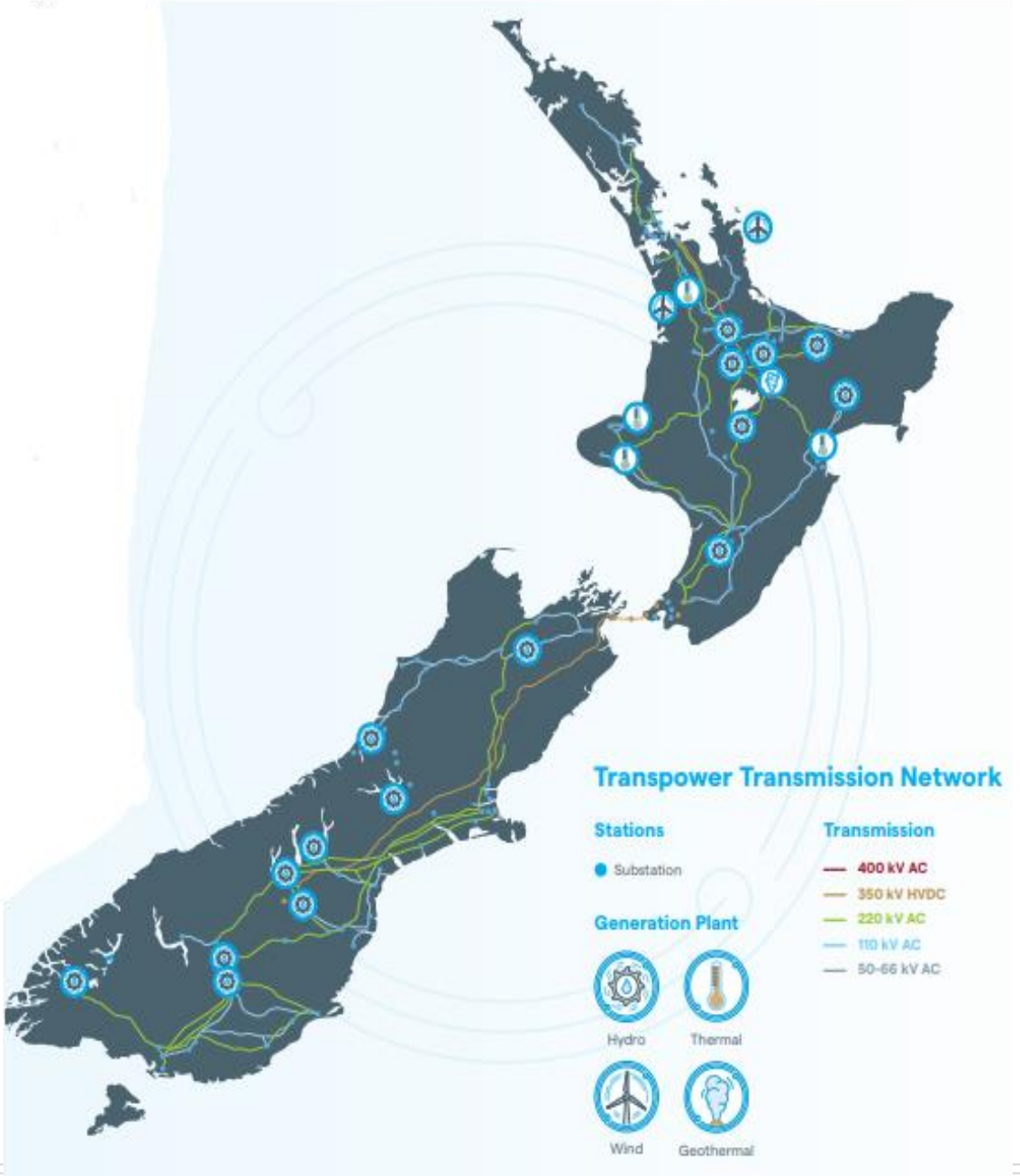
8 Commercial
Some commercial customers that consume large quantities of energy purchase power directly from the wholesale electricity market.

9 Retail
Retailers buy power on the electricity market, package it together with other costs of delivering power (transmission and distribution), and on-sell it to customers.

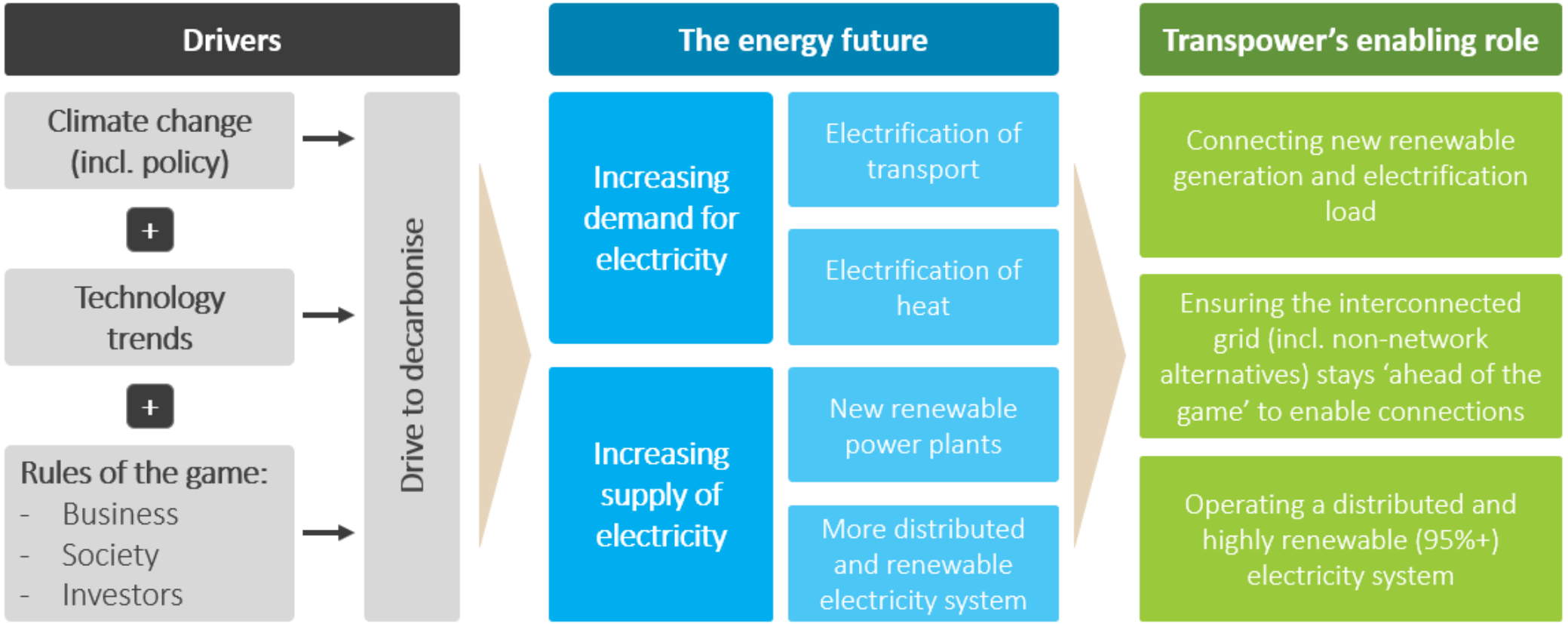
10 Domestic and business users
Domestic and business users receive their electricity directly from retail companies, which deliver power to homes, businesses and commercial operations using distribution companies' lines.

Our role as Grid Owner

- We own and operate New Zealand's national electricity transmission network
- We provide the infrastructure and market system that connects electricity generators to major electricity users and the distribution network
- Over $5 billion in assets positioned across some 30,000 properties
- 174 substations, 25,000 transmission towers and more than 11,000 kilometres of lines
- Our assets are high voltage and safety is our number one priority – for our people, our providers, and the public
- Our people are based in our offices in Wellington, Auckland, Hamilton and Christchurch
- Around 900 staff plus a service provider workforce of 2500



Enabling role



The size of the challenge for our industry

Electricity demand, TWh

Accelerated Electrification

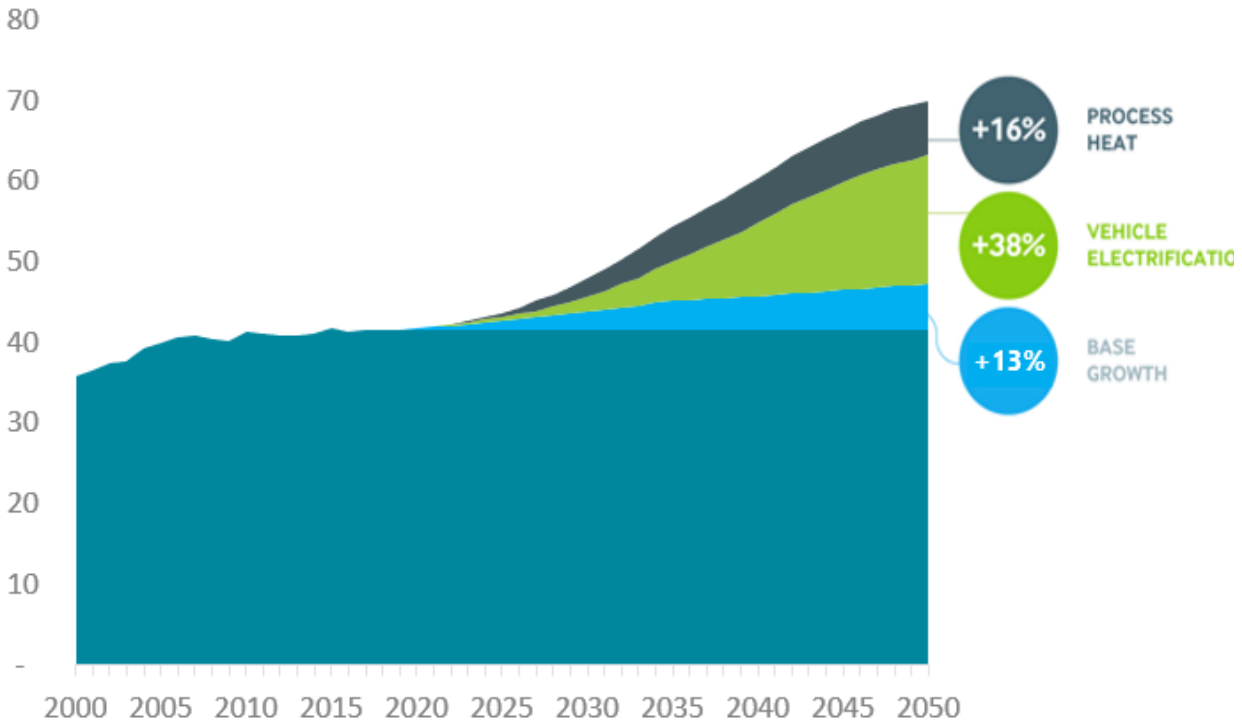
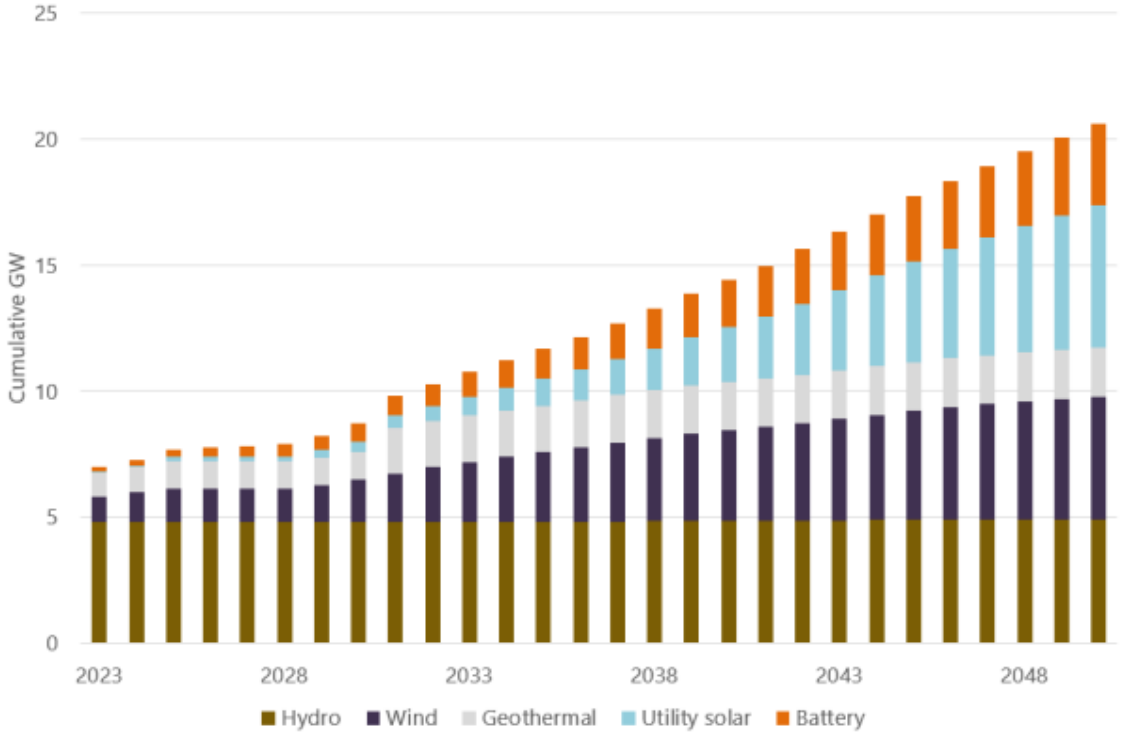
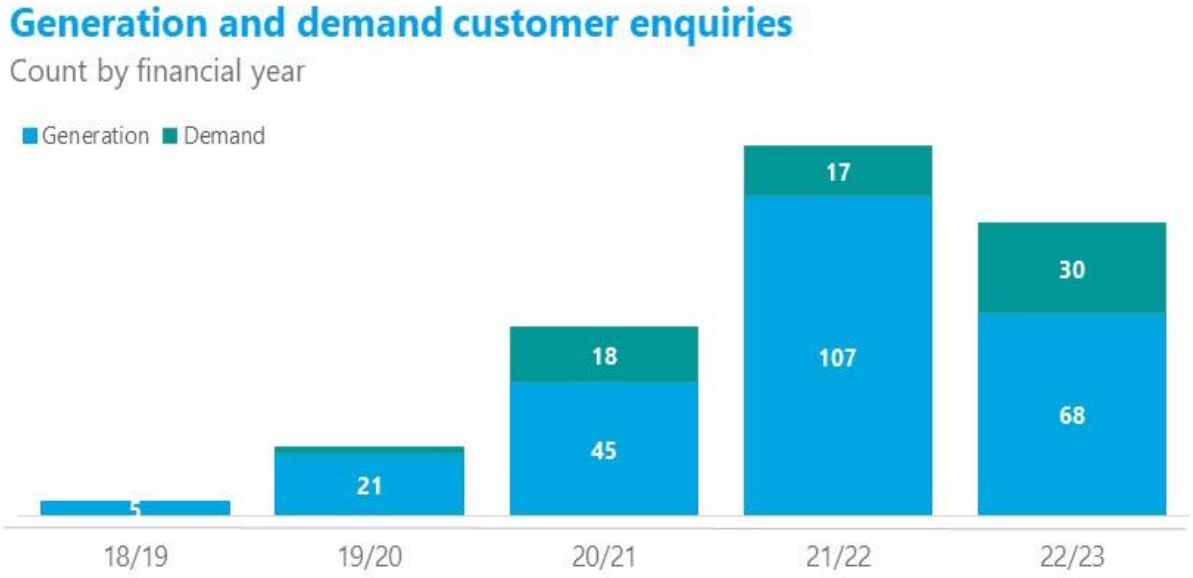


Figure 13: Total renewable energy generation and battery storage capacity to be developed through to 2050

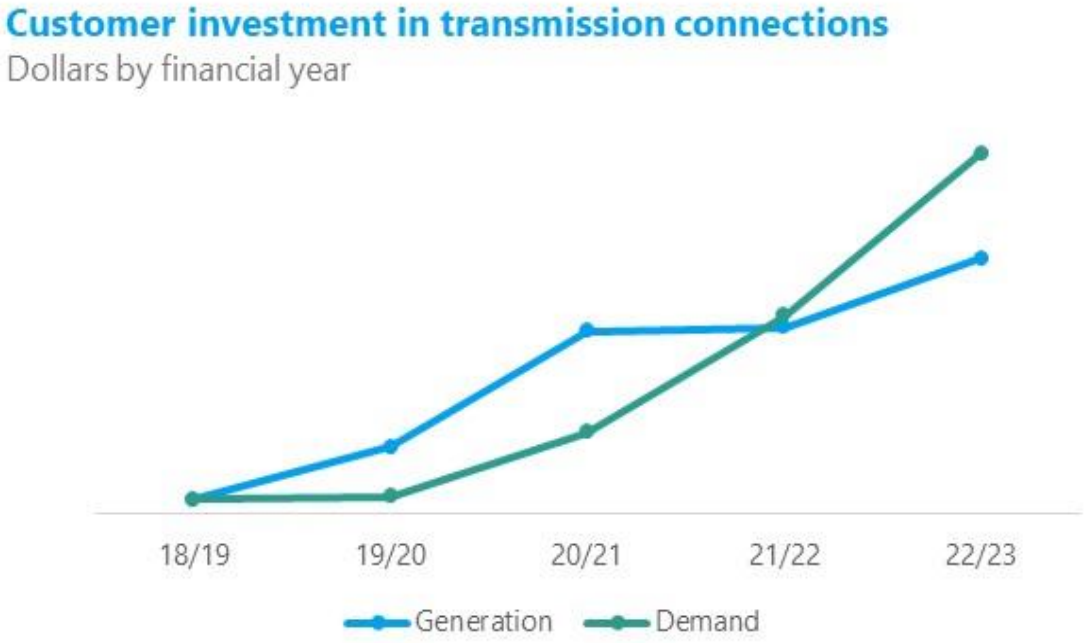


Source: Transpower, Infrastructure Commission (Sapere report)

Transpower is seeing the start of the electrification ramp



Generation pipeline of 30 GW large enough to meet 2050 forecasted energy demand



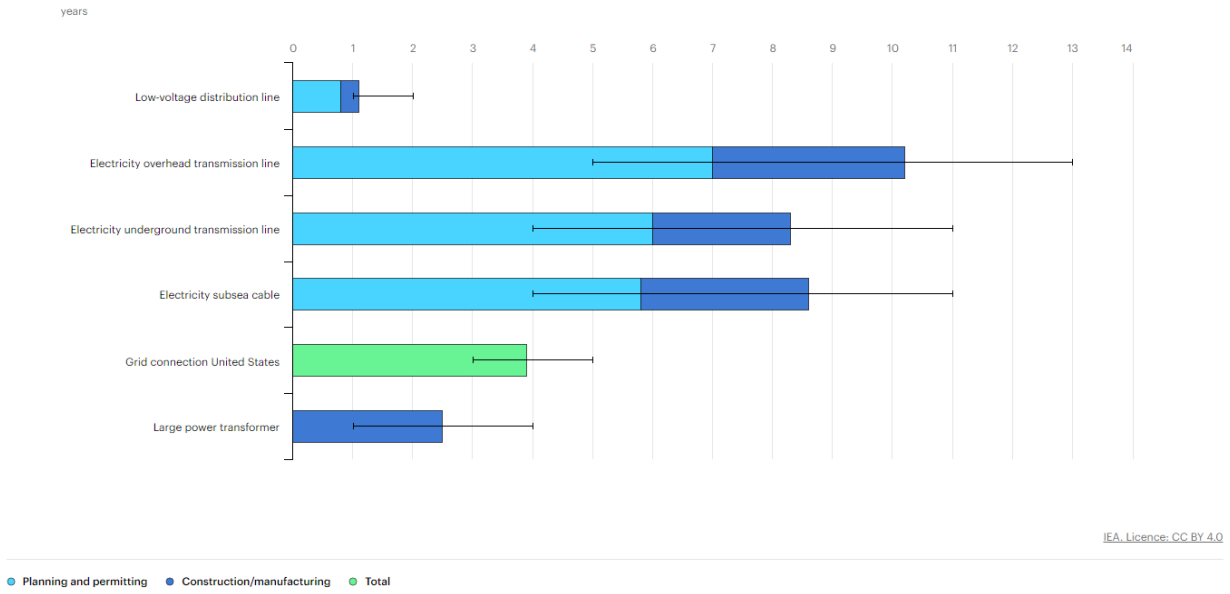
Contracted investment in demand projects has exceeded generation in FY23

Note: Excludes non-connected customers enquiries. Grid scale batteries are included in demand enquiries.

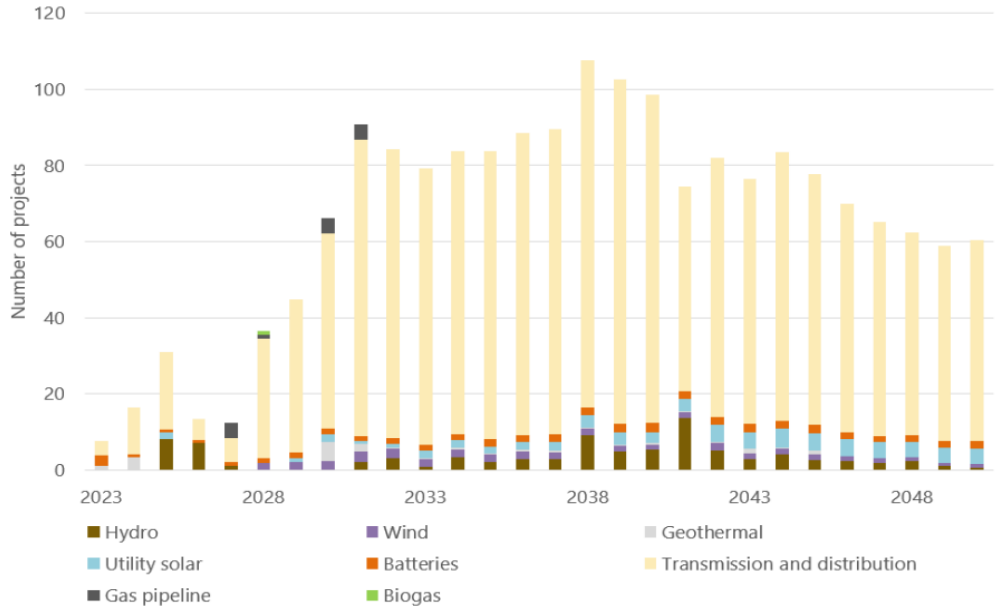
Long lead times mean coordination is critical

- In New Zealand, consenting and land access for large projects can take anywhere between three and seven years to complete
- 1,800 energy projects in NZ will require consenting or reconsenting by 2050 – with transmission and distribution making up 85% of this

Average lead times to build new electricity grid assets in Europe and the United States, 2010-2021



Number of energy projects to be (re)consented, by type of project



Source: IEA report, Infrastructure Commission (Sapere report)

Investment Test

What is it?

- Investment Test is a cost-benefit analysis (CBA)
- Developed by Electricity Commission in 2004 and originally called Grid Investment Test (GIT)
- Commerce Commission, when it took over our regulation, developed its own version to replace it, called the Investment Test (IT)
- Commerce Commission version is very similar to Electricity Commission approach, but it includes learnings from applying GIT
- The Commission's approach put a greater emphasis on the engagement process that we must follow in developing an investment proposal

Objectives of the IT (process)

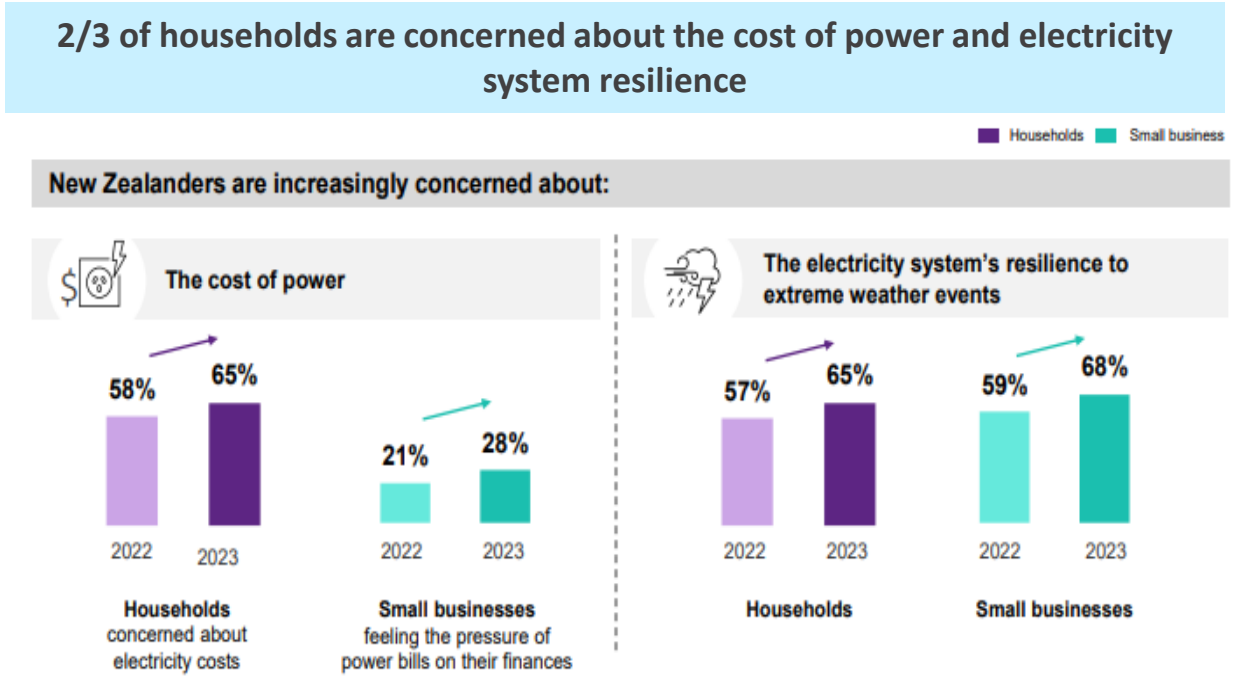
- Promote outcomes in long term interests of consumers
- Ensure we don’t under or over build the grid
- Ensure a range of investment alternatives are considered – not just the ones we think are best
- Ensure non-transmission alternatives (e.g., batteries, demand response, etc) are considered
- Help bring stakeholders with us on upgrades and ensure they can have their say
- The payoff – Transpower gets to recover its efficient costs

Costs and benefits considered

- Constrained to electricity market costs and benefits
- Objective is to minimise delivered cost electricity to consumers
- The Commission must choose the option that maximises net benefits
- Excludes costs-benefits outside of the electricity market and any externalities
- Ignores wealth transfers
- The arrangements mean that the investment test is likely to favour just-in-time investments
- There is flexibility in the scenarios that can be used to deal with uncertainty

Costs and benefits considered in IT

- Capital costs (e.g. build, land, commissioning, consenting)
- Ongoing operating and maintenance
- Generation – capital, fuel, operating and maintenance
- Ancillary service costs
- Losses
- Unserved energy (using value of lost load)
- Competition benefits
- Third party contributions

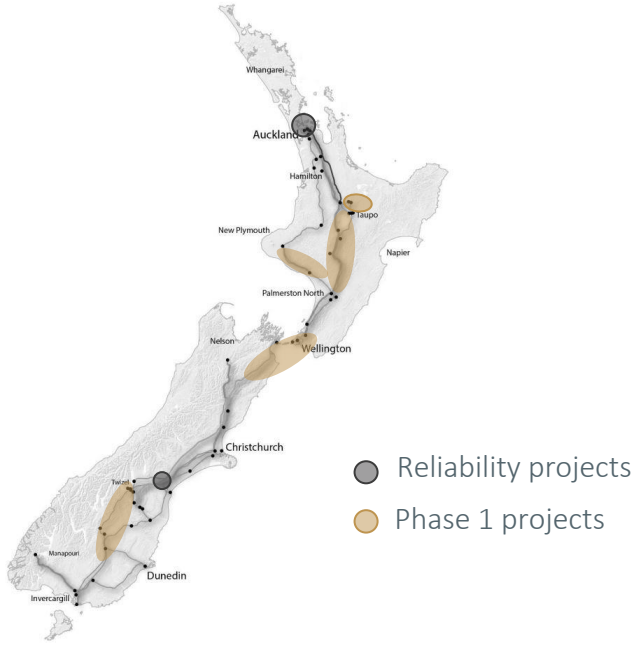


Source: Consumer Sentiment Survey

Net Zero Grid Pathways

Grid investment:
Phased investment approach for Net Zero Grid Pathways

Phase 1 – 2021-2035

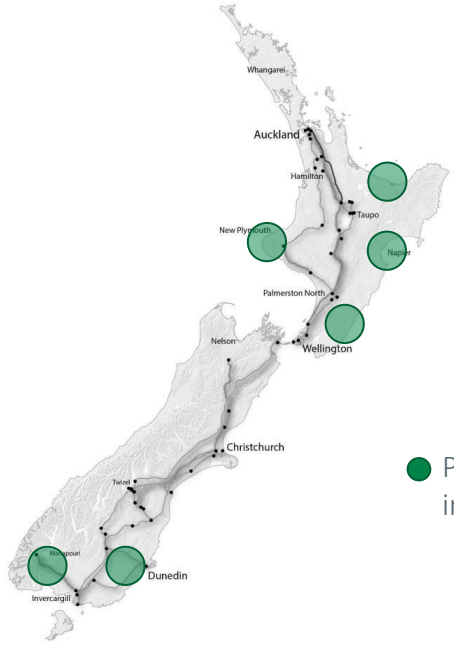


Reliability projects

Phase 1 projects

Phase 1 takes an approach to upgrading the grid backbone assets; selecting investments that would be required under all future scenarios

Phase 2 – 2035-2050



Phase 2 regions of interest

Phase 2 considers regions with high potential for load or generation growth and takes a longer-term perspective of the future grid state; including the installation of new interconnections to supplement the existing grid backbone.

Thank you

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