Project Wolsno: Futureproofing the Waitaki Scheme

Meridian

APEX Summit 2025

Fiona Hamilton

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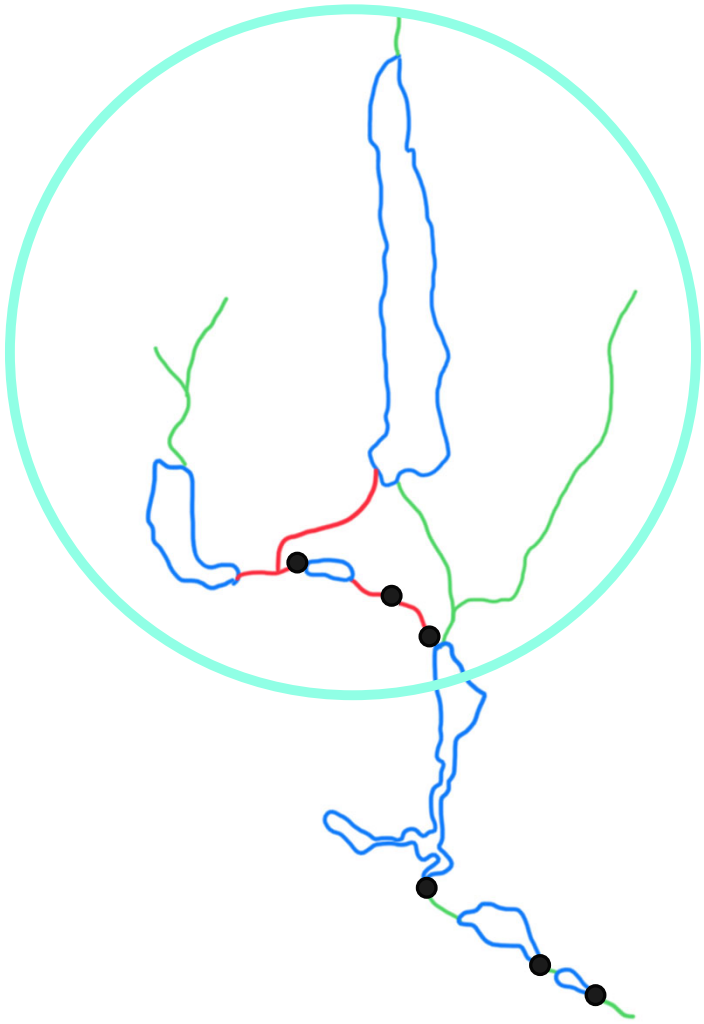
Introduction to Meridian Energy

- New Zealand's largest 100% renewable energy generators
- Total capacity 3240 MW
- 7 Hydro stations
- 8 Wind farms
- 1 Battery energy storage

Waitaki Scheme Overview

Upper Waitaki

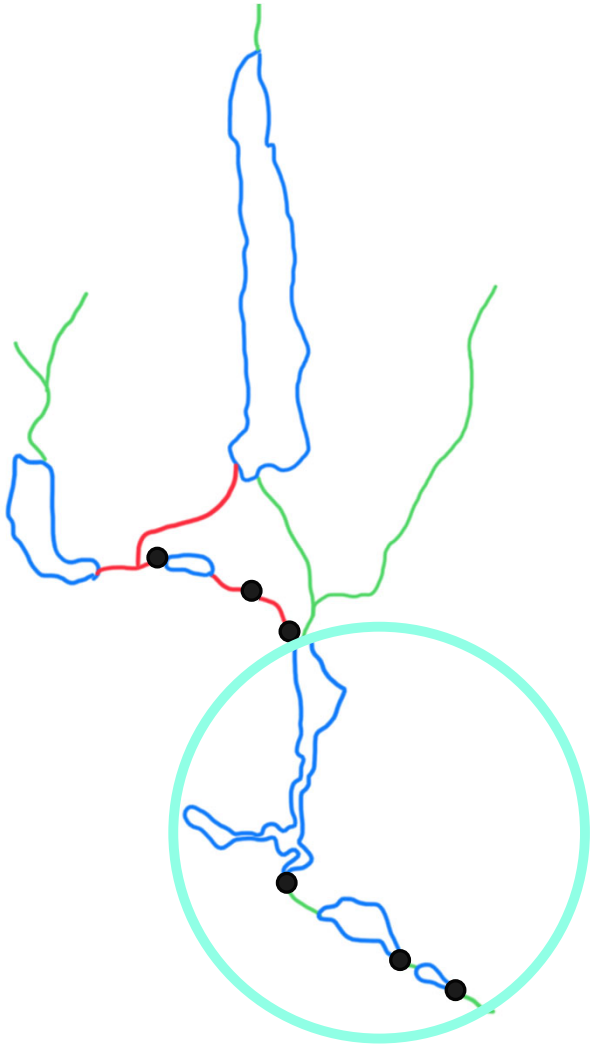
- Ohau A
  - 4 x 66 MW Francis, commissioned 1980
- Ohau B
  - 4 x 55 MW Francis, commissioned 1984
- Ohau C
  - 4 x 54 MW Francis, commissioned 1985



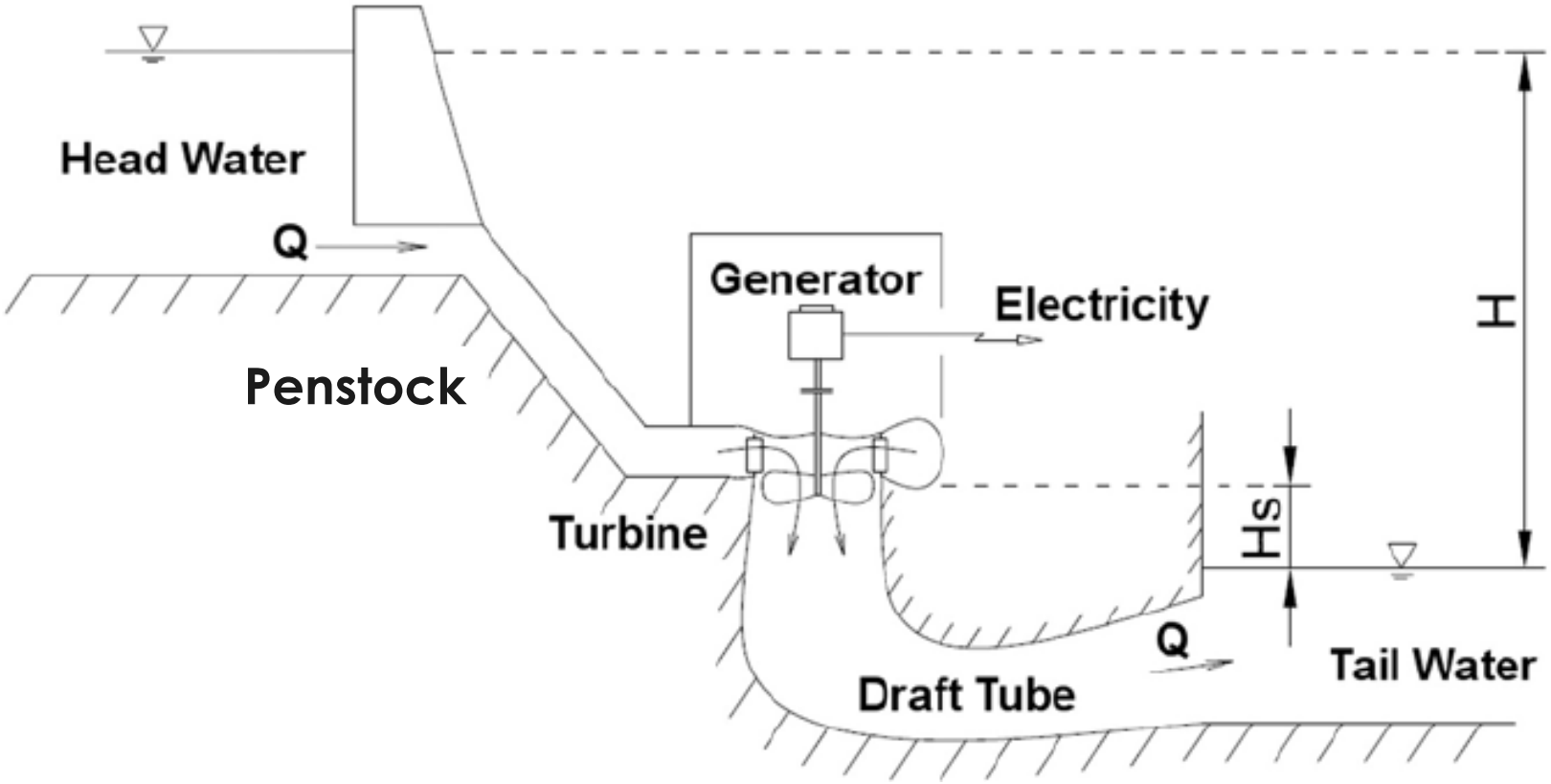
Waitaki Scheme Overview

Mid Waitaki

- Benmore
  - 6 x 93 MW Francis, commissioned 1965
- Aviemore
  - 4 x55 MW Francis, commissioned 1968
- Waitaki
  - 5 x 15 MW Francis, 3 x 15 MW bulb, commissioned 1935, 1949, 1954

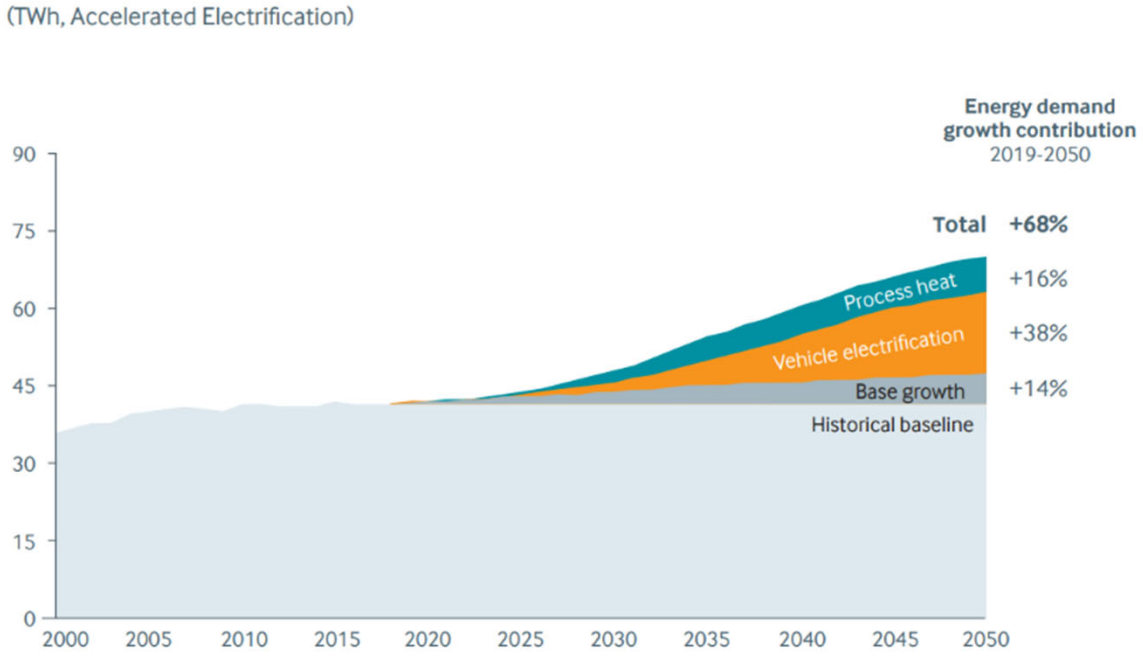


Hydro power key components



New Zealand Electricity Market

- Electrification is driving the demand up
- Growth in intermittent generation
- Challenges with intermittent generation
- Firming of intermittent generation
- Impacts on hydro generation



New Zealand Electricity Market

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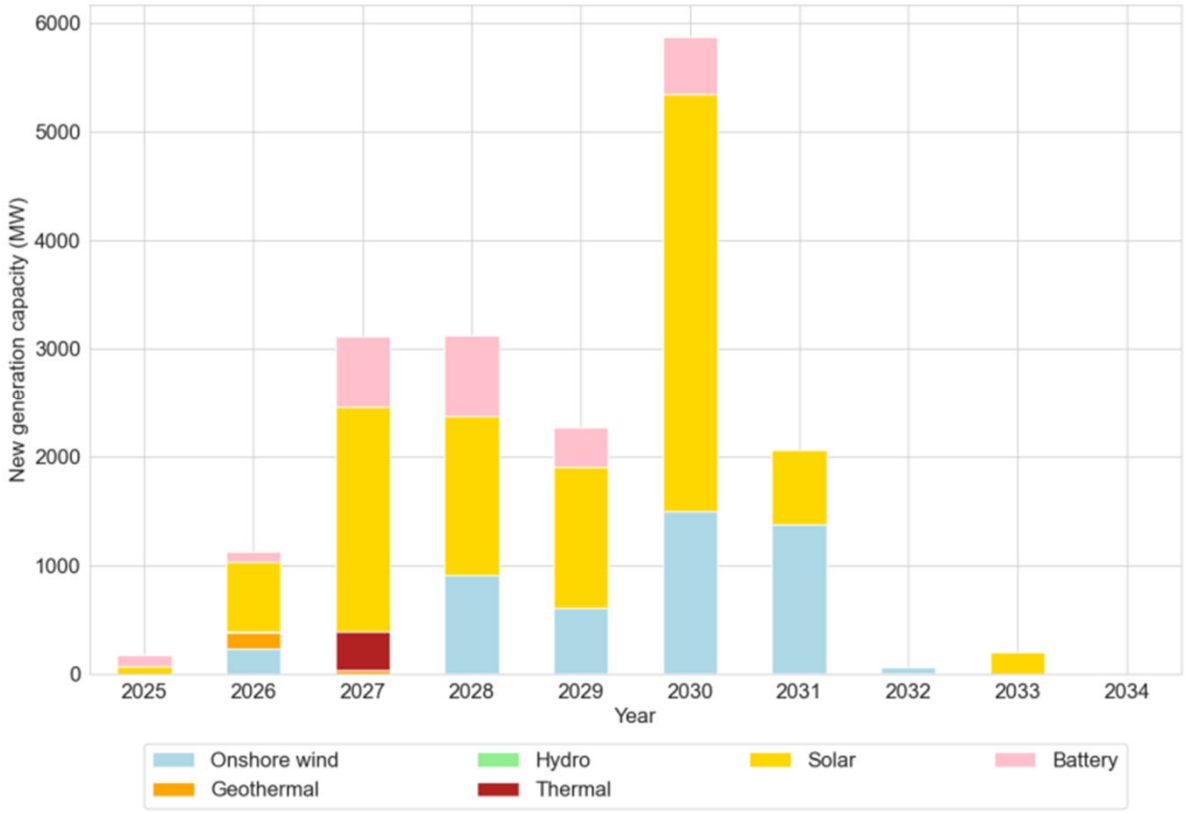
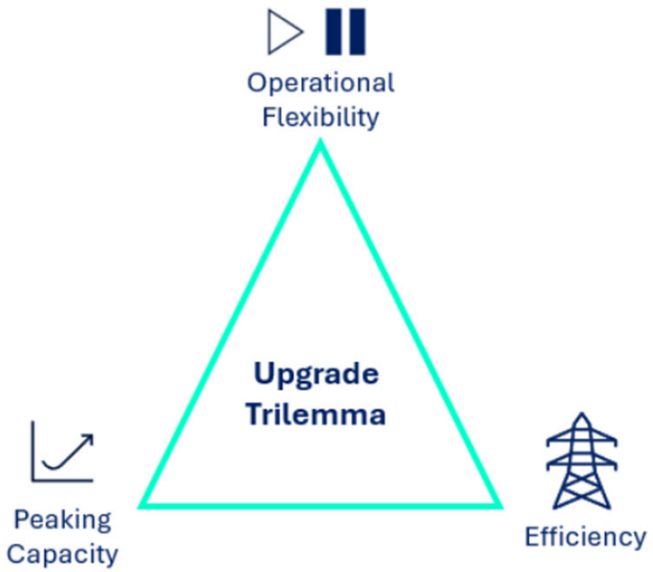
Proposed new project supply timeline



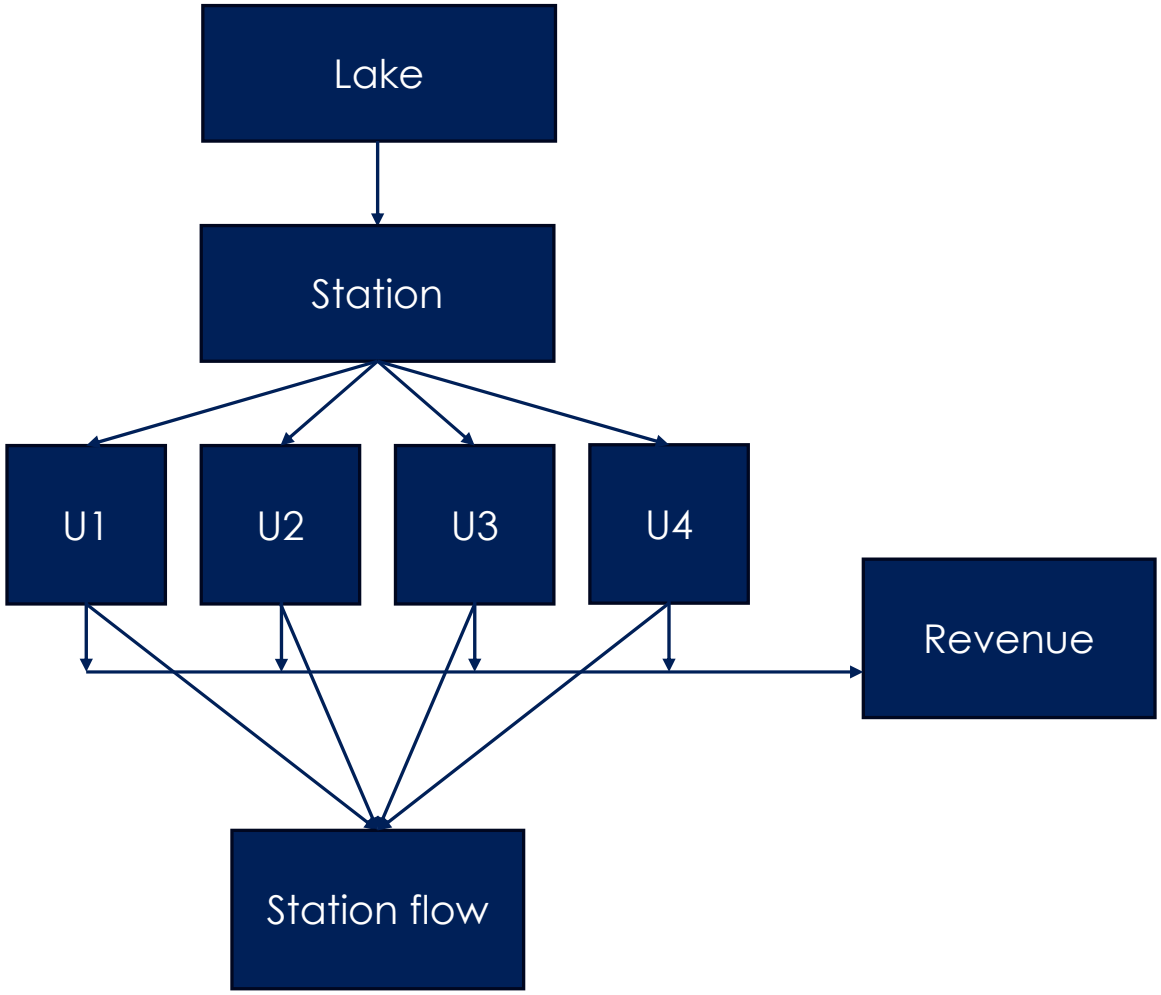
Project Overview

- Investigate options to better firm intermittent generation
- Evaluate refurbishment, replacement, and modification pathways
- Evaluate the key turbine performance priorities
  - Capacity
  - Flexibility
  - Efficiency



Model

- Model software selection
  - 11 models were assessed
    - 5 internal, and 6 external
    - Selected software- STELLA architect
  - Model development
  - Model assumptions



Data Inputs

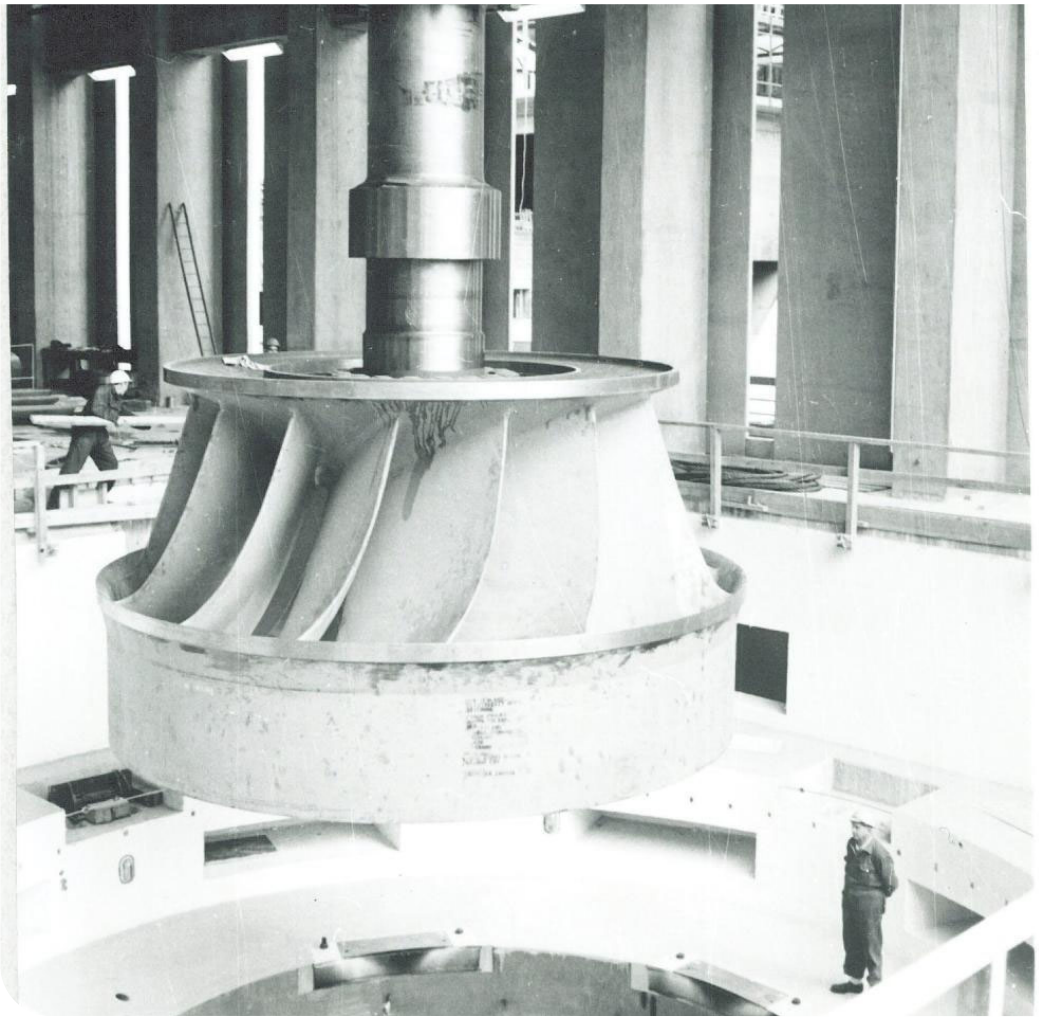
- Penstock diameter, length and surface roughness
- Draft tube exit area
- Lake level constraints
- Required consents
- Forward price paths
- Future hydraulic flow
- Turbine efficiency
- Generator efficiency
- Average head and tail water levels

Validation

- Purpose of validation
  - ensure model accuracy and reliability
- Validation method
  - Input historical water flow data
  - Compare output of historical to modelled
  - Results

Original Equipment Manufacturer Collaboration

- Scope for the OEM
  - Runner
- Early OEM input
- Current progress



Next Steps

- Generate future flow paths
- Determine strategic focus to guide the OEM
- Analyse each OEM iteration in the model and provide feedback to the OEM
- Complete this iteration process for the stations
- Run the model with all stations
- Hand the model onto the development team

Questions?

References:

Accelerated Electrification graph from 'Whakamana I Te Mauri Hiko-Empowering our Energy Future' Figure 3: Gross Energy Demand, Transpower 2020

New Generation Capacity graph from 'Appendices for Security Supply Assessment 2025' Figure 7: Proposed new supply project timeline for the reference case, Transpower 2025