New Zealand Energy Scenarios TIMES-NZ 2.0

EECA and BEC Lunchtime Webinar

Agriculture, Forestry, and Fishing

NZ Energy Scenarios TIMES-NZ 2.0

Our work at EECA included creating the data structure, data inputs, modelling, and analysis of the results.

NZ Energy Scenarios TIMES-NZ 2.0

Kea

Kea represents a scenario where climate change is prioritised as the most pressing issue and New Zealand deliberately pursues cohesive ways to achieve a low-emissions economy.

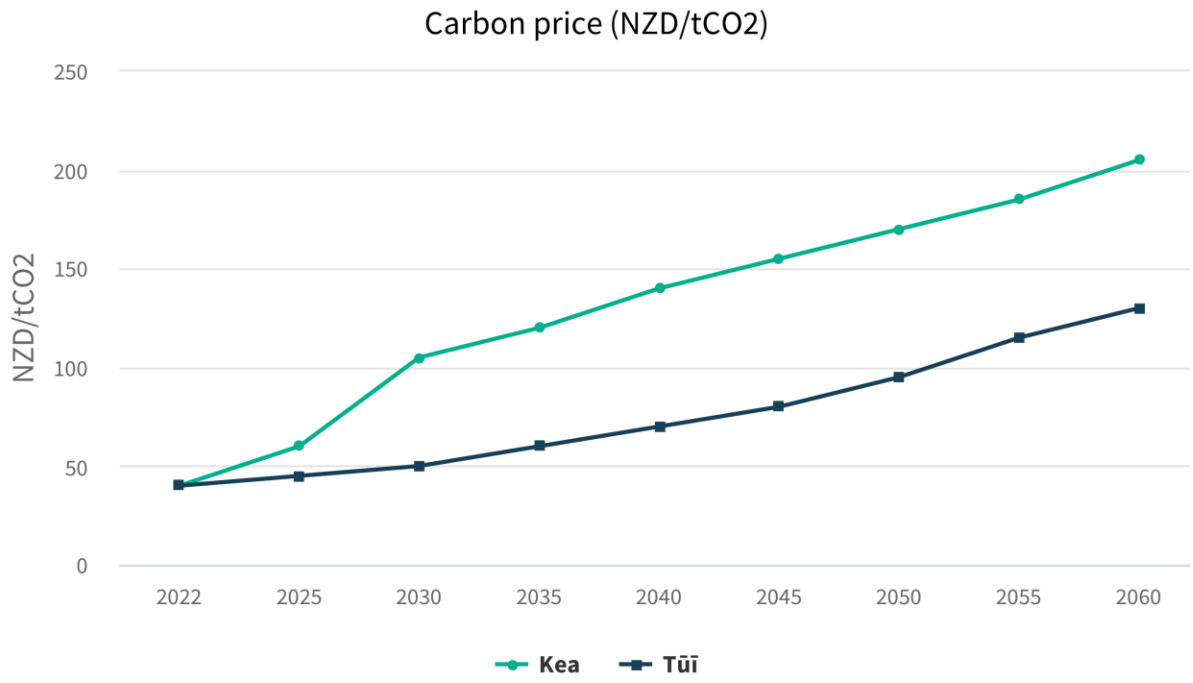
Tūī

Tūī represents a scenario where climate change is an important issue to be addressed as one of many priorities, with most decisions being left up to individuals and market mechanisms.

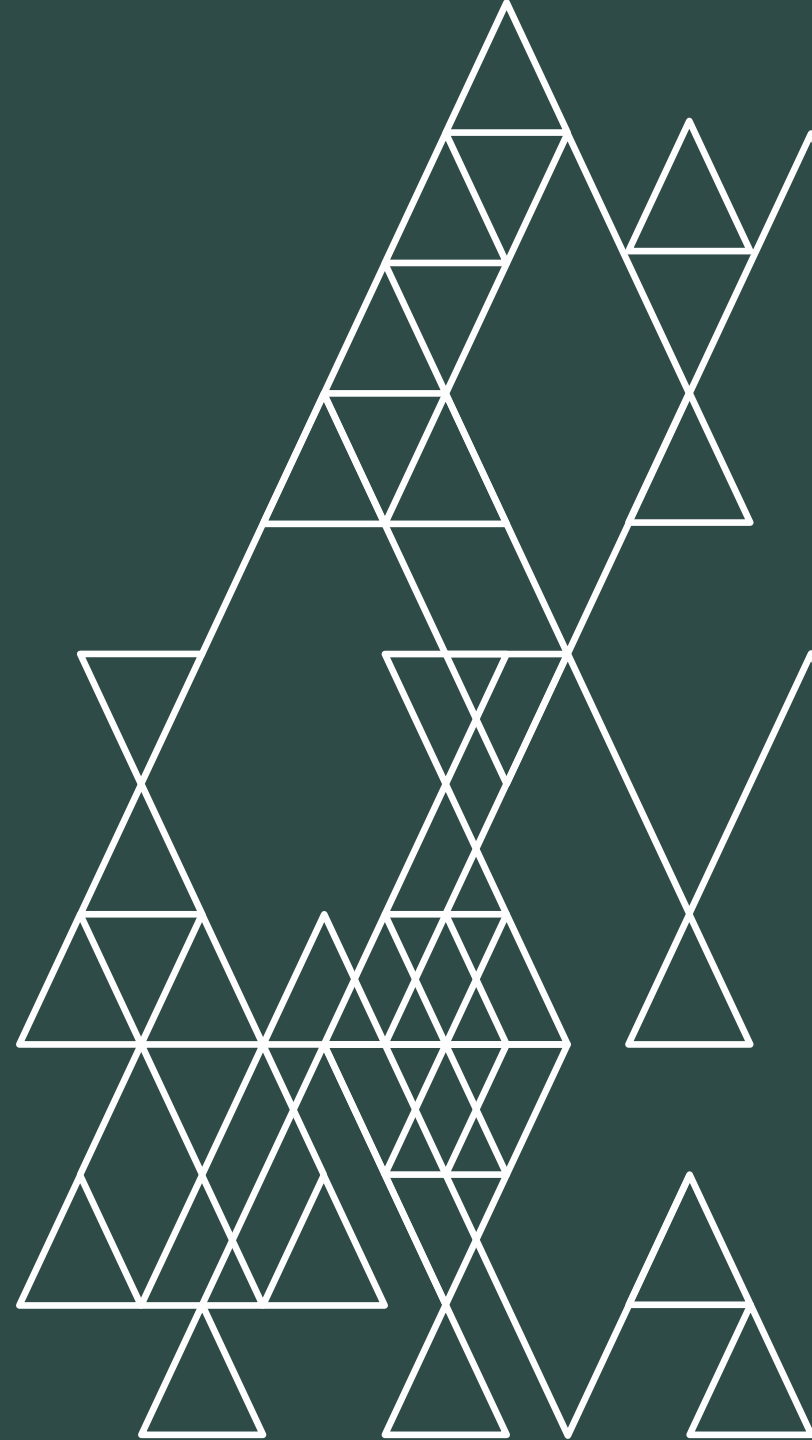
Scenario Parameters

The key model input differences between Kea and Tūī are:

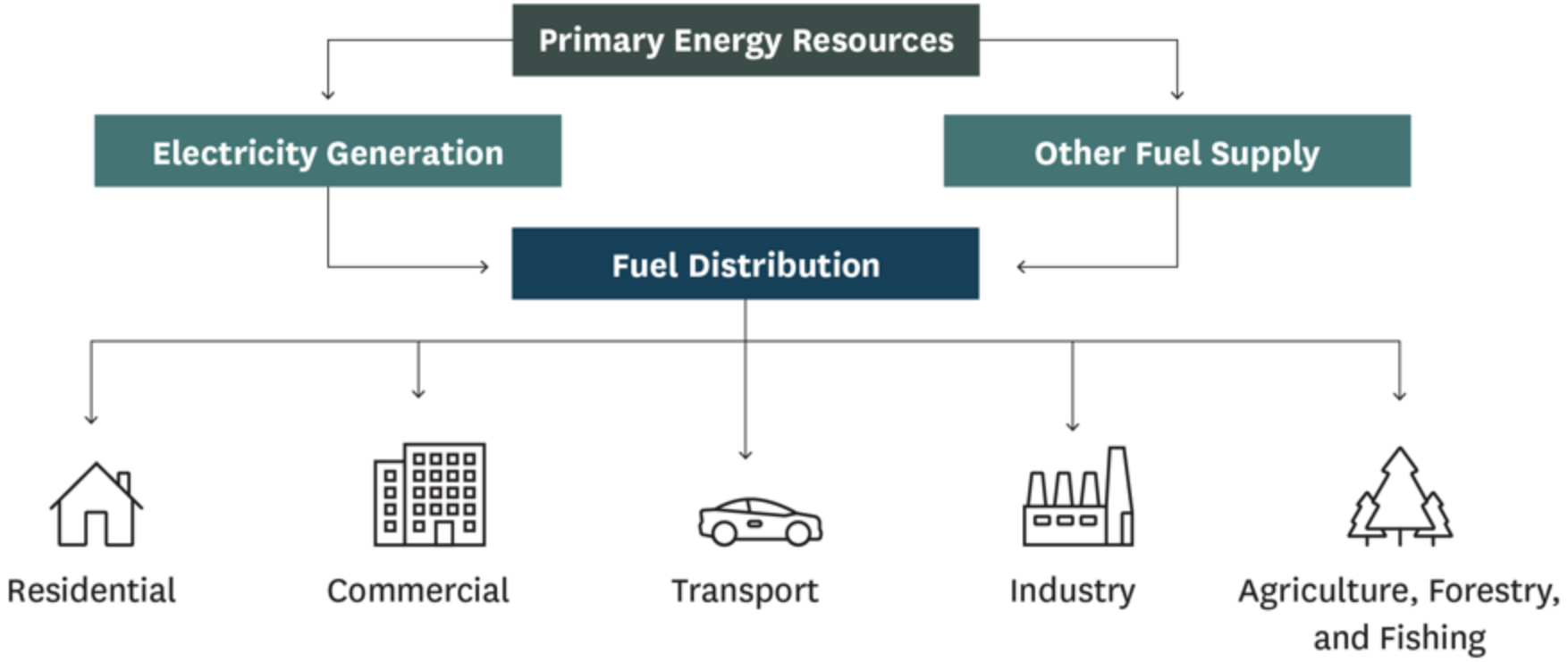
- **Composite GDP**
- **Carbon price**
- **Discount rates**
- **Technology cost curves**



TIMES-NZ Overview



TIMES-NZ 2.0 Model Structure



TIMES-NZ 2.0 Model Structure

Residential

Detached Dwellings
Joined Dwellings

Commercial

Education
Healthcare
Office blocks
Warehouses Supermarkets and Retail (WSR)
Other

Transport

Light road
Heavy road
Aviation
Shipping
Rail

Industry

Aluminium
Construction
Dairy Product Manufacturing
Food Processing
Iron/Steel Manufacturing
Meat Processing
Metal Product Manufacturing
Methanol Production
Mineral Production
Mining
Petroleum/Chemicals
Refining of petroleum products
Urea Production
Wood Product Manufacturing
Wood Pulp and Paper Processing

Agriculture, Forestry, and Fishing

Dairy Farming
Livestock Farming
Outdoor Horticulture & Arable Farming
Indoor Cropping
Forestry
Fishing

EECA's Energy End Use Database (EEUD) provides a greatly improved input dataset for describing demand sectors.

TIMES-NZ 2.0 Model Structure

Regions and Time Representation

Time horizon: 2018 - 2060

Category	Values	Number of
Season	Summer Autumn Winter Spring	4
Weekday type	Weekday Weekend	2
Time of day	Day Time Peak Time Night Time	3

4 x 2 x 3 = 24 time slices per year

Assumptions

TIMES-NZ 2.0 Model Structure

Residential

Detached Dwellings
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Methanol Production
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Agriculture, Forestry, and Fishing

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EECA's Energy End Use Database (EEUD) provides a greatly improved input dataset for describing demand sectors.

Agriculture
Demand Projections

Subsector	Driver
Dairy Cattle Farming	Land Use/Animal Number Projections
Livestock Farming	Land Use/Animal Number Projections
Outdoor Horticulture/Arable Farming	Land Use Projections
Indoor Cropping	Population
Forestry	Land Use Projections
Fishing	Assumed Constant

Agriculture Technology options

- Dairy shed
  - Milking Machine (Vacuum pump)
  - Transfer Pumps
  - Refrigeration
  - Water heating
  - Heat recovery

- Farm vehicles
  - Bike
  - Truck
  - Ute

- Irrigation (with/without VSD)

- Indoor cropping
  - Boiler
    - Electric
    - Hydrogen
    - Biomass
    - Natural Gas
    - Coal
  - Heat Pump

Agriculture Heavy Vehicles

- Farm Heavy vehicles
  - Tractors/Harvesters
    - Diesel
    - Electric
    - Hydrogen

- Forestry
  - Ground Based
    - Diesel
    - Electric
    - Hydrogen

  - Cable Yarding
    - Diesel
    - Electric
    - Hydrogen

Agriculture

Load Distribution

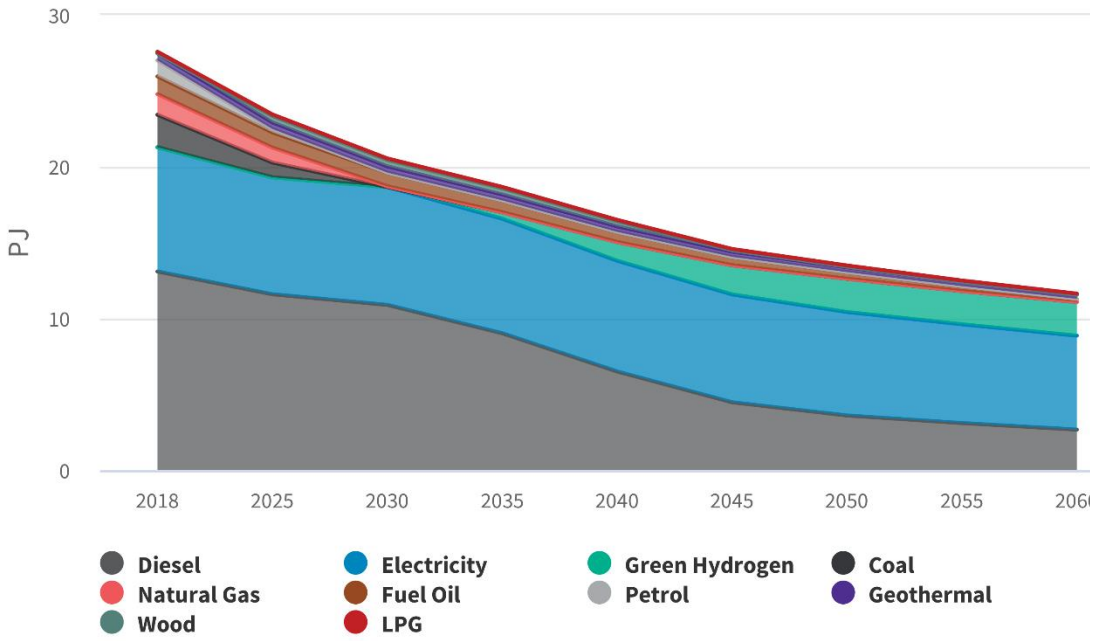
- Irrigation
- Dairy shed
- Farm vehicles charging
- Greenhouse heating

Results

Agricultural Fuels

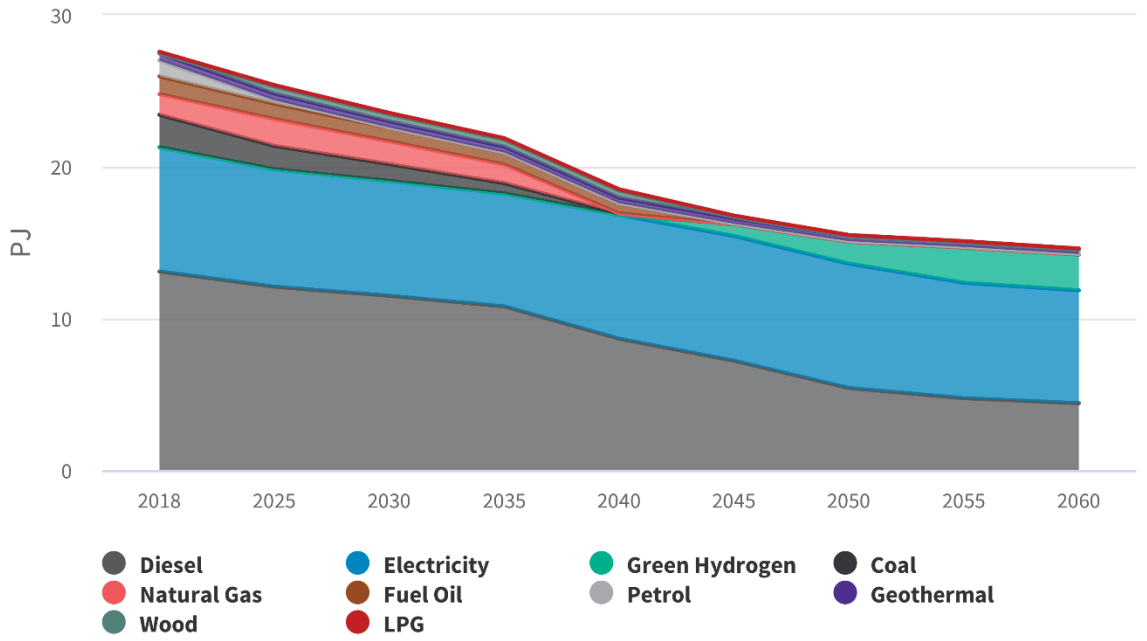
Fuel Consumption

Kea Fuel Consumption



TIMES-NZ 2.0, Scenario: Kea

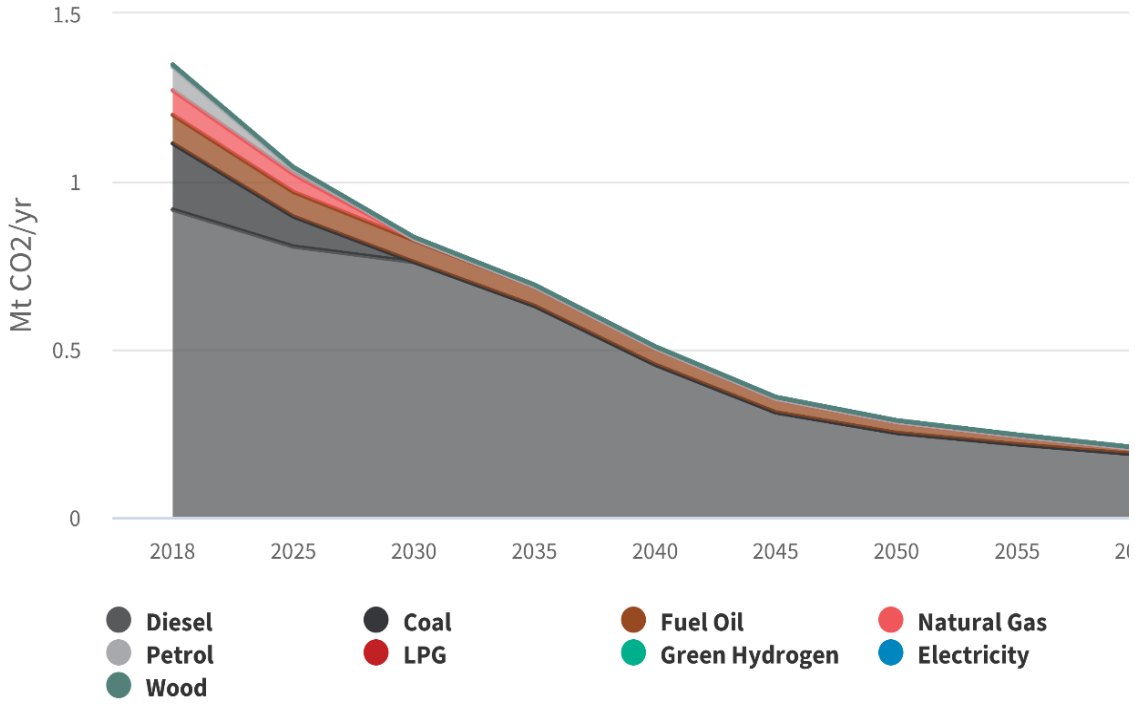
Tui Fuel Consumption



TIMES-NZ 2.0, Scenario: Tūī

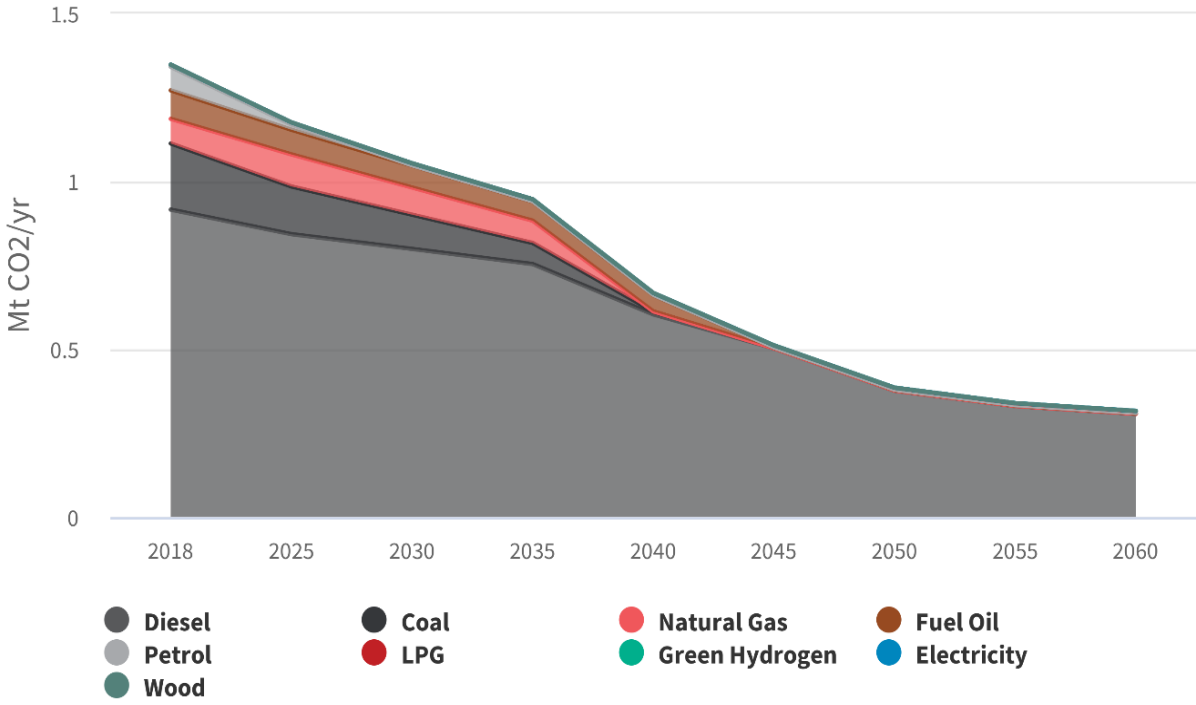
Agricultural Emissions

Kea Emissions



TIMES-NZ 2.0, Scenario: Kea

Tui Emissions

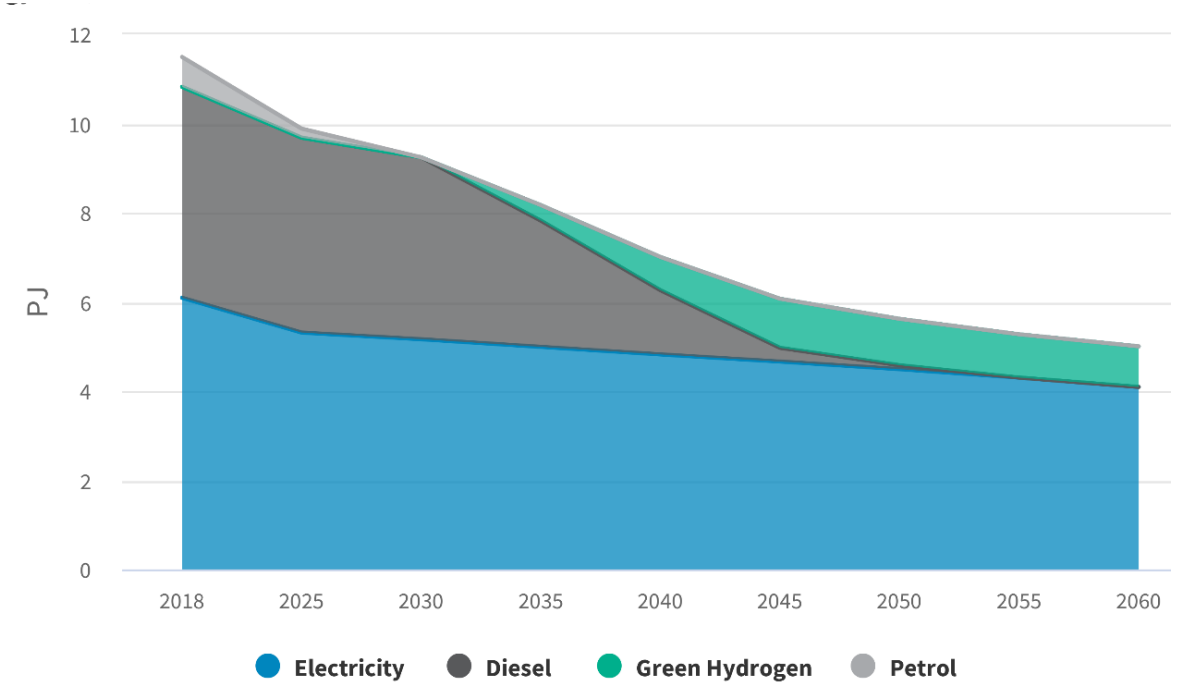


TIMES-NZ 2.0, Scenario: Tūī

Dairy Farming

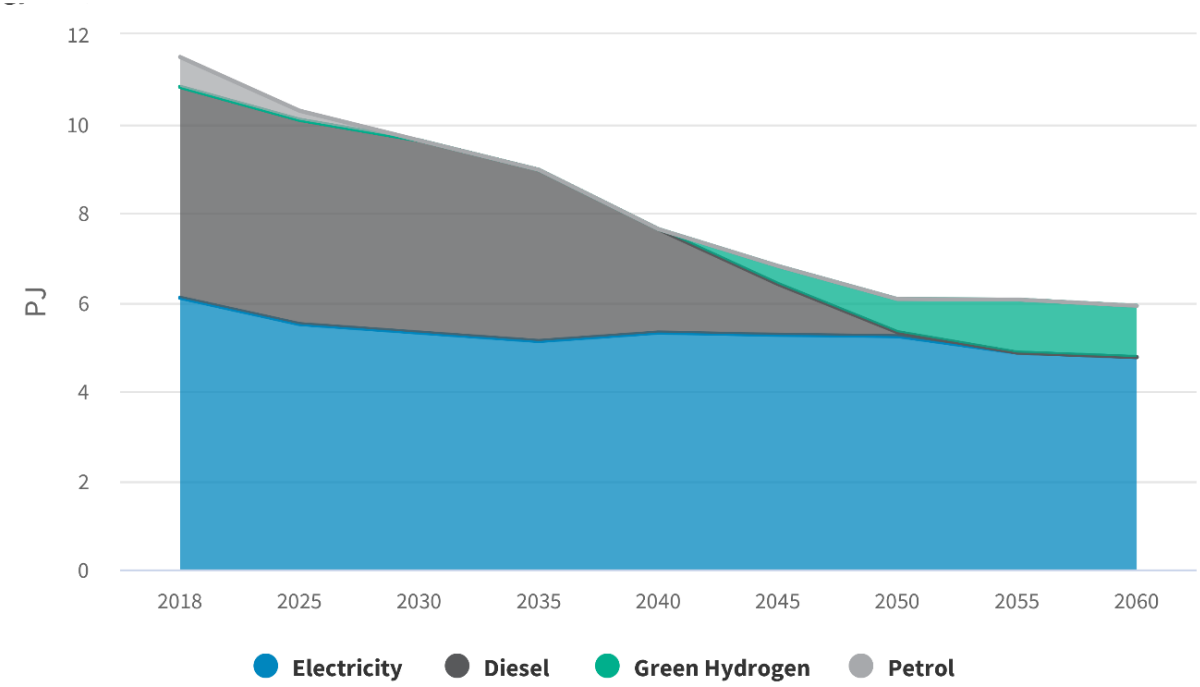
Fuel Consumption

Kea Fuel Consumption - Dairy



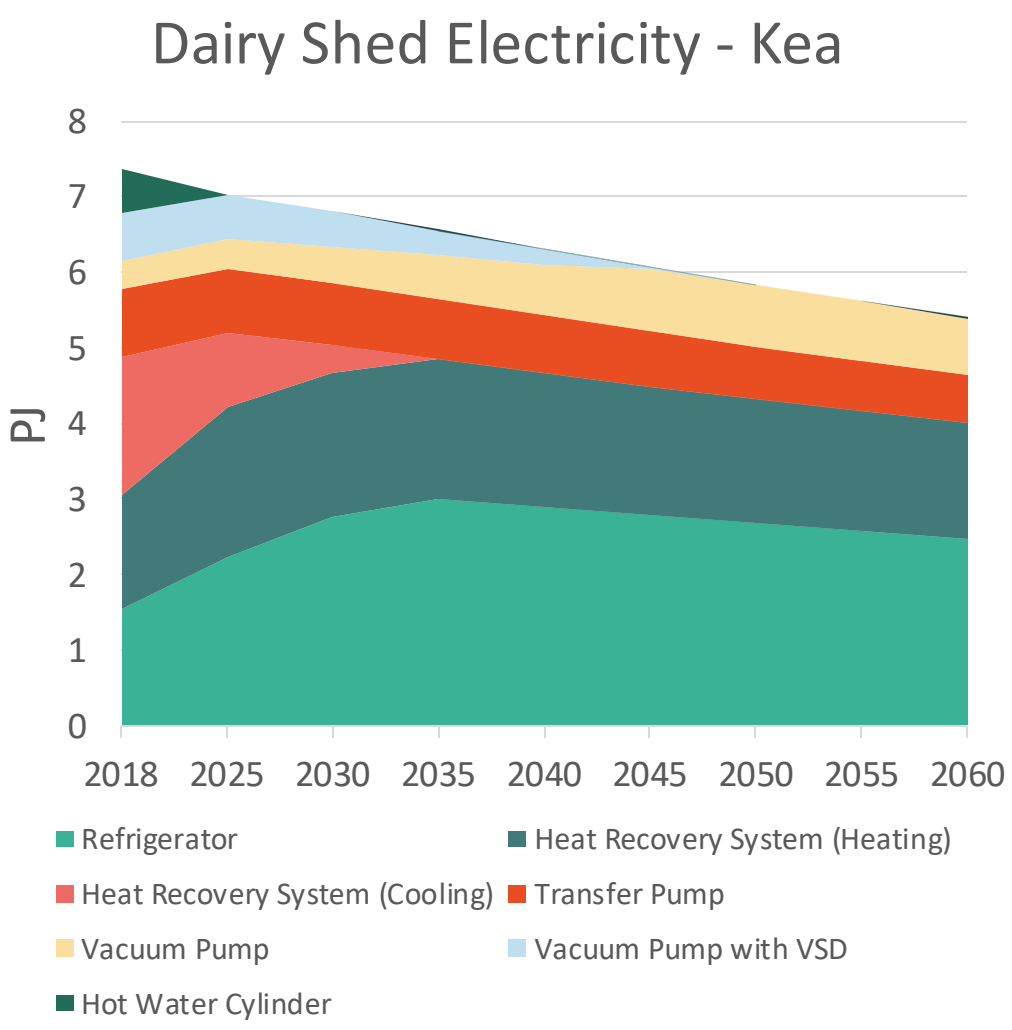
TIMES-NZ 2.0, Scenario: Kea

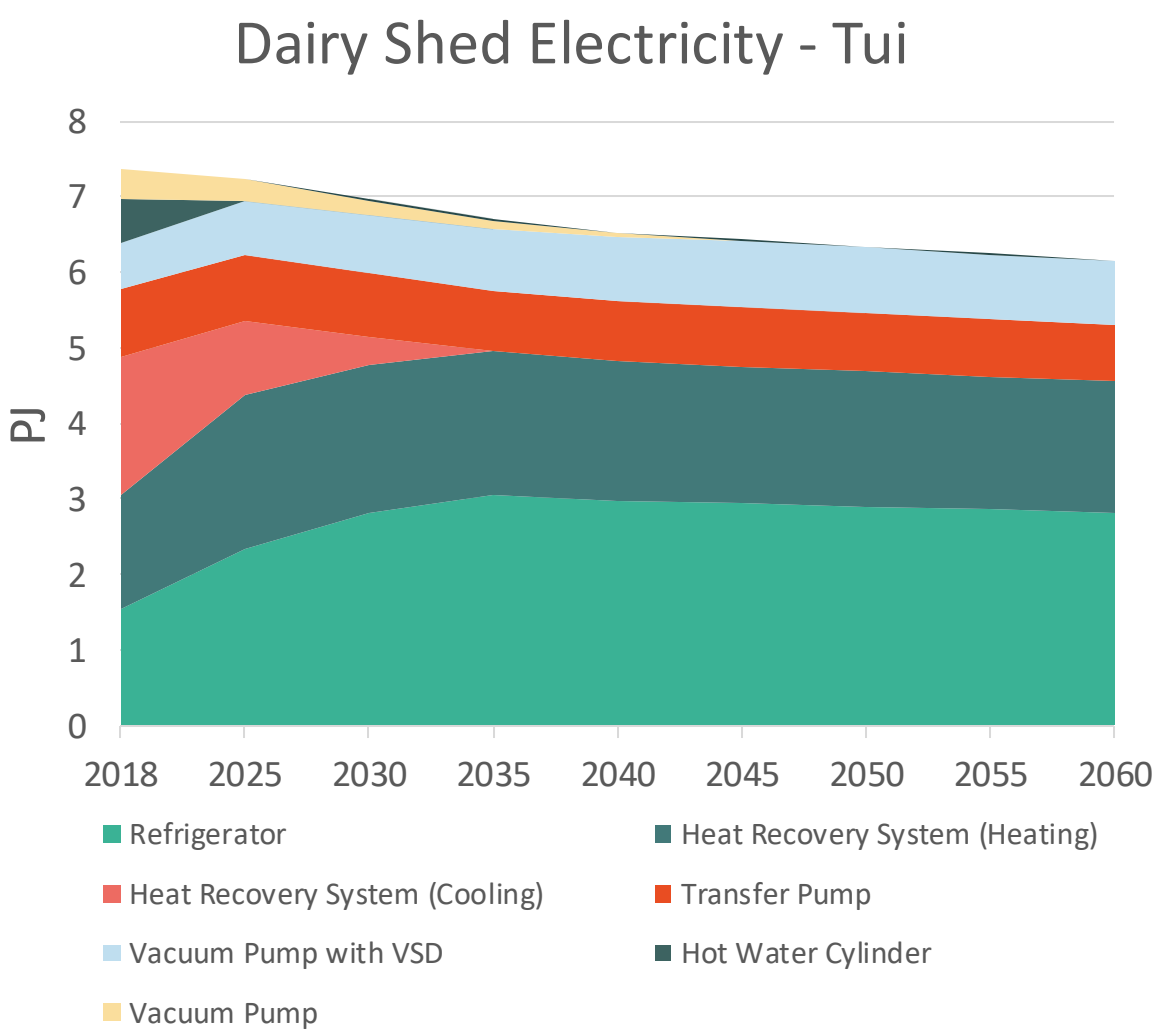
Tui Fuel Consumption - Dairy



TIMES-NZ 2.0, Scenario: Tūī

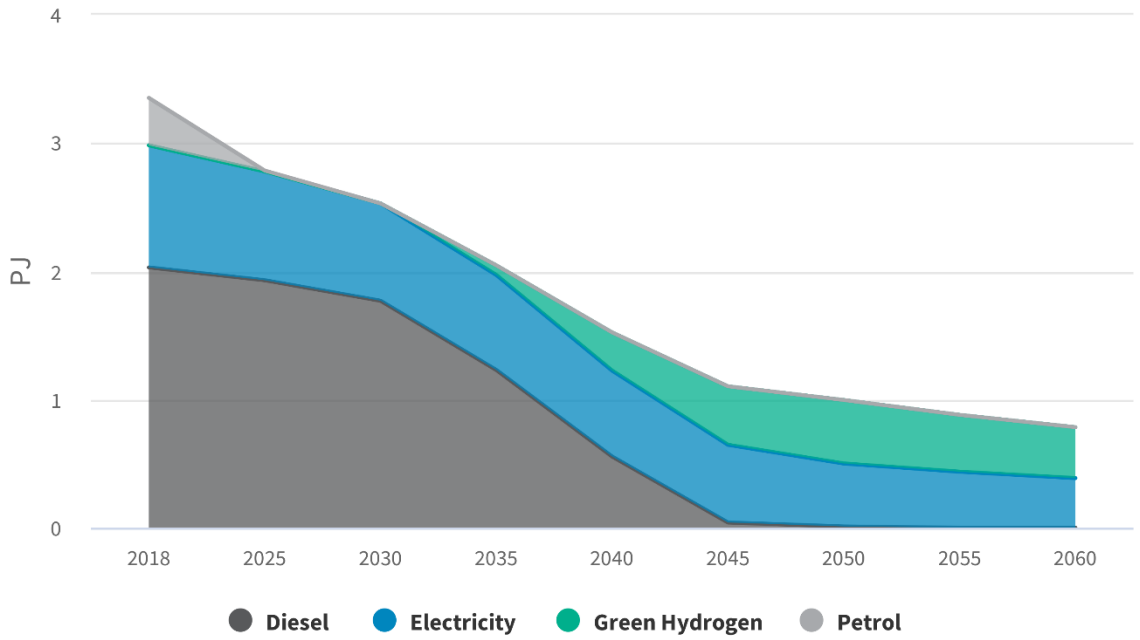
Dairy Shed Electricity





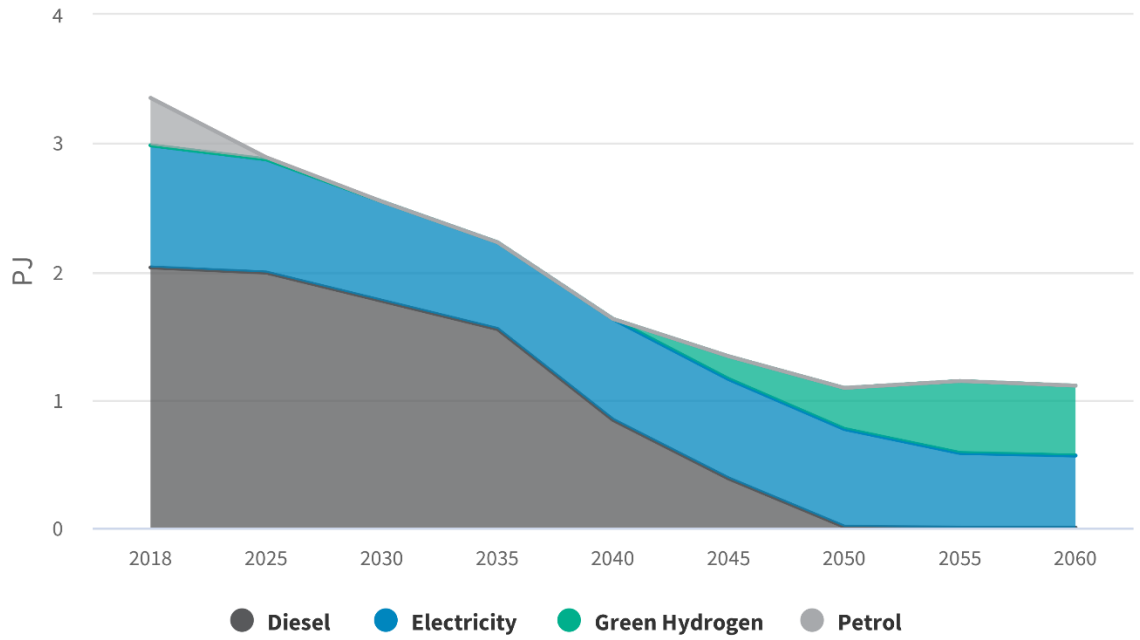
Livestock Farming

Kea Fuel Consumption - Livestock



TIMES-NZ 2.0, Scenario: Kea

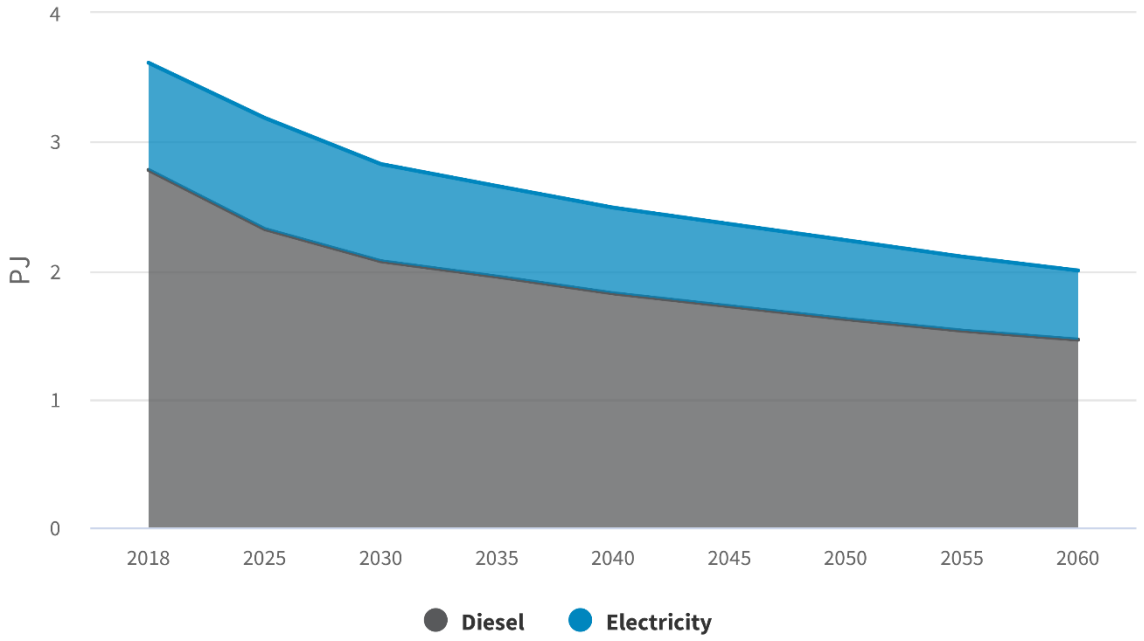
Tui Fuel Consumption - Livestock



TIMES-NZ 2.0, Scenario: Tūī

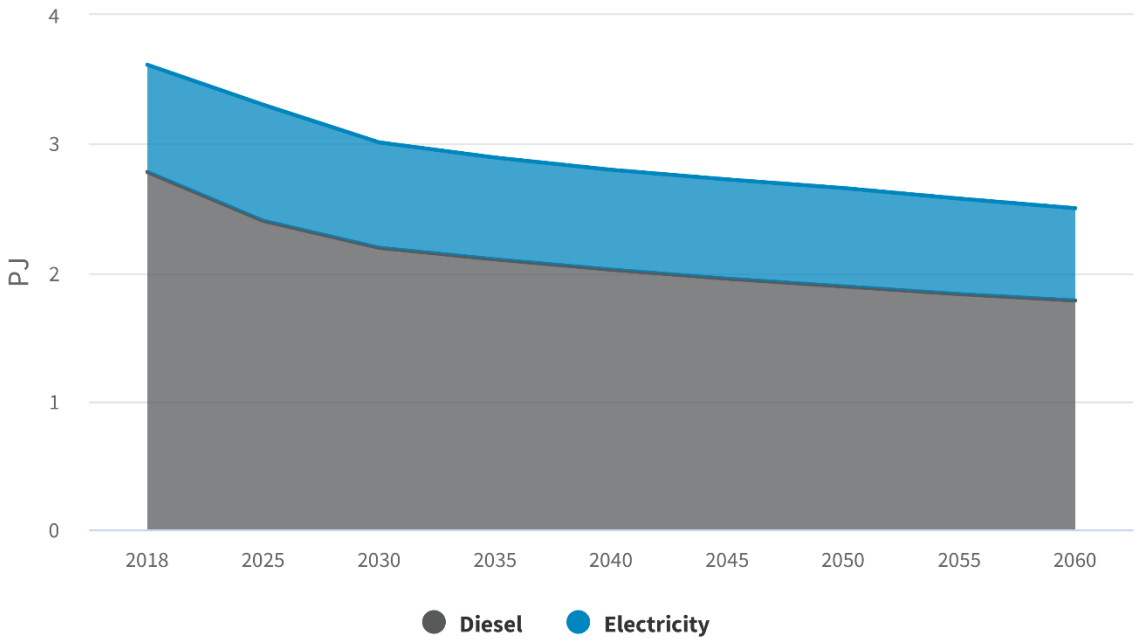
Outdoor Horticulture & Arable Farming

Kea Fuel Consumption – Outdoor Horticulture



TIMES-NZ 2.0, Scenario: Kea

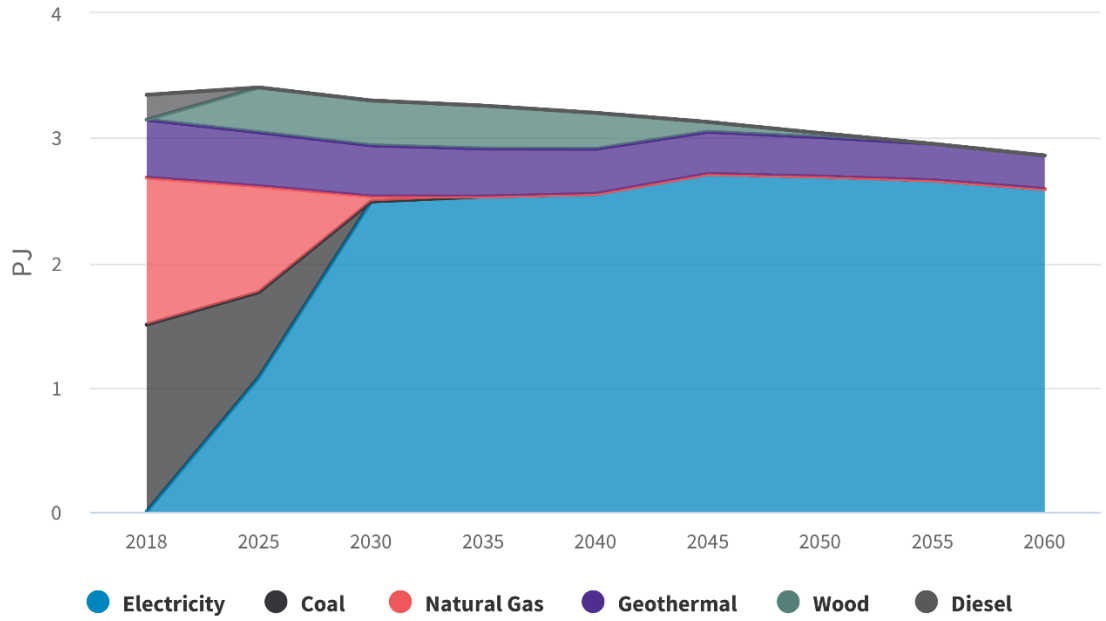
Tui Fuel Consumption – Outdoor Horticulture



TIMES-NZ 2.0, Scenario: Tūī

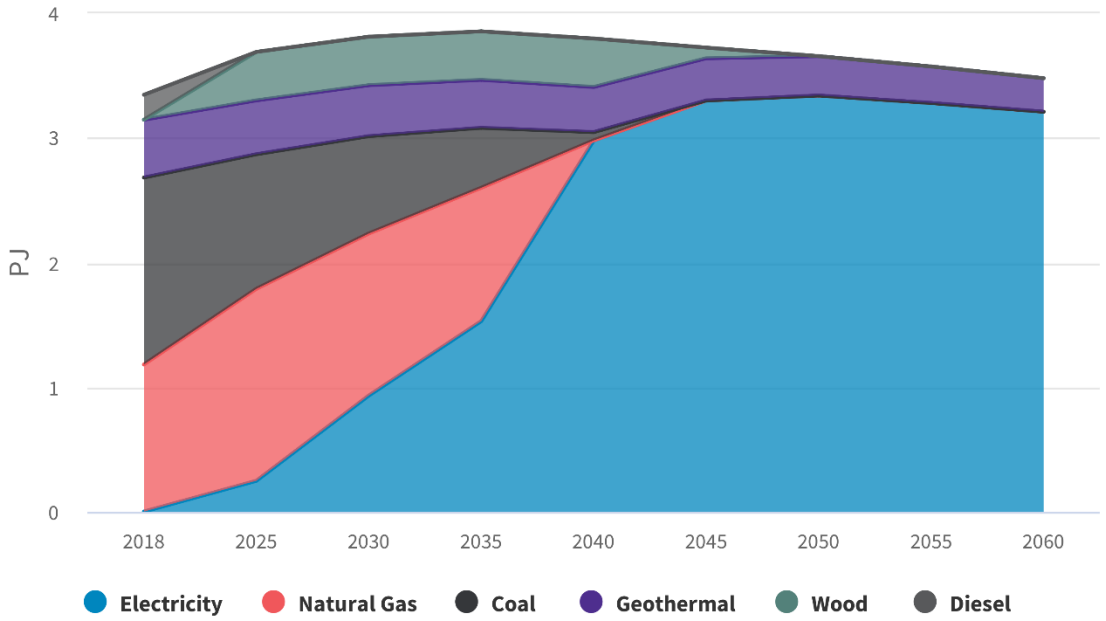
Indoor Cropping

Kea End Use Demand – Indoor Cropping



TIMES-NZ 2.0, Scenario: Kea

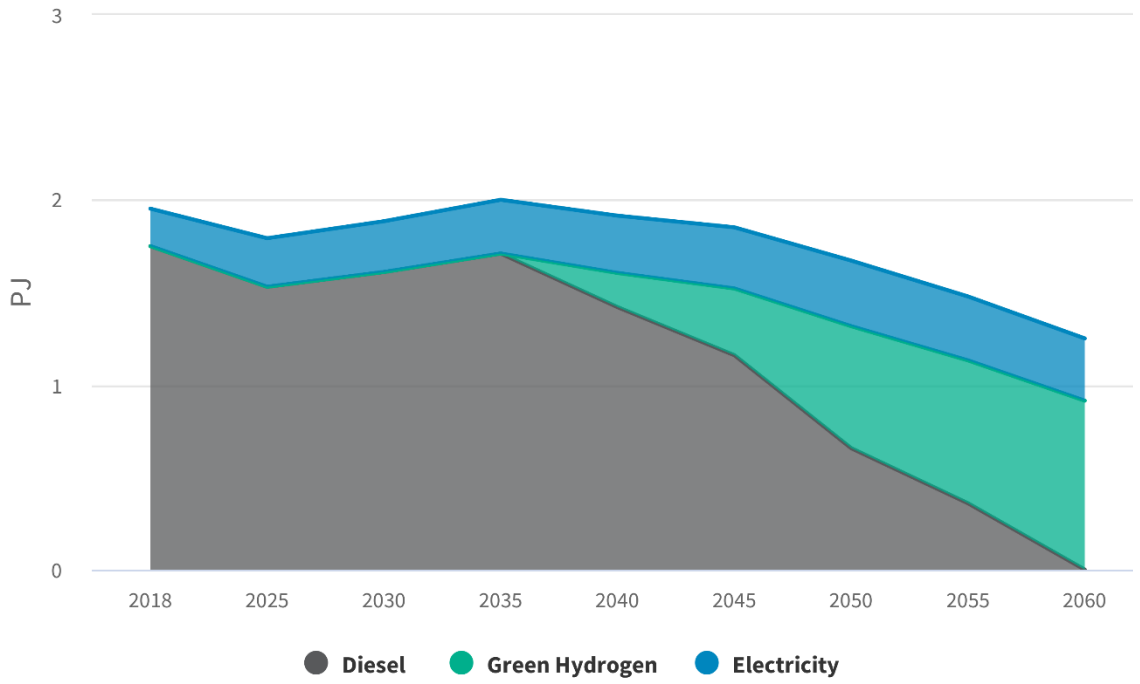
Tui End Use Demand – Indoor Cropping



TIMES-NZ 2.0, Scenario: Tūī

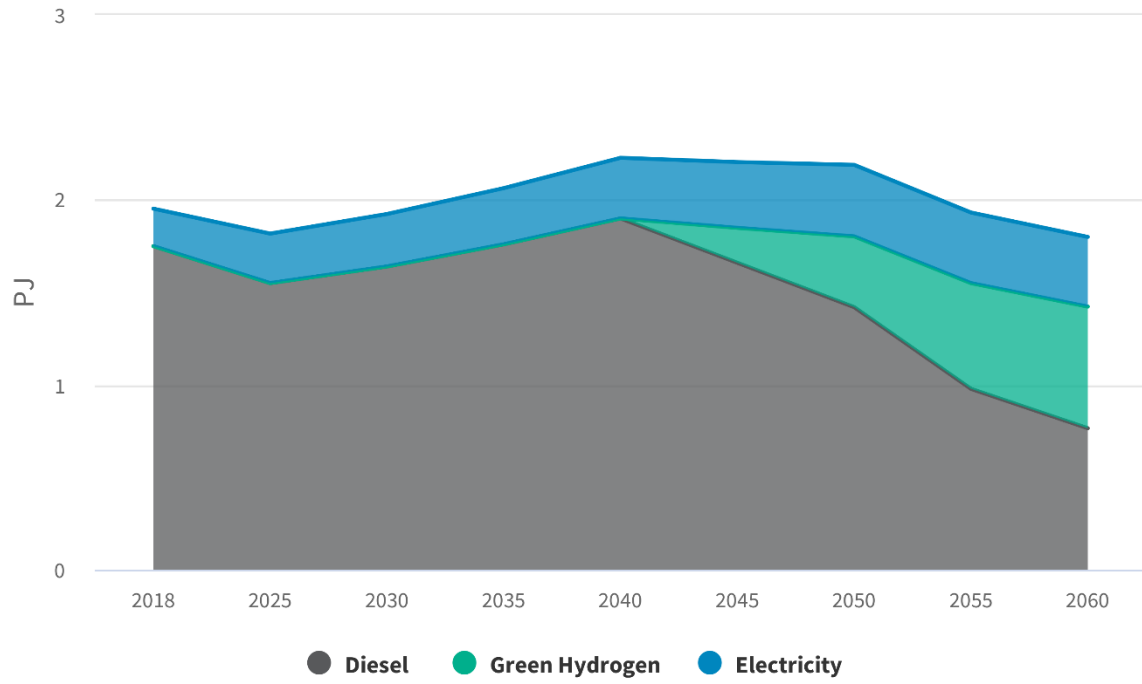
Forestry

Kea Fuel Consumption - Forestry



TIMES-NZ 2.0, Scenario: Kea

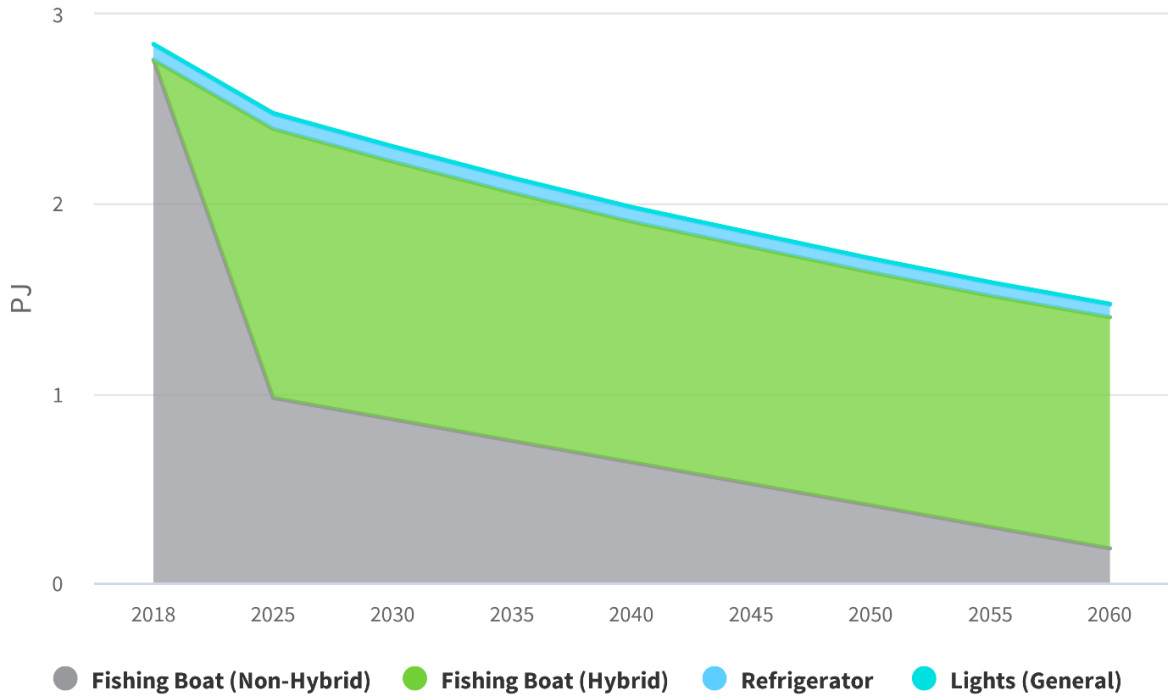
Tui Fuel Consumption - Forestry



TIMES-NZ 2.0, Scenario: Tūī

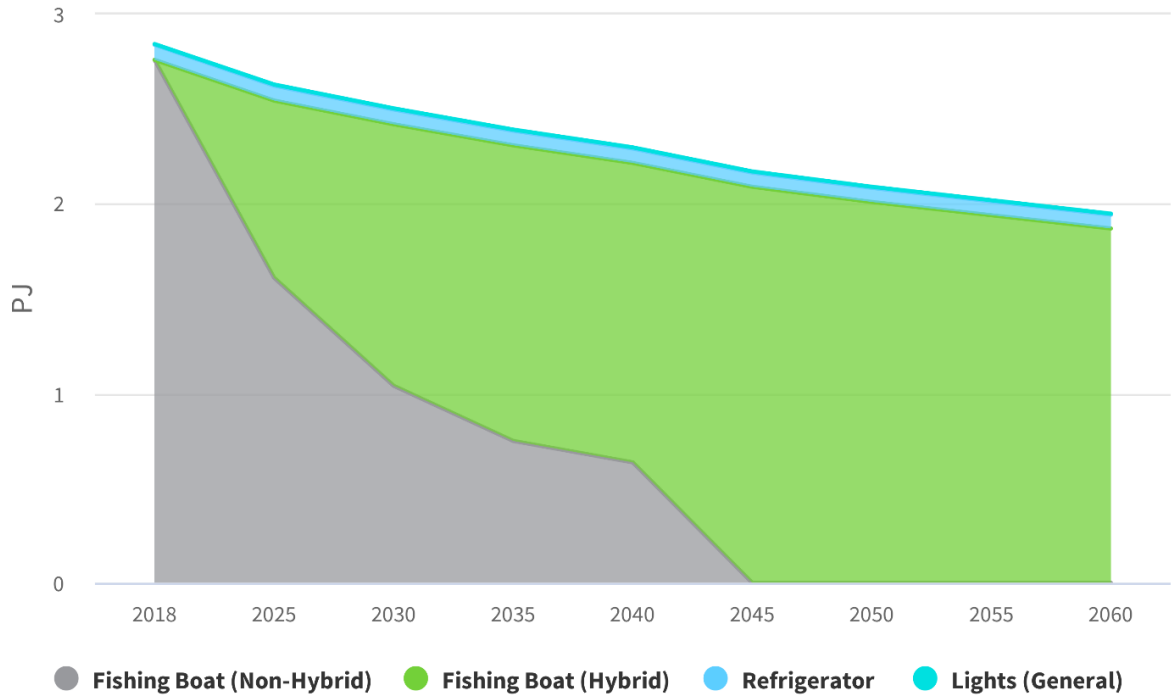
Fishing

Kea Fuel Consumption - Fishing



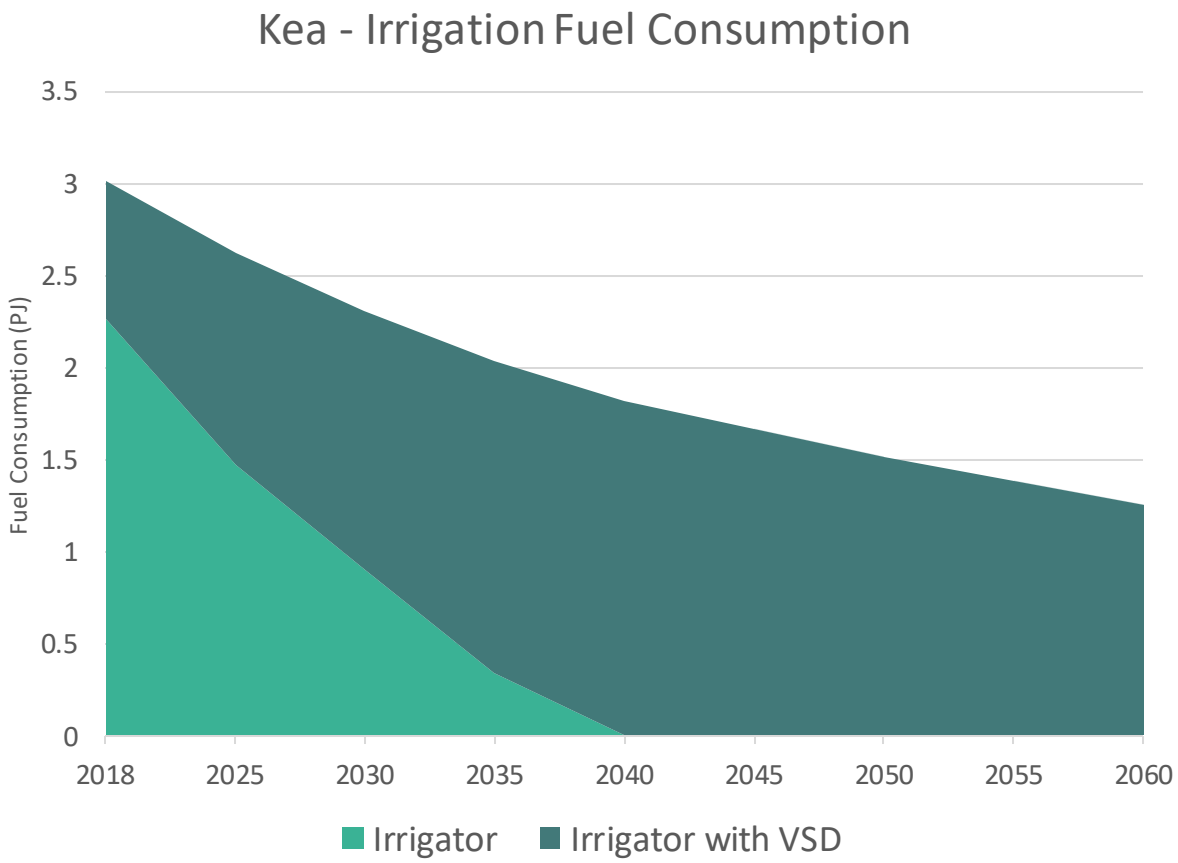
TIMES-NZ 2.0, Scenario: Kea

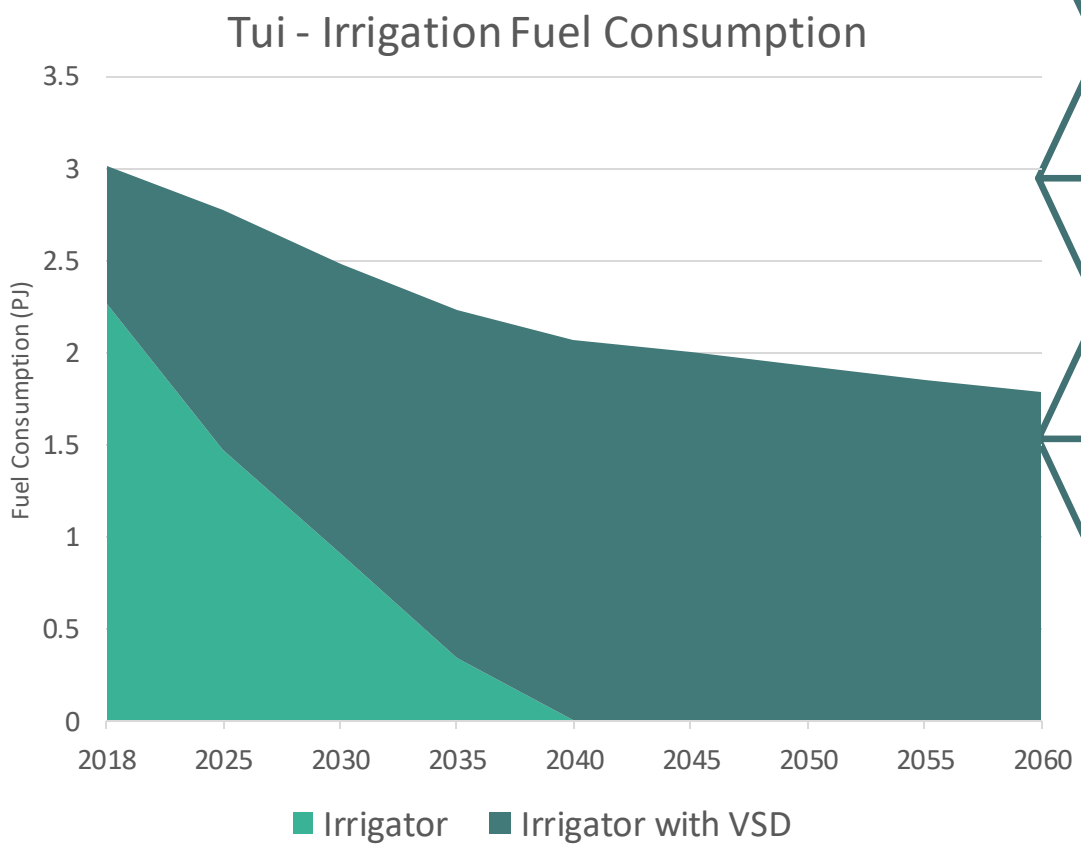
Tui Fuel Consumption - Fishing



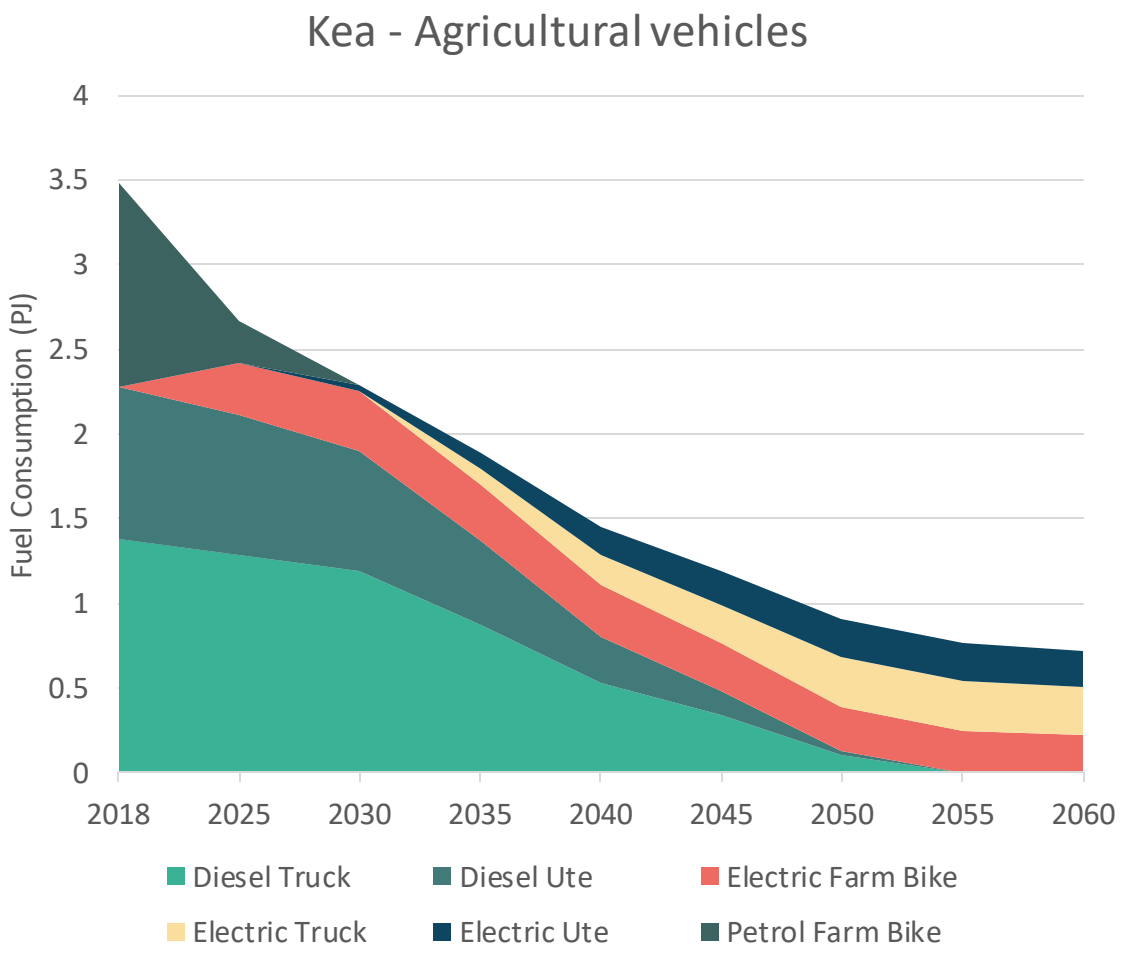
TIMES-NZ 2.0, Scenario: Tūī

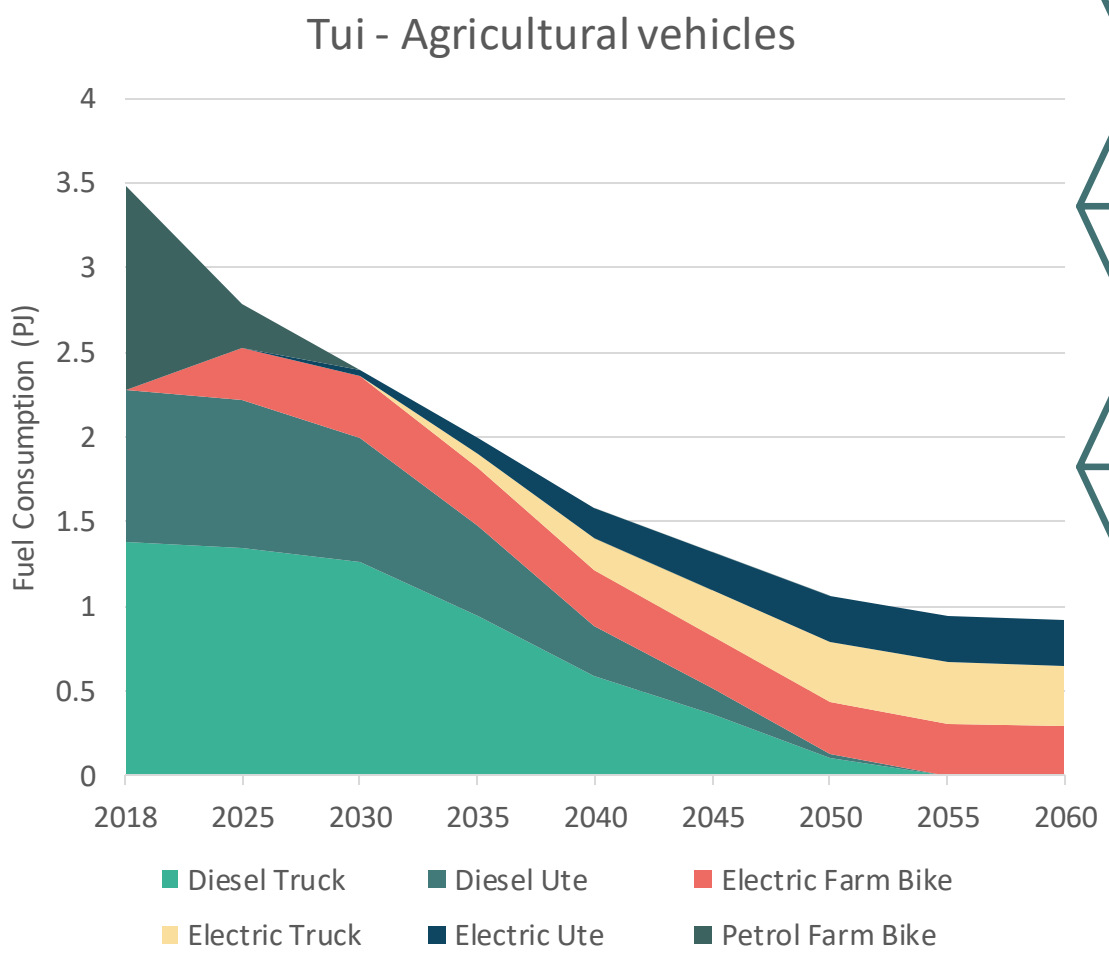
Irrigation


Kea - Irrigation Fuel Consumption
Fuel Consumption (PJ)
3.5
3
2.5
2
1.5
1
0.5
0
2018
2025
2030
2035
2040
2045
2050
2055
2060
Irrigator
Irrigator with VSD

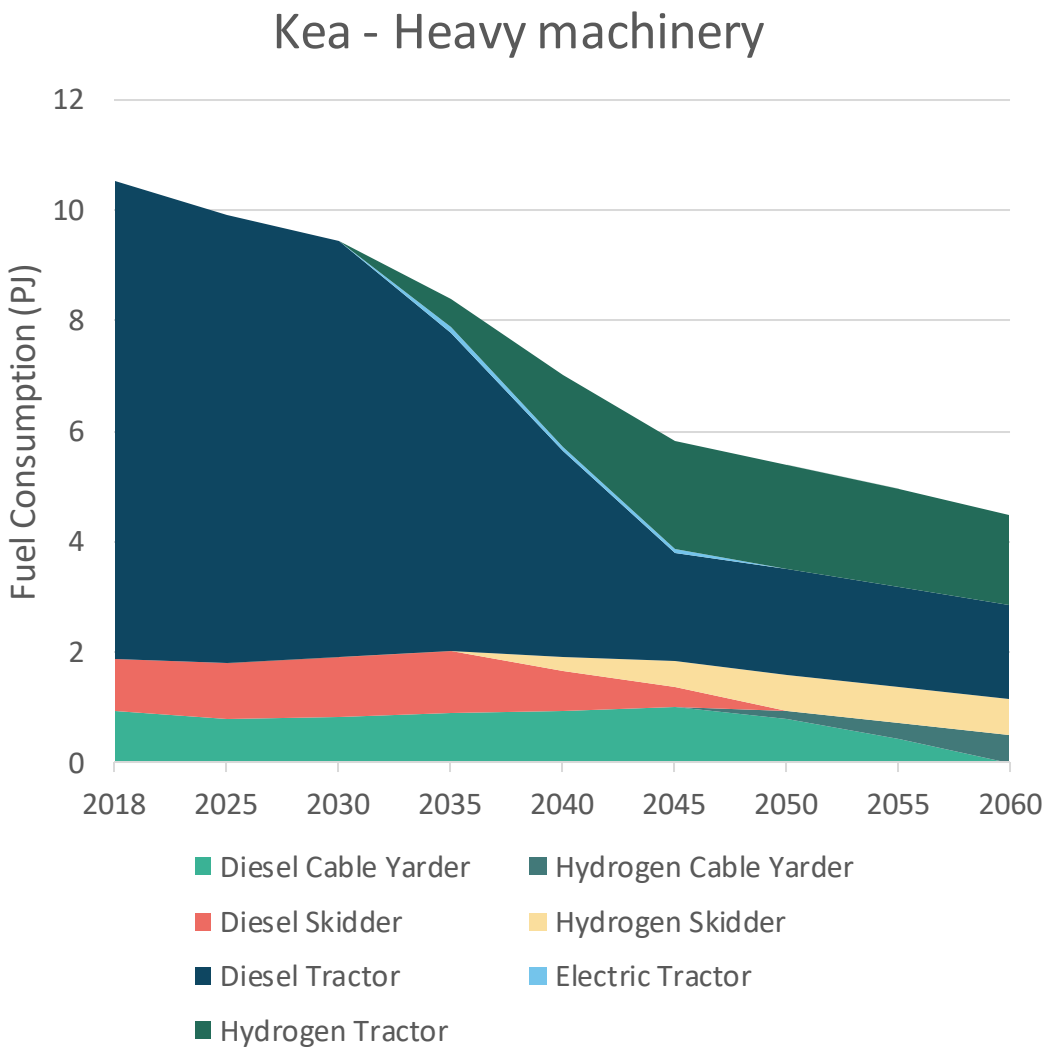

Tui - Irrigation Fuel Consumption
Fuel Consumption (PJ)
3.5
3
2.5
2
1.5
1
0.5
0
2018
2025
2030
2035
2040
2045
2050
2055
2060
Irrigator
Irrigator with VSD

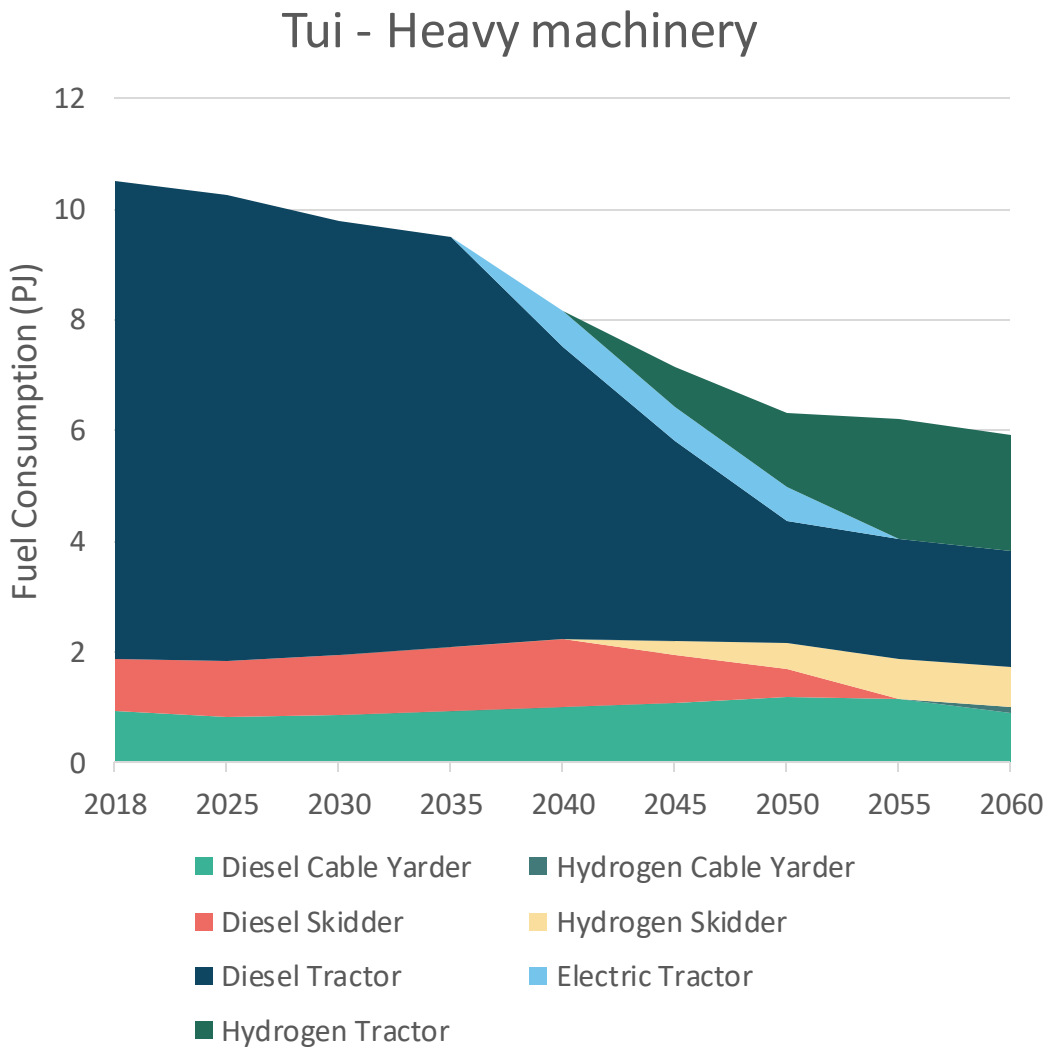
Agricultural Vehicles





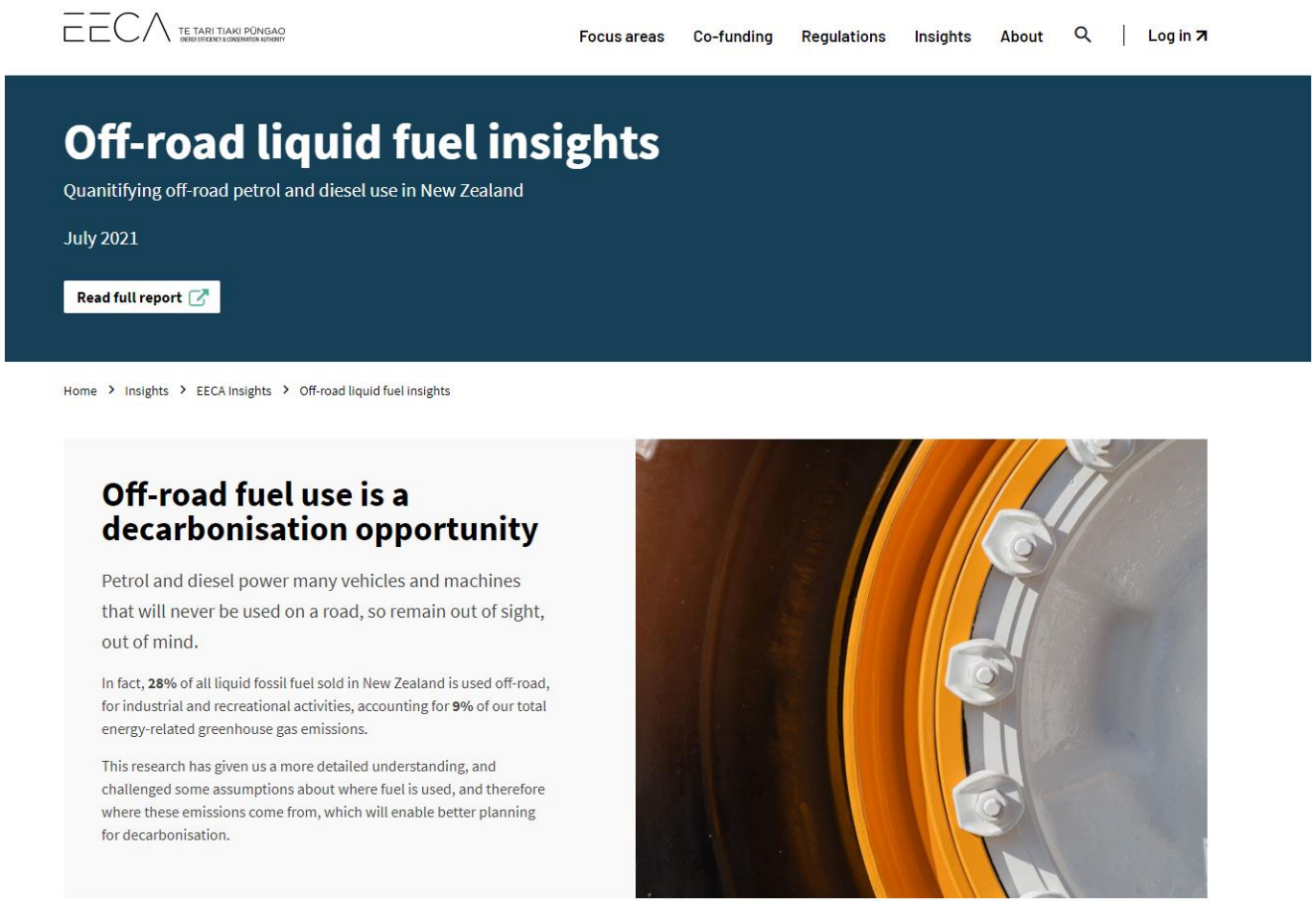
Agricultural Heavy Machinery



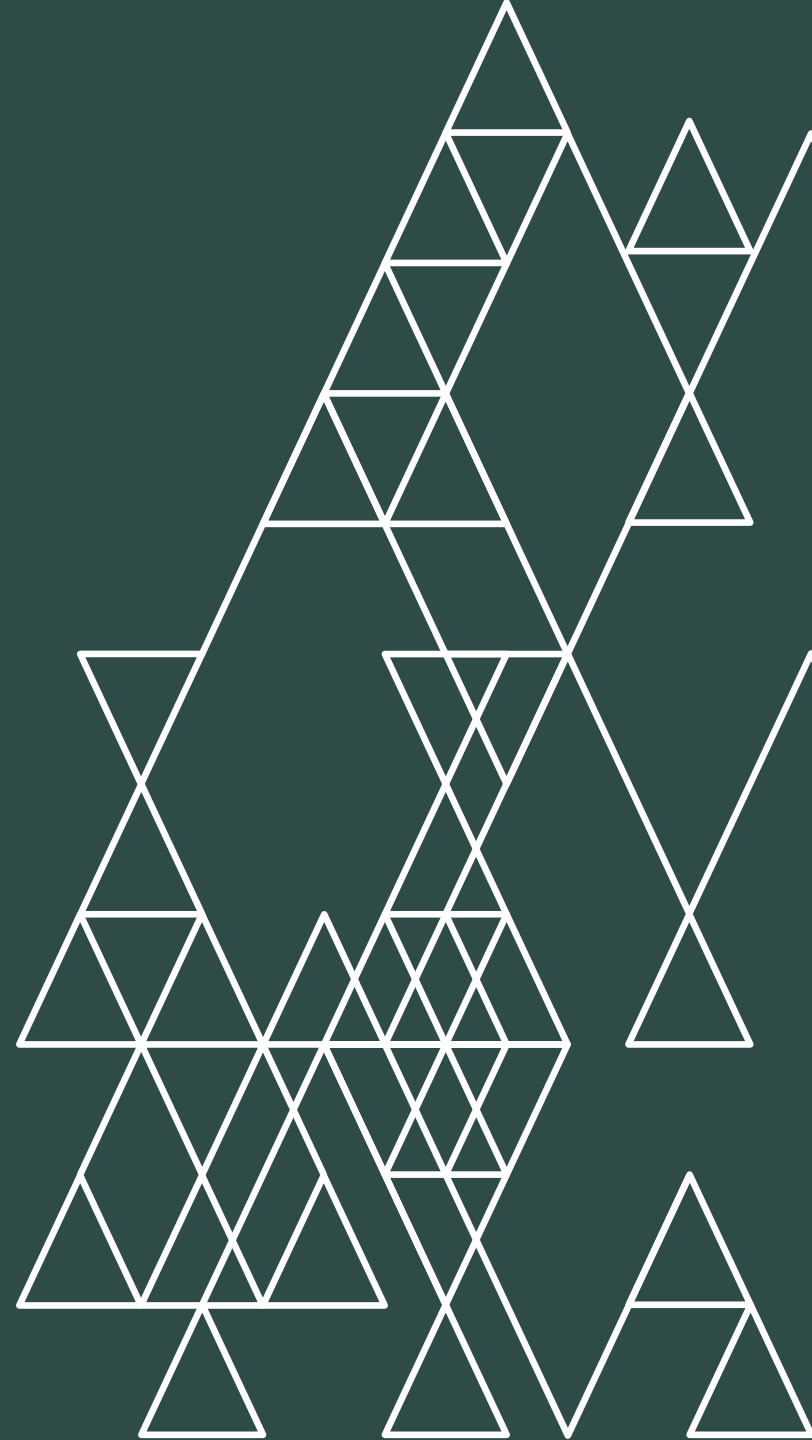


Off-Road Liquid Fuels

https://www.eeca.govt.nz/insights/eeca-insights/off-road-liquid-fuel-insights/

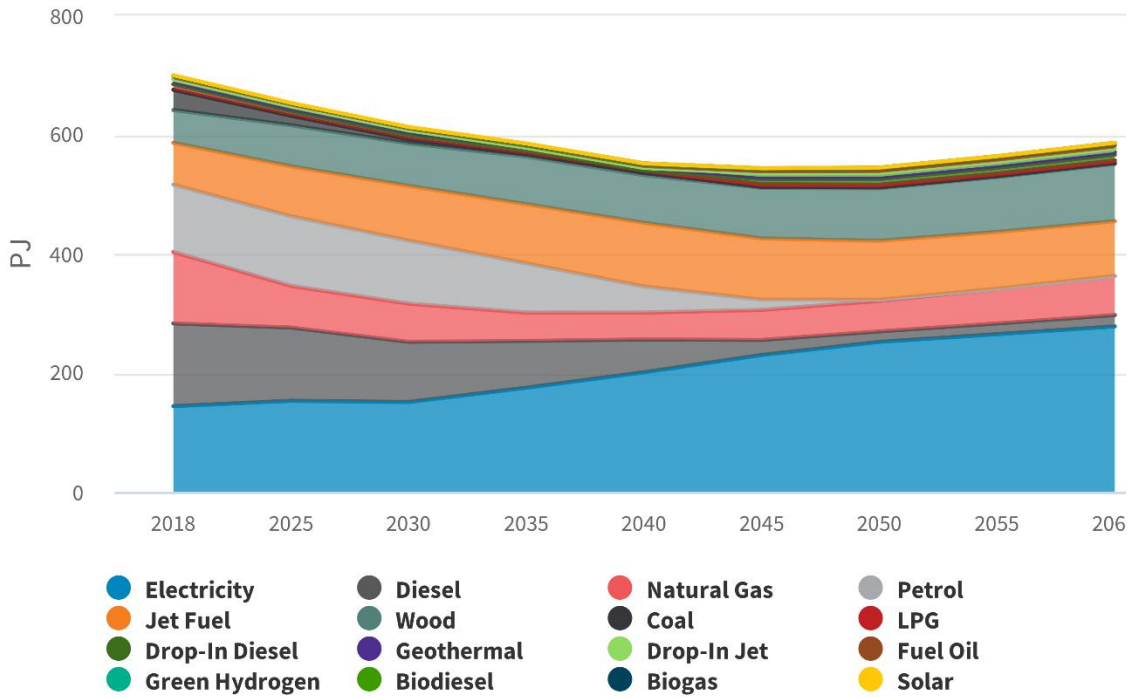


Summary of All Sectors



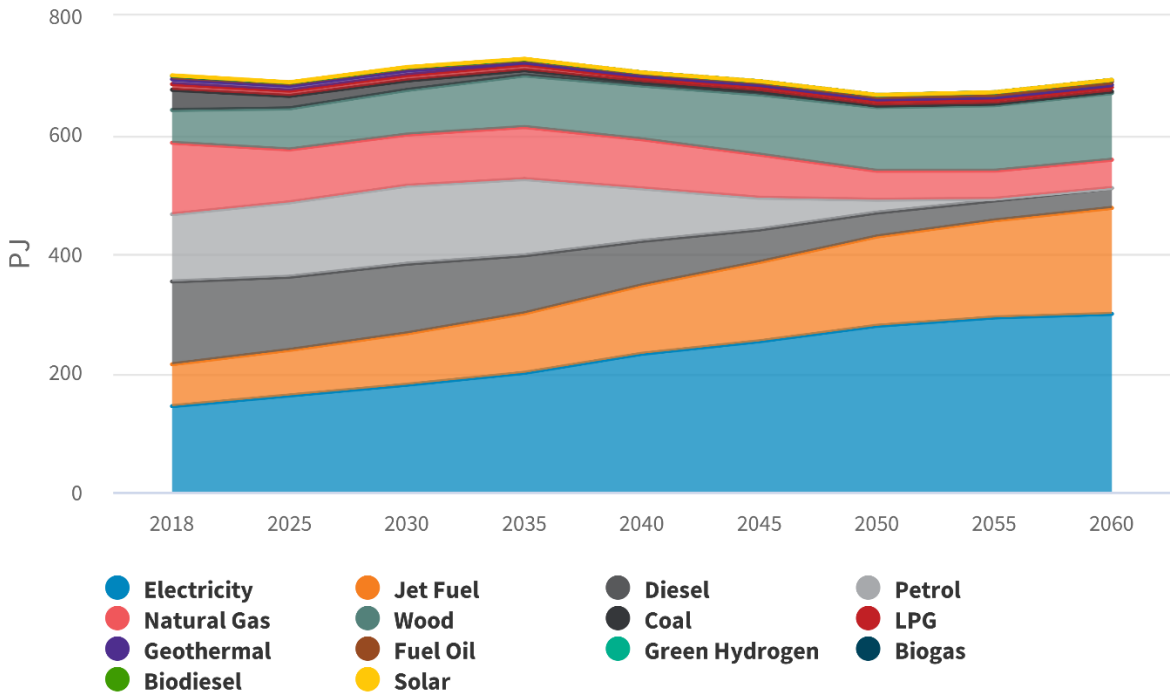
Fuel Consumption

Fuel consumption for all sectors, all end use and all technology (PJ)



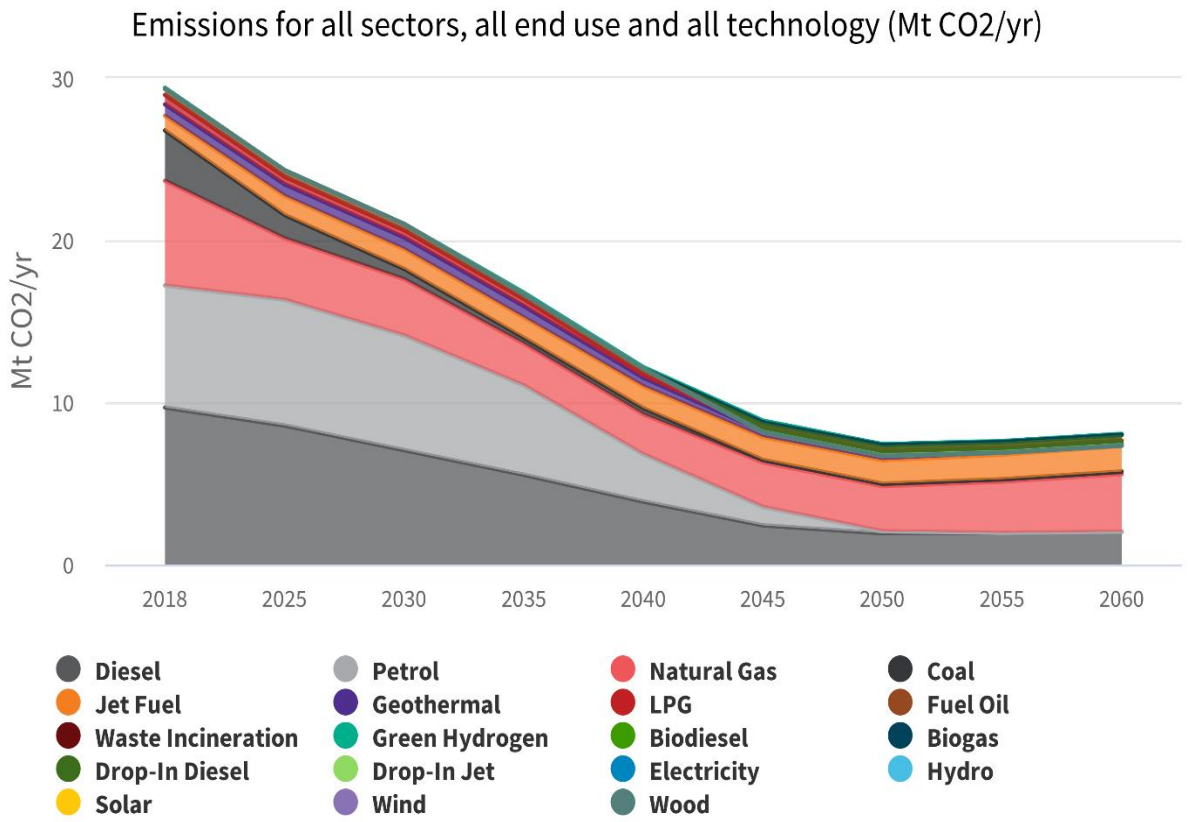
TIMES-NZ 2.0, Scenario: Kea

Fuel consumption for all sectors, all end use and all technology (PJ)

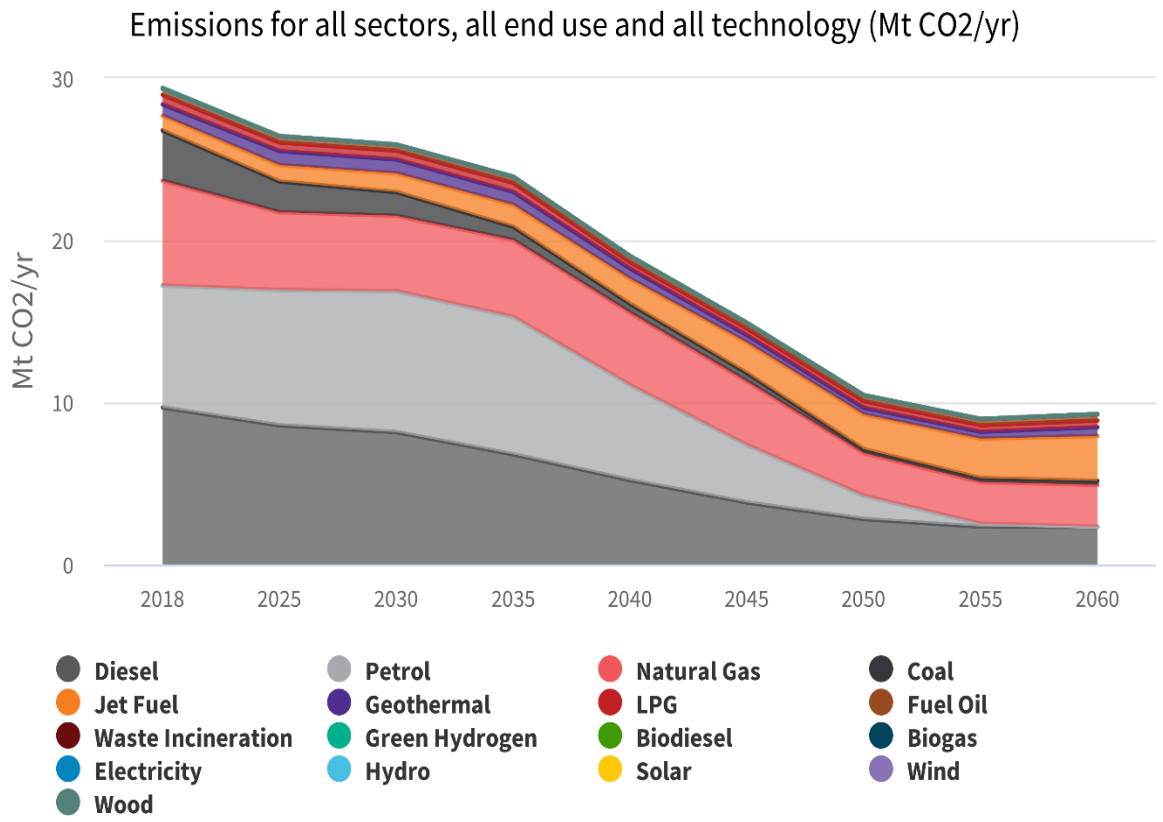


TIMES-NZ 2.0, Scenario: Tūī

Emissions

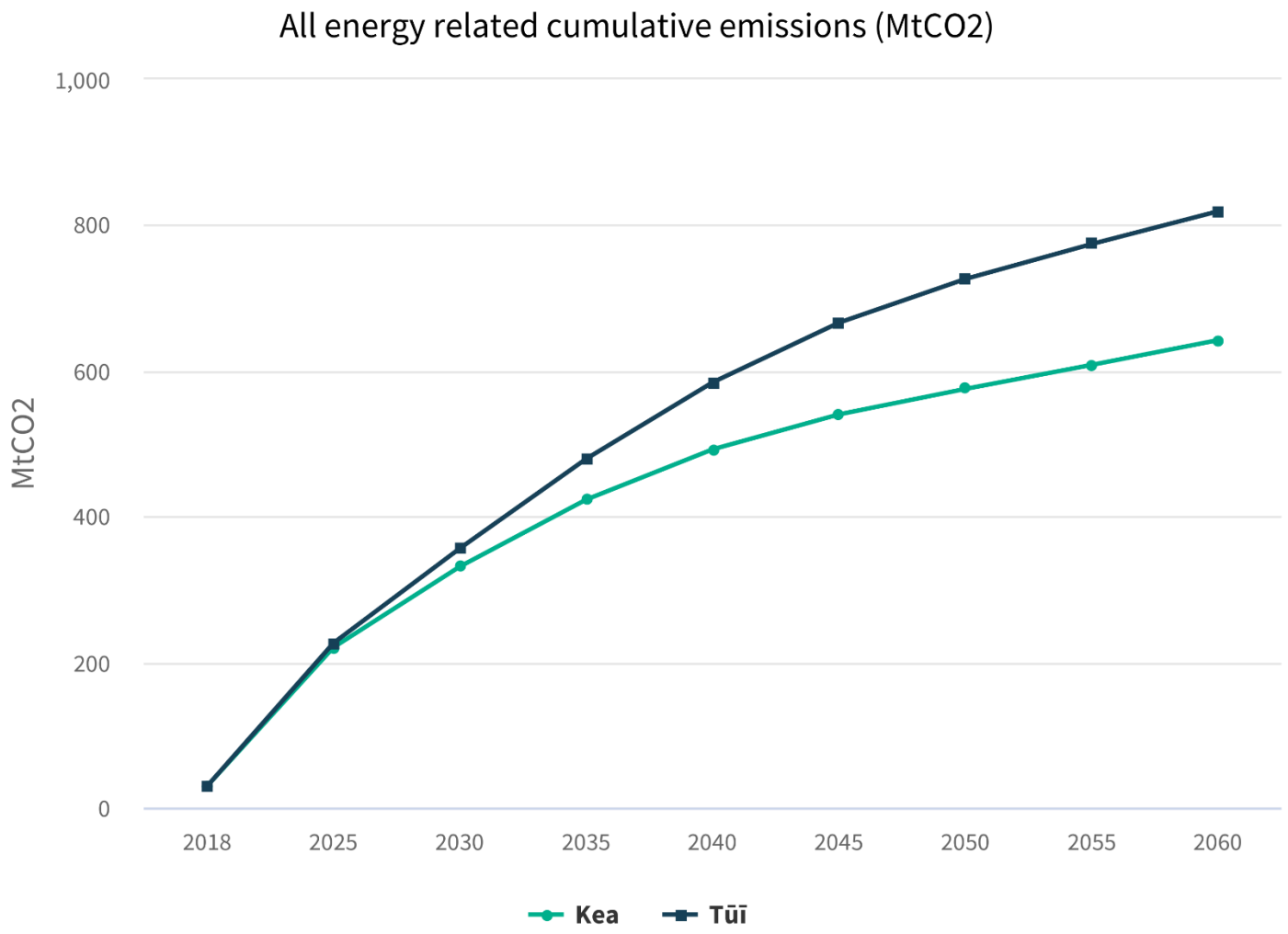


TIMES-NZ 2.0, Scenario: Kea

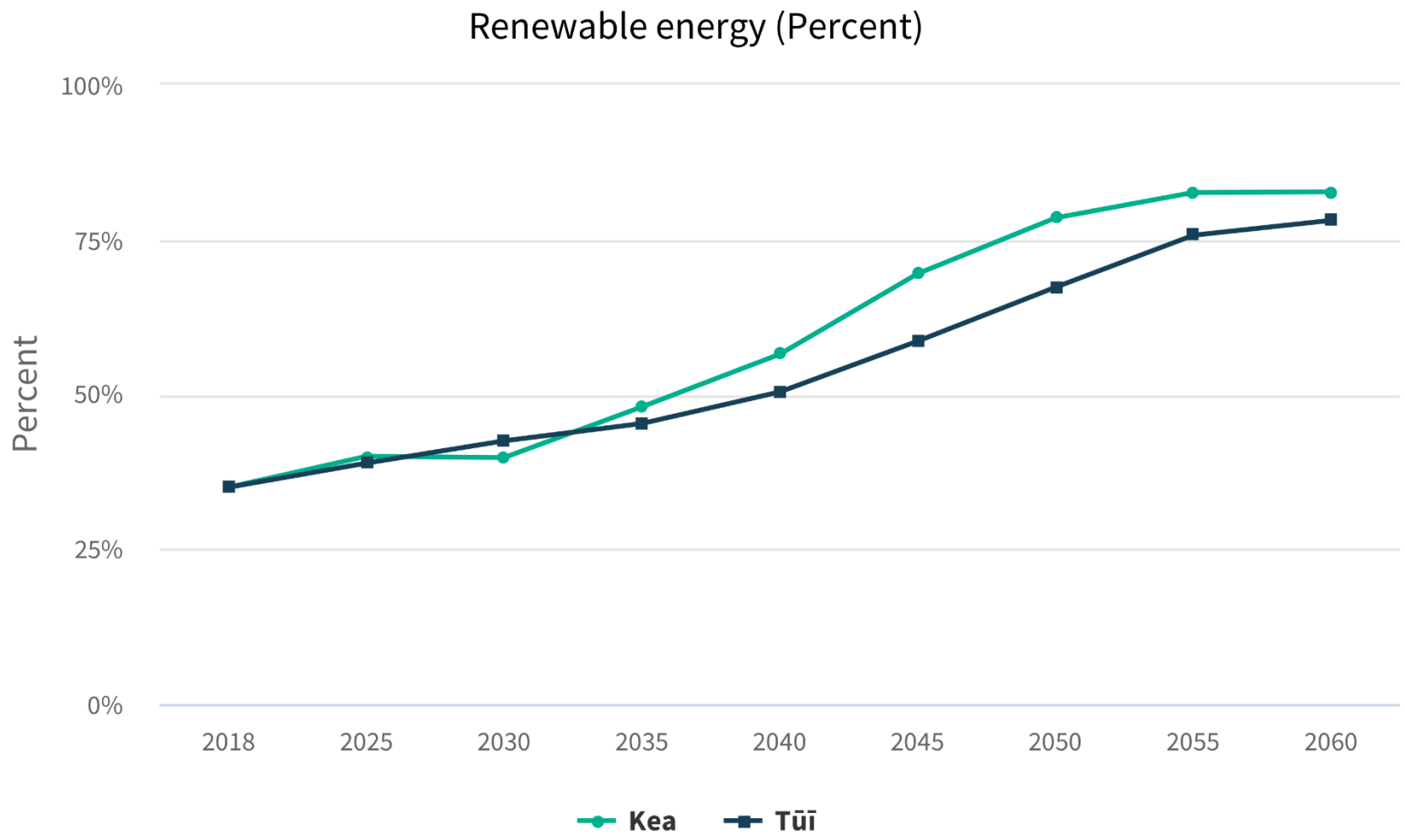


TIMES-NZ 2.0, Scenario: Tūī

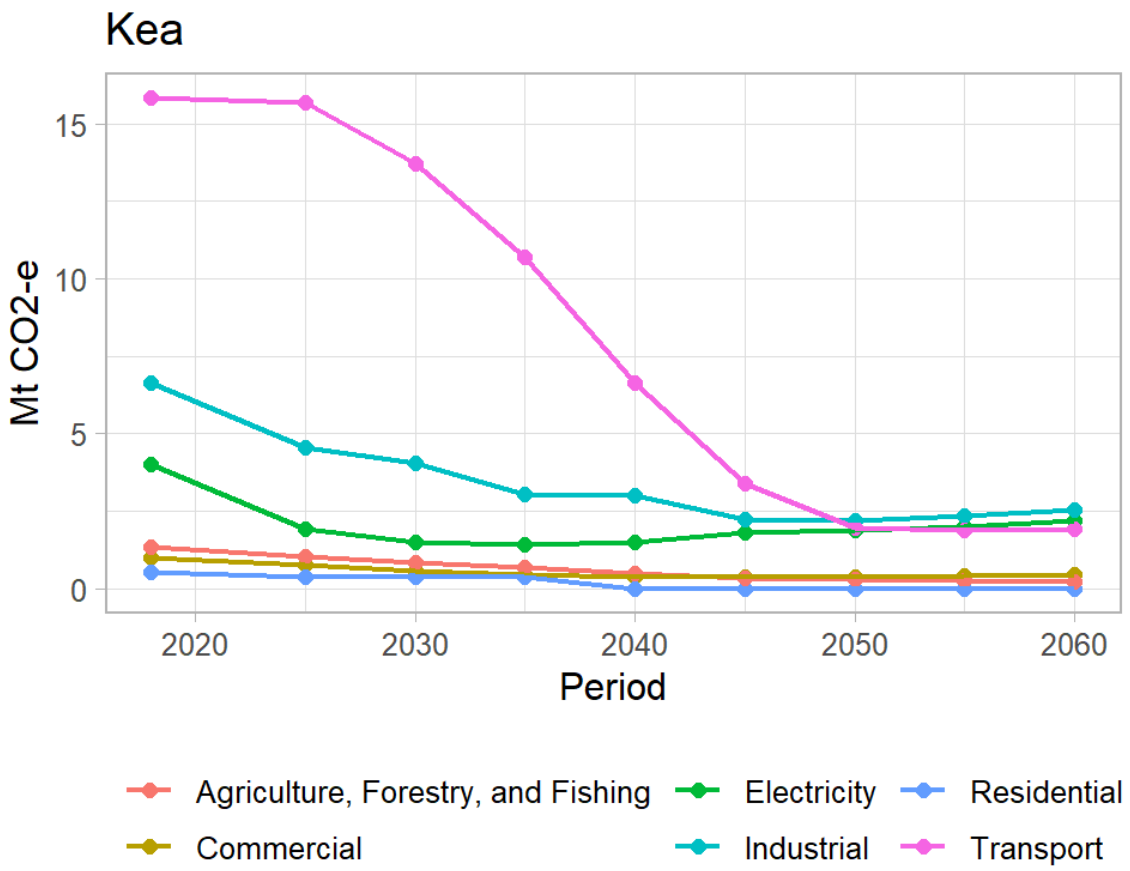
Cumulative emissions

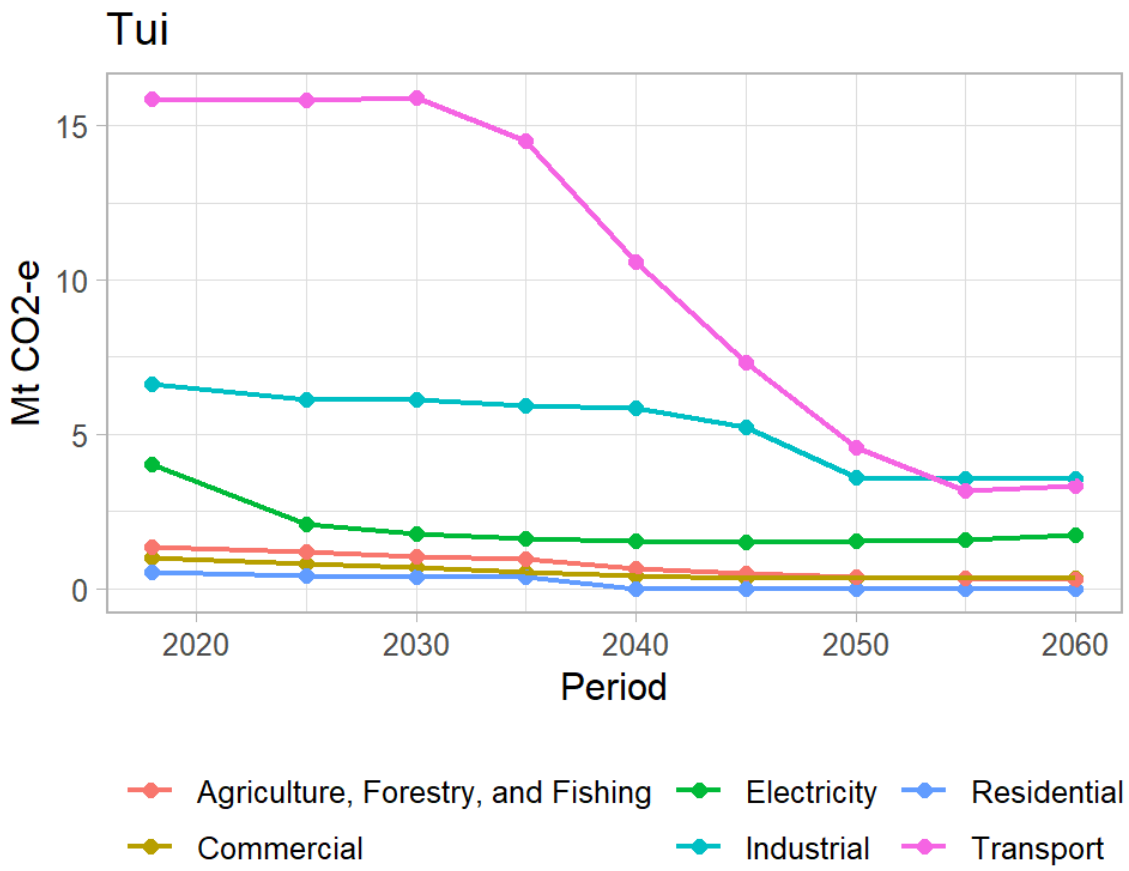


Renewable Energy

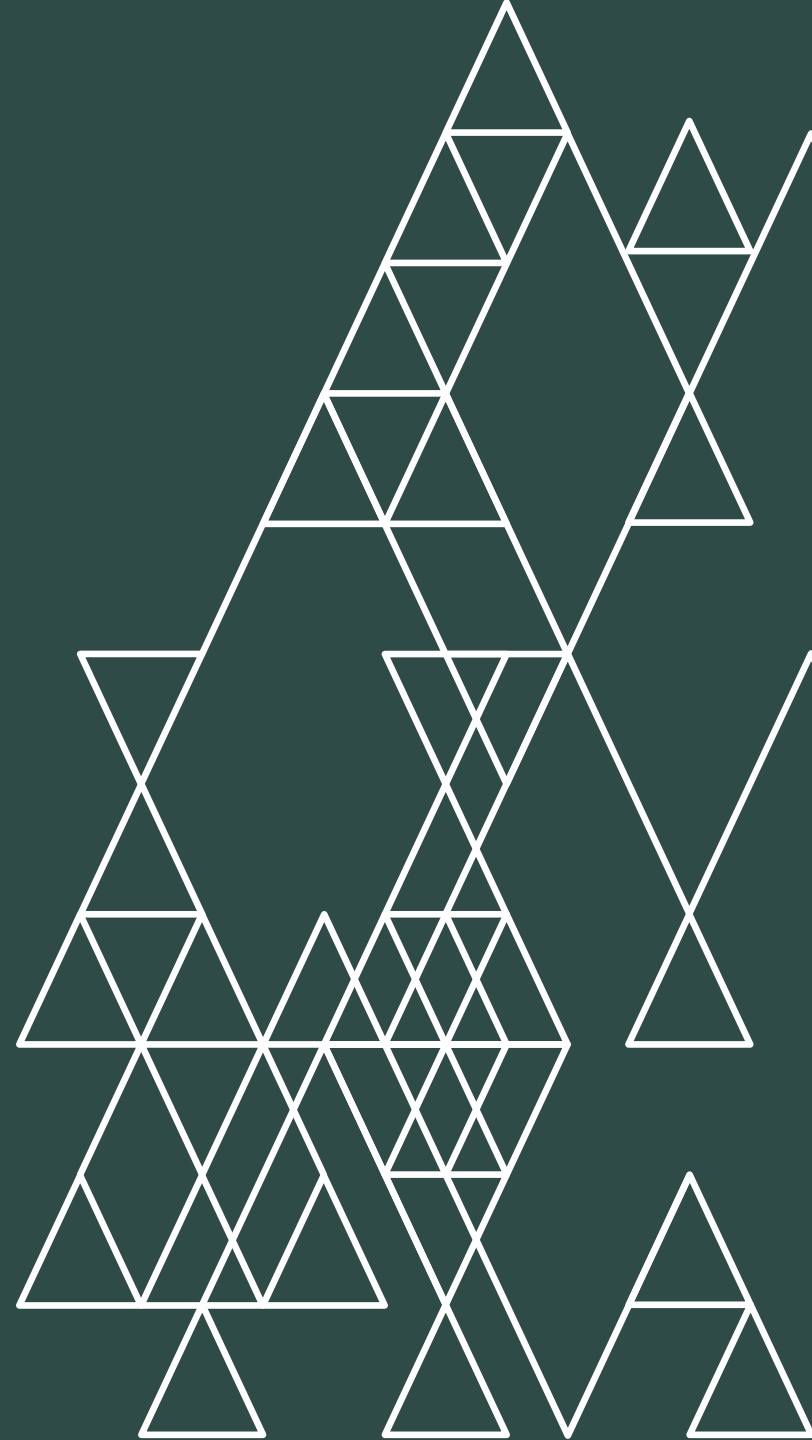


Emissions By Sector





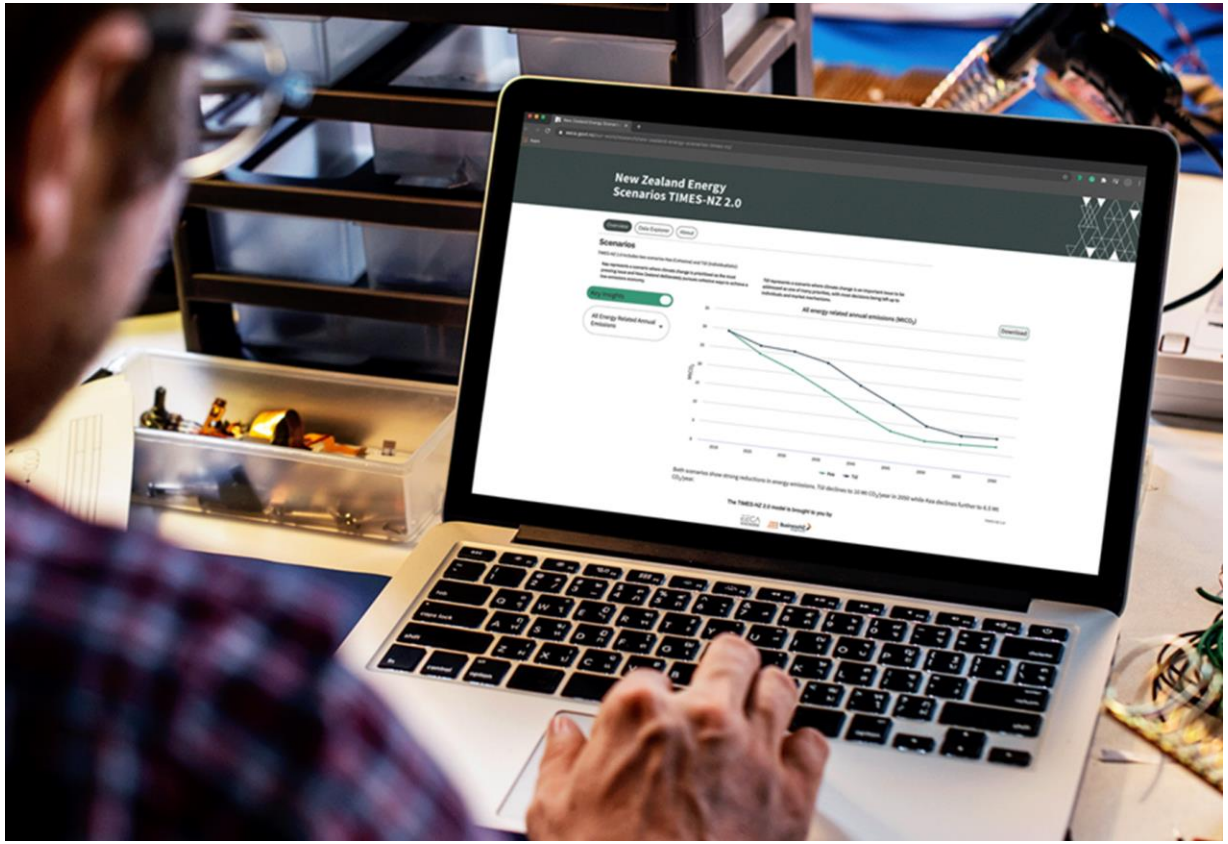
Data Visualisation



NZ Energy System Scenarios TIMES-NZ 2.0

Innovative communication

To ensure results are accessible to the community, and clearly communicated, TIMES-NZ 2.0 data have been released as an interactive visualisation app: http://www.eeca.govt.nz/times-nz



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https://times.bec.org.nz/