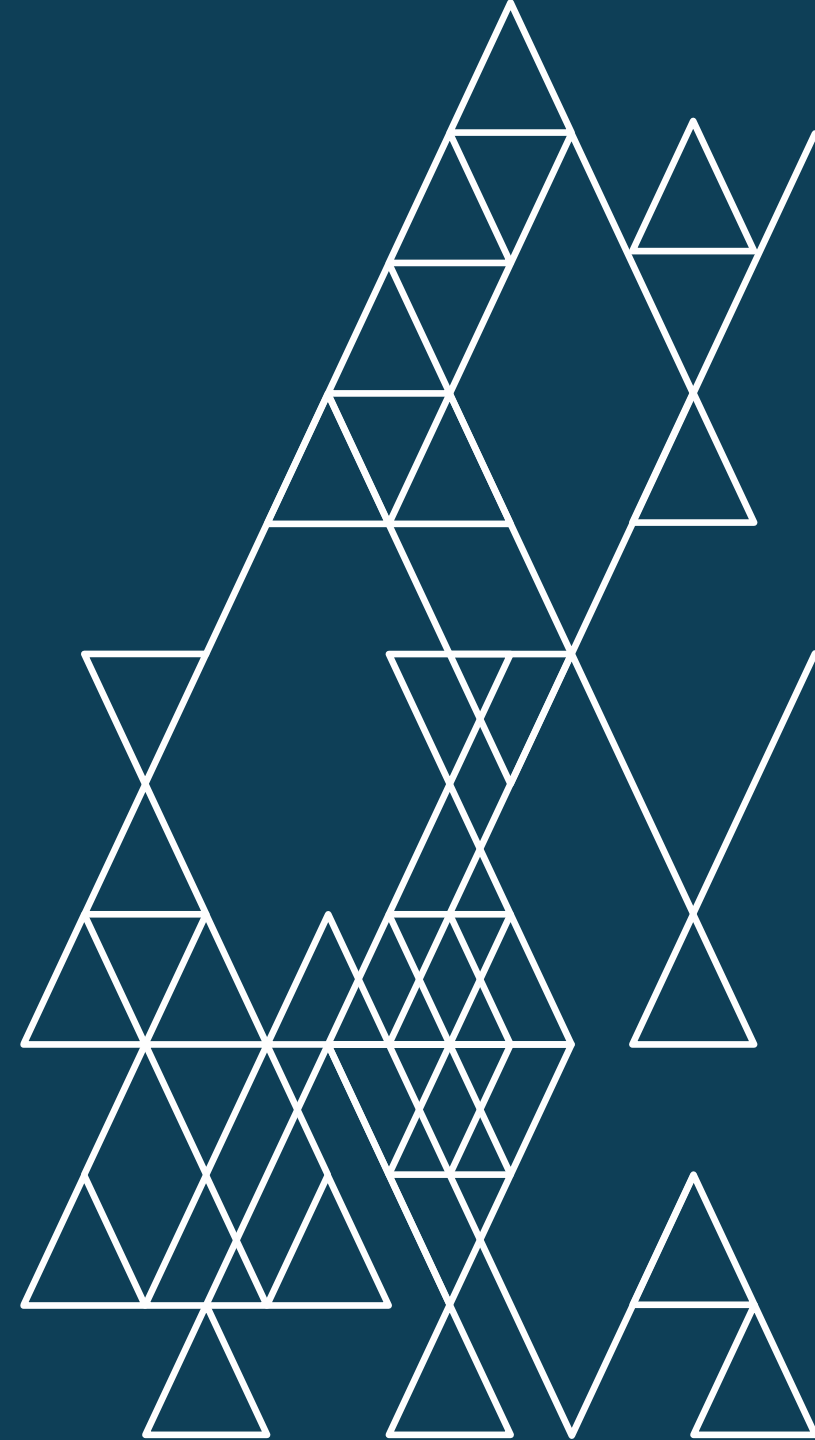


NZ Energy Scenarios TIMES-NZ 2.0

18 November 2021



Project overview and the TIMES-NZ model structure



Project history



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



A big team effort

EECA: Chiraag Ishwar, Vincent Smart, Dr Silvina Pugliese, Andrew Greed, Anand Krishnan, Michael Henry, Kate Kolich, Dr Gareth Gretton, Vij Kooyela, John Duncan, Matthew Hammond-Blain, Dr Marcos, Alan Hsieh, Penny St. John, Carolyn Small.

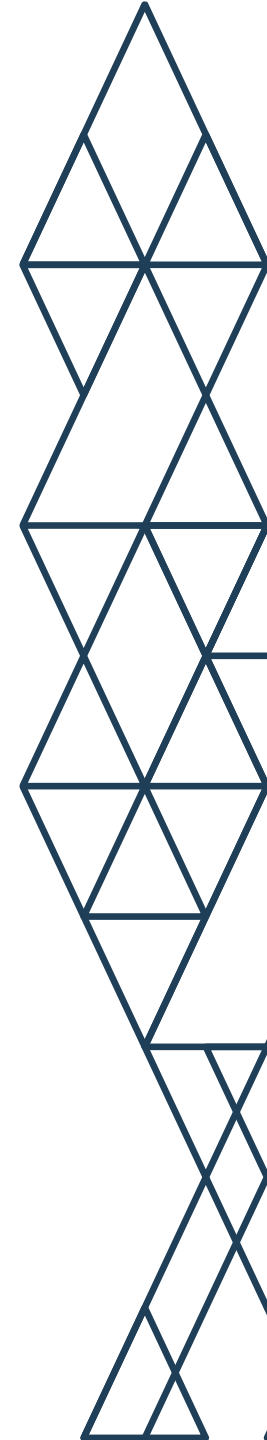
BEC: Hon David Caygill, Tina Schirr, Emily Calvert, Dane Ambler, Debbie Dougen, Joseph Plunket, Matthew Patterson.

Paul Scherrer Institut (Switzerland): Dr Tom Kober, Bakytzhan Suleimenov.

Sapere Consulting: Toby Stevenson, Corina Comendant, Dr Stephen Batstone, Michael Young.

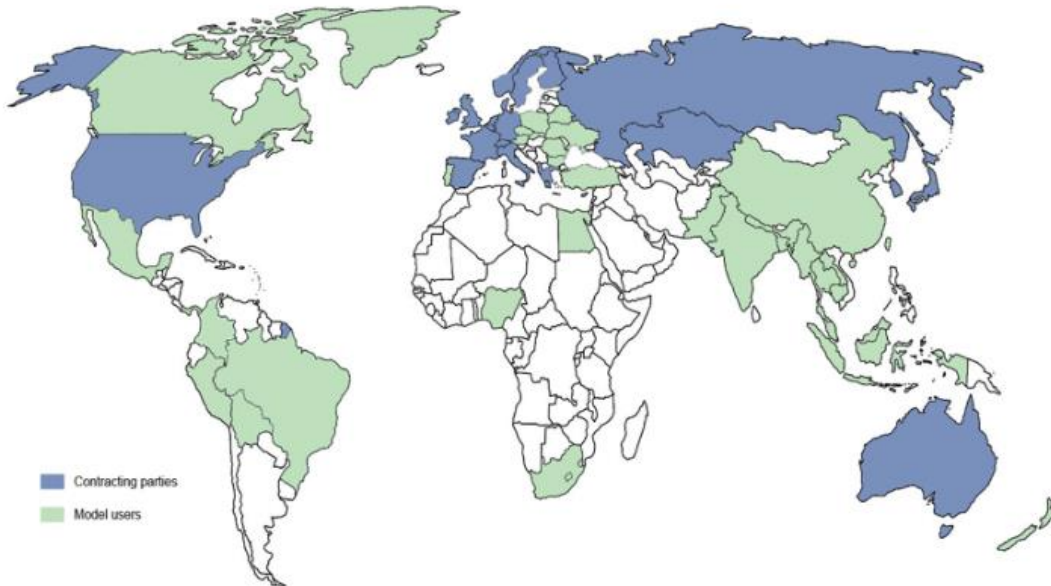
Nicholson Consulting: Dr Kenny Graham, Conrad MacCormick.

Assumptions working group: Agcarm, ARUP, Beca, BP, BRANZ, Contact Energy, Dairy NZ, Environmental Science & Research, Farmlands, Federated Farmers NZ, Fletcher Building, Flux Federation, Fonterra, Genesis Energy, Hiringa Energy, Horticulture NZ, Infratec, Kiwi Property Group Limited, LIC, Lion, Massey University, Master Builders, Meat Industry Association of NZ, Mercury Energy, Meridian Energy, Methanex, Ministry of Business Innovation and Employment, Ministry for Primary Industries, Ministry of Transport, Mot or Trade Association, Naylor Love, NERI, New Zealand Marine Industry Association, NZ Steel, Oceana Gold, OJI Fibre, OMV, Pan Pac Forest Products, Powerco, Ravensdown, Rio Tinto, Sanford, Scion Research, Stonewood, The A2 Milk Company, Todd Energy, Transpower, Trustpower, University of Auckland, Vector, Waka Kotahi New Zealand Transport Agency, Westland Milk Products, Whakatane Mill, Winstone Pulp Intl, WPMA, Z Energy, Zespri International Ltd.



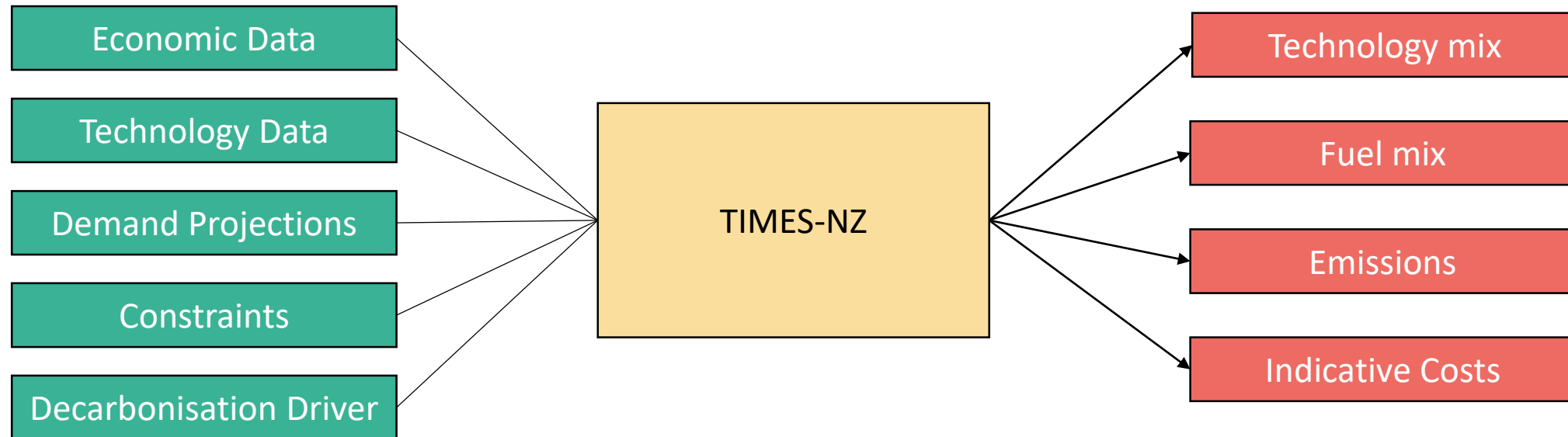
IEA ETSAP Technology Collaboration Program modelling methodology

- Energy System Scenario Model
- Solves for the least cost solution
- Enables exploration into possible energy futures

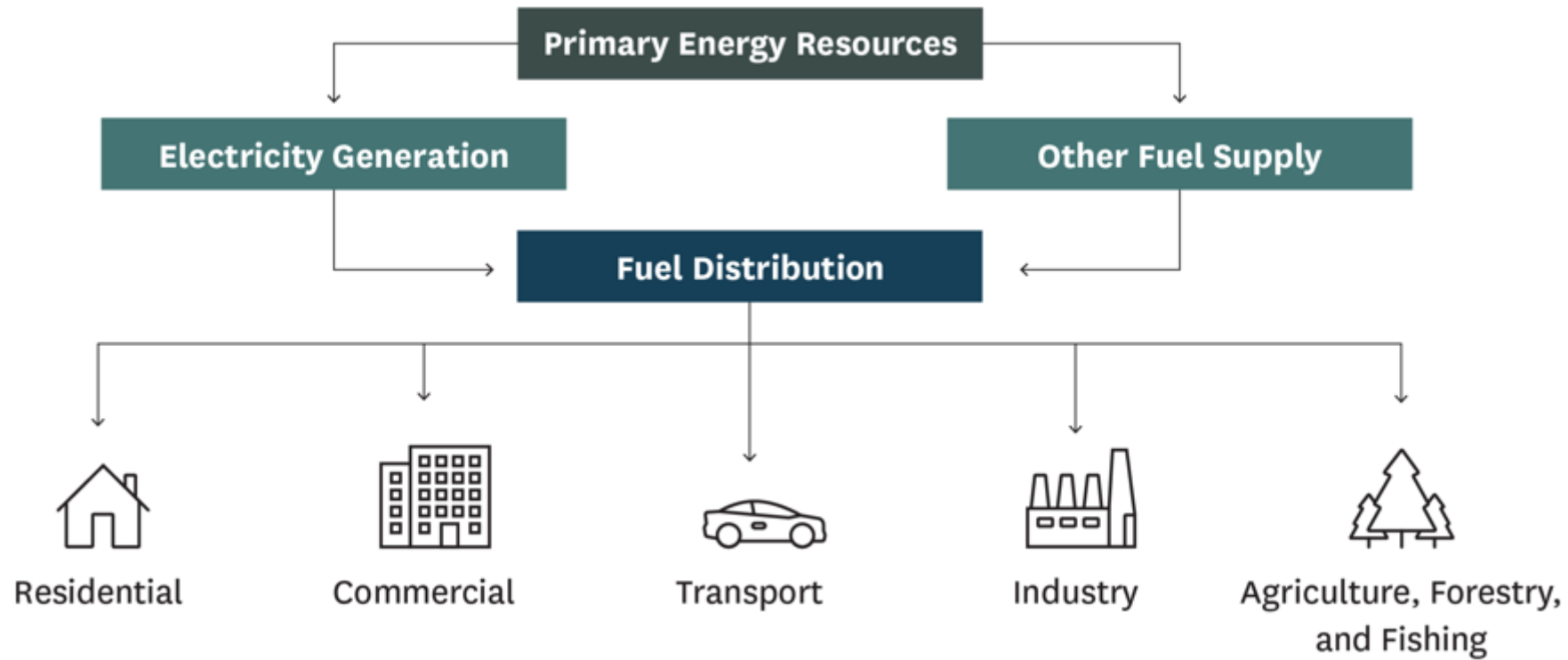


TIMES-NZ 2.0 model

- Five-year periods from 2025 to 2060
- 24 time slices per year
- North Island and South Island



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



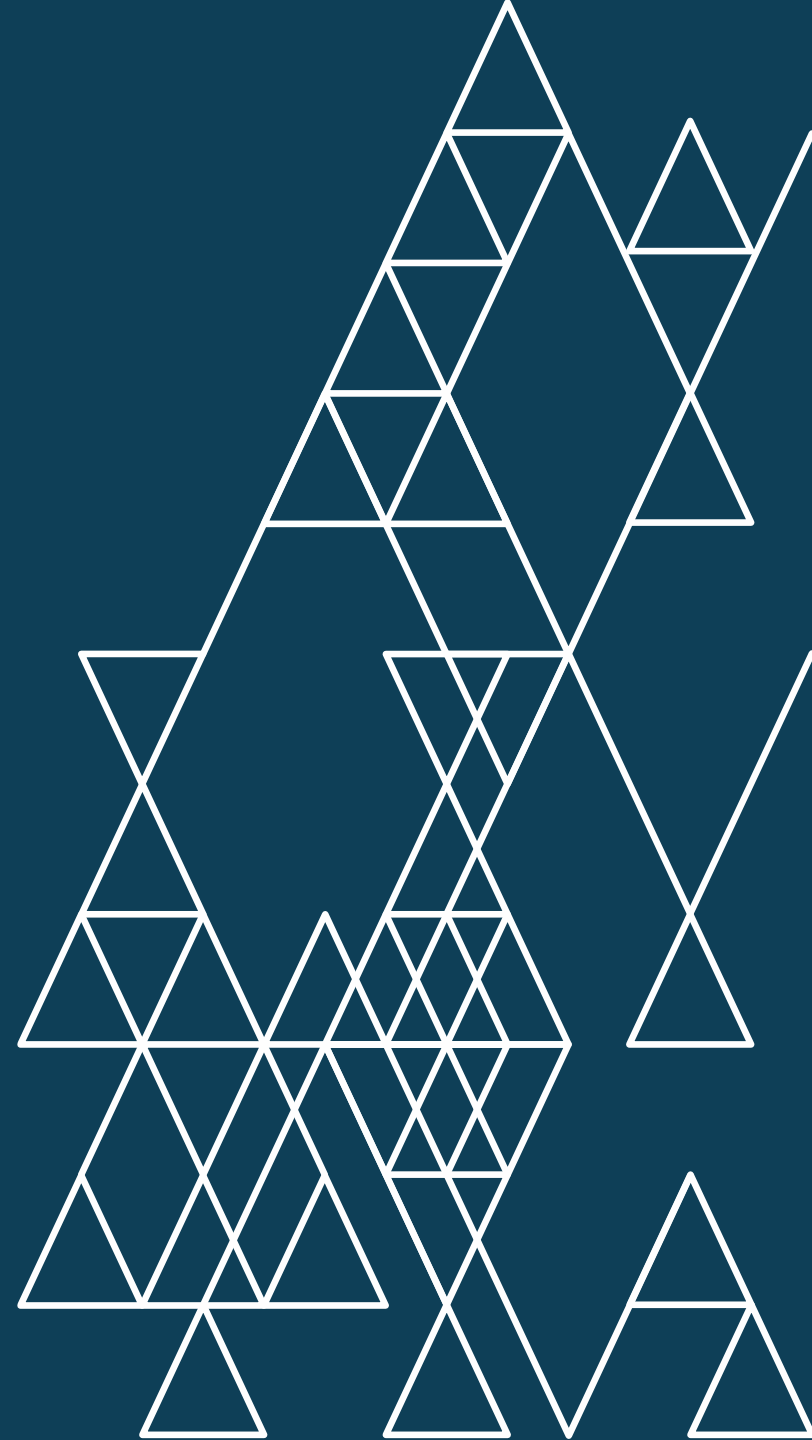
Agriculture, Forestry, and Fishing

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

EECA's Energy End Use Database (EEUD) is a key source of input data for TIMES. This is based on a top-down dissection of MBIE energy data, and gives us the starting point for the model.



Scenarios



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

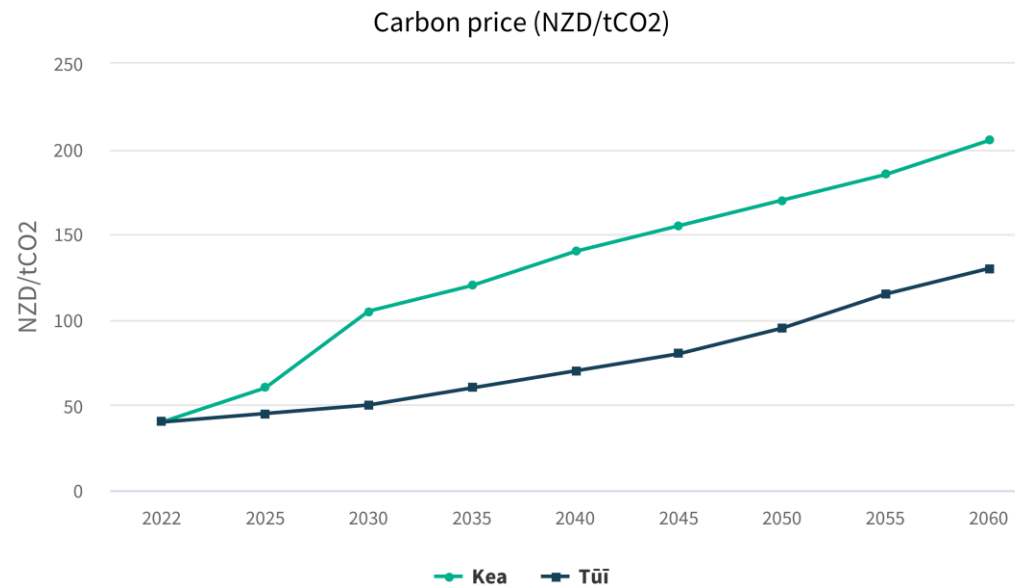
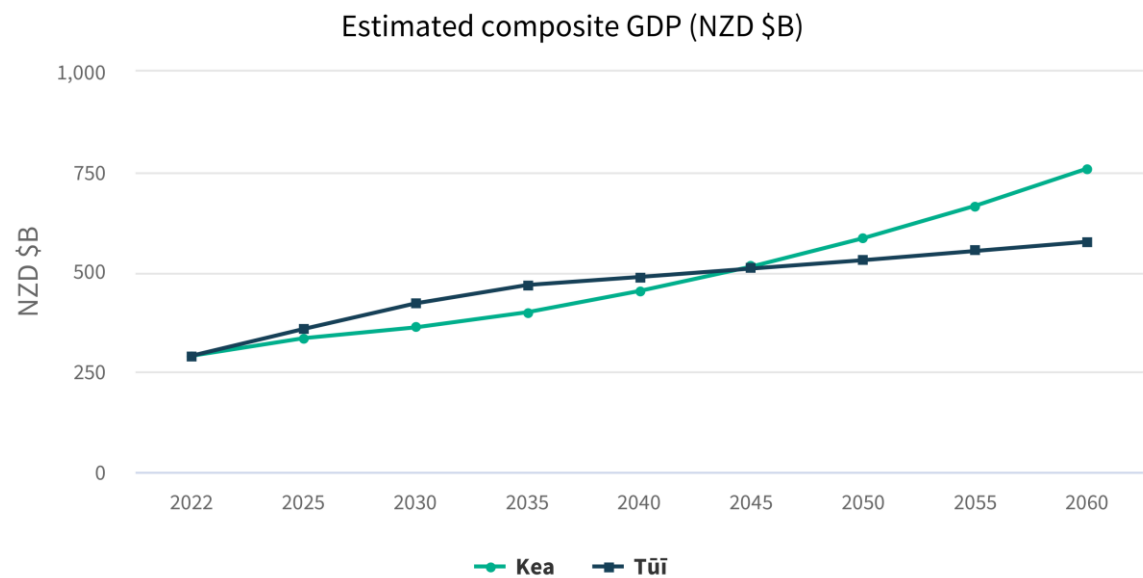


Tūī represents a scenario where climate change is an important issue to be addressed as one of many priorities, with most decisions being left up to individuals and market mechanisms.

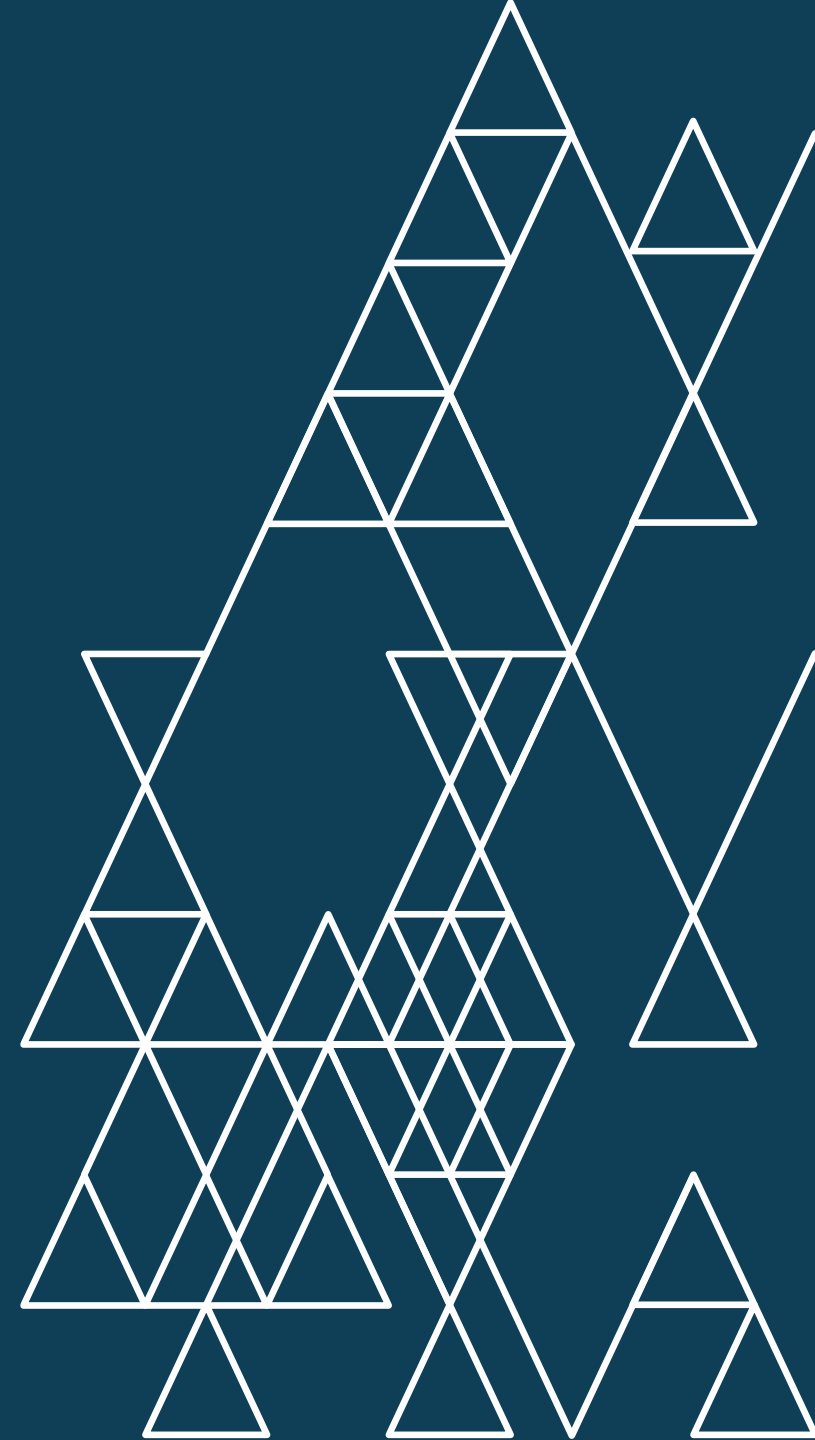


Scenario parameters

The key model input differences between Kea and Tūi are:



Key insights

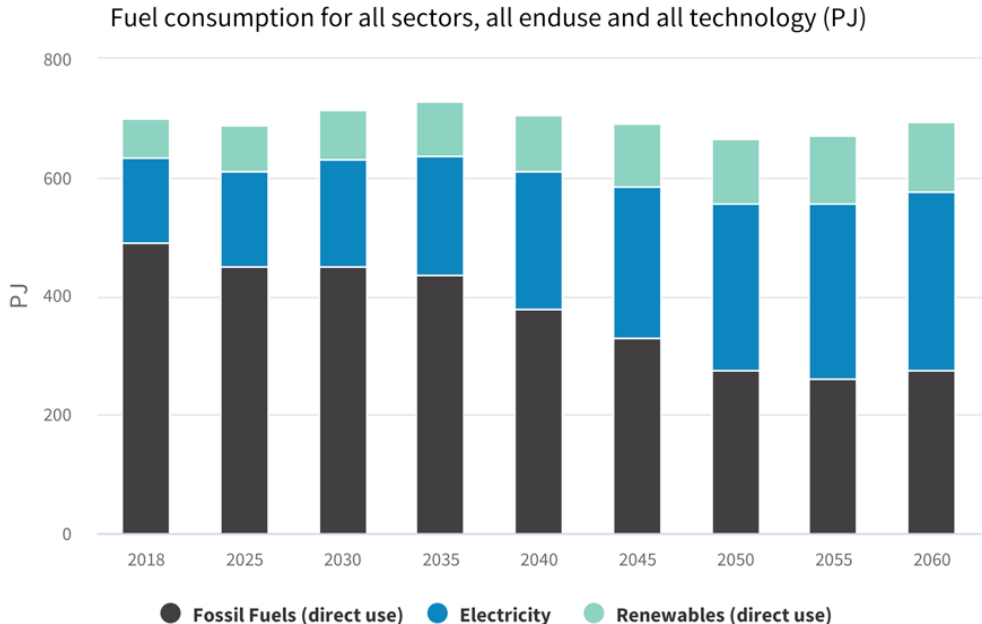
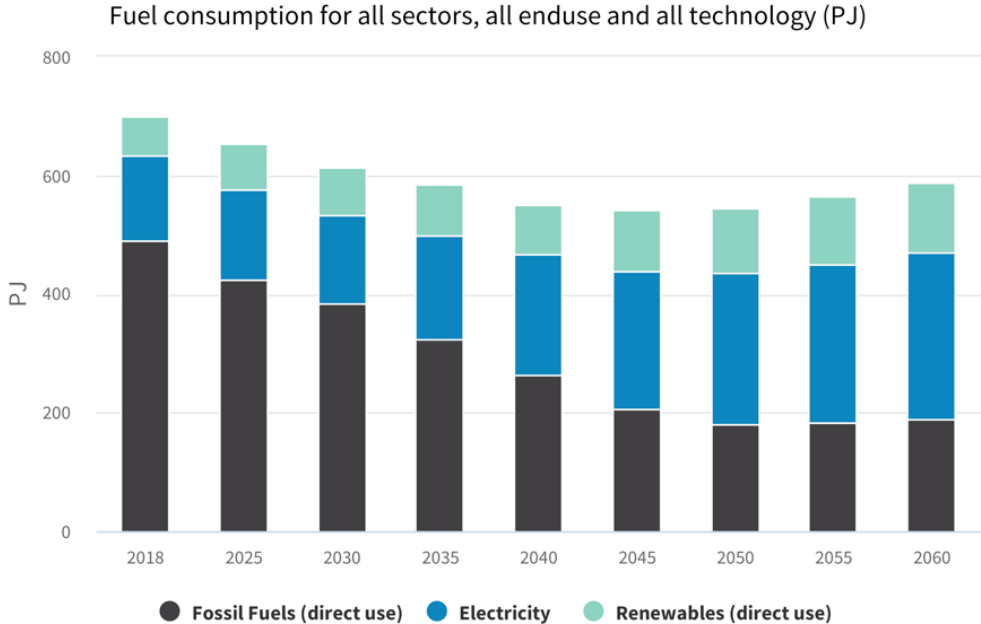


All sectors

What and how much energy might we consume?

Kea

Tūi



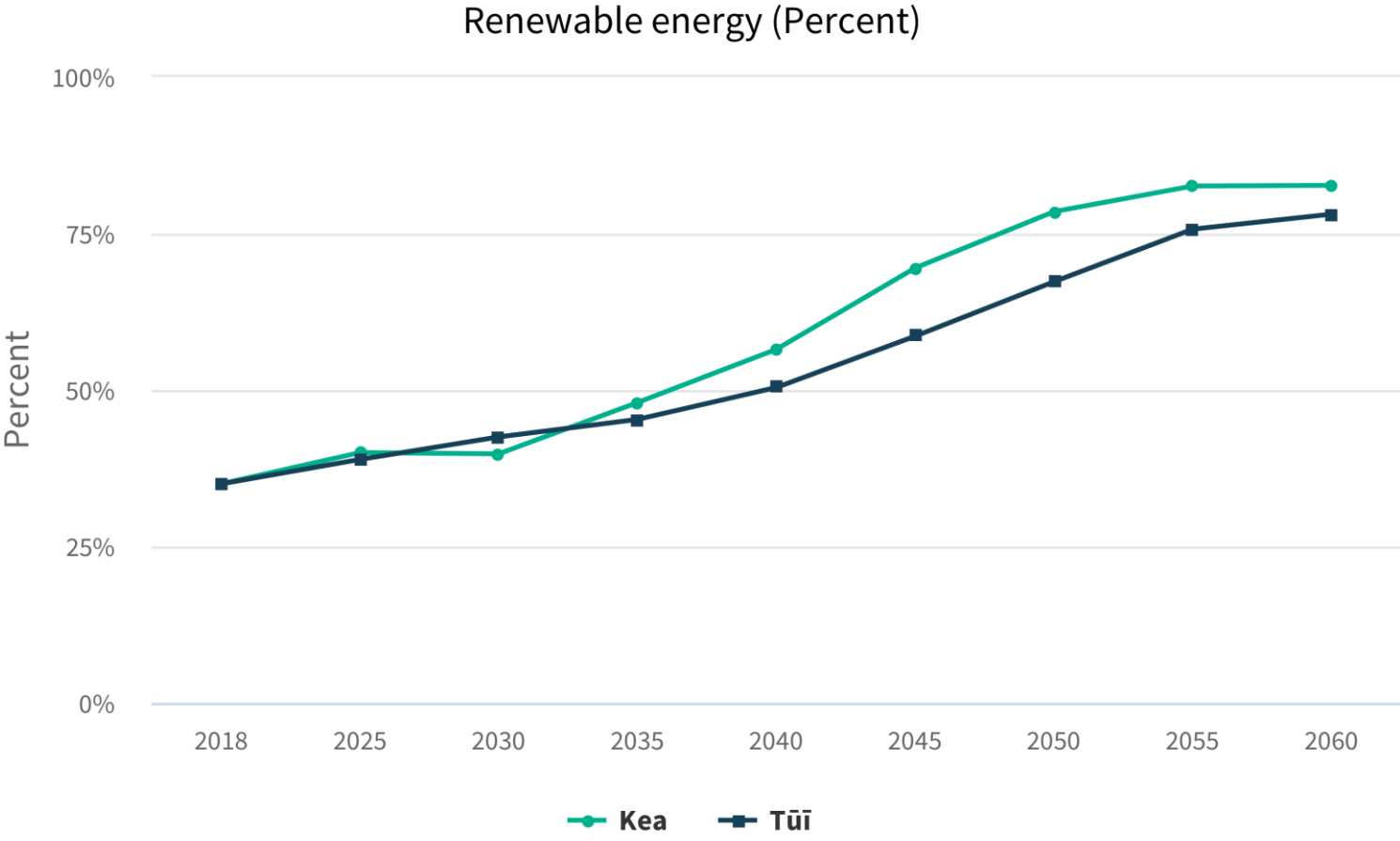
TIMES-NZ 2.0, Scenario: Kea

TIMES-NZ 2.0, Scenario: Tūi



All sectors

How much renewable energy might we use?



All sectors

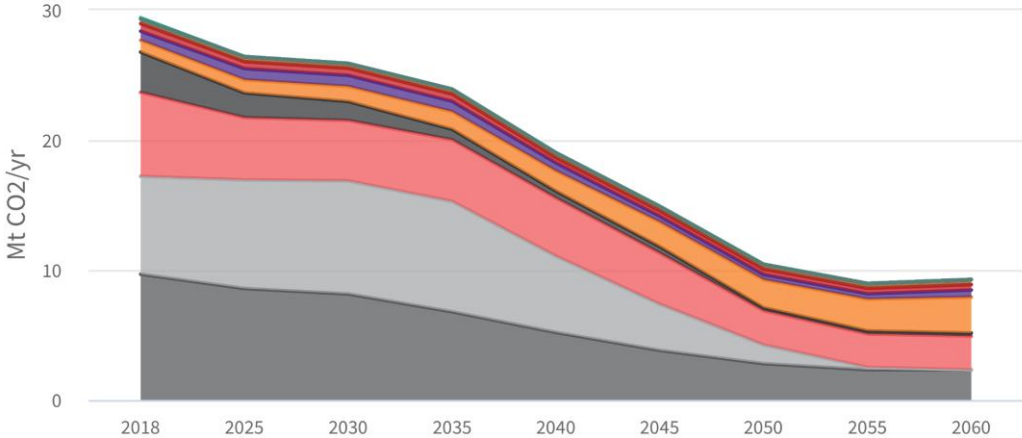
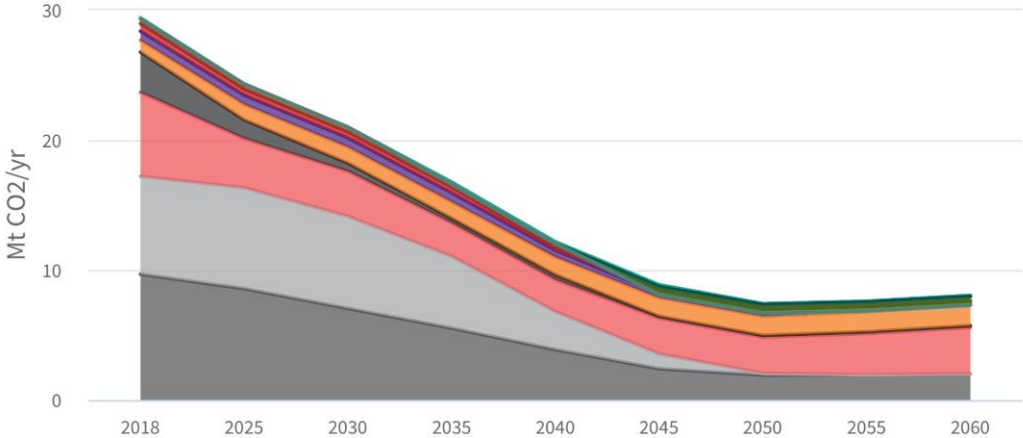
What might our energy-related emissions profile look like?

Kea

Tūi

Emissions for all sectors, all enduse and all technology (Mt CO2/yr)

Emissions for all sectors, all enduse and all technology (Mt CO2/yr)



- Diesel
- Jet Fuel
- Waste Incineration
- Drop-In Diesel
- Solar
- Petrol
- Geothermal
- Green Hydrogen
- Drop-In Jet
- Wind
- Natural Gas
- LPG
- Biodiesel
- Electricity
- Wood
- Coal
- Fuel Oil
- Biogas
- Hydro

- Diesel
- Jet Fuel
- Waste Incineration
- Electricity
- Wood
- Petrol
- Geothermal
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- Solar
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- Wind

TIMES-NZ 2.0, Scenario: Kea

TIMES-NZ 2.0, Scenario: Tūi

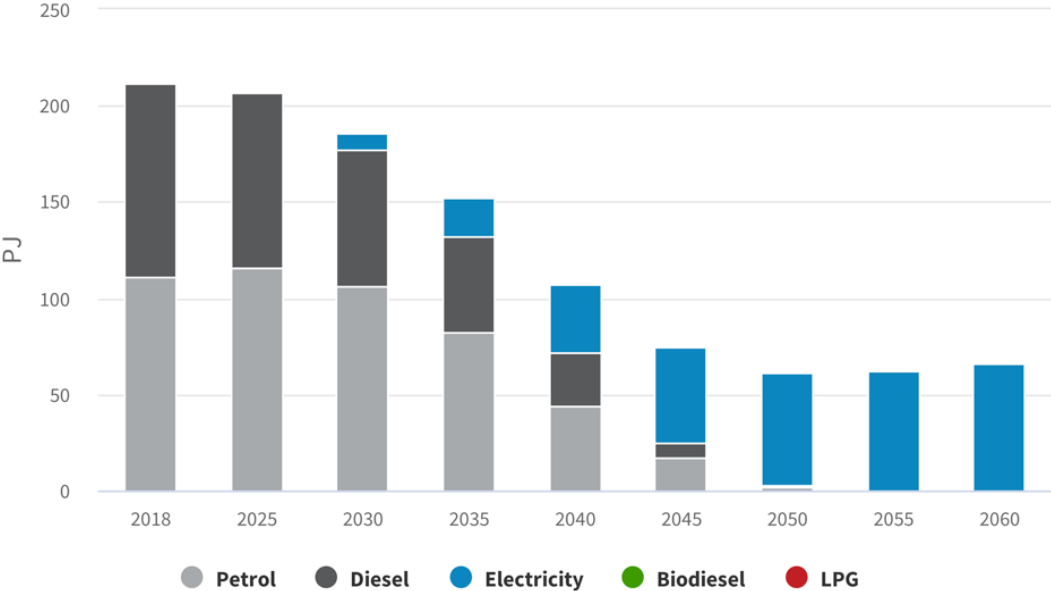


Transport

How might road transport look?

Kea

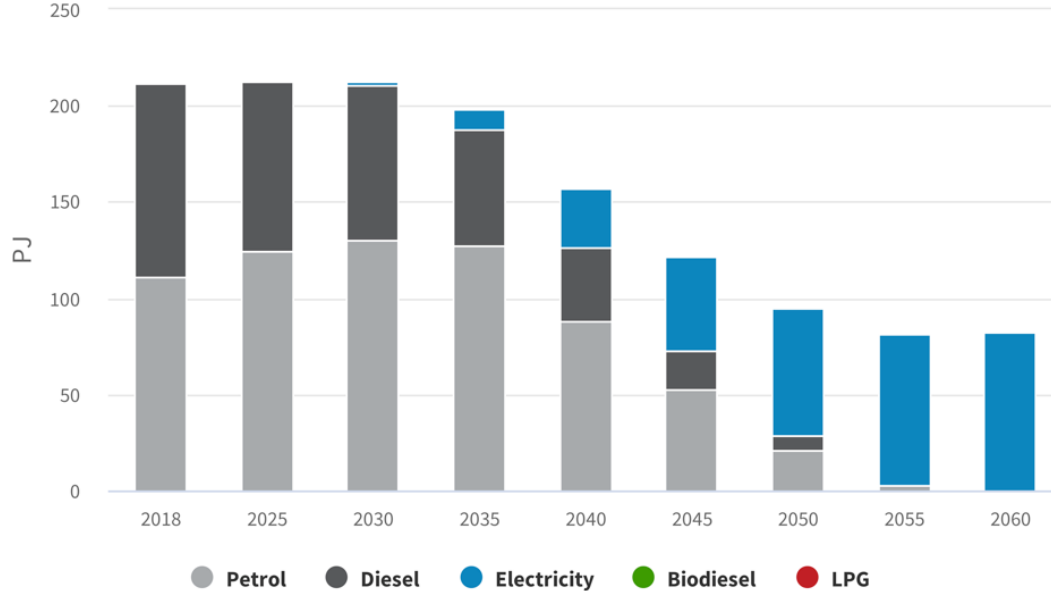
Transport Fuel Consumption for Road Transport, All Enduse and All Technology (PJ)



TIMES-NZ 2.0, Scenario: Kea

Tūi

Transport Fuel Consumption for Road Transport, All Enduse and All Technology (PJ)



TIMES-NZ 2.0, Scenario: Tui

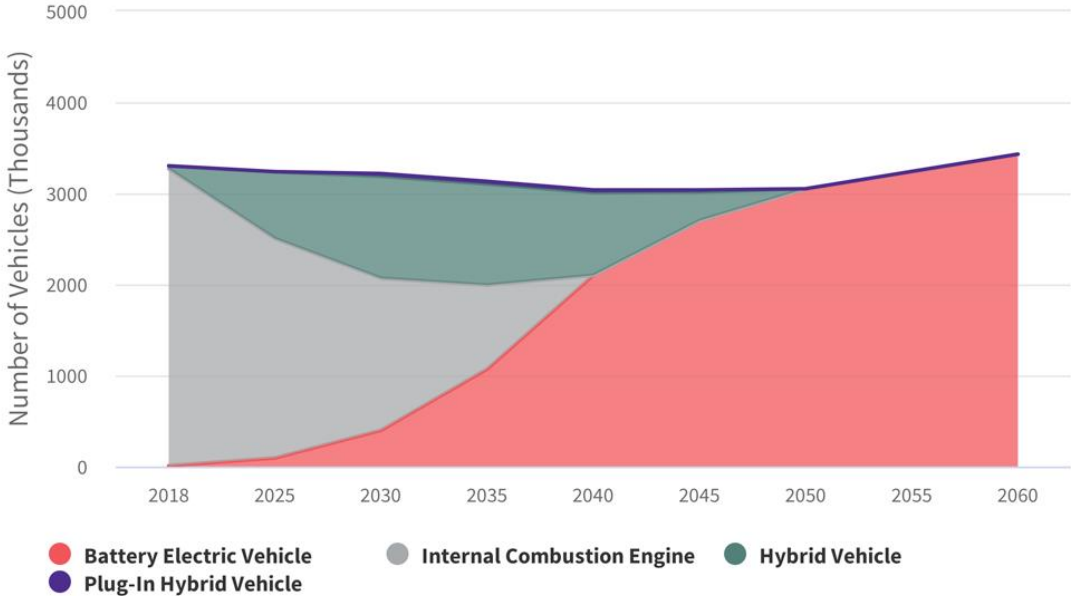


Transport

What cars might we drive?

Kea

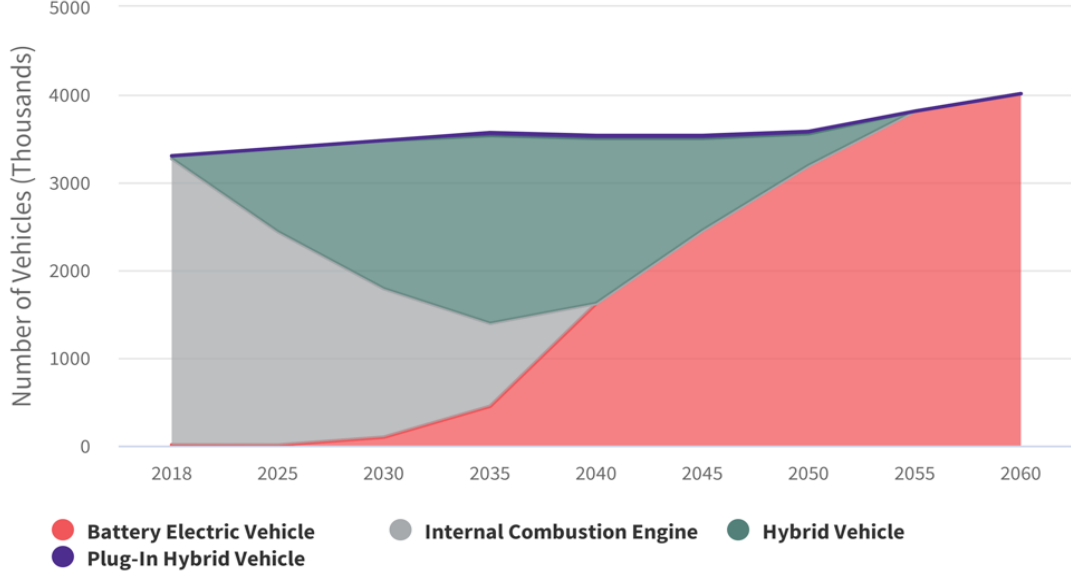
Transport number of vehicles for all subsectors, car/suv and all technology
(Number of Vehicles (Thousands))



TIMES-NZ 2.0, Scenario: Kea

Tūi

Transport number of vehicles for all subsectors, car/suv and all technology
(Number of Vehicles (Thousands))



TIMES-NZ 2.0, Scenario: Tūi

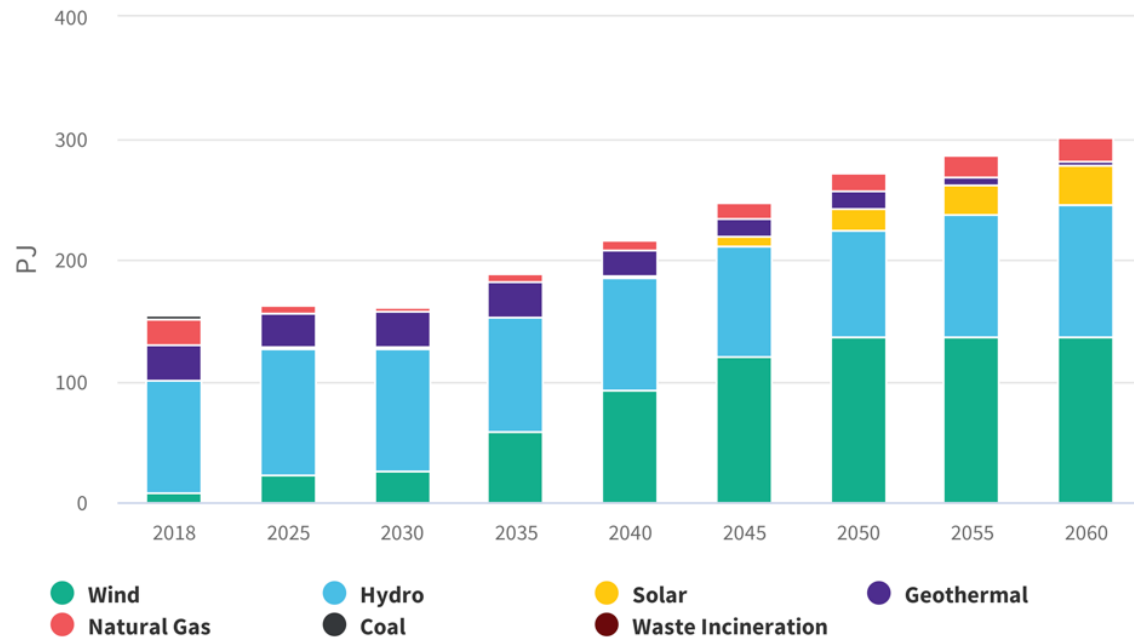


Electricity generation

What might electricity generation look like?

Kea

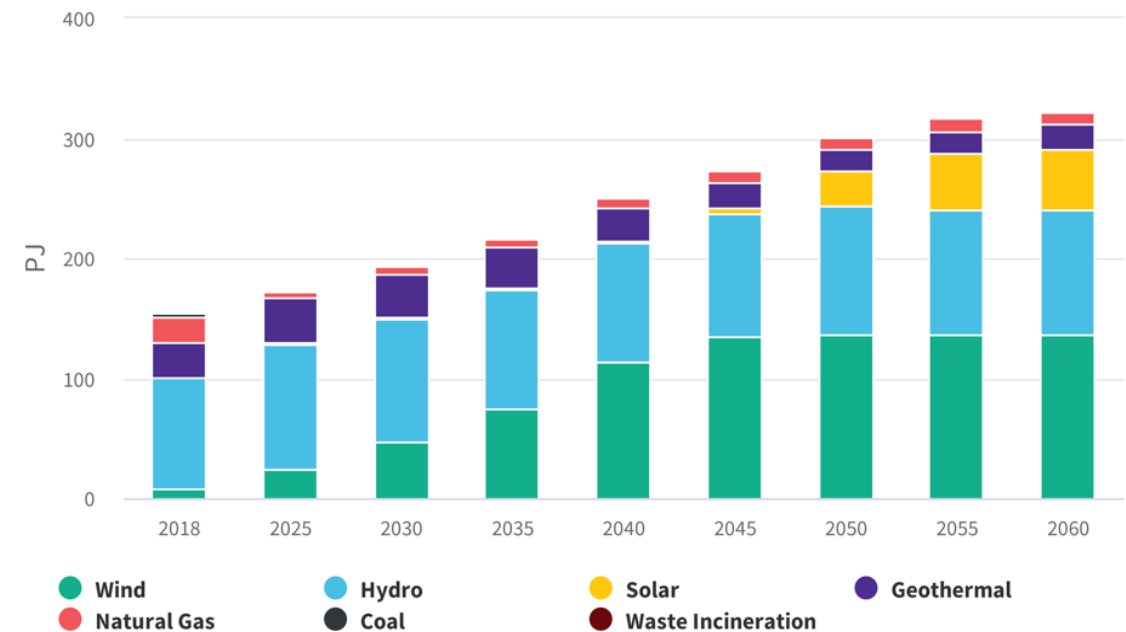
Electricity generation electricity generation for all subsectors, all enduse and all technology (PJ)



TIMES-NZ 2.0, Scenario: Kea

Tūi

Electricity generation electricity generation for all subsectors, all enduse and all technology (PJ)



TIMES-NZ 2.0, Scenario: Tūi

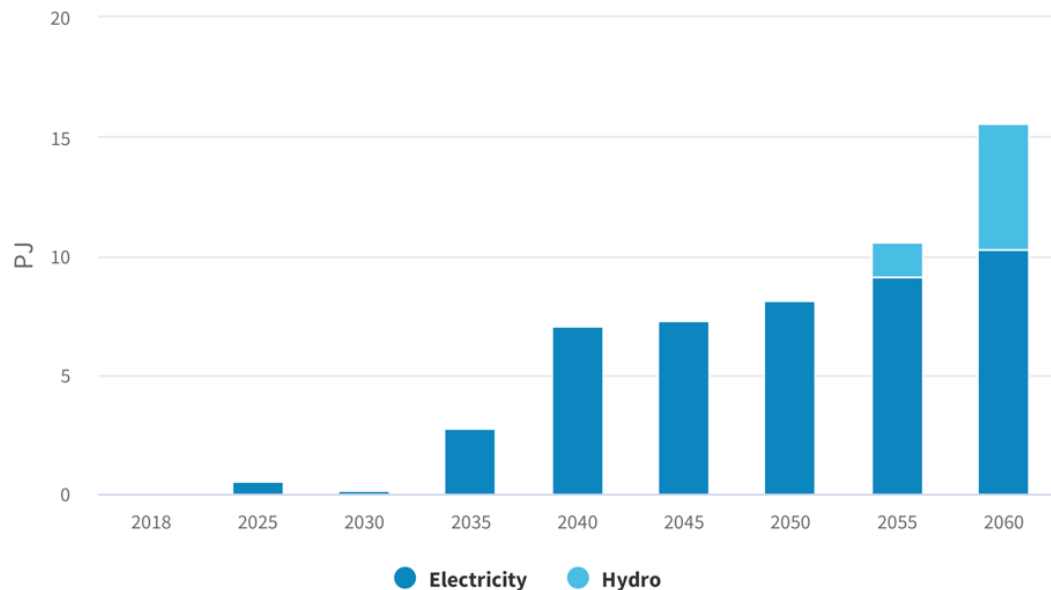


Electricity storage

How might we store electricity?

Kea

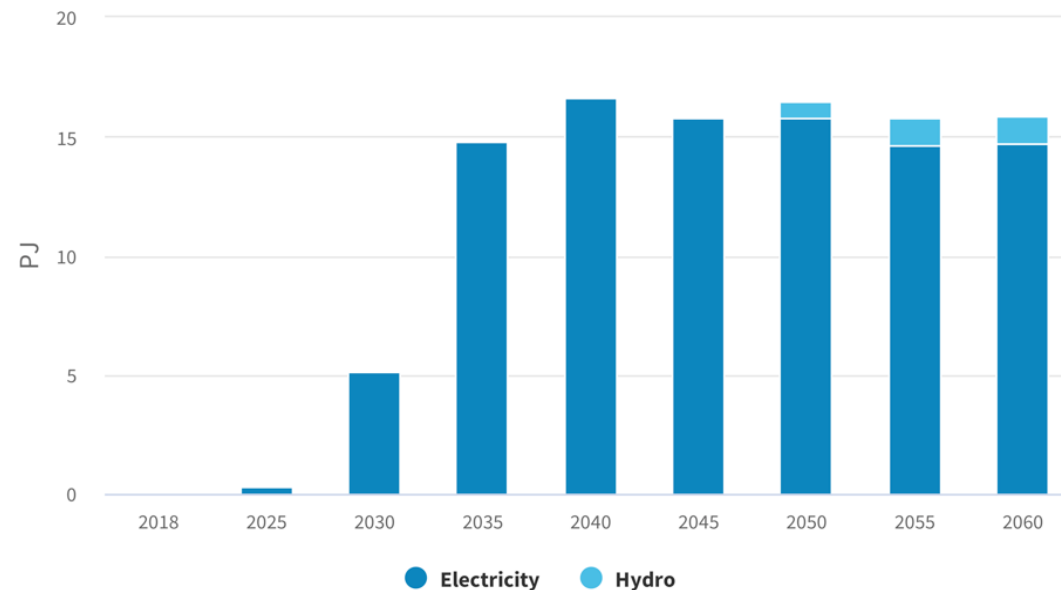
Electricity generation gross electricity storage for all subsectors, all enduse and all technology (PJ)



TIMES-NZ 2.0, Scenario: Kea

Tūi

Electricity generation gross electricity storage for all subsectors, all enduse and all technology (PJ)



TIMES-NZ 2.0, Scenario: Tūi

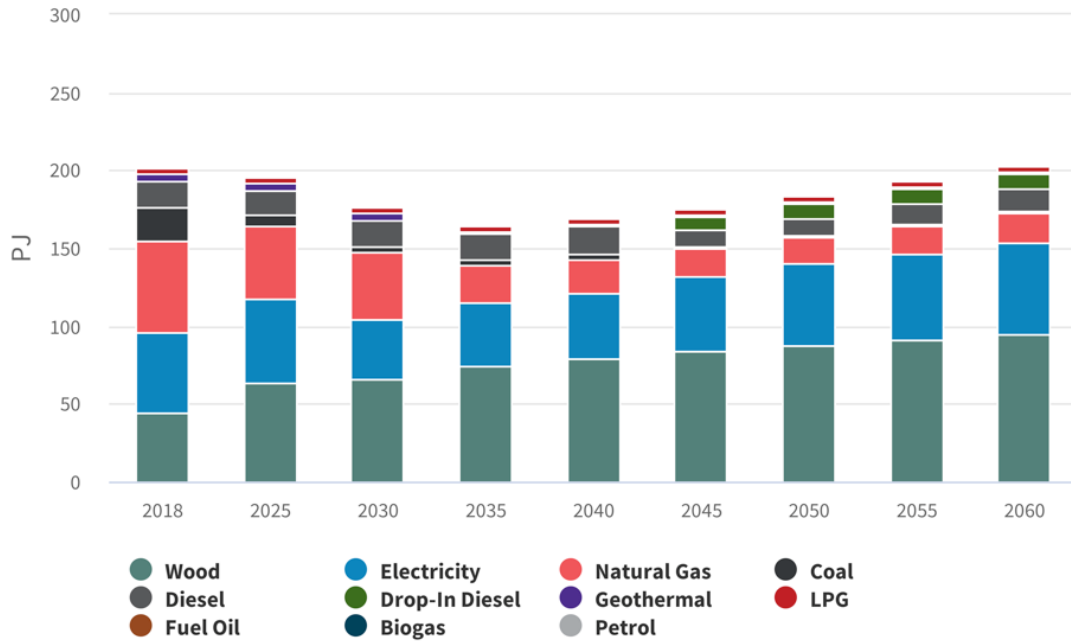


Industry

What fuels might industry use?

Kea

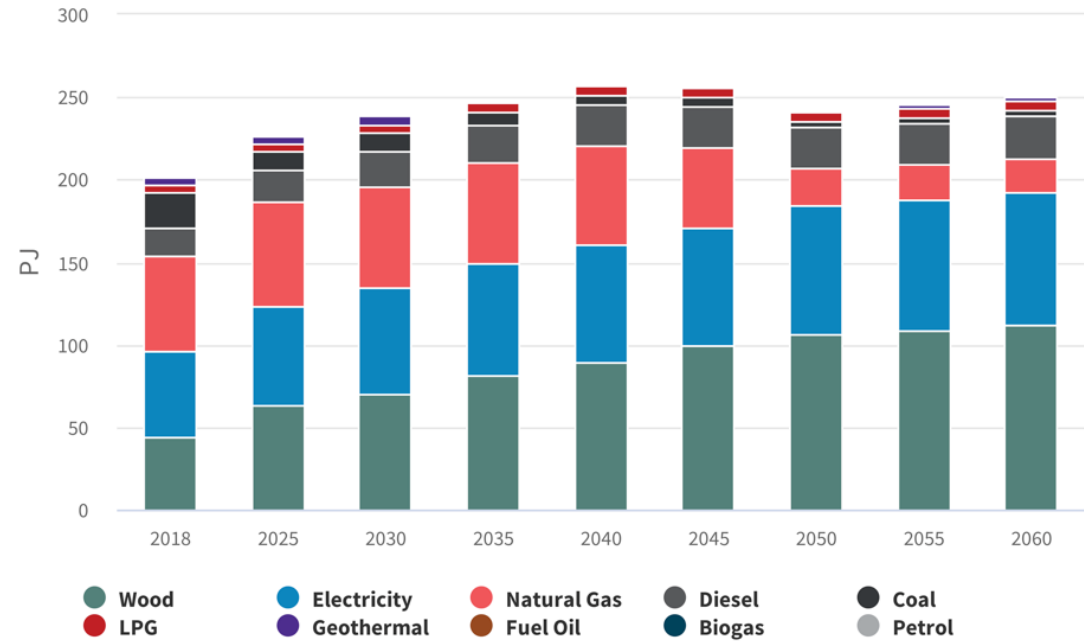
Industrial fuel consumption for all subsectors, all enduse and all technology (PJ)



TIMES-NZ 2.0, Scenario: Kea

Tūi

Industrial fuel consumption for all subsectors, all enduse and all technology (PJ)



TIMES-NZ 2.0, Scenario: Tūi



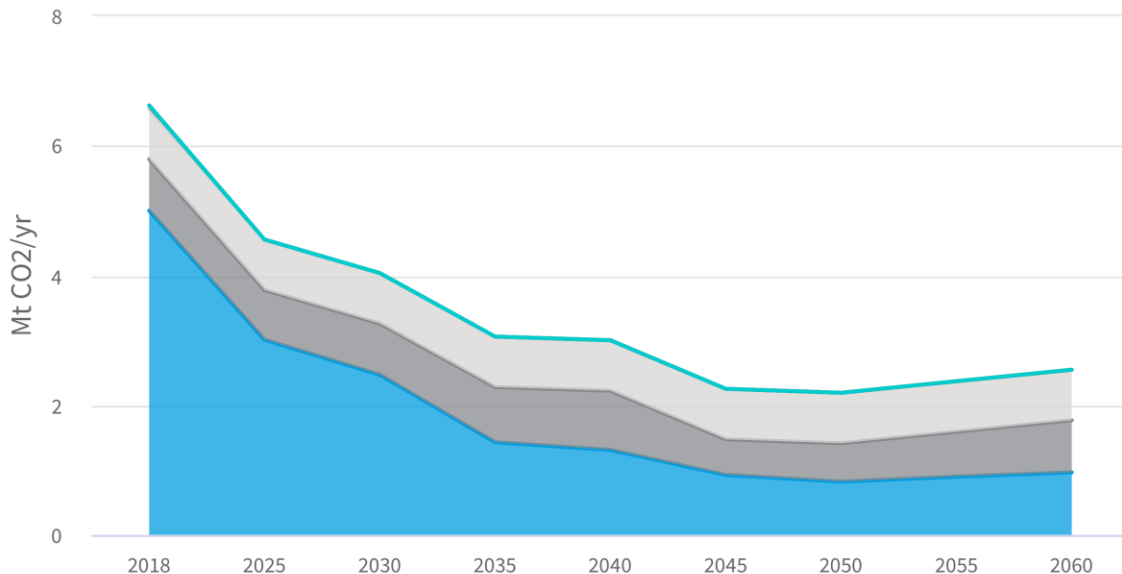
Industry

What technologies decarbonise more readily?

Kea

Tūi

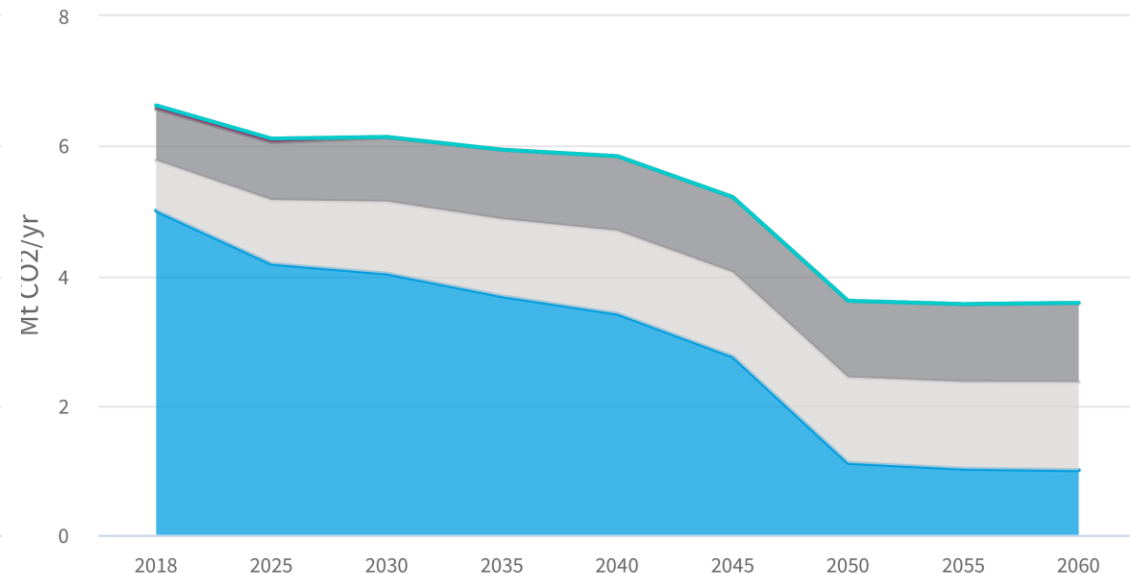
Industrial emissions for all subsectors, all end use and all technology (Mt CO₂/yr)



● Heating/Cooling ● Mobile Motive Power ● Other
● Stationary Motive Power ● Electronics and Lighting

TIMES-NZ 2.0, Scenario: Kea

Industrial emissions for all subsectors, all end use and all technology (Mt CO₂/yr)



● Heating/Cooling ● Other ● Mobile Motive Power
● Stationary Motive Power ● Electronics and Lighting

TIMES-NZ 2.0, Scenario: Tūi

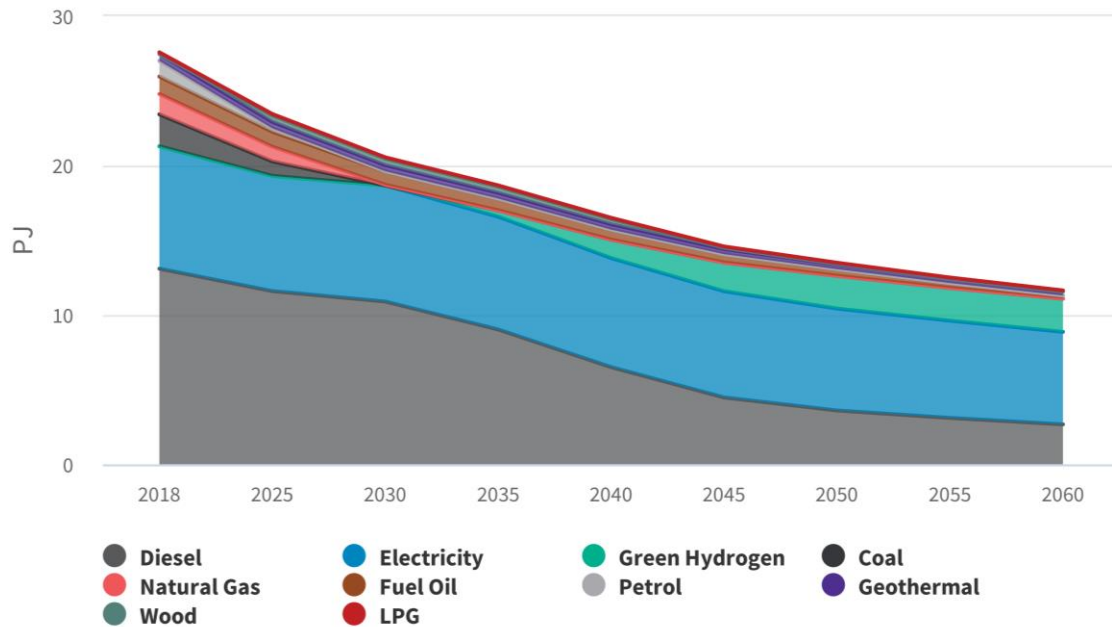


Agriculture

What fuel might we use in agriculture?

Kea

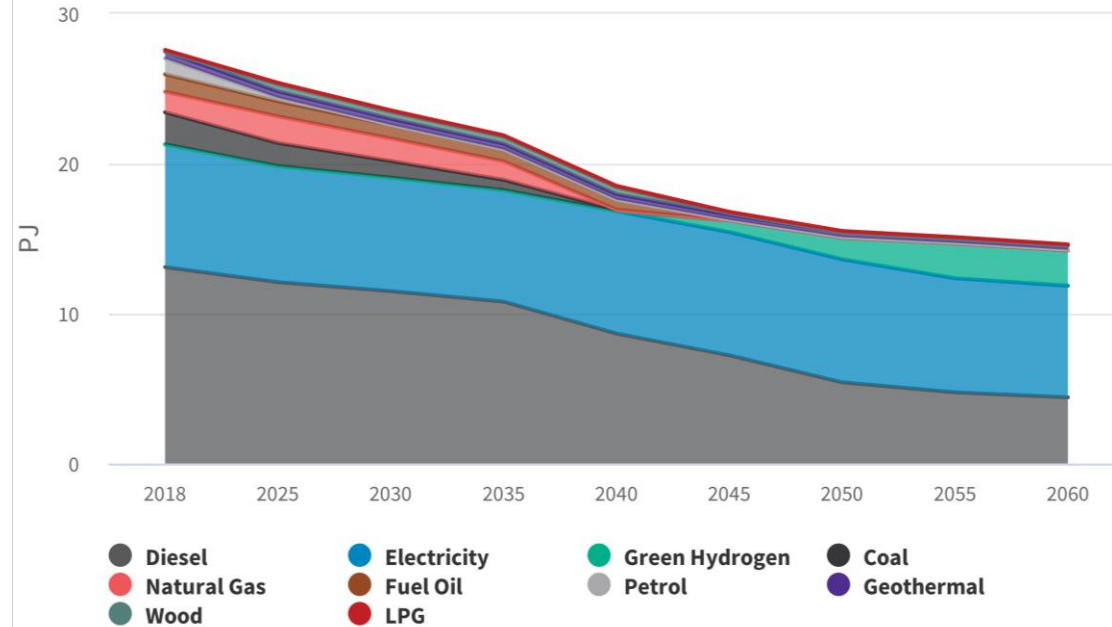
Agriculture fuel consumption for all subsectors, all end use and all technology



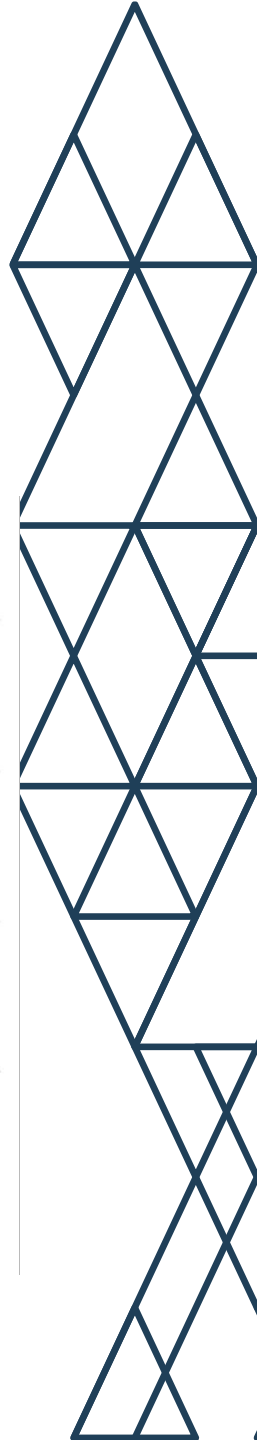
MES-NZ 2.0, Scenario: Kea

Tūi

Agriculture fuel consumption for all subsectors, all end use and all technology



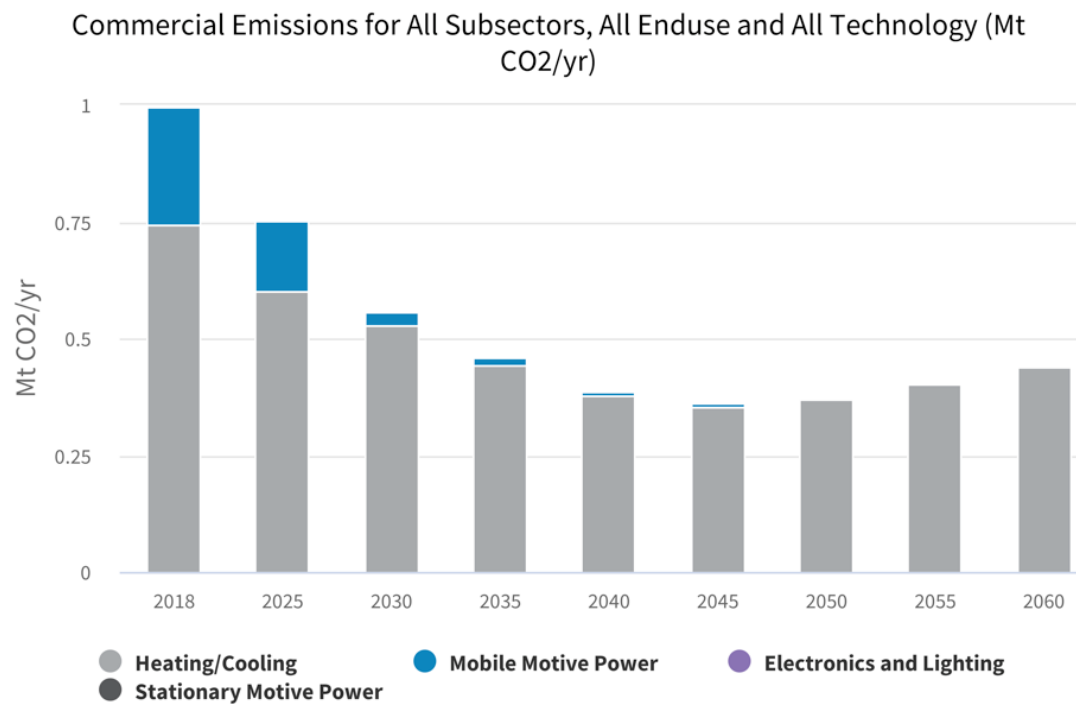
MES-NZ 2.0, Scenario: Tūi



Commercial

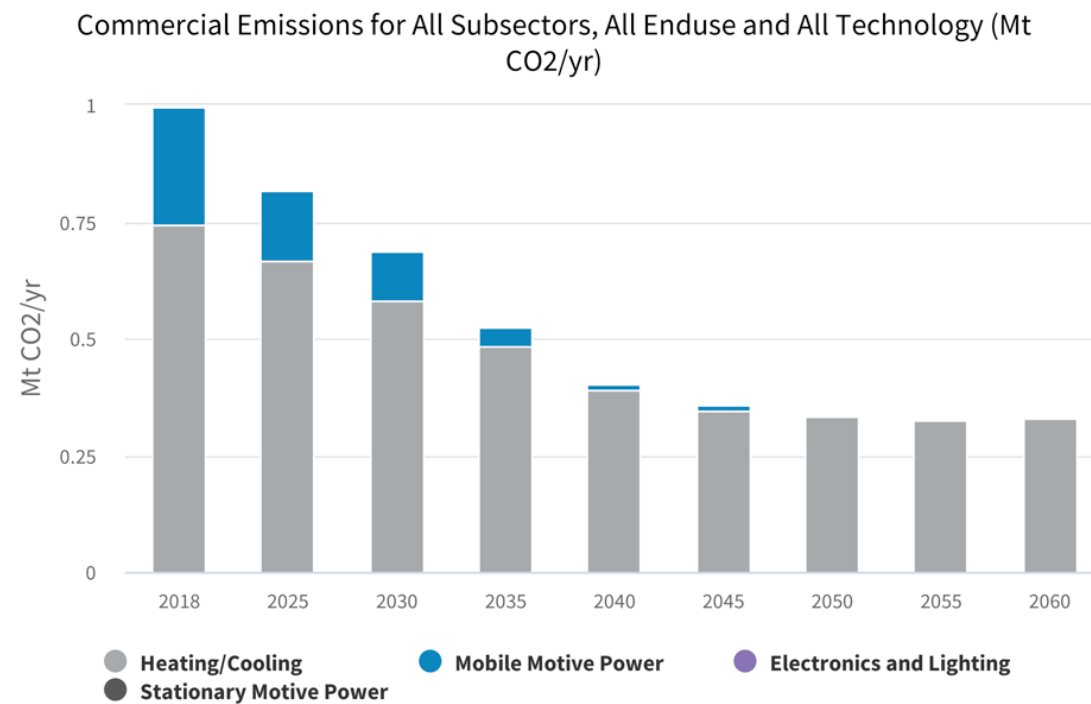
Where might we see emissions decrease?

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūi



TIMES-NZ 2.0, Scenario: Tūi

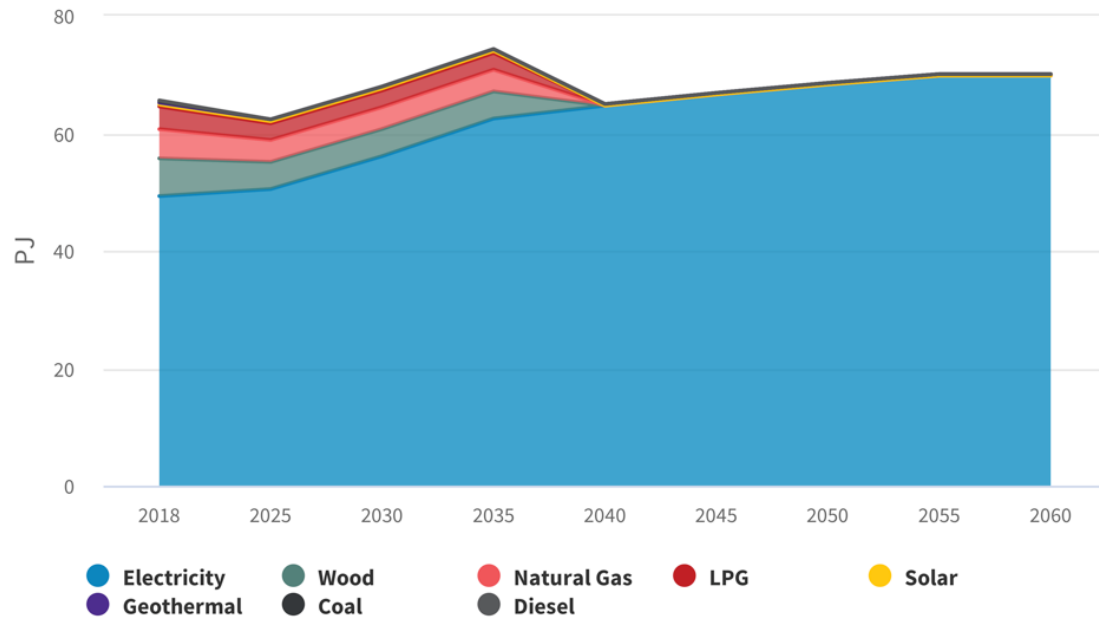


Residential

What energy sources might we use at home?

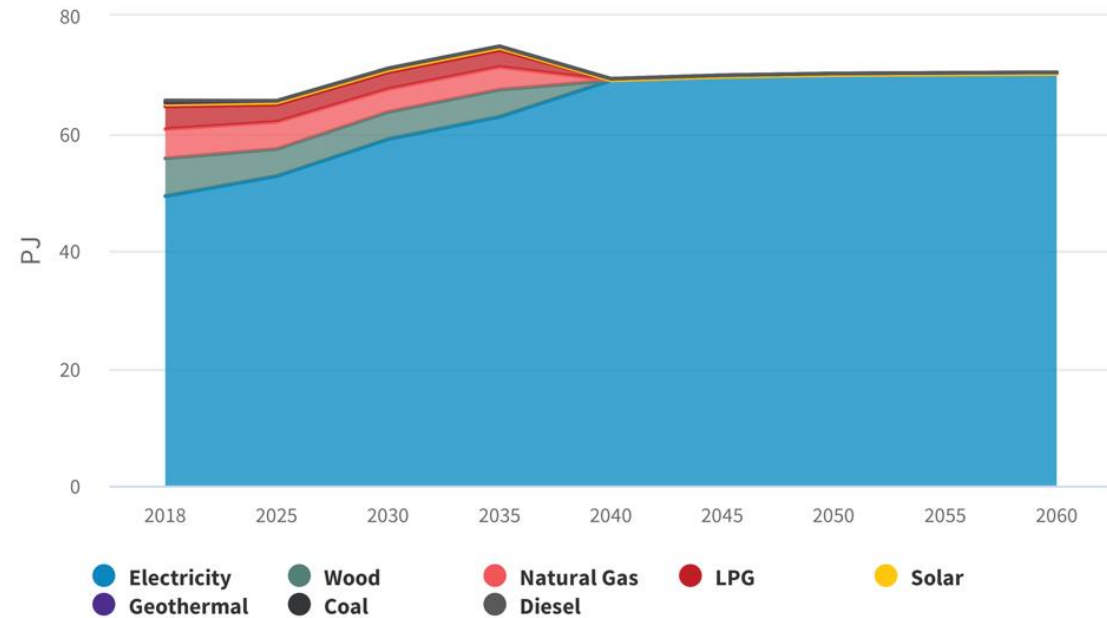
Kea

Residential Fuel Consumption for All Subsectors, All Enduse and All Technology (PJ)



Tūi

Residential Fuel Consumption for All Subsectors, All Enduse and All Technology (PJ)

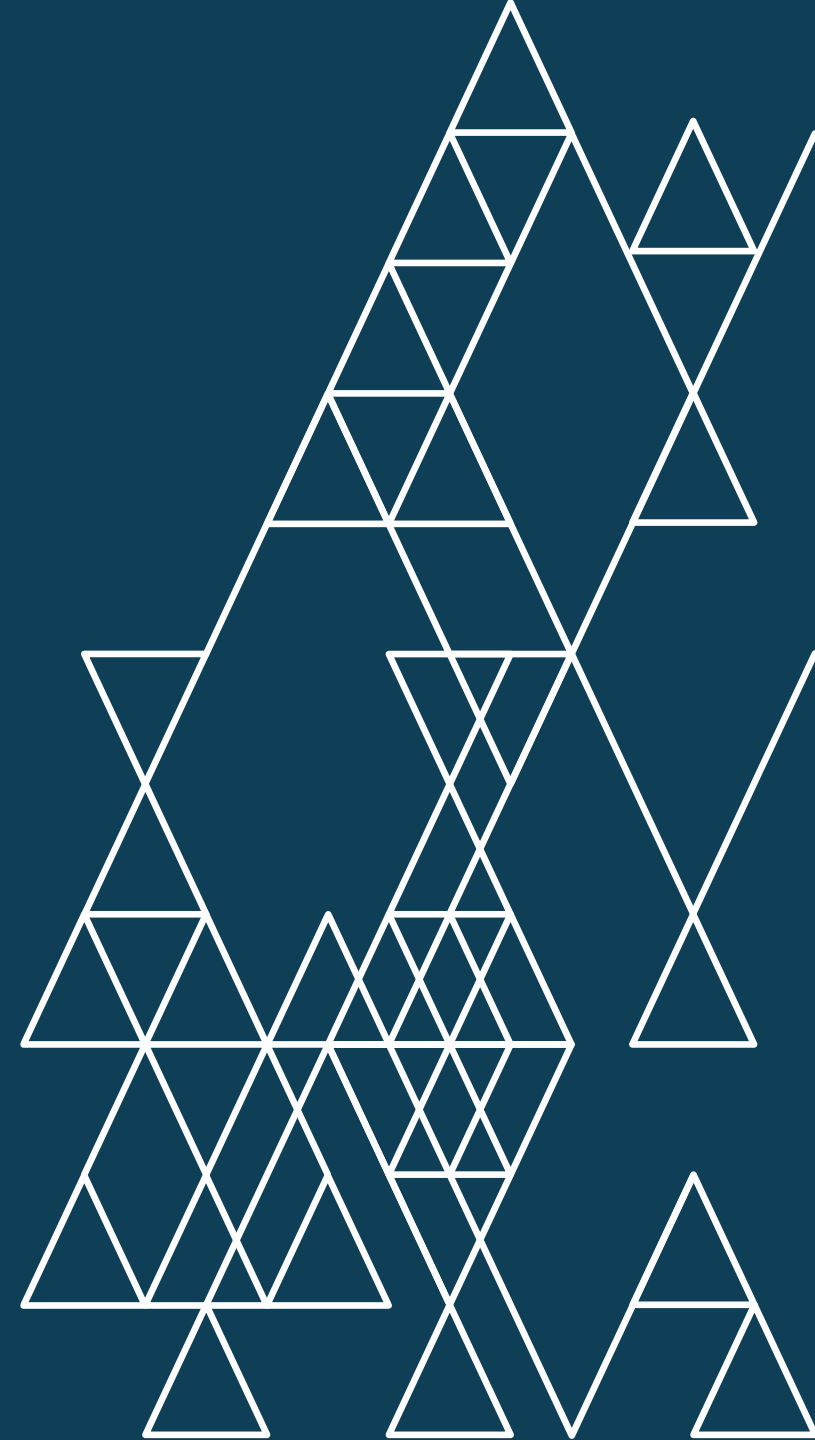


TIMES-NZ 2.0, Scenario: Kea

TIMES-NZ 2.0, Scenario: Tui



Data visualisation and next steps



NZ Energy 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>

