New Zealand Energy Scenarios TIMES-NZ 2.0

EECA and BEC Lunchtime Webinar

Residential and Commercial Sectors

NZ Energy Scenarios TIMES-NZ 2.0

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

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.

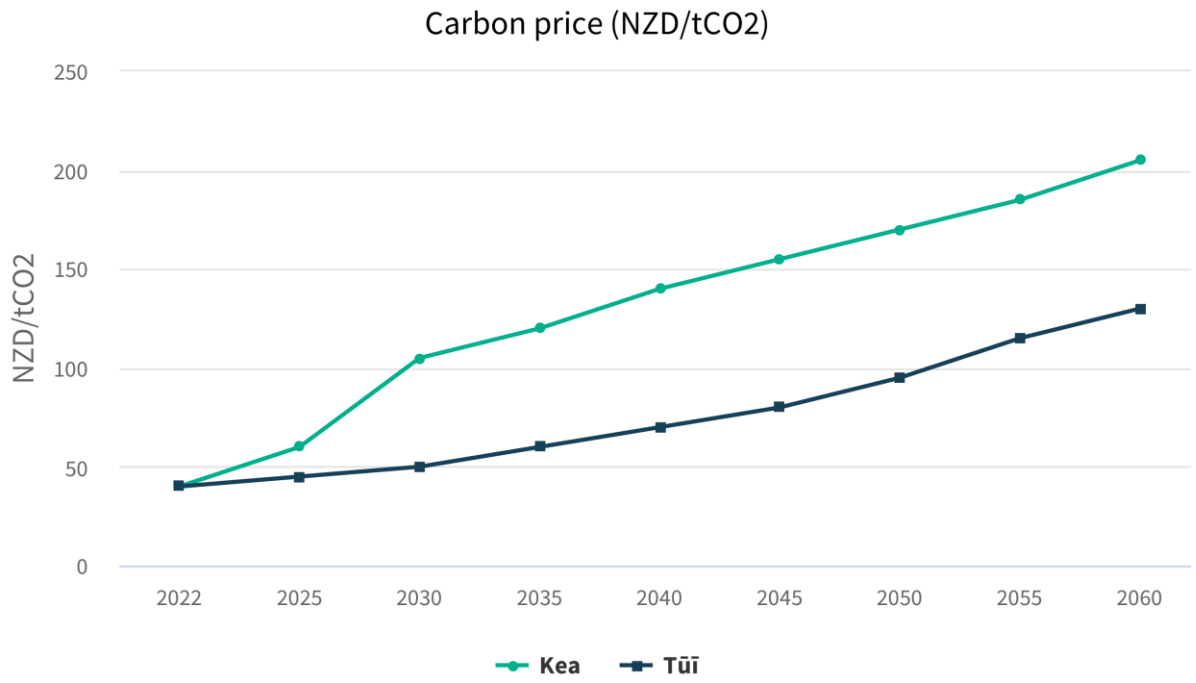
Tūī

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.

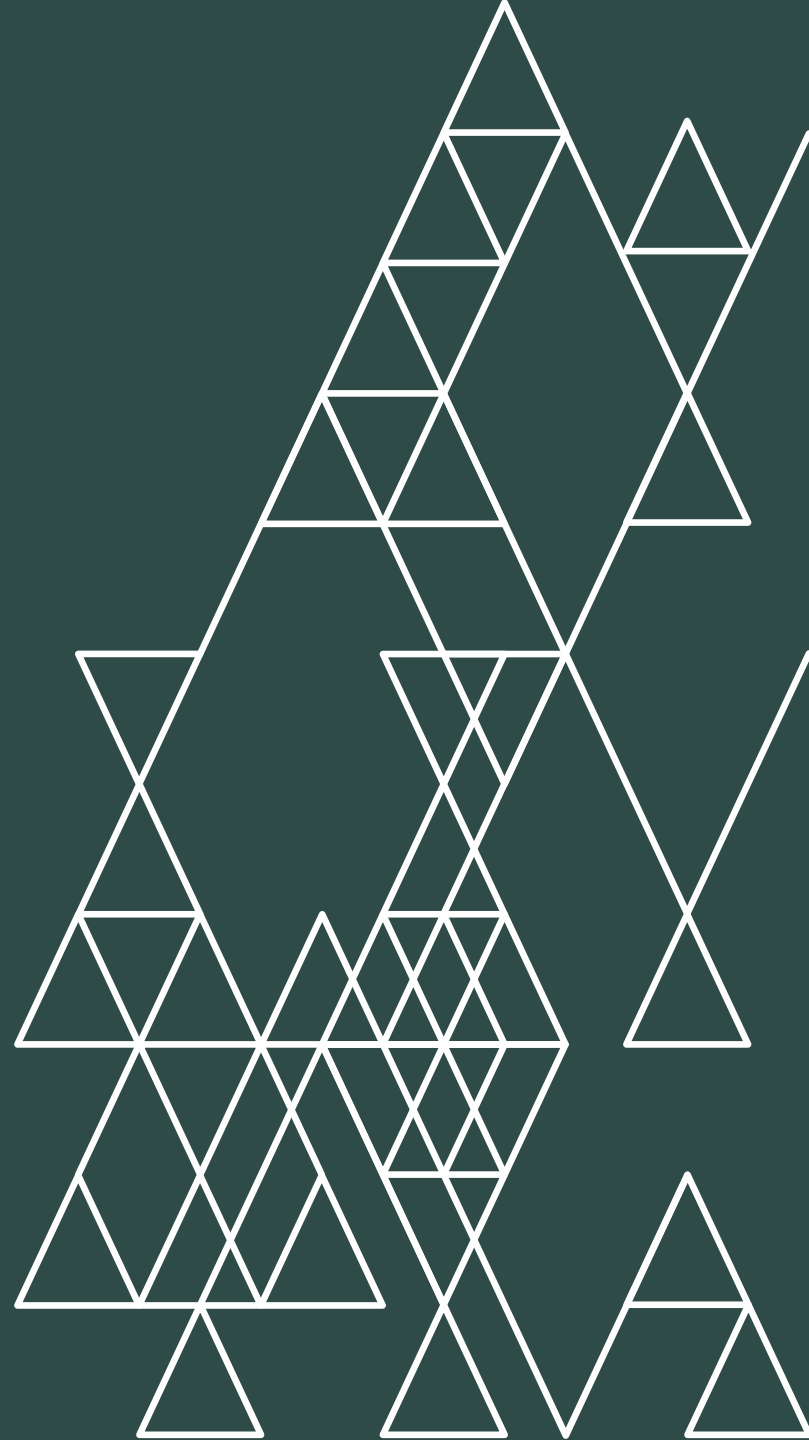
Scenario Parameters

The key model input differences between Kea and Tūī are:

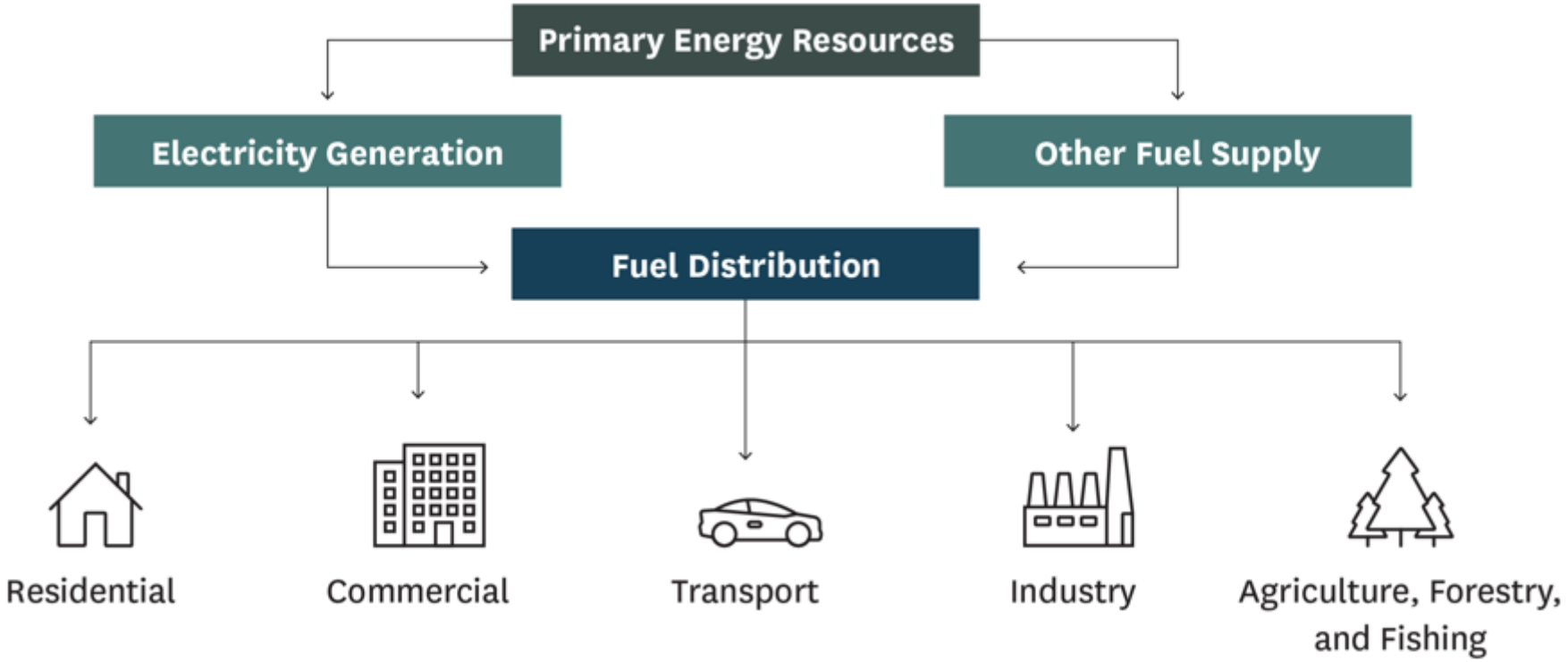
- **Composite GDP**
- **Carbon price**
- **Discount rates**
- **Technology cost curves**



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

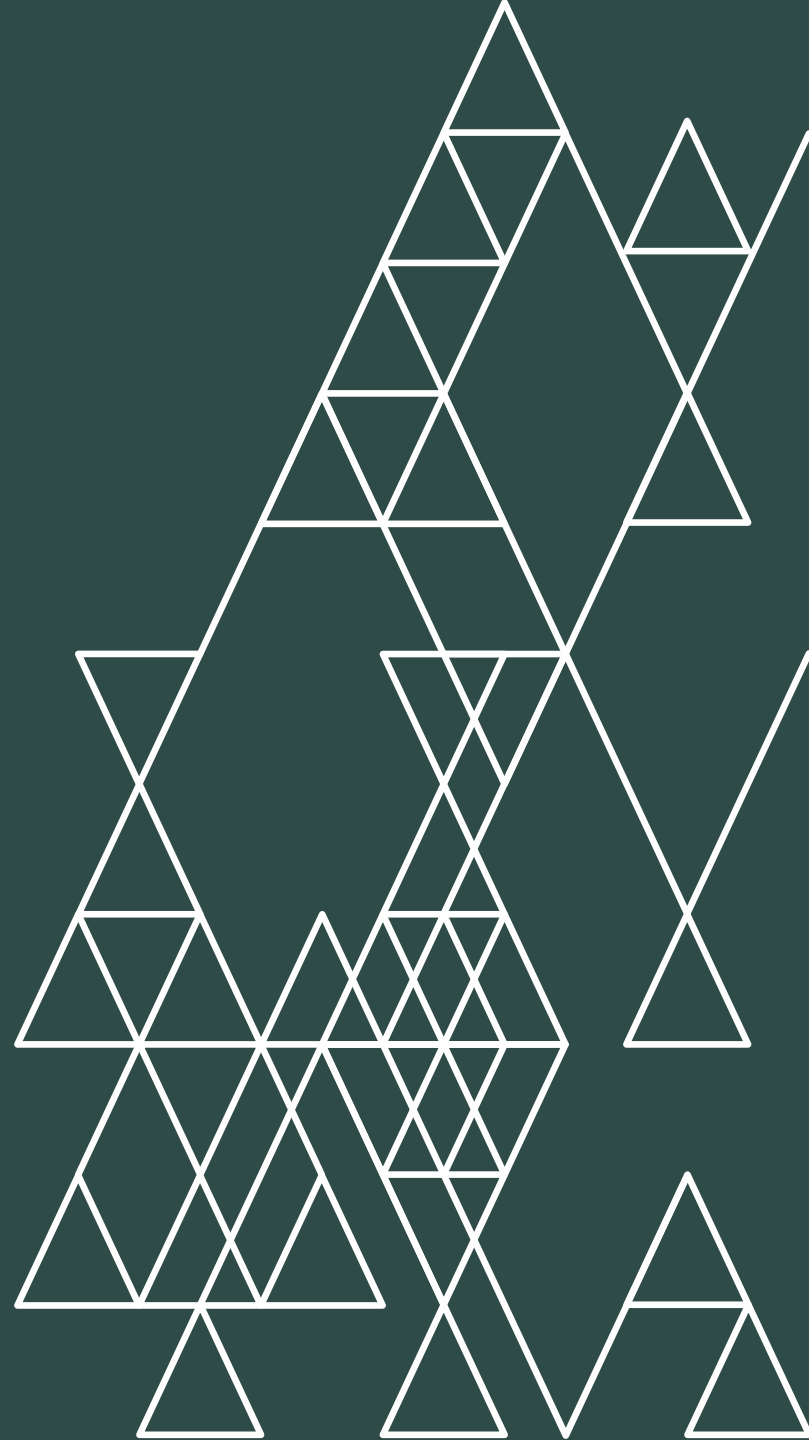
Regions and Time Representation

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

Residential Sector Overview



TIMES-NZ 2.0 Residential Sector

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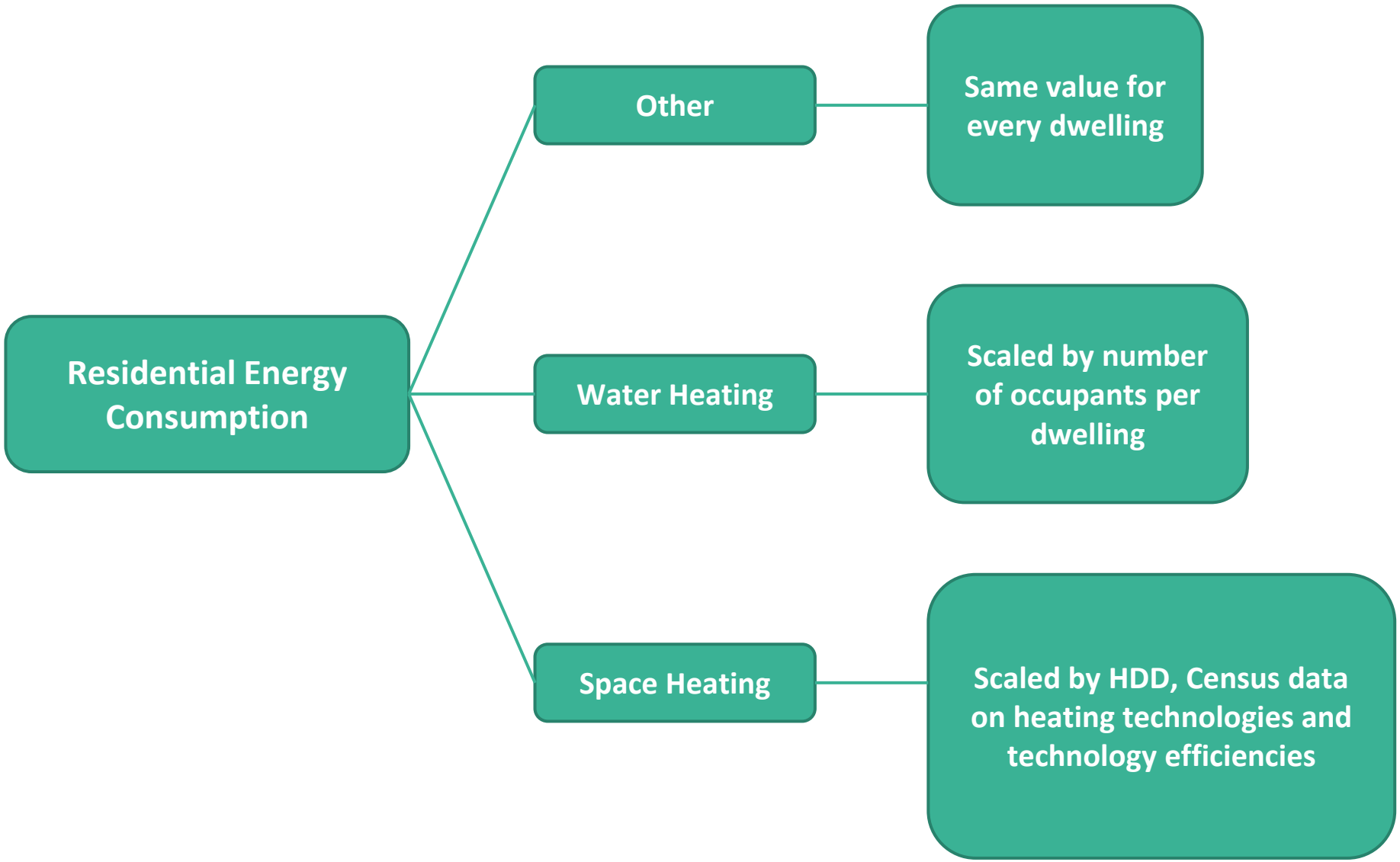
Residential Sector

Energy Split for the Reference Year (2018)



Residential Sector

Scaling Space Heating consumption across regions

Calculated Heating Degree Days

Percentages from known heating sources

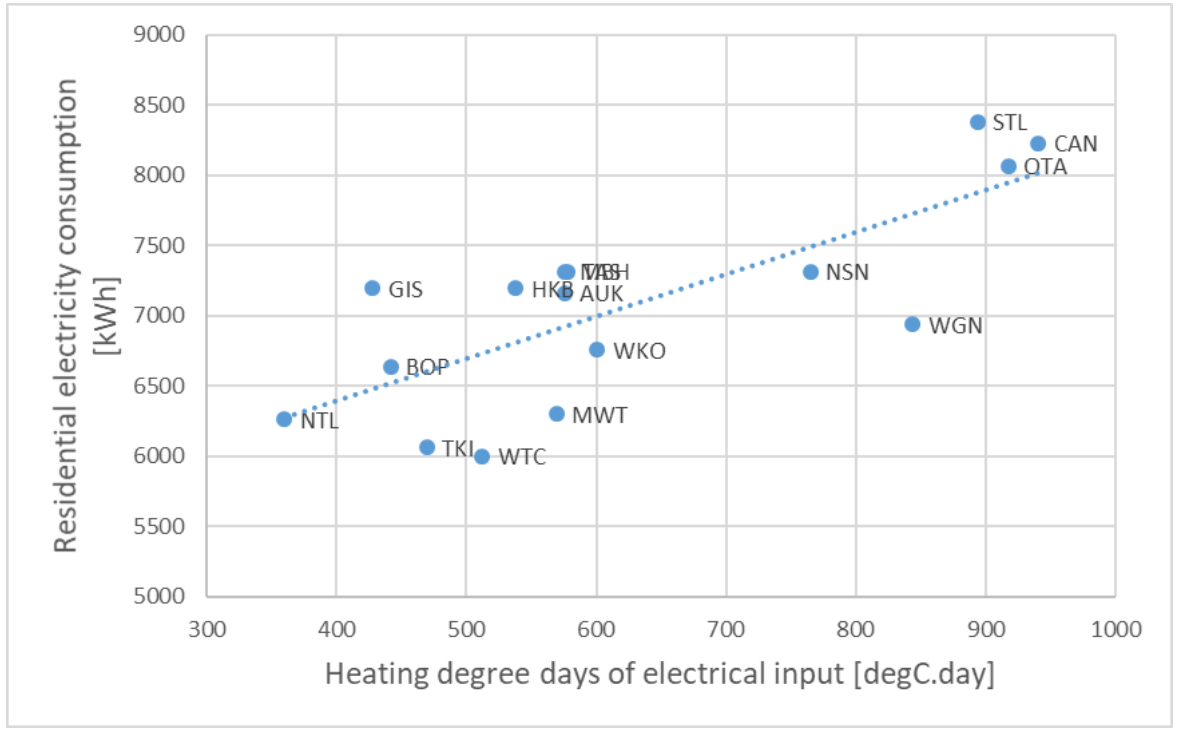
Relative heat delivered from each source

Efficiencies

Energy input from each heat source

Residential Sector

Scaling Space Heating consumption across regions



Linear regression suggests: $Variable\ load \propto HDD$

Residential Sector

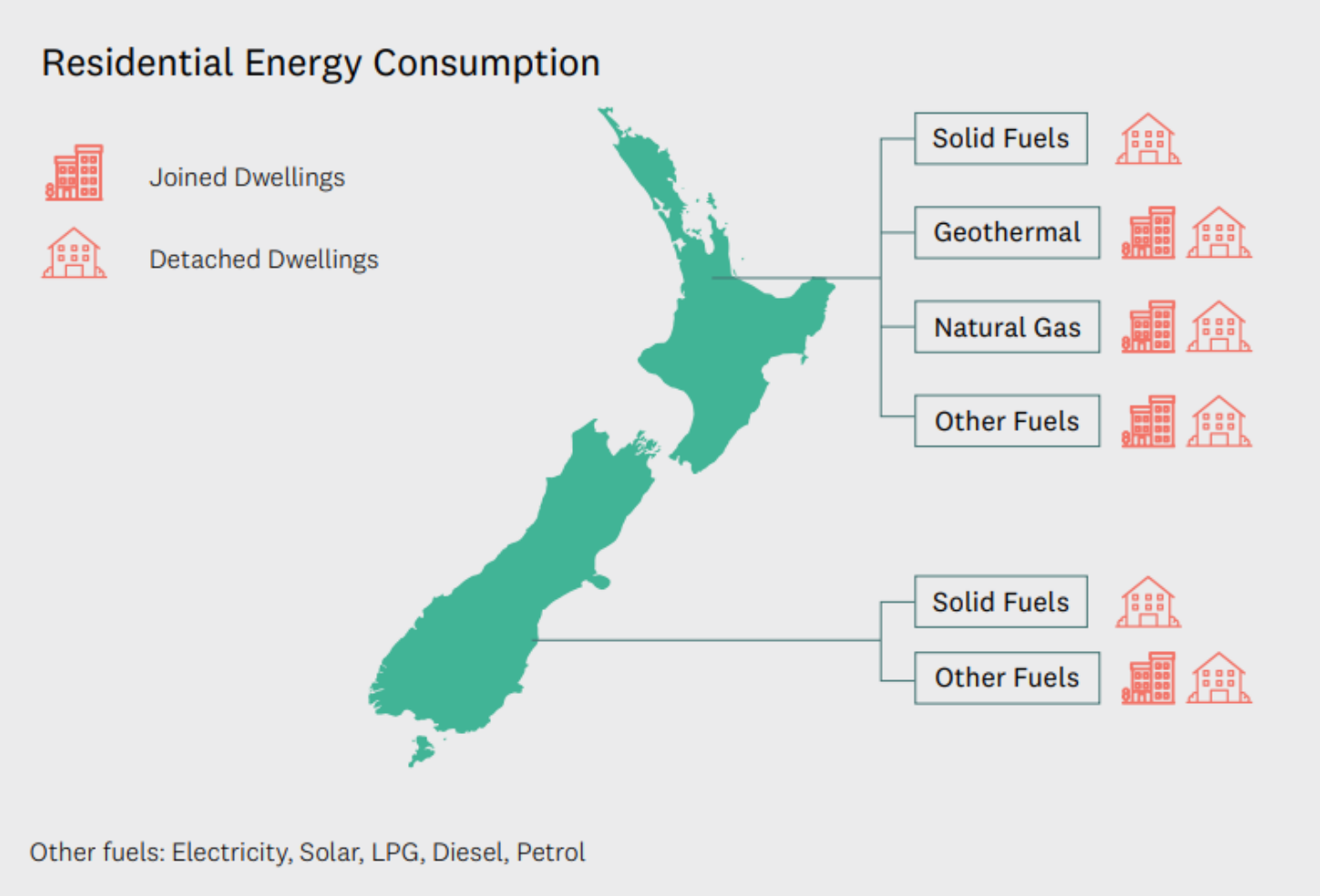
Scaling Water Heating consumption across regions

Factors that affect water heating consumption include:

Factor	Regional Variation	Data Availability
Type of water heater	Yes	No
Number of occupants	Yes	Yes
Behaviours (e.g. length of showers)	No	No
Temperature settings	No	No

Residential Sector

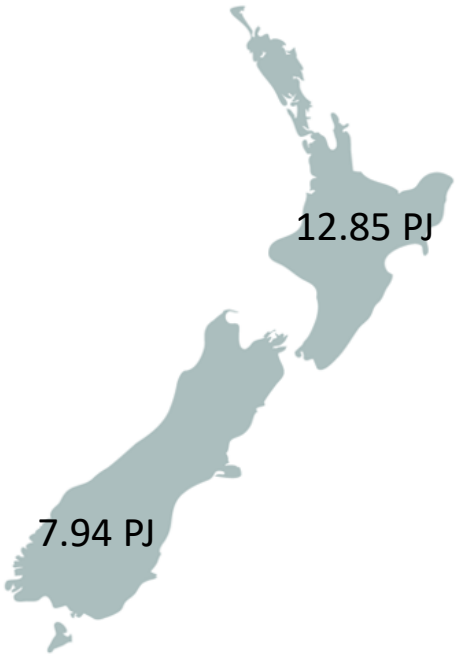
Energy Split for the Reference Year (2018)



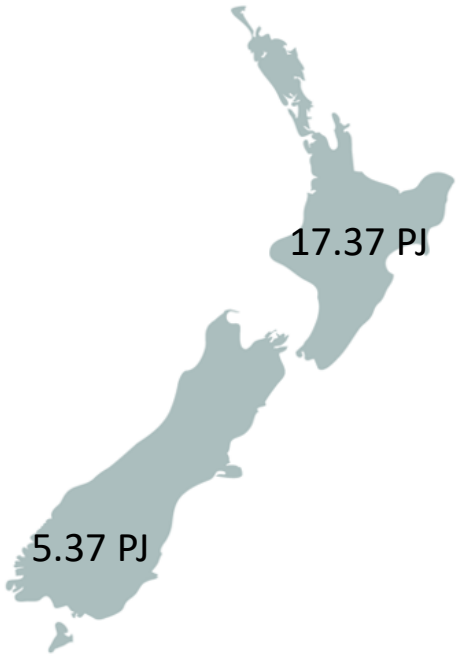
Residential Sector

Energy Split for the Reference Year (2018)

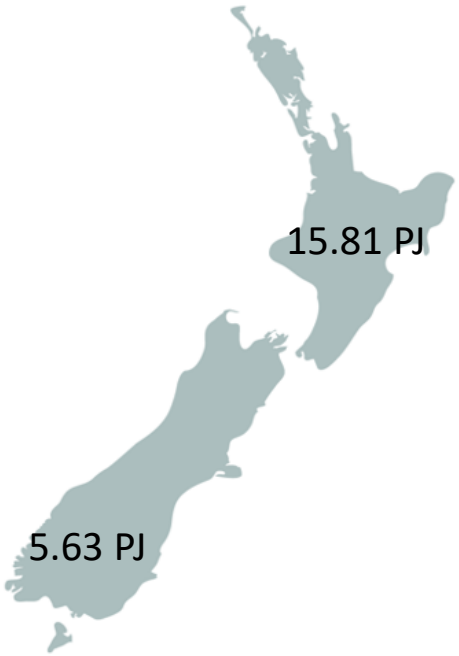
Space Heating



Water Heating



Other End Uses

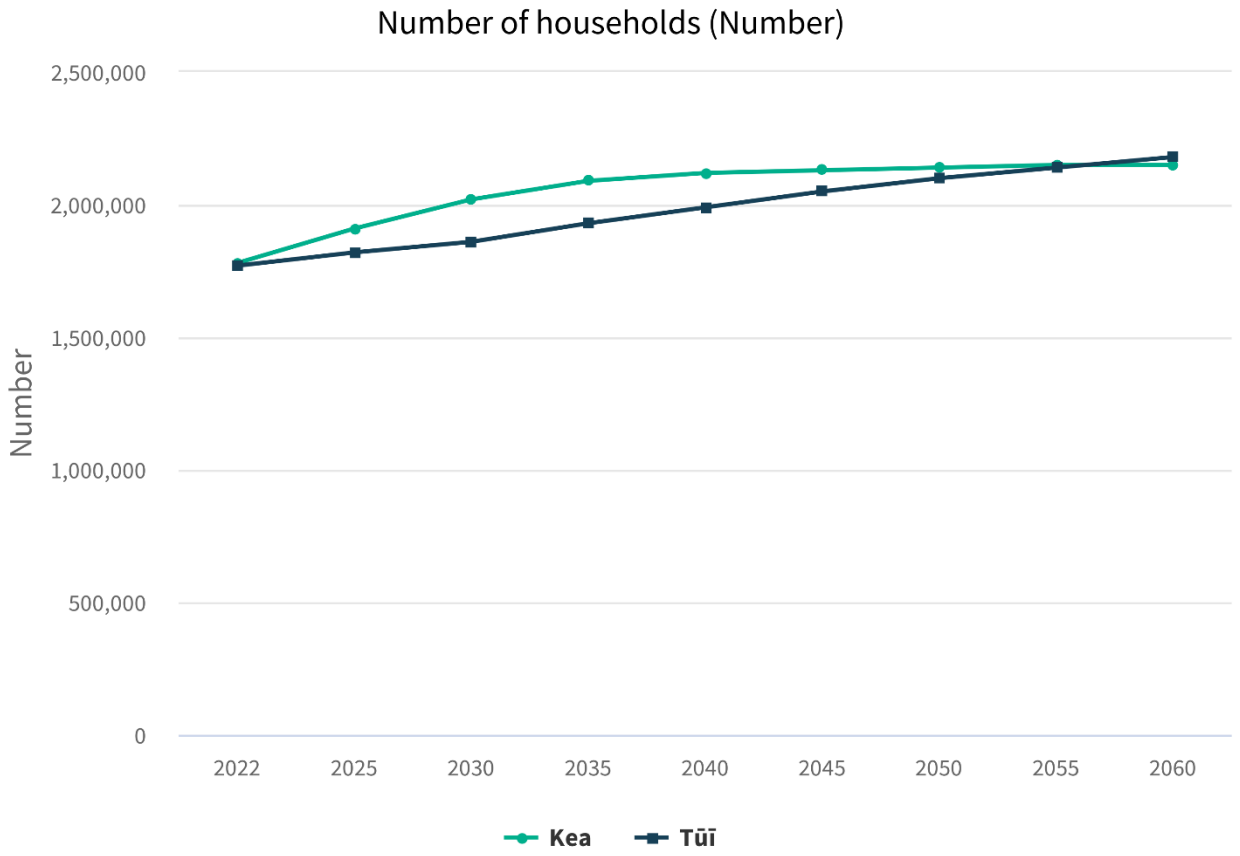


Unallocated (Geothermal)

Residential Sector

Demand Projections

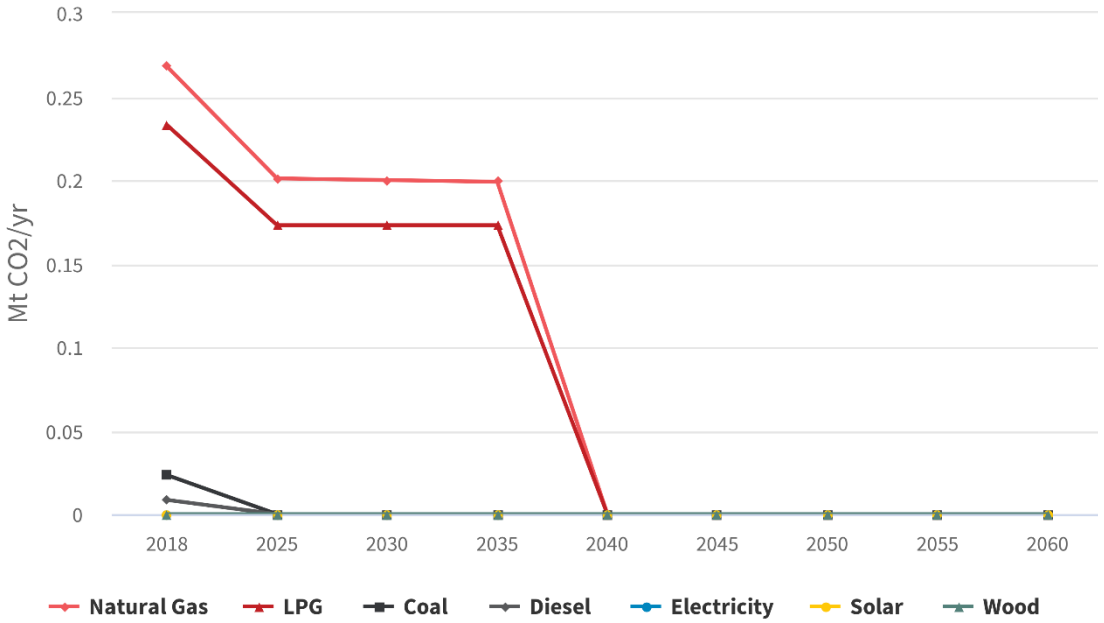
Demand projections are considered to be driven by the number of households and their type, which are exogenous assumptions.



Residential Sector

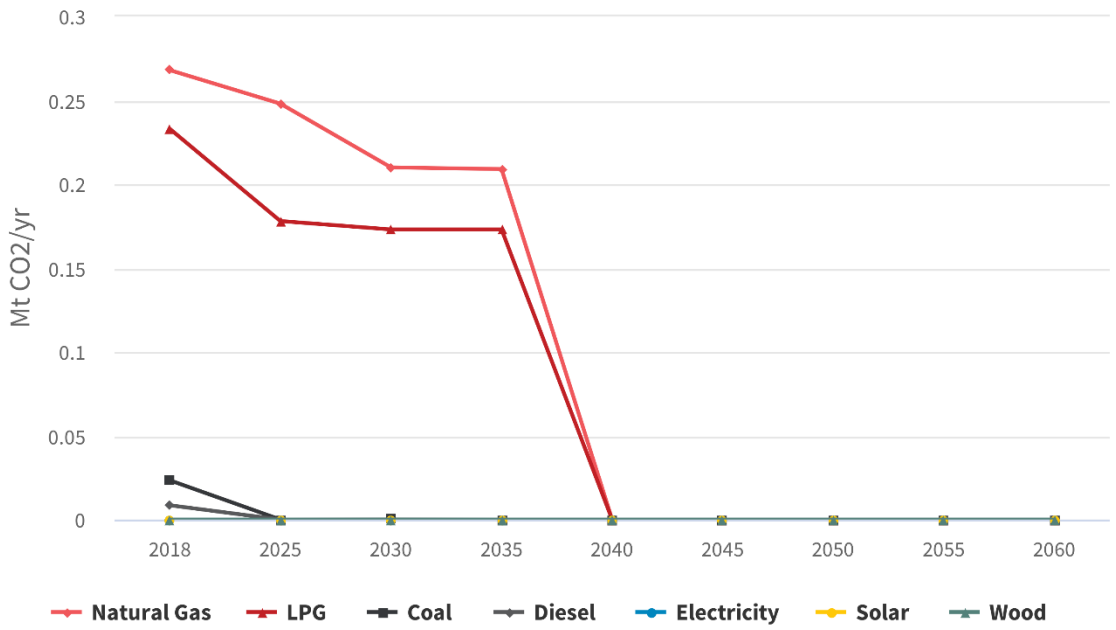
Model Outputs - Emissions

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūī

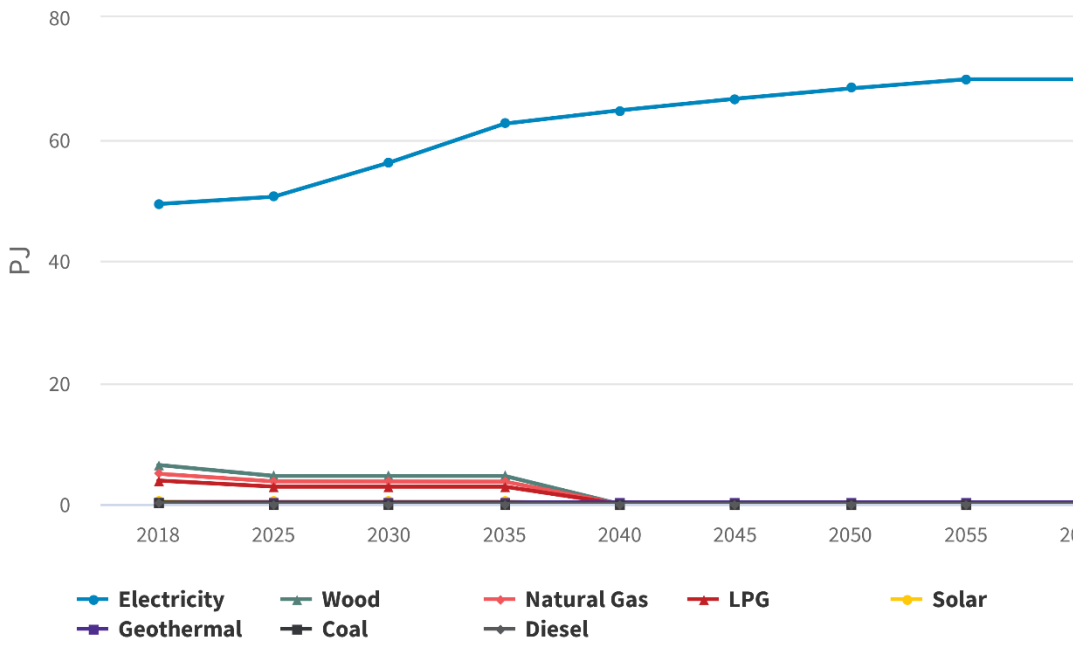


TIMES-NZ 2.0, Scenario: Tūī

Residential Sector

Model Outputs – Fuel Consumption

Kea



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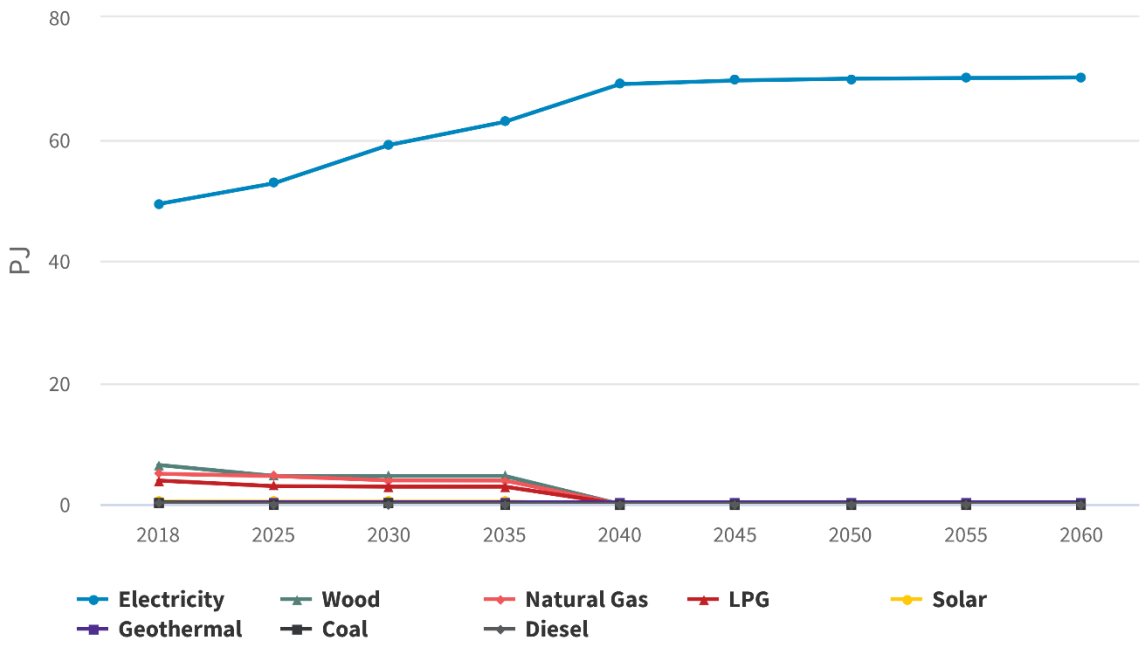
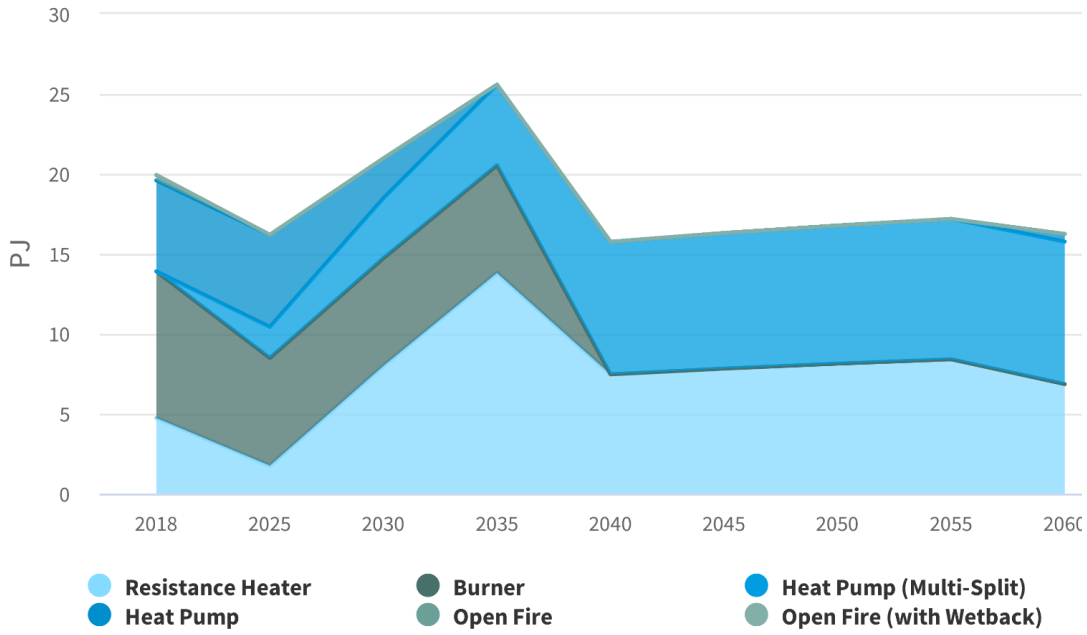


TIMES-NZ 2.0, Scenario: Tūī

Residential Sector

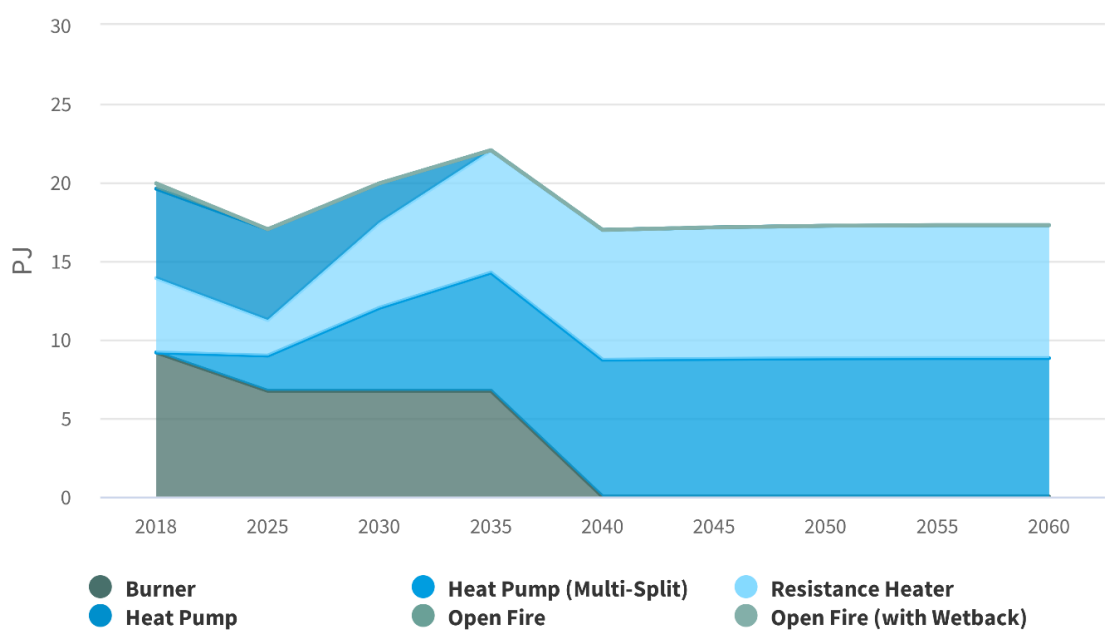
Model Outputs – Space Heating

Kea



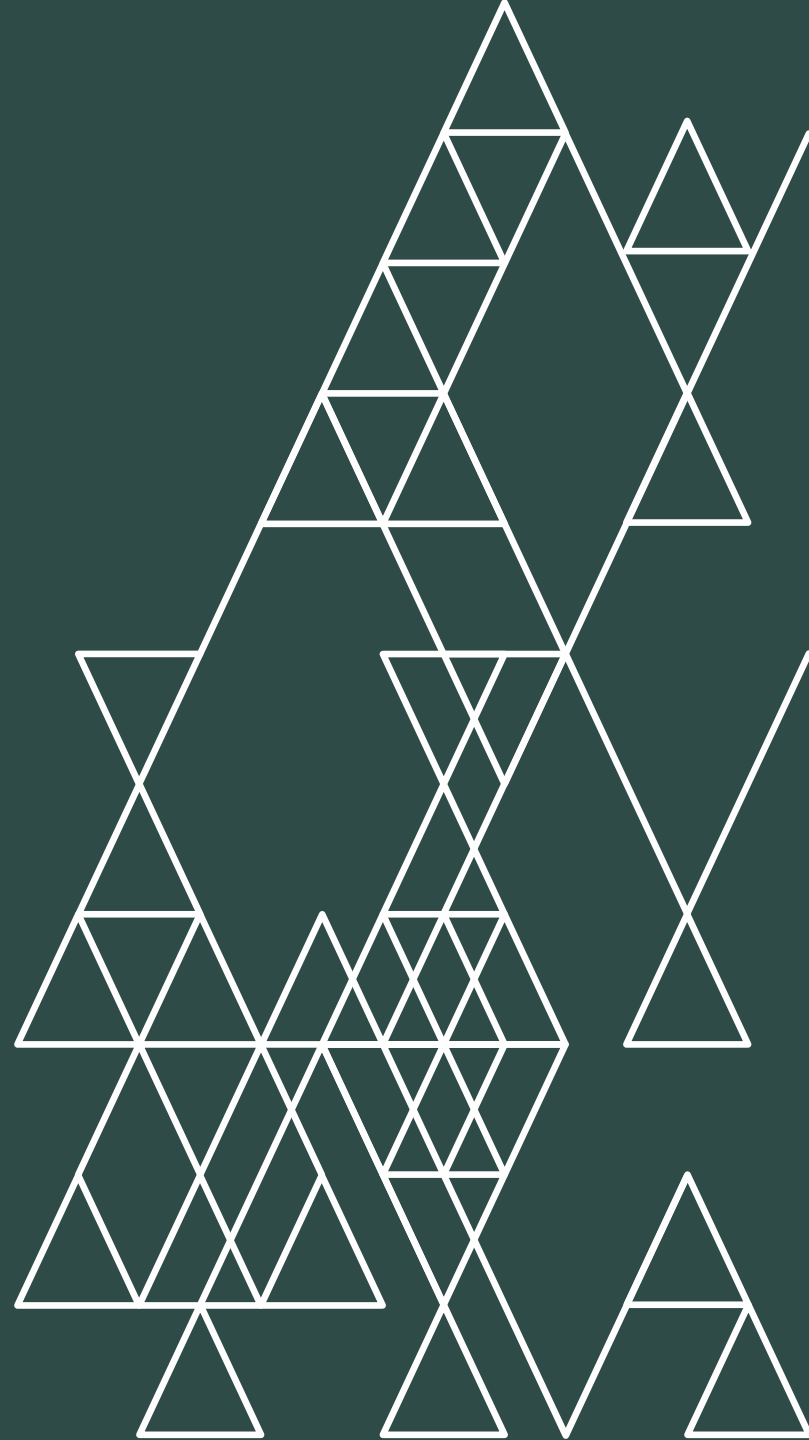
TIMES-NZ 2.0, Scenario: Kea

Tūī



TIMES-NZ 2.0, Scenario: Tūī

Commercial Sector Overview



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Commercial Sector

Inputs and Assumptions

Sub-sector	Example activities included
Education	Childhood and tertiary education
Healthcare	Hospitals and health clinics
Office Blocks	Finance and insurance, government
Warehouses, Supermarkets & Retail	Transport and postal services, retail goods
Other	Arts and recreation, defence

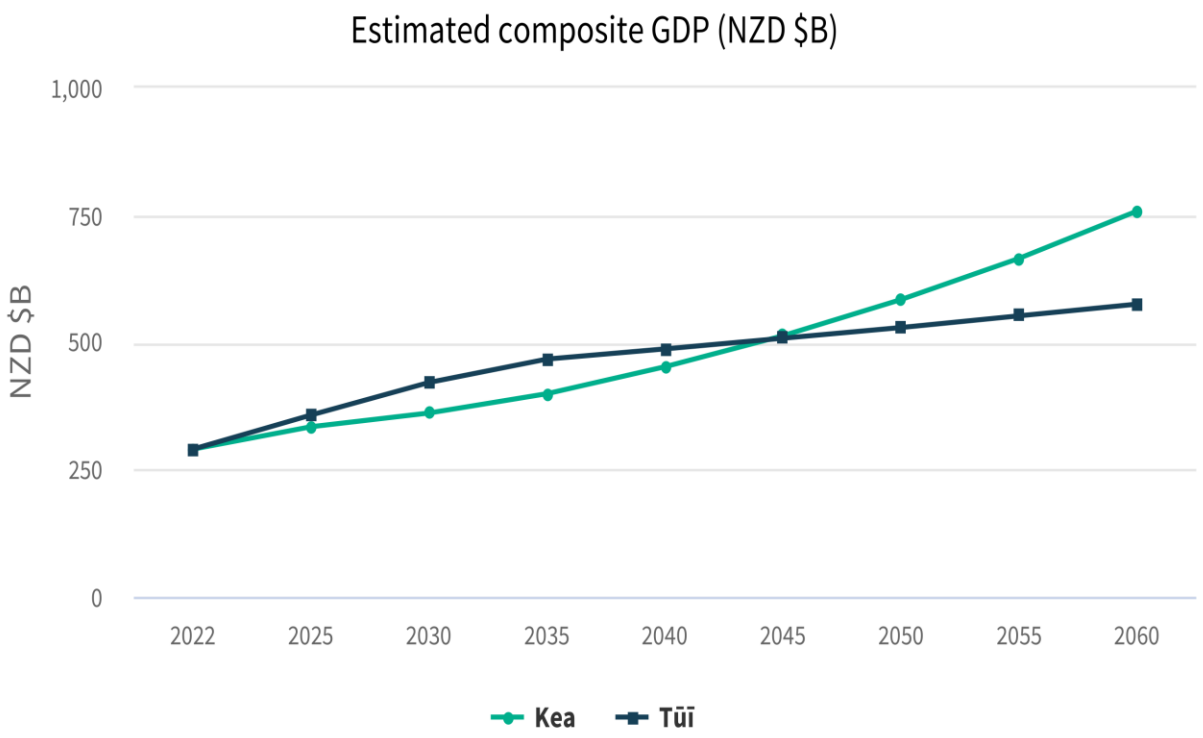
Commercial Sector

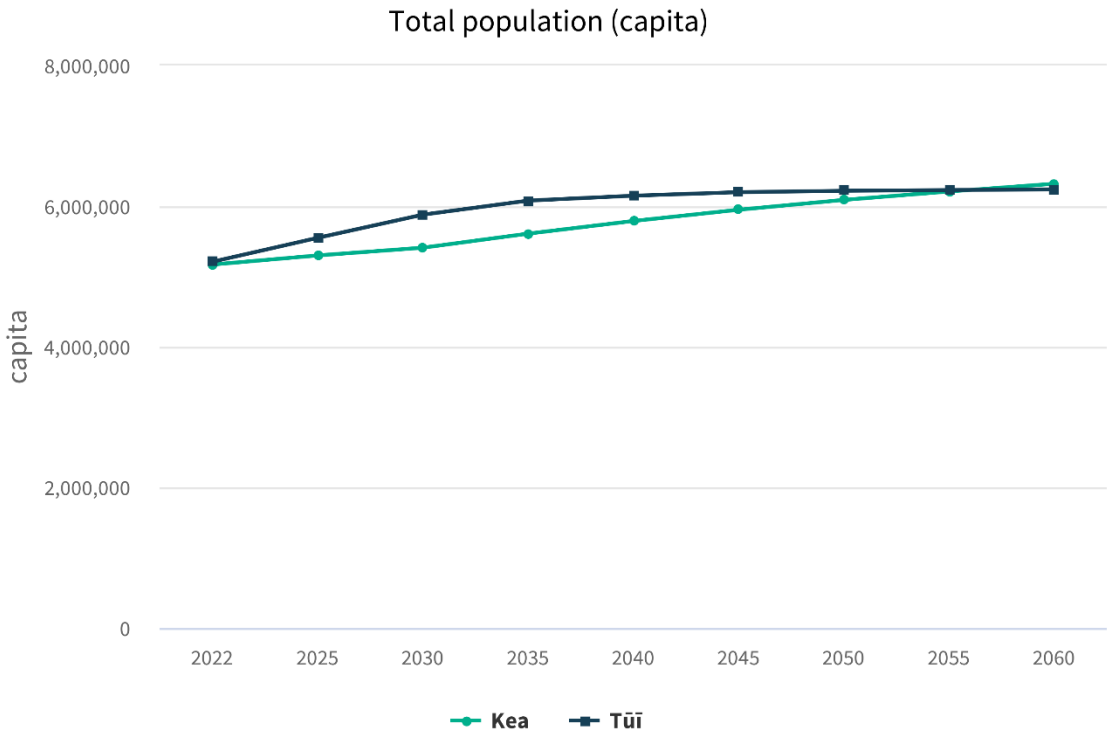
Inputs and Assumptions

Sub-sector	Regional Split Determinant
Education	Number of enrolled students
Healthcare	Number of hospital beds
Office Blocks	GDP
Warehouses, Supermarkets & Retail	GDP
Other	Population

Commercial Sector

Inputs and Assumptions

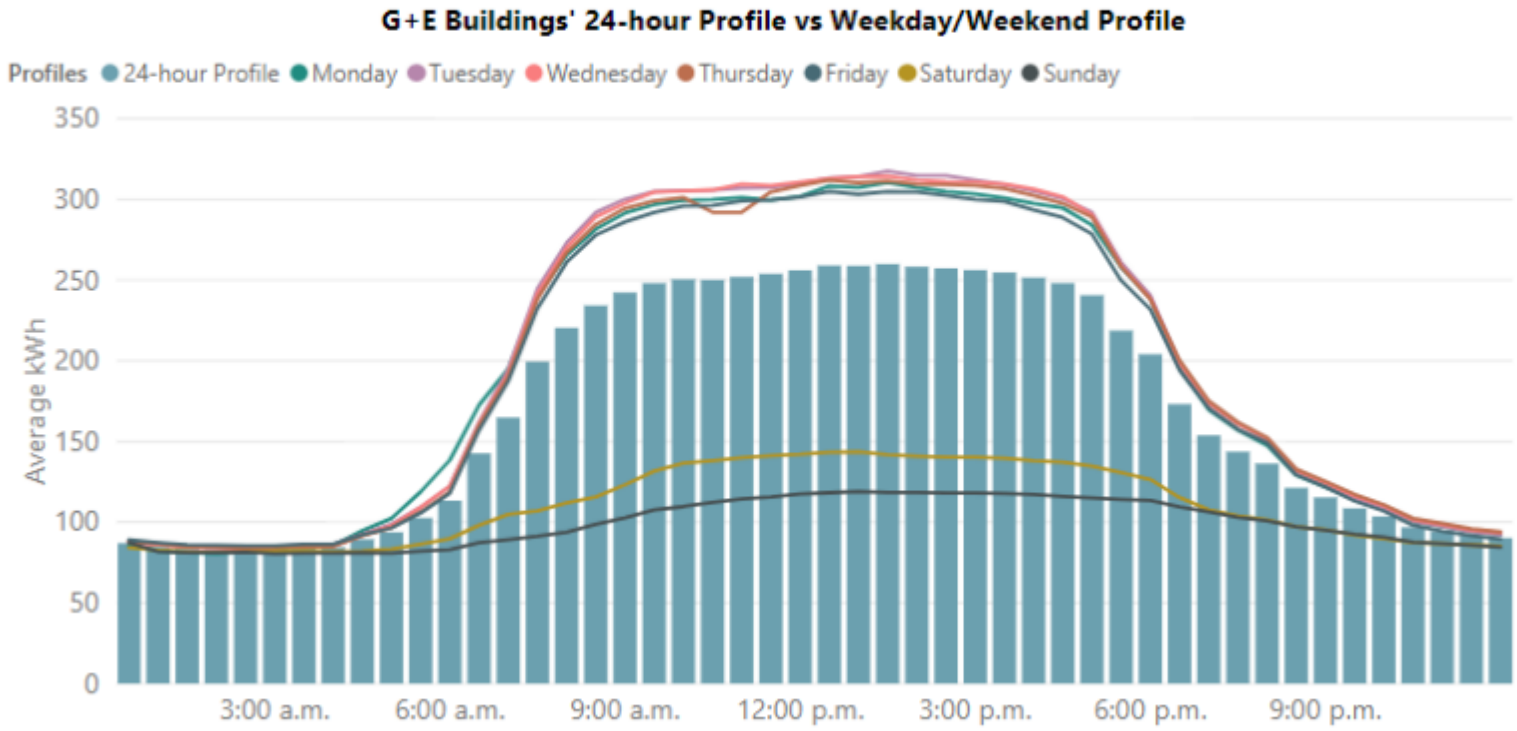




Commercial Sector

Inputs and Assumptions

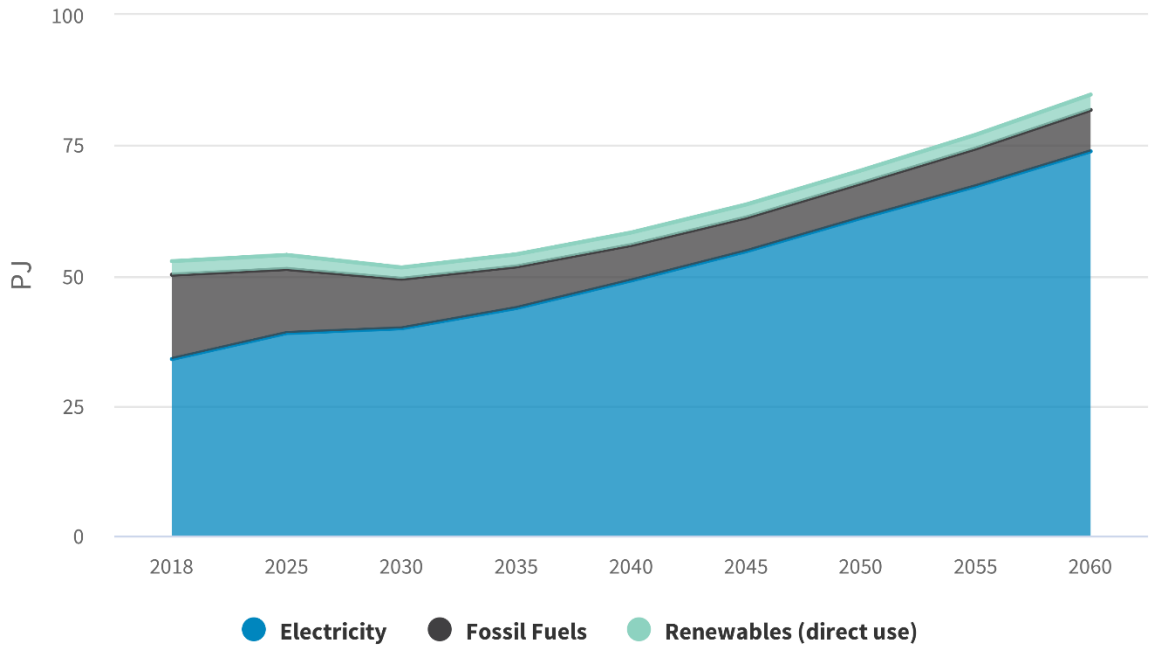
24-hour profile by weekday (G+E)



Commercial Sector

Insights

Commercial Sector Fuel Consumption (PJ) – Kea



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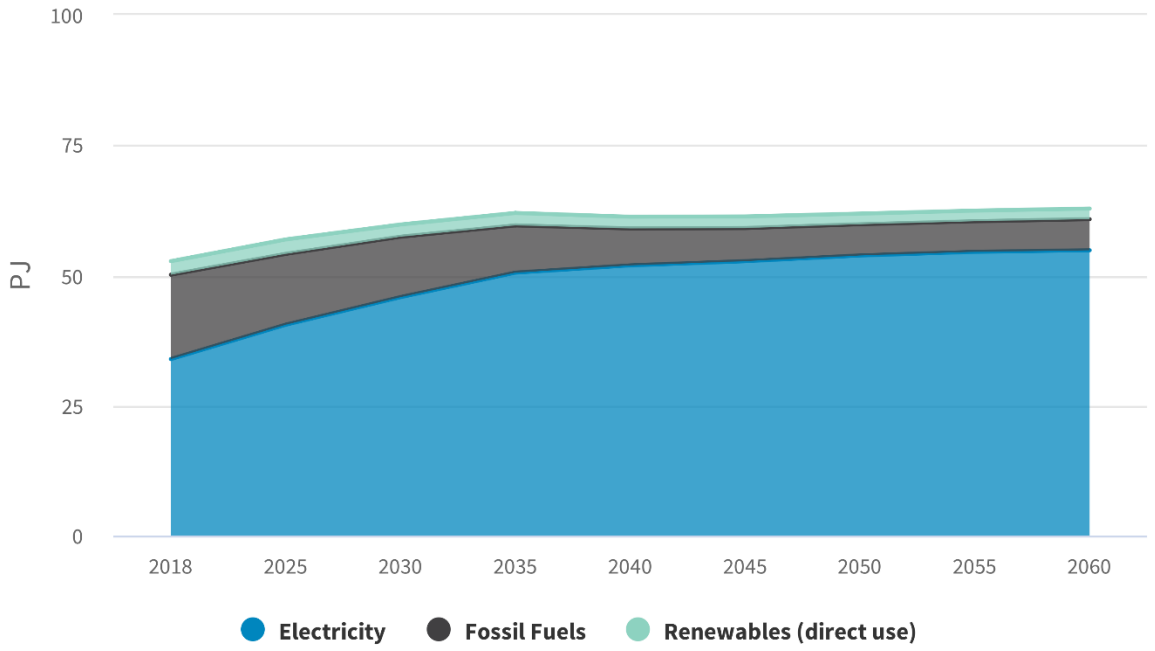
Commercial Sector Fuel Consumption (PJ) – Tūī

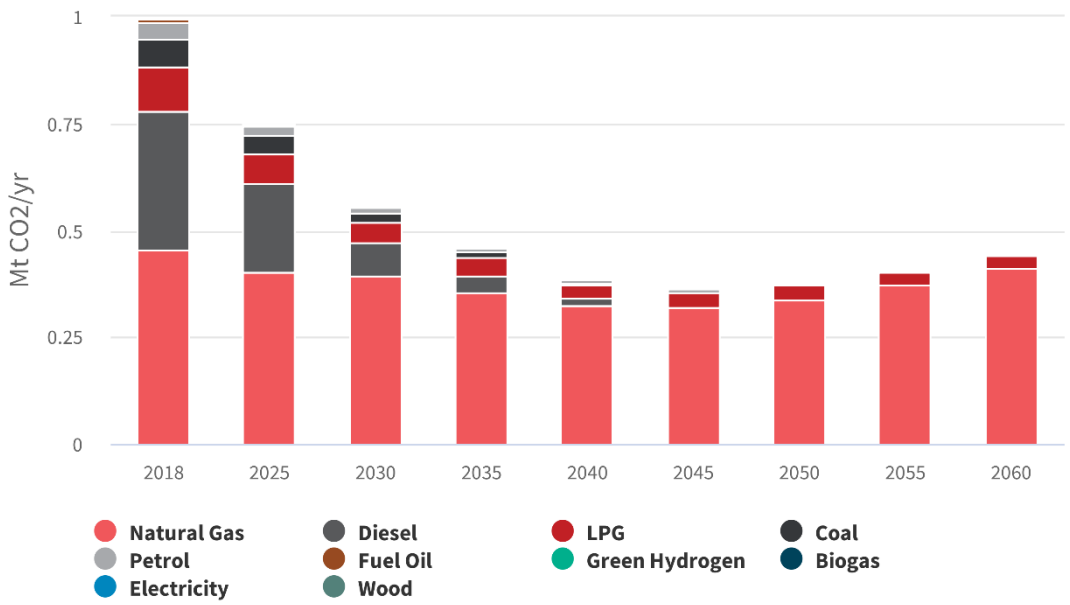


TIMES-NZ 2.0, Scenario: Tūī

Commercial Sector

Insights

Commercial Sector Emissions (Mt CO2/yr) – Kea



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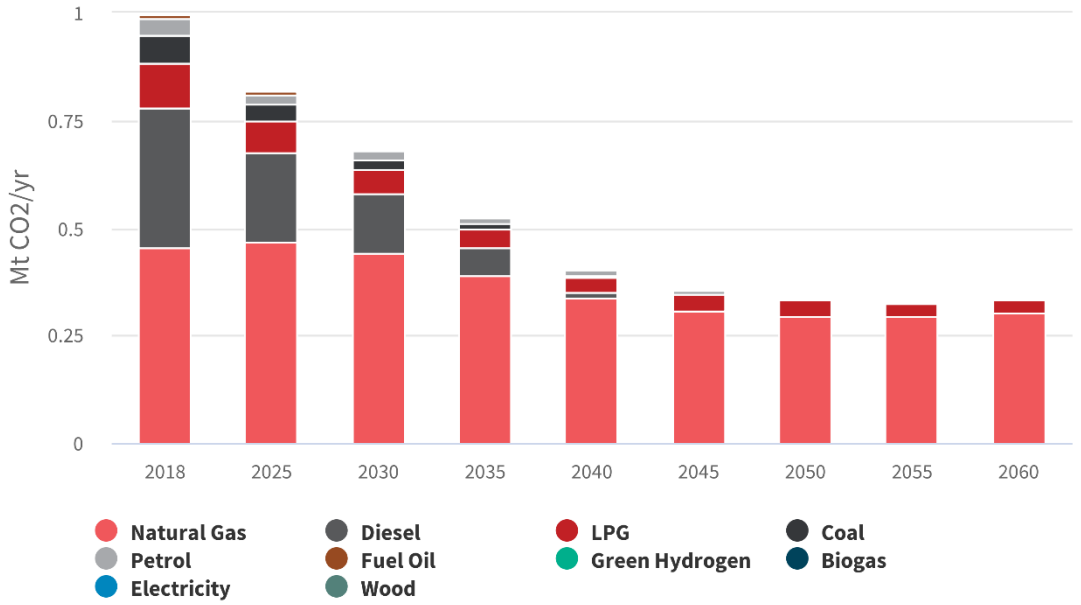
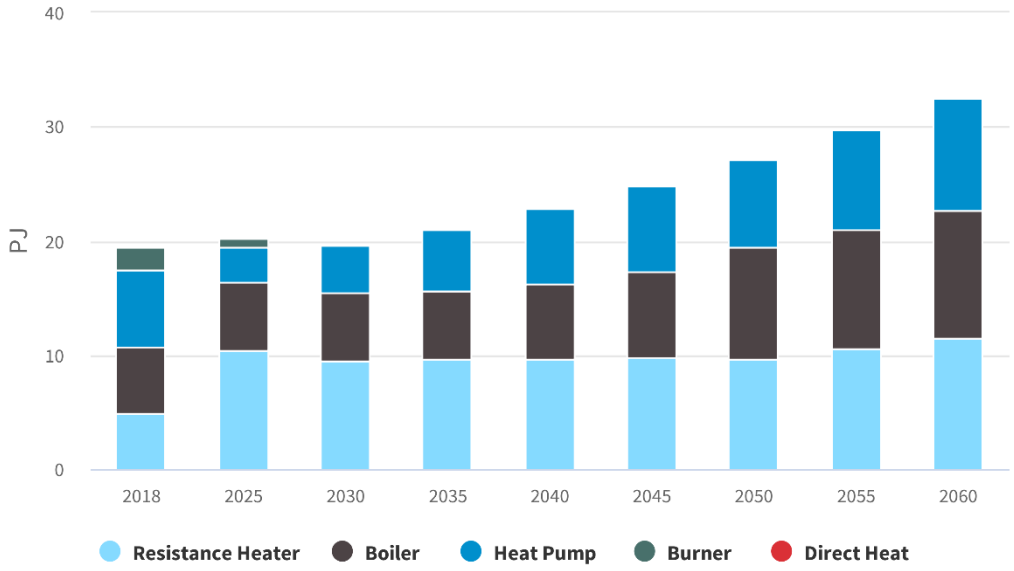


TIMES-NZ 2.0, Scenario: Tūī

Commercial Sector

Insights

Commercial Sector Space Heating Demand (PJ) – Kea



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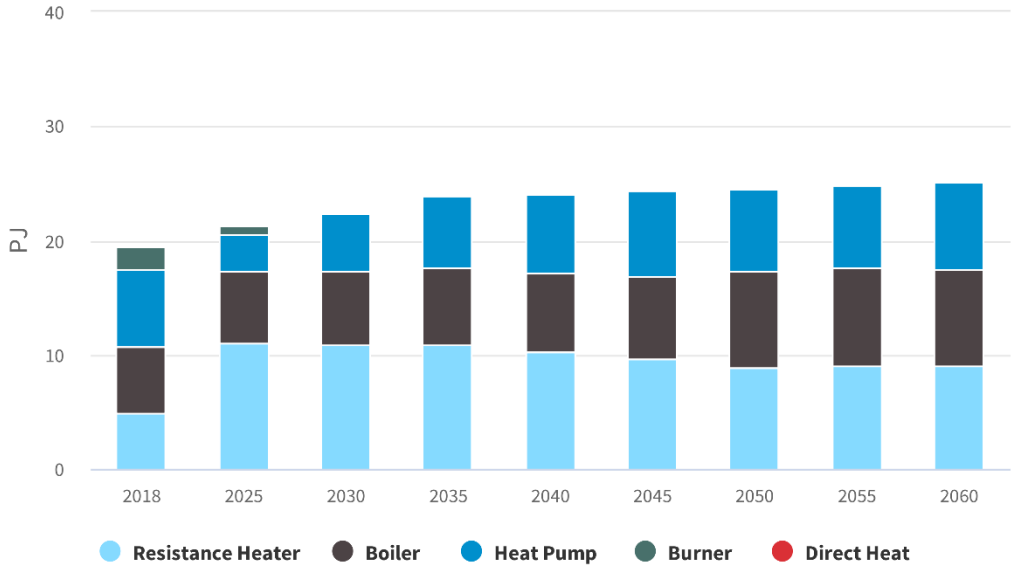
Commercial Sector Space Heating Demand (PJ) – Tūī

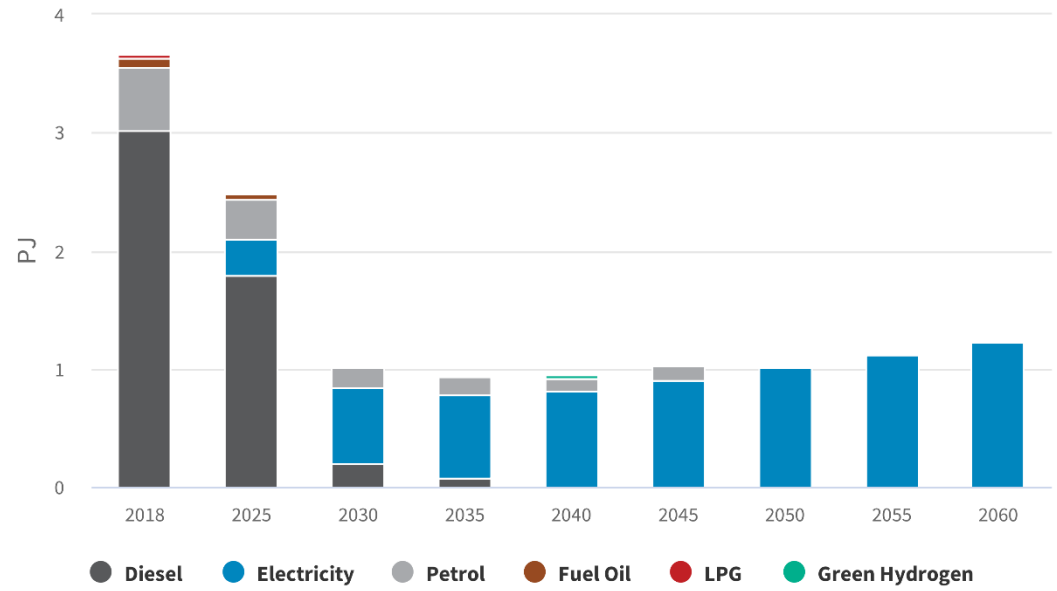


TIMES-NZ 2.0, Scenario: Tūī

Commercial Sector

Insights

Commercial Mobile Motive Power Fuel Use (PJ) – Kea



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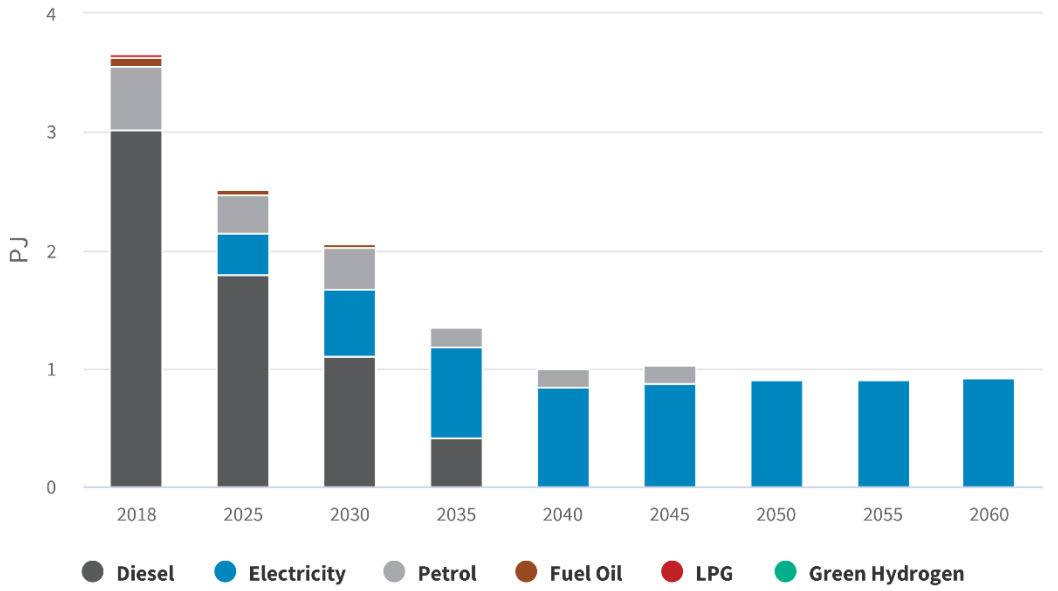

TIMES-NZ 2.0, Scenario: Tūī

Commercial Sector

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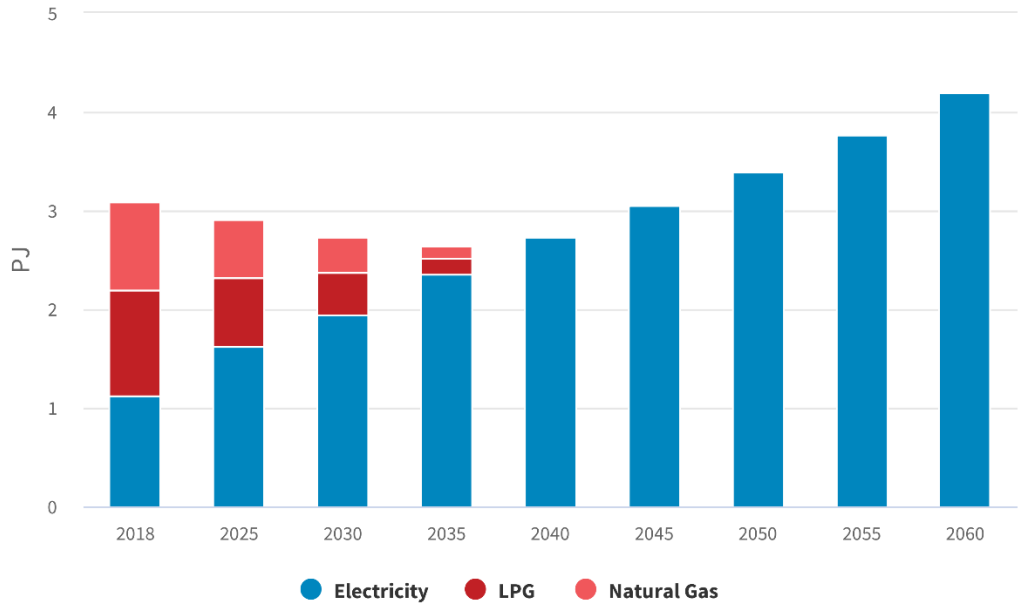
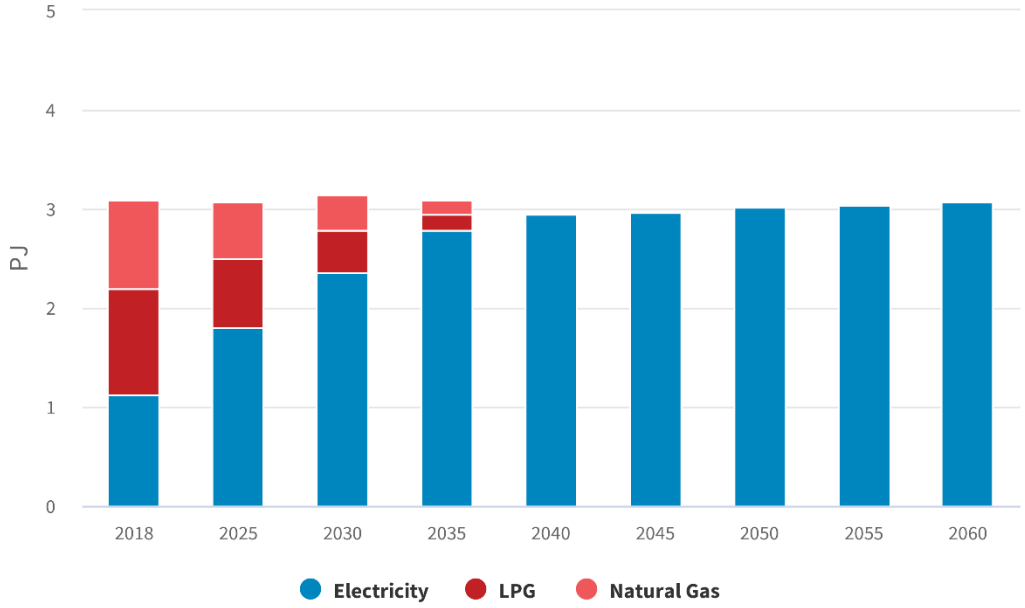
Commercial Cooking Fuel Use (PJ) – Kea



TIMES-NZ 2.0, Scenario: Kea

Commercial Cooking Fuel Use (PJ) – Tui



TIMES-NZ 2.0, Scenario: Tūī

Summary

Summary

- Electricity displaces residential wood and gas entirely by 2040 – in both Kea and Tūī
- Increased efficiency gives a modest reduction in the energy intensity of homes
- Further demand in the future of commercial is supplied by electricity

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