

New Zealand Energy Scenarios



TIMES-NZ Scenarios

Introduction



How do you tell the story of the future?

What if most Kiwis chose to see climate change as the most important problem to solve?

What would happen if they invested now in new technologies and led the world in decarbonising the economy?

How would New Zealand's energy sector evolve?

What are the choices and trade-offs?

TIMES-NZ Scenarios

Kea and Tūī



Kea (cohesive)

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 (individualistic)

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



TIMES-NZ Scenarios

Residential

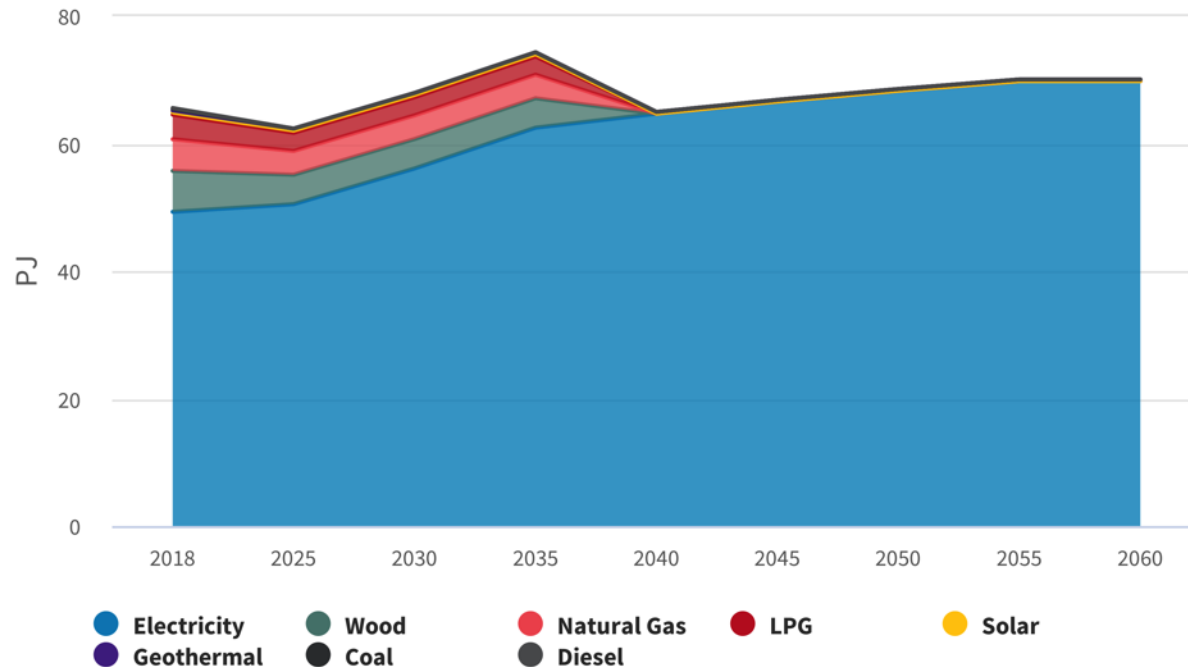


Residential

What energy sources might we use at home?

Kea

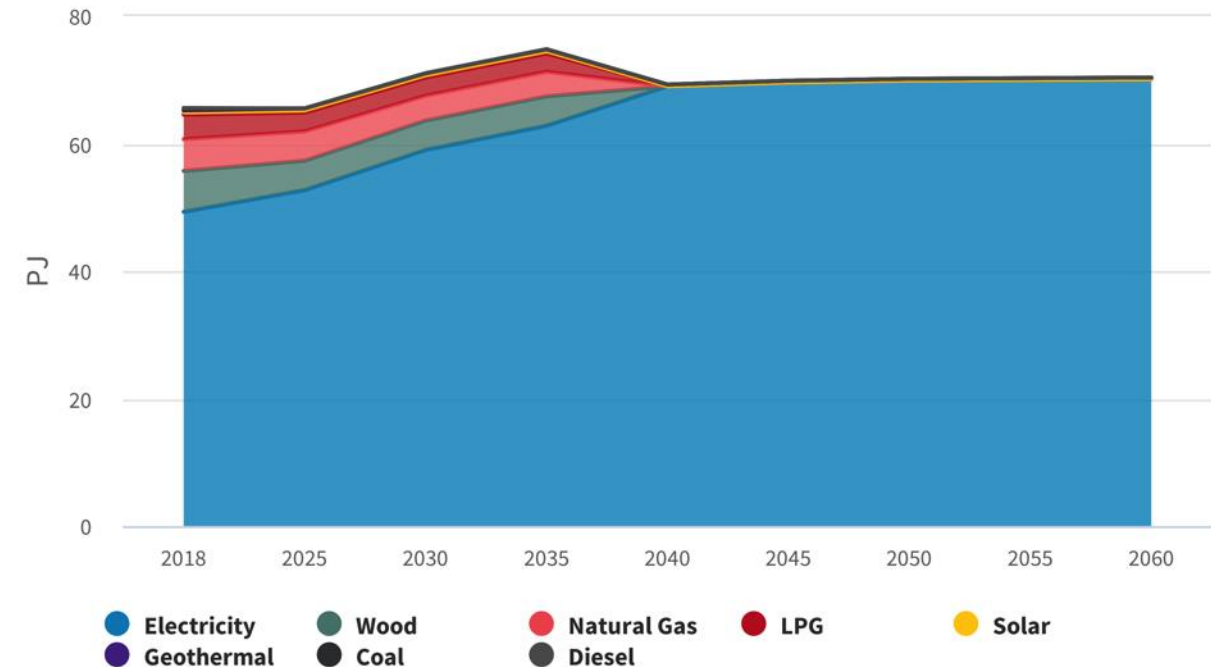
Residential Fuel Consumption for All Subsectors, All Enduse and All Technology (PJ)



TIMES-NZ 2.0, Scenario: Kea

Tūi

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



TIMES-NZ 2.0, Scenario: Tui

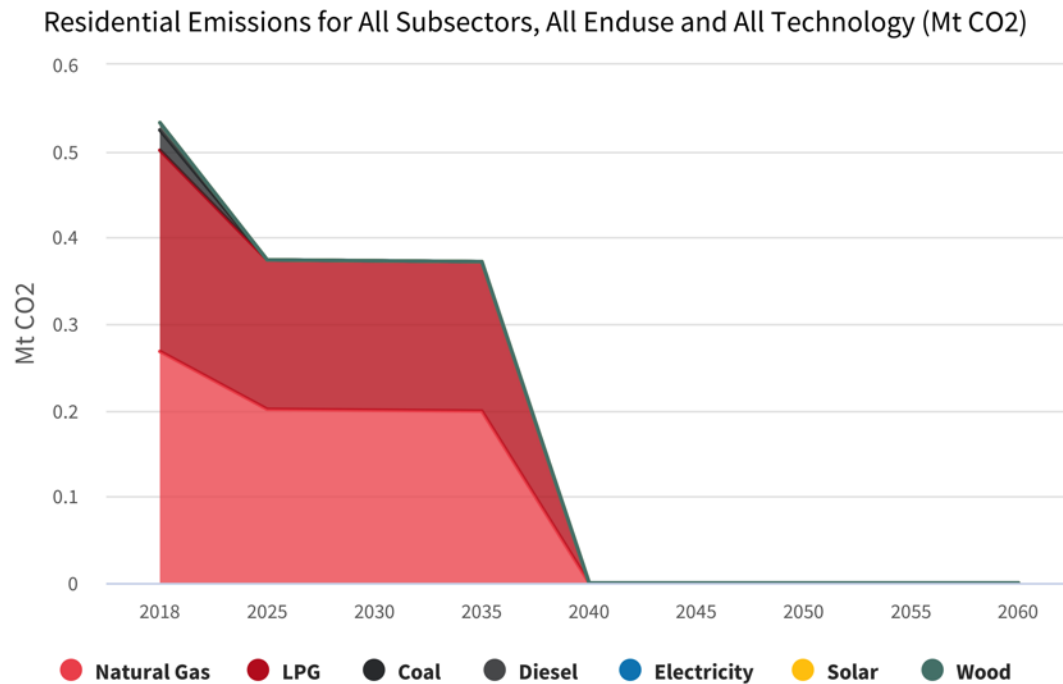
Residential - What energy sources might we use at home?

In both scenarios, the overall fuel consumption is relatively steady, despite increasing population, and plateaus at around 70 PJ of energy consumption by 2050. This is already mostly met by electricity and is 100% electric from 2040.

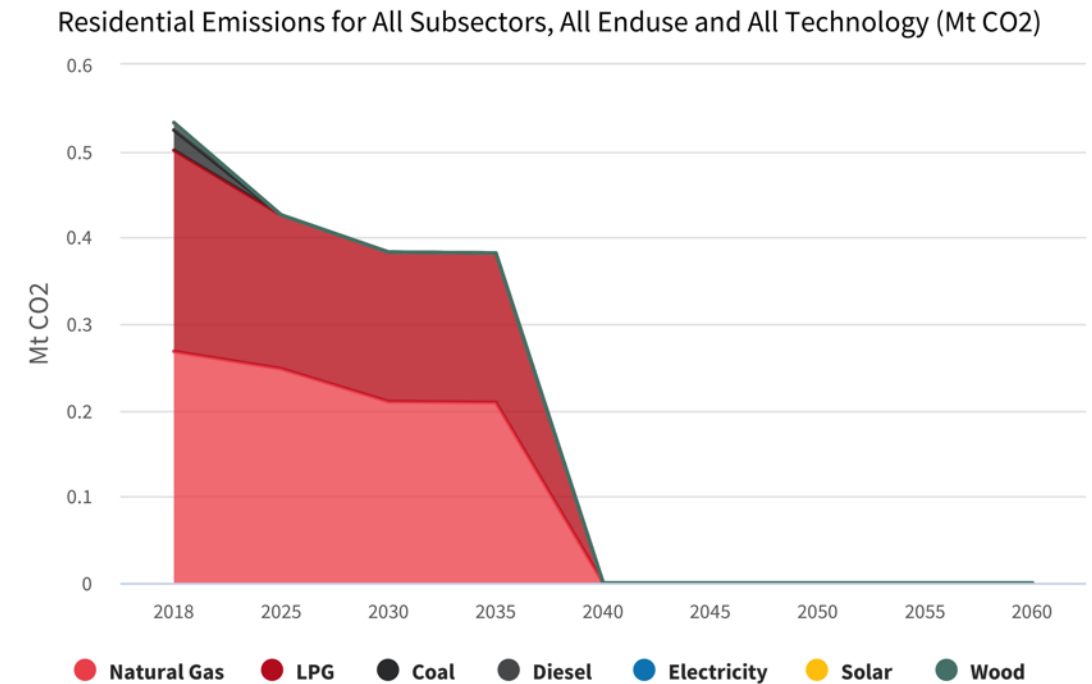
Residential

What is the potential for homes to reduce carbon emissions?

Kea



Tūi



Residential - What is the potential for homes to reduce carbon emissions?

There is little difference in the distribution of fossil fuel and renewable demand between Kea and Tūi for residential energy and both scenarios are zero emissions in 2040. Renewable electricity already makes up 90% of residential energy consumption. The majority of emissions in the residential sector come from cooking and heating (for both water and space). This provides tangible areas where decarbonisation can be targeted. Wood is considered as a renewable fuel and is used for heating in burners but will be phased out by 2040 in both scenarios.

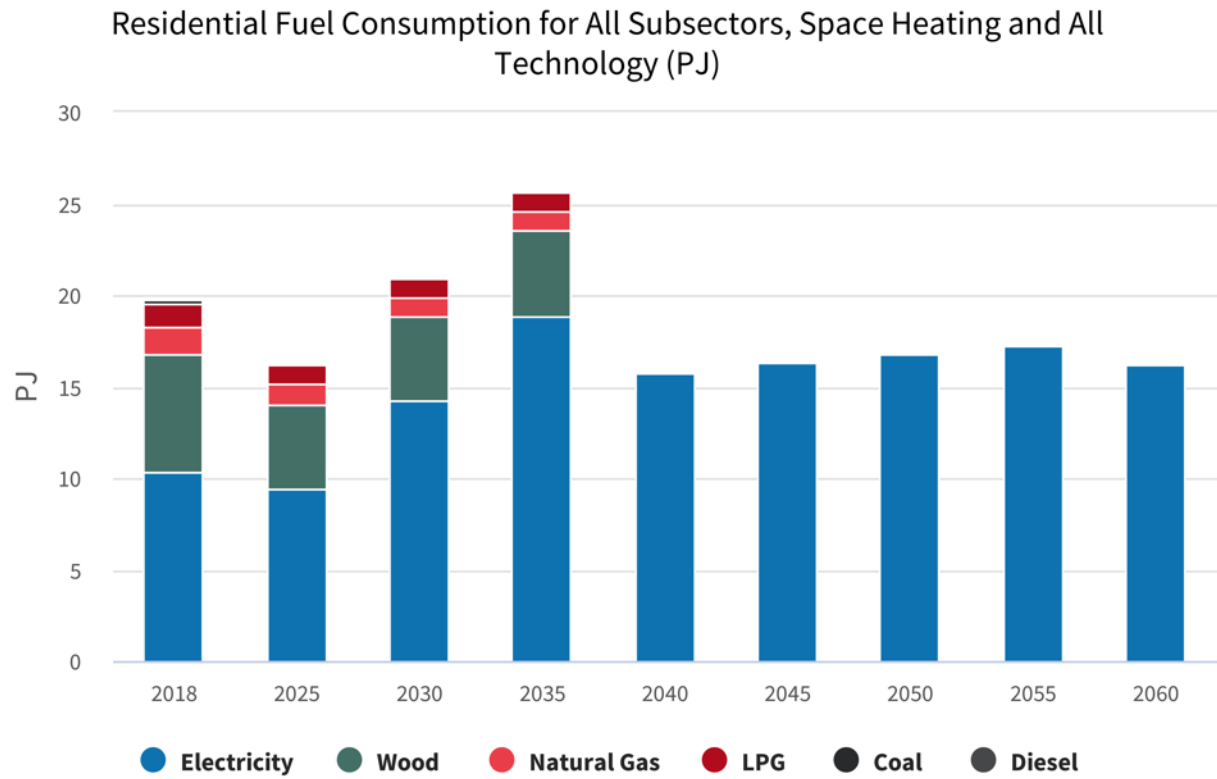
In Kea, decarbonisation initially happens faster, dropping from 0.53 Mt CO₂-e to 0.37 Mt CO₂-e by 2025 before levelling off until 2035 and then again dropping sharply to zero by 2040.

Tūi has a more gradual decrease in emissions, falling to 0.43 Mt CO₂-e by 2025 and 0.38 Mt CO₂-e in 2030. Emissions in Tūi then quickly fall to zero by 2040. Both coal and LPG emissions reduce at a similar rate in both scenarios, with the difference in decarbonisation profiles due to slower decarbonisation of natural gas.

Residential

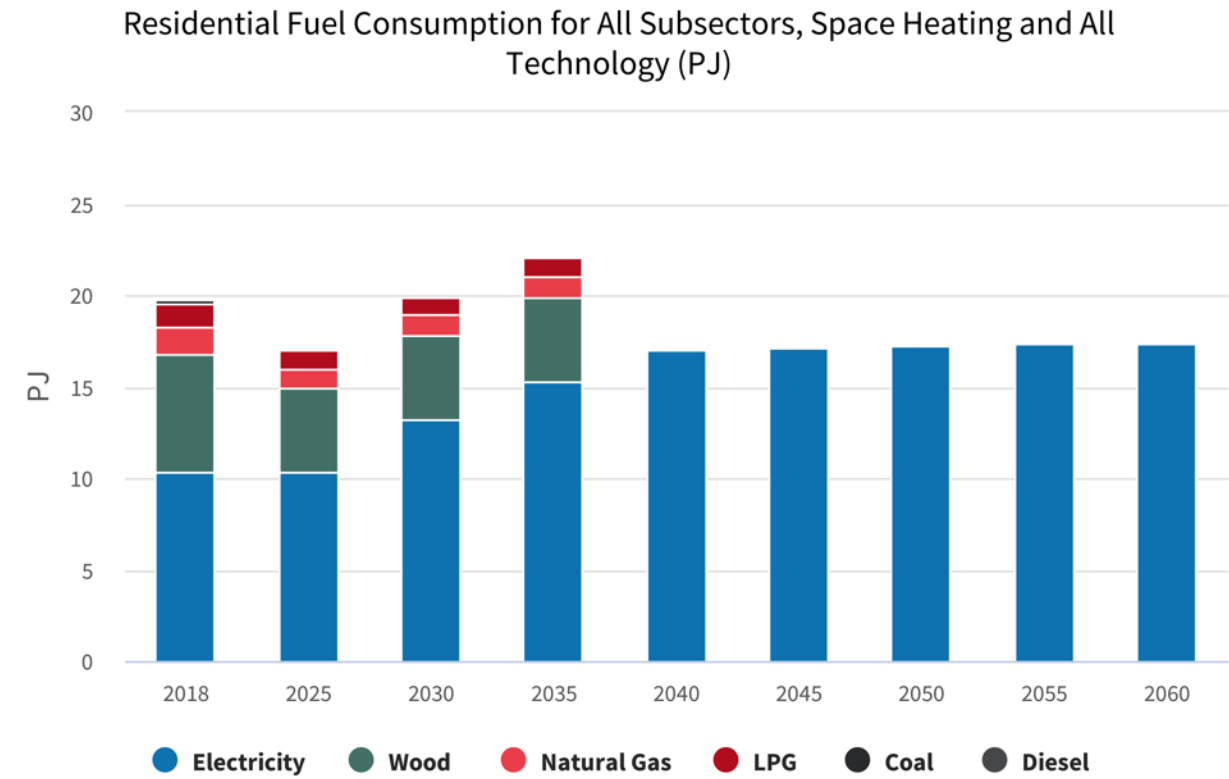
What energy source might we use for heating?

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūi



TIMES-NZ 2.0, Scenario: Tui

Residential - What energy source might we use for heating?

Both scenarios have the same amount of energy provided for by fossil fuels, including a large proportion of energy for heating provided by burning wood which decreases from 6.35 PJ to 4.62 PJ in 2025 for both scenarios.

In Kea, however, there is a larger increase in electricity consumption to 18.9 PJ in 2035 before falling to 15.8 PJ in 2040 as fossil fuels are phased out. This is not reflected in Tūī, where electrical demand increases steadily to 2040 and levels off at 17PJ at the same time as fossil fuels are phased out.

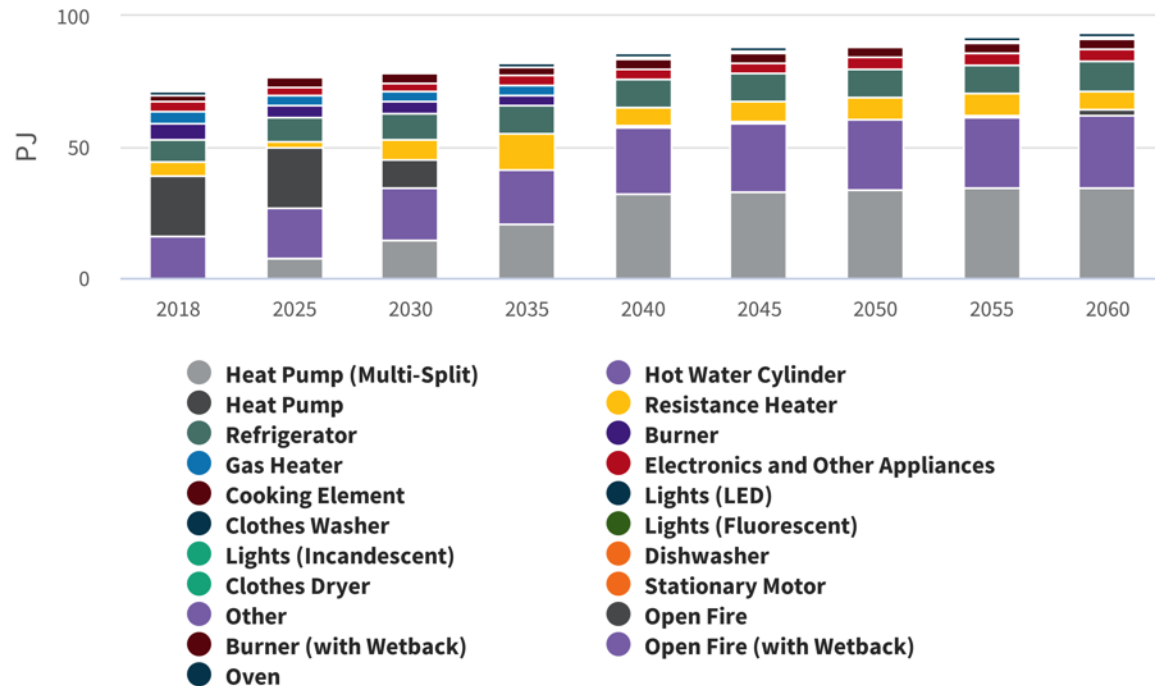
The higher electricity consumption in Kea before 2040 can be attributed to the assumption that the GDP growth is slower than in Tūī. This results in people choosing less energy efficient appliances and they are not incentivised to switch out aging systems before the end of their life due to the higher capital cost and lower wealth to afford new appliances.

Residential

What technology might we use in our homes?

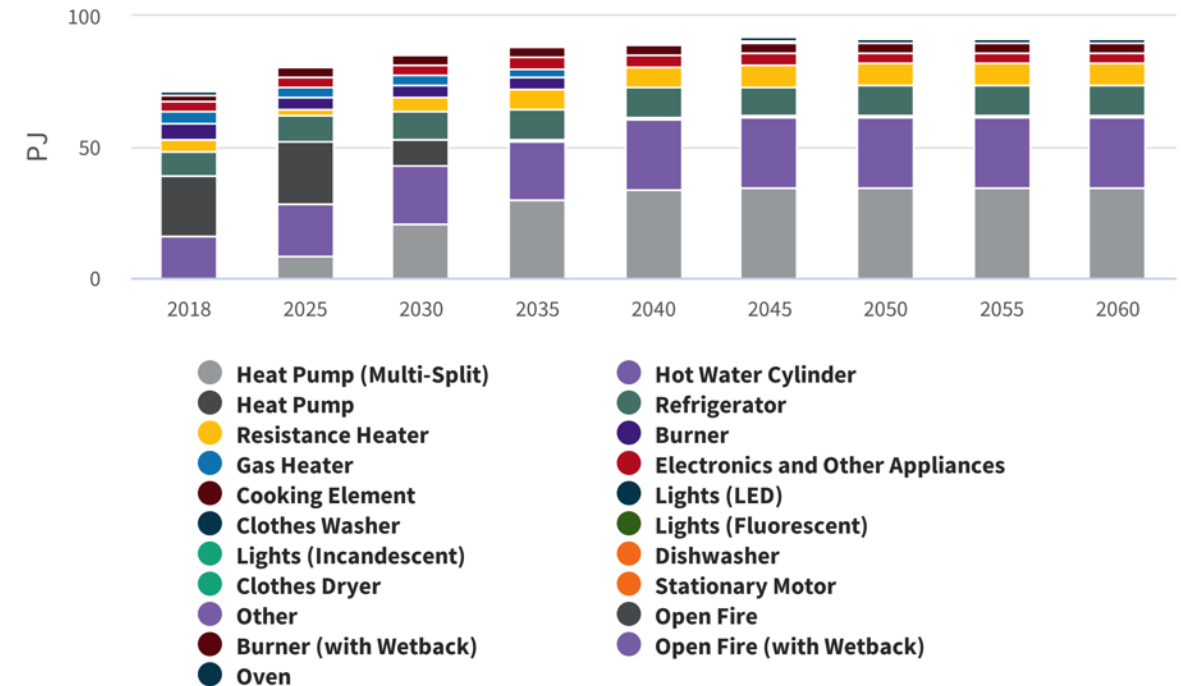
Kea

Residential Demand for All Subsectors, All Enduse and All Technology (PJ)



Tūi

Residential Demand for All Subsectors, All Enduse and All Technology (PJ)



Residential- What technology might we use in our homes?

Residential energy demand increases as the number of houses nationwide increases, offset to some extent by efficiency gains.

In Tūi, population, and therefore demand increases faster, reaching 88 PJ in 2030 and 93 PJ in 2050, whereas the Kea scenario has slower growth in demand to 81 PJ in 2030 and 91 PJ by 2050.

In both scenarios, coal and gas heaters are phased out and replaced by heatpumps (multi-split) powered by electricity. Multi-split heatpumps increase from zero to 33.9PJ and 37% of the energy demand by 2050.

In both scenarios, burners used for hot water are phased out by 2040 and are replaced by hot water cylinders which increase share of energy demand from 22% to 29% by 2050.

In this model, gas heaters are primarily fueled by natural gas and LPG while burners are fueled by wood or coal. It can be seen that the difference in decarbonisation profiles between Kea and Tūi is due to continued higher use of gas heaters in Tūi while the use of wood burners remains similar between the two scenarios.

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