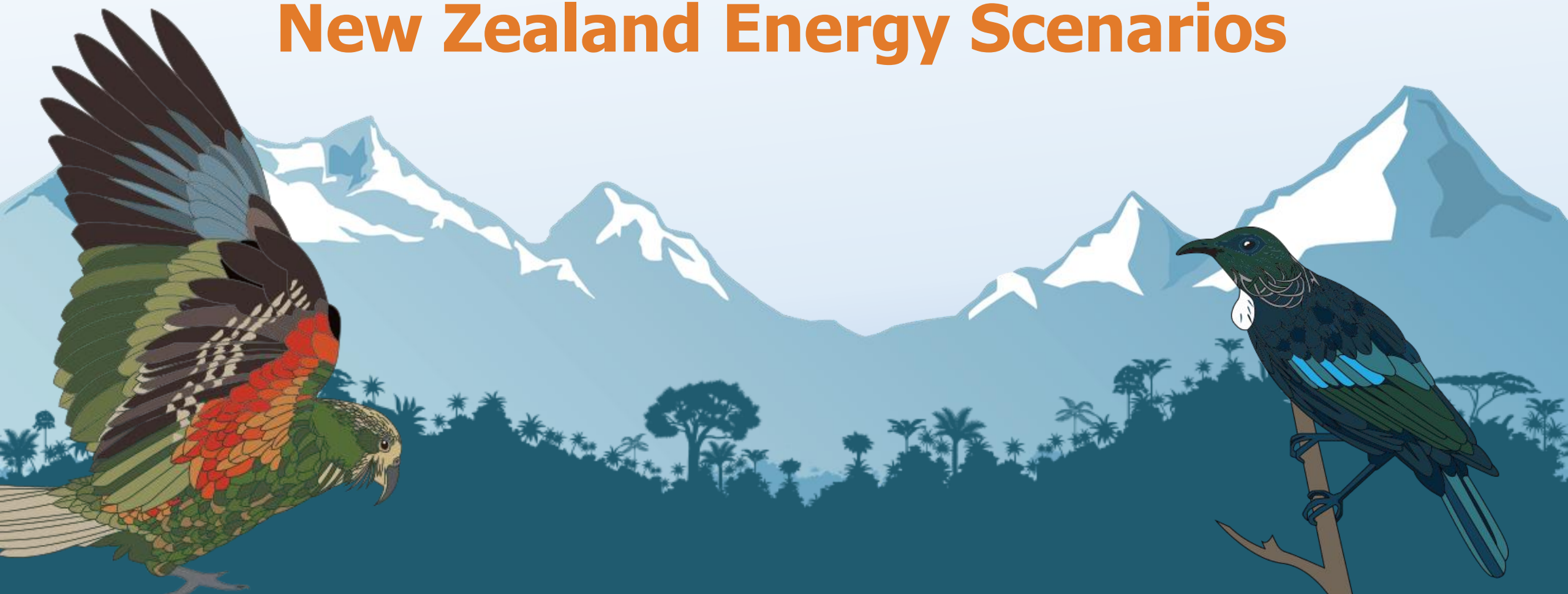
WORLD ENERGY COUNCIL | BusinessNZ Energy Council

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

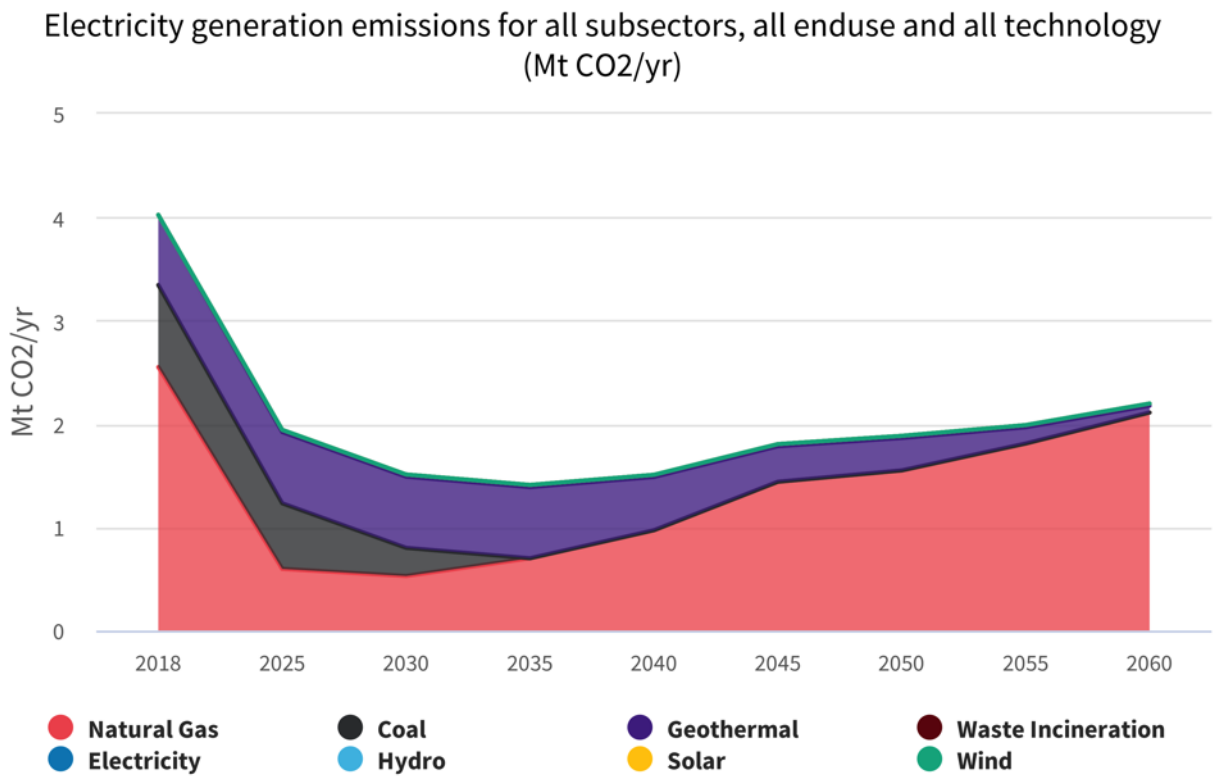
TIMES-NZ Scenarios

Electricity

Electricity

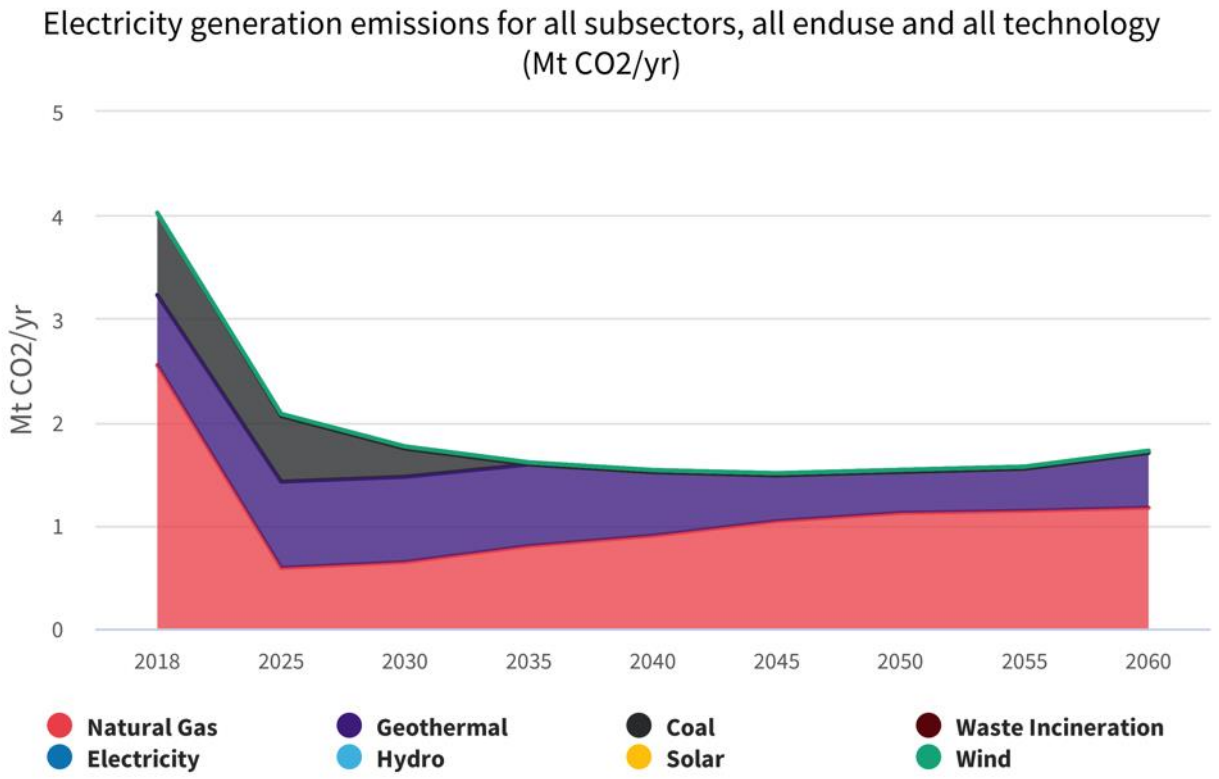
What might our carbon emission footprint look like?

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūī



TIMES-NZ 2.0, Scenario: Tūī

Electricity – What might our carbon emission footprint look like?

In both scenarios, electricity emissions halve by 2030. Emissions from coal are removed by 2035 in both scenarios due to increasing carbon prices (Huntly is assumed to retire, but no new coal generation is built by the model due to costs and carbon prices), while emissions from gas initially decrease then begin to increase from 2035 onwards as gas continues to play a firming role.

In Kea, a growing proportion of emissions come from natural gas with 1.5 Mt CO2-e by 2050, as opposed to 1.1 Mt CO2-e in Tūī in 2050.

Geothermal, on the other hand, remains a greater contributor to emissions in Tūī, with the fuel source accounting for a quarter of total electricity sector emissions 26% in 2050 as opposed to 17% in the Kea scenario.

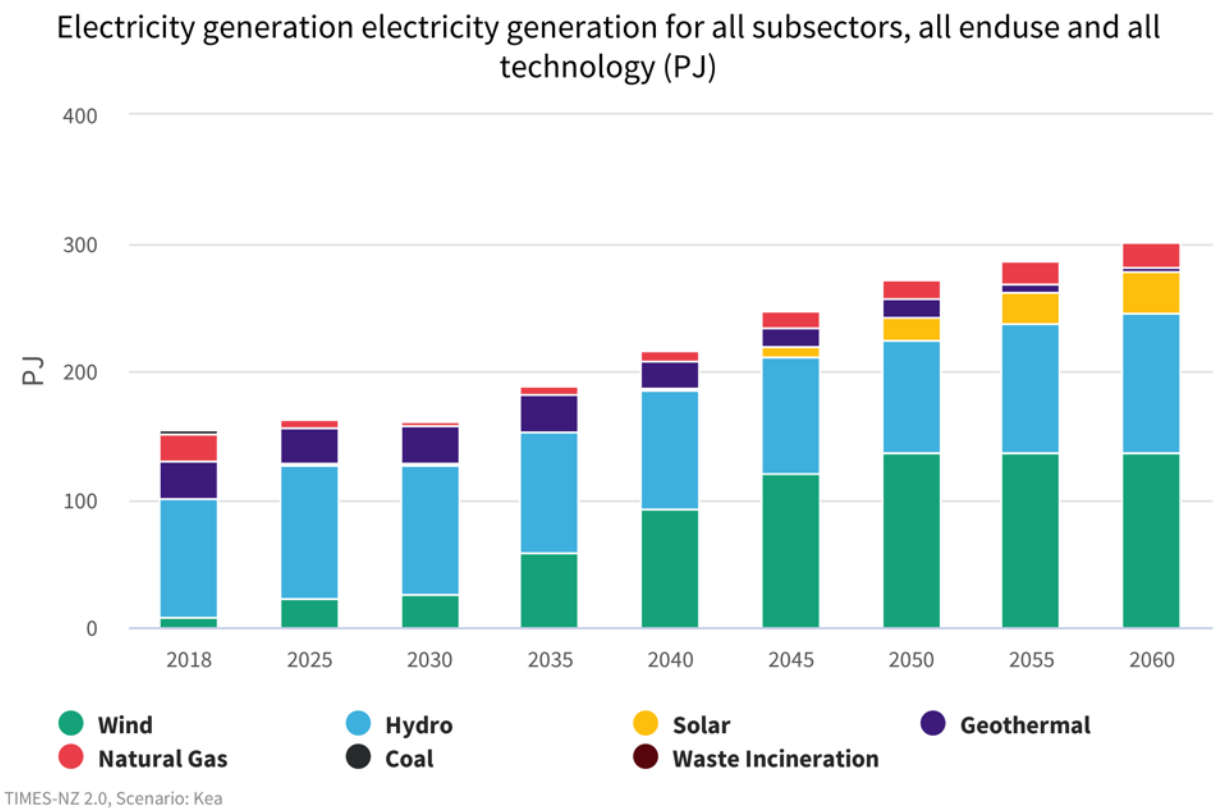
After an initial fall in the Kea scenario, from 4 Mt CO2-e to 1.4 Mt CO2-e in 2035, emissions increase rising to1.8 Mt CO2-e by 2050. This is due to increasing gas consumption for winter peaking.

Interestingly, emissions are held slightly lower for longer in the Tūī scenario, with an initial decrease to 1.6 Mt CO2-e in 2035 then remaining fairly steady below 1.6 Mt CO2-e until 2060. Higher levels of solar generation, and an ongoing contribution from geothermal, plus an expansion of hydro generation reduces our reliance on natural gas slightly.

Electricity

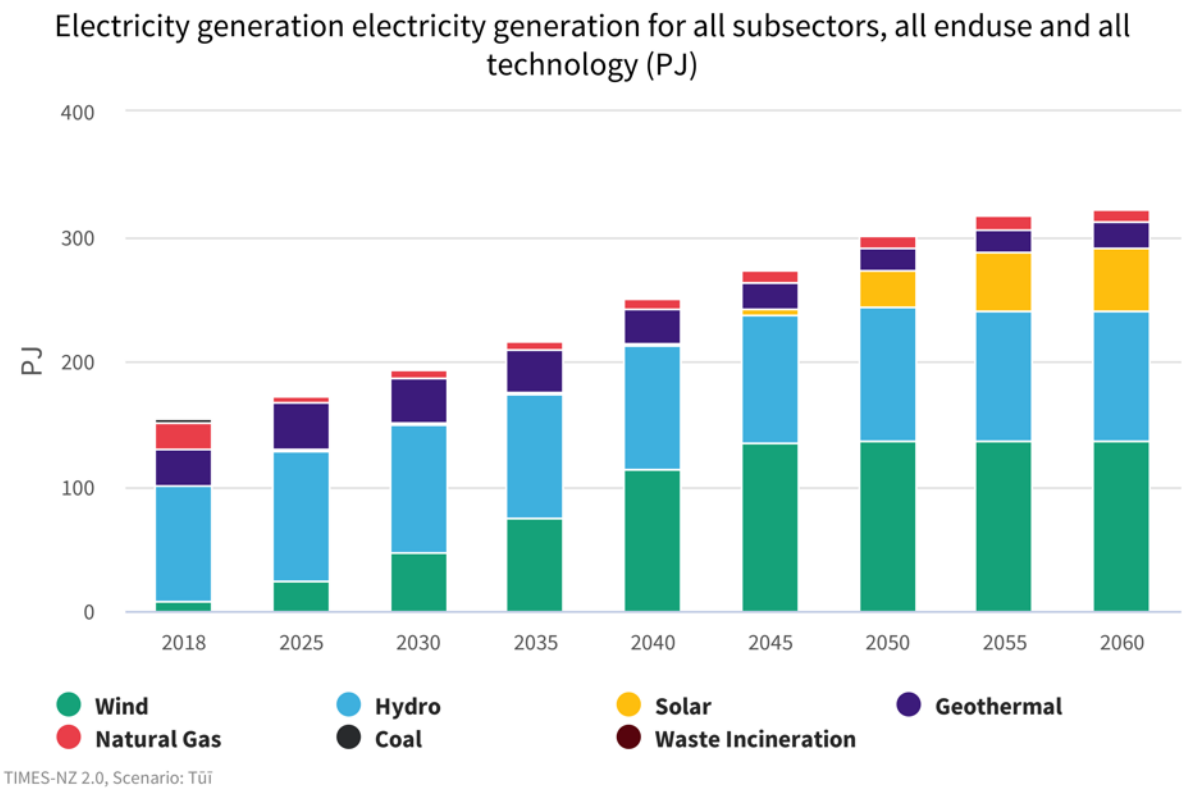
What might electricity generation look like?

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūī



TIMES-NZ 2.0, Scenario: Tūī

Electricity – What might electricity generation look like?

Electricity generation increases significantly as demand from the industrial, commercial and residential sectors grow. Electrification across all sectors results in electricity demand roughly doubling in both scenarios, from 144 PJ in 2018 to around 270 PJ.

Under both scenarios, this increased demand is met by very large increases in wind generation accompanied by large increases to solar (primarily grid-scale) in later years by the model.

Under both scenarios, winter gas peaking is retained, and there is a gradual decline in geothermal generation. Under the Tūī scenario, hydro generation expands where possible, reducing dependence on gas peakers.

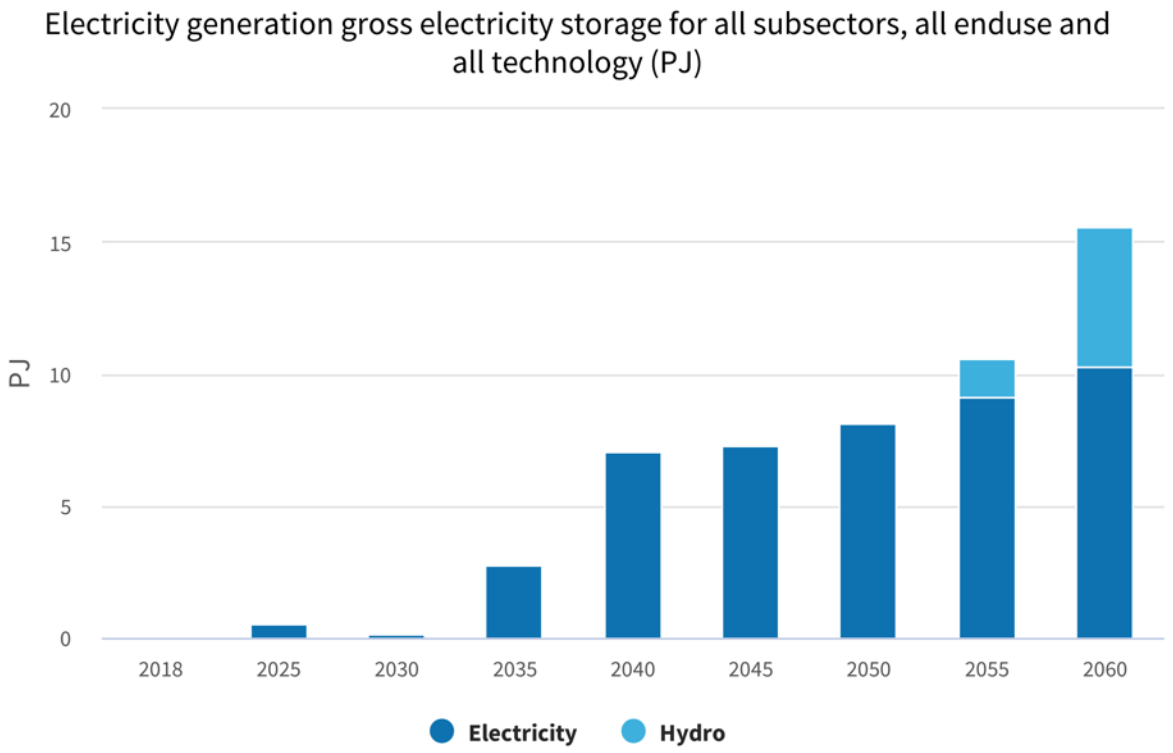
Natural gas continues to play a role, while coal reduces in the next 15 years and geothermal decreases from 2035 onwards.

Electricity supplies up to 59% in Kea and 54% in Tūī of all energy demand by 2050.

Electricity

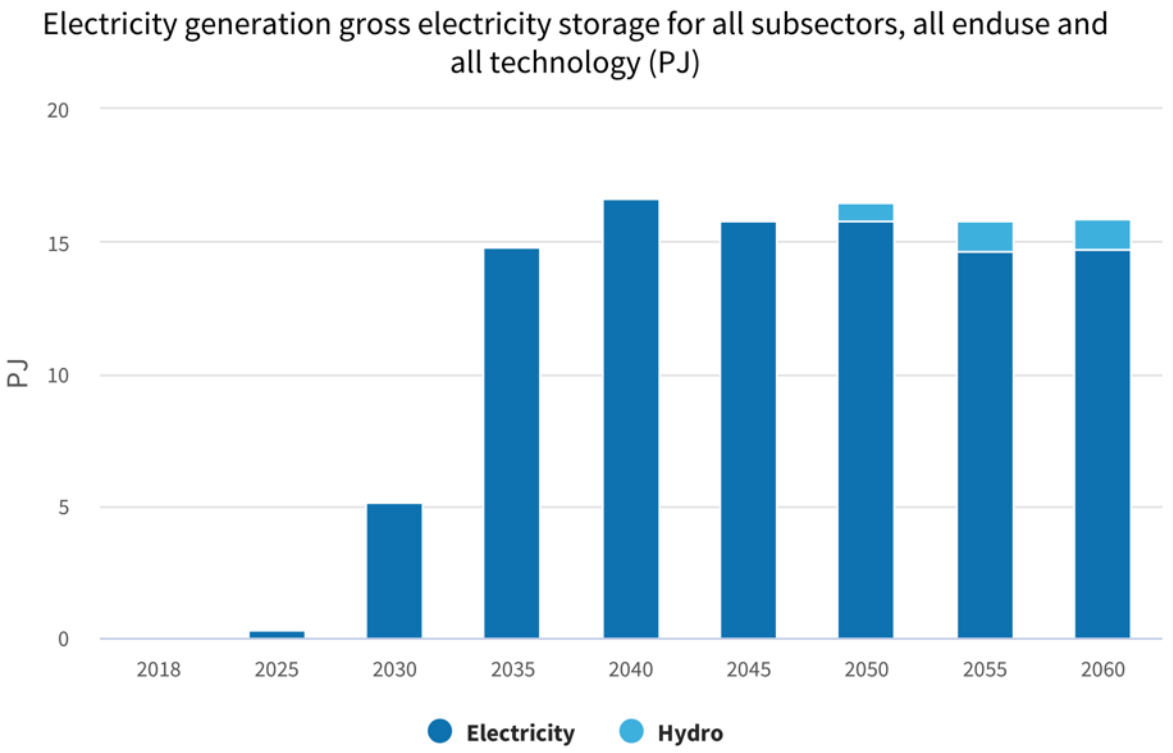
How much electricity storage might be used in an average year?

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūī



TIMES-NZ 2.0, Scenario: Tūī

Electricity – How much electricity storage might be used in an average year?

With increasing renewable generation more electricity storage is seen as economic by the model. This is primarily provided as electrical storage batteries with 9 PJ by 2050 in the Kea scenario and 15 PJ in the Tūī scenario.

Both scenarios use electricity storage to meet demand peaks, particularly from lithium-ion batteries.

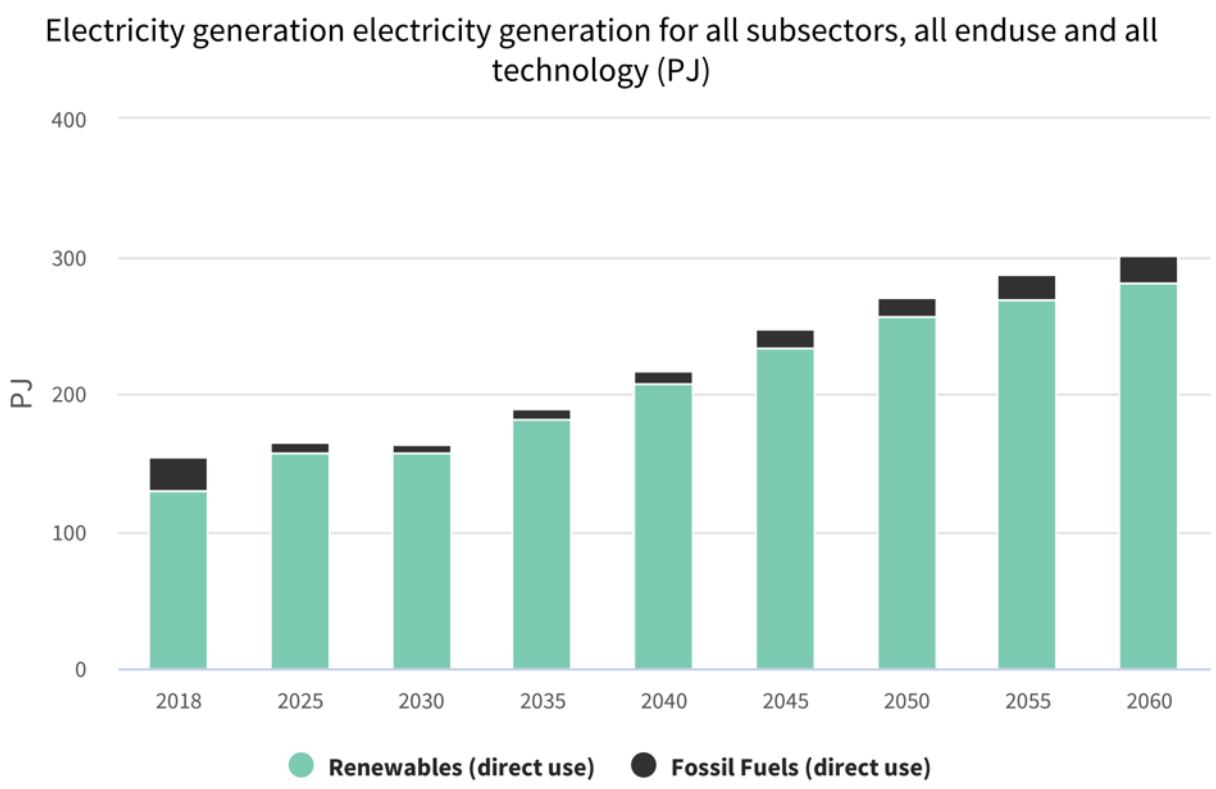
Both scenarios make limited use of large-scale pumped hydro from 2050 onwards, while Tūī makes greater use of battery storage.

The model does not specifically model dry years, so the storage requirement findings represent average hydro years only.

Electricity

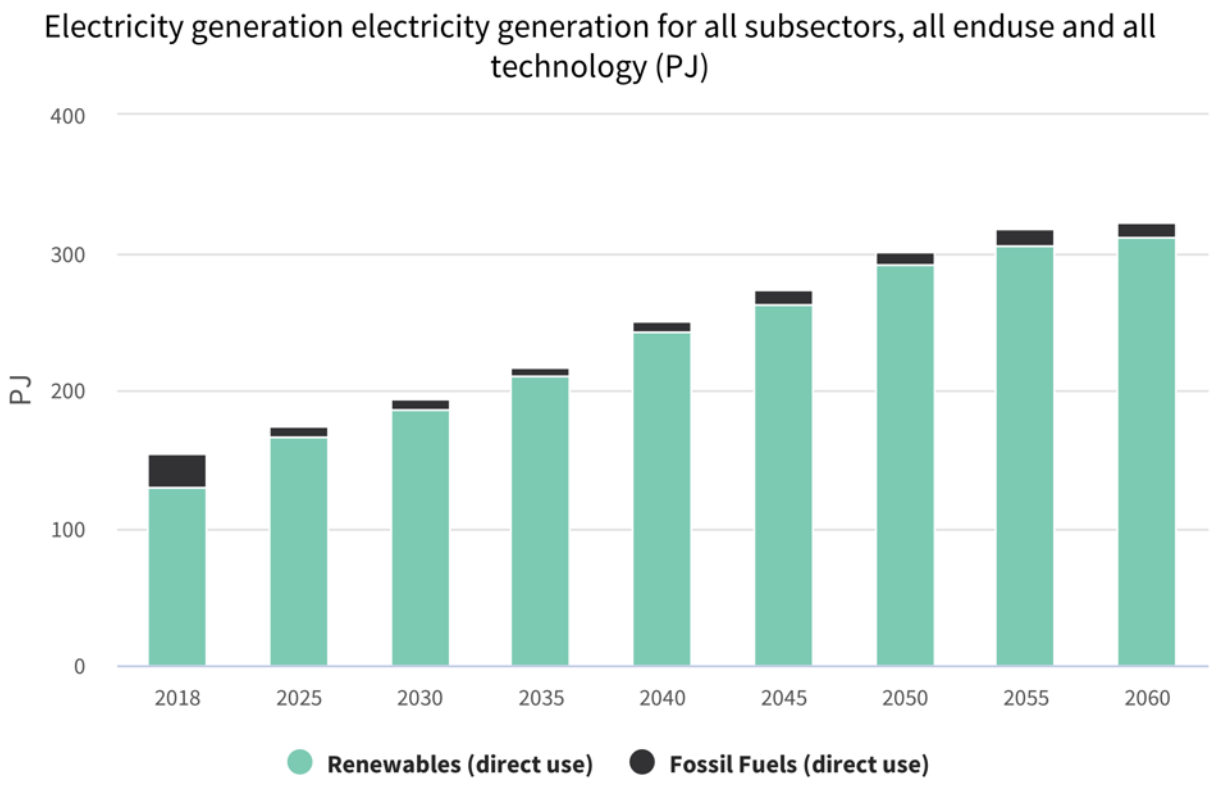
Does the model show us reaching 100% renewable electricity?

Kea



TIMES-NZ 2.0, Scenario: Kea

Tūī



TIMES-NZ 2.0, Scenario: Tūī

Electricity – Does the model show us reaching 100% renewable electricity?

Both scenarios converge on a very high renewable electricity percentage of around 95% from 2030 onwards.

Tūī includes higher levels of geothermal and solar generation and battery storage.

In contrast, in Kea the higher carbon price drives out geothermal generation earlier. Natural gas provides firming to meet winter energy and capacity margins throughout the modelled period.

Both scenarios continue to use natural gas as a flexible fuel for meeting electricity daily and seasonal peak demands. TIMES-NZ results give an indicative picture of the electricity system, further exploration of more extreme scenarios requires the use of additional modelling tools.

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