CHAPTER 13

New Zealand Country Report

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1. Background

New Zealand is an island country in the southwestern Pacific Ocean, about 1,500 kilometres (km) east of Australia. It consists of two large islands, the North Island and South Island, and several smaller ones, of which Stewart Island is the largest. The population was about 5.1 million on 31 March 2022 (Statistics New Zealand, 2022). Although it has some light and heavy industry, foreign trade heavily depends on agriculture, tourism, forestry, and fishing. In 2020, New Zealand had a nominal gross domestic product (GDP) of about $194.7 billion in United States dollars, (constant 2015 US dollars [US$]) or about $38,000 per capita.

This chapter shows the progress of net zero emissions by comparing several scenarios: business-as-usual (BAU), alternate policy scenario (APS), and the low carbon energy transition (LCET) scenario until 2050.

New Zealand possesses significant indigenous energy resources, including hydropower, geothermal, wind, natural gas, and coal. New Zealand is self-sufficient in natural gas and electricity and is a net exporter of coal. New Zealand has locally produced crude oil, which is exported because of its high quality. Therefore, it has high value on the international market. In 2020, New Zealand's production of oil – excluding liquefied petroleum gas (LPG) – was 7.9 million barrels, of which 93% was exported. In 2020, New Zealand imported 28 million barrels of crude oil – compared to 38 million barrels of crude oil in 2019 – to meet its oil demand. The largest amount of crude oil that New Zealand imported in 2020 came from the Middle East, with the rest coming from Russia, Asia, and the United States of America.

In 2020, the amount of crude oil and feedstocks taken in by Refinery NZ was 73% lower than 2019. Specifically, it dropped from 41.6 million barrels in 2019 to 30.4 million barrels in 2020. Additionally, the refinery output decreased from 41.3 million barrels in 2019 to 29.6 million barrels in 2020. These reductions were caused by multiple factors, including low refining margins, the effects of COVID-19, New Zealand's transition to low-carbon transport fuels, and high cost of operating in New Zealand. Due to these challenges, Refinery NZ conducted an 18-month Strategic Review, which involved engaging with various stakeholders, such as customers and the government. Based on this review, Refinery NZ decided to stop refinery operations in 2022 and instead transition to import terminal operations. As of April 2022, Refinery NZ changed its name Channel Infrastructure and is now operating as an import terminal from Marsden Point (Channel Infrastructure NZ Limited, 2021).

As of 1 January 2022, total oil and condensate reserves (2P) were 58.6 million barrels and natural gas reserves were 51.5 billion cubic metres. National in-ground resources of all coal are estimated over 15 billion tonnes, of which 80% of this is lignite in the South Island (Ministry of Business, 2021).

With the impacts of the coronavirus disease (COVID-19) pandemic, New Zealand's total primary energy supply (TPES) decreased by 3.4% from 20.5 million tonnes of oil equivalent (Mtoe) in 2019 to 19.8 Mtoe in 2020. By share, oil represented the largest source at about 29.9%, followed by geothermal energy at 27.5%, and natural gas at 18.7%. The rest of the primary energy supply came from hydropower at 10.9%, coal at 6.0%, biomass with 5.9%, and a smaller percentage of other renewables such as wind, solar photovoltaics, and biofuels.

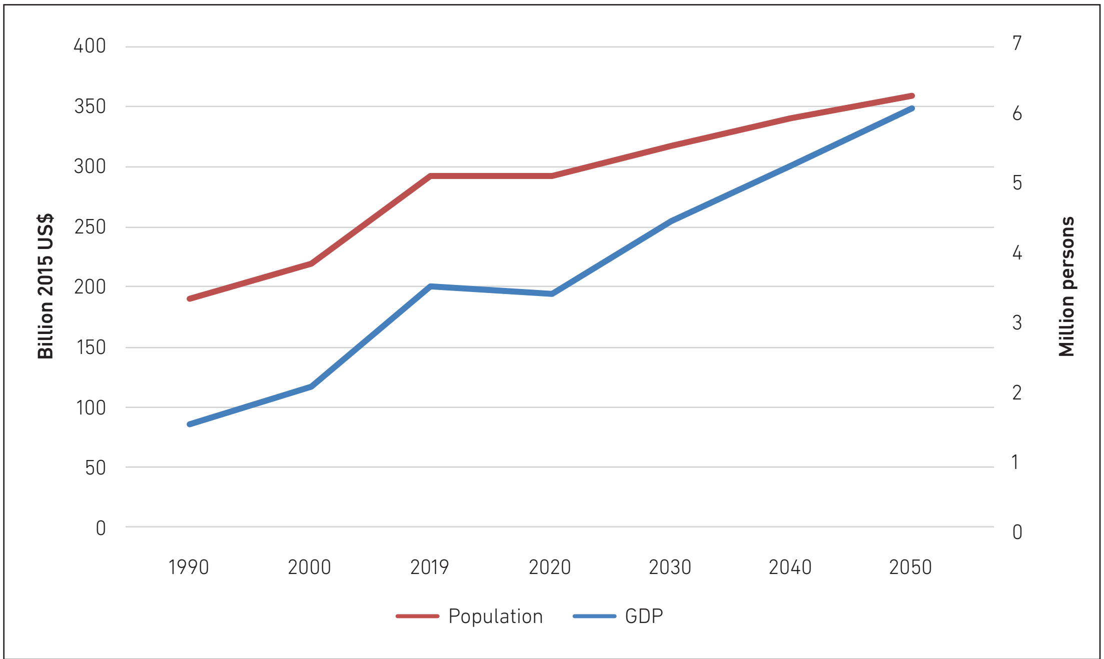
Final energy consumption was about 14.1 Mtoe in 2020. By share, the transport sector was the largest at around 33.9% because New Zealand depends heavily on private road vehicles, road freight, and air transport. The industrial sector was the second largest with about 30.9%, followed by the agricultural, residential, and commercial sectors, with 24.6% altogether. The non-energy sector consumed the remaining 10.7%.

In 2020, the total gross power generation output was about 44.3 terawatt-hours (TWh), of which hydropower accounted for about 56.8% (the most utilised source), followed by geothermal with about 21.3%, natural gas with about 10.8%, coal with 3.7%, and other renewables with 7.4%. Oil, a minor source in electricity generation, is only used for peaking and emergency supply.

2. Modelling Assumptions

This outlook assumes that New Zealand's GDP will grow at an average rate of 1.8% per year between 2019 and 2050, and its population will increase by an average rate of 0.7% per year from 5.1 million in 2019 to 6.3 million by 2050 (Figure 13.1).

Figure 13.1 Gross Domestic Product and Population, 1990–2050
(Billion 2015 US$ per Million Persons)



GDP = gross domestic product.

Source: Author's calculations.

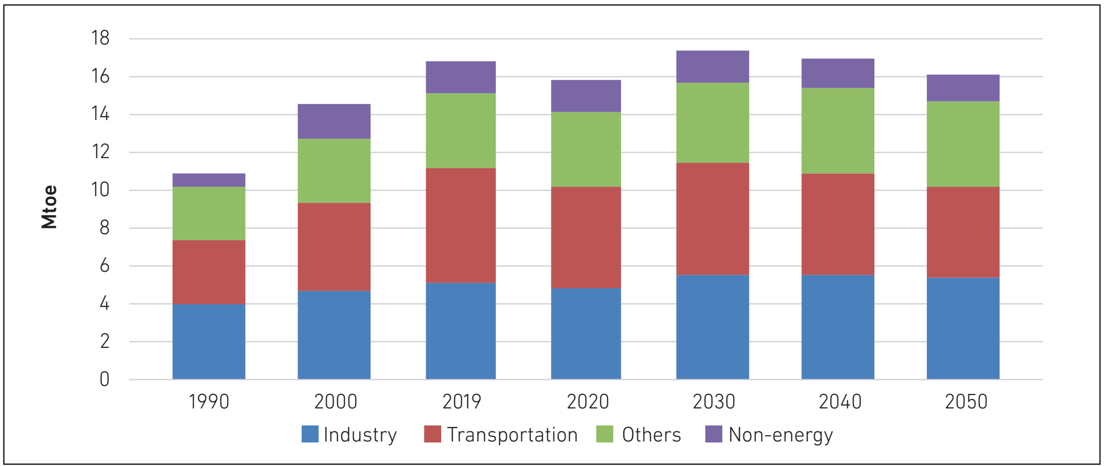
3. Outlook Results

3.1. Business-as-Usual Scenario

3.1.1. Final Energy Consumption

New Zealand's final energy consumption grew by 1.5% per year from 9.8 Mtoe in 1990 to 15.0 Mtoe in 2019. The business-as-usual (BAU) scenario projects a decrease in final energy consumption from 2019 to 2050 at an average rate of 0.2% per year, resulting in a decrease of 0.7 Mtoe. Transport energy consumption is projected to decrease by 1.1 Mtoe at an average rate of 0.7% per year, while the non-energy sector is predicted to decrease by 0.3 Mtoe also at an average rate of 0.7% during 2019–2050. However, the 'others' sector (agricultural, residential, and commercial) is projected to increase by 0.5 Mtoe at an average rate of 0.4% per year, and the industry sector is also projected to increase by 0.2 Mtoe at an average growth rate of 0.2% per year (Figure 13.2).

Figure 13.2 Final Energy Consumption by Sector, Business-As-Usual, 1990–2050
(Mtoe)



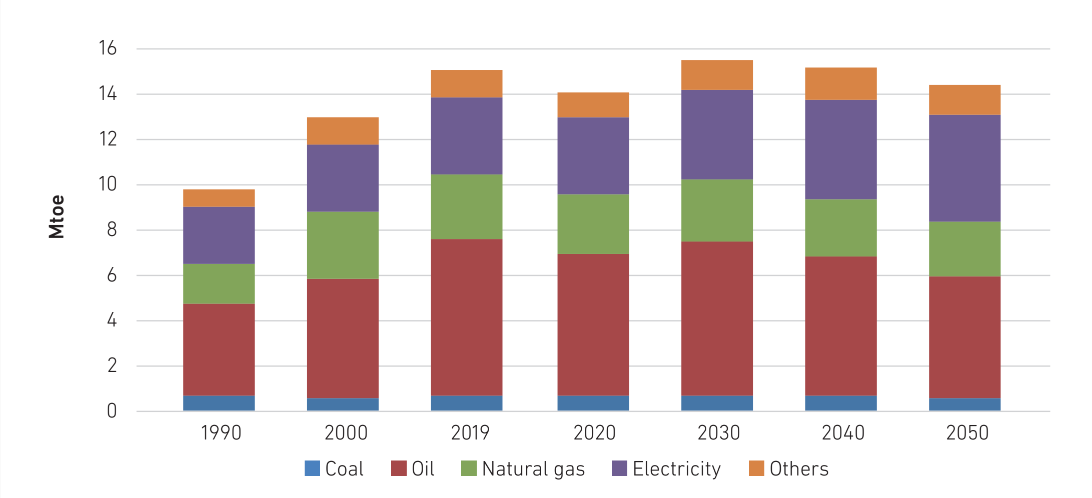
BAU = business-as-usual; Mtoe = million tonnes of oil equivalent.

Note: 'Others' includes agricultural, residential, and commercial sectors.

Source: Author's calculations.

By source, in 2019–2050, final electricity demand will increase by 1.4 Mtoe at an average rate of 1.1% per year and final demand of other renewable energy, including geothermal, solar, biogas, and woody biomass used for direct-use heat applications, will increase slightly at an average rate of 0.1% per year. In 2050, final oil, natural gas, and coal demand will decrease by 1.6 Mtoe at an average rate of 0.8% per year, 0.4 Mtoe at an average rate of 0.5% per year, and 0.1 Mtoe at an average rate of 0.6% per year respectively (Figure 13.3).

Figure 13.3 **Final Energy Consumption by Source, Business-As-Usual, 1990–2050**
(Mtoe)



BAU = business-as-usual; Mtoe = million tonnes of oil equivalent.

Note: 'Others' include geothermal, solar, biogas, and woody biomass.

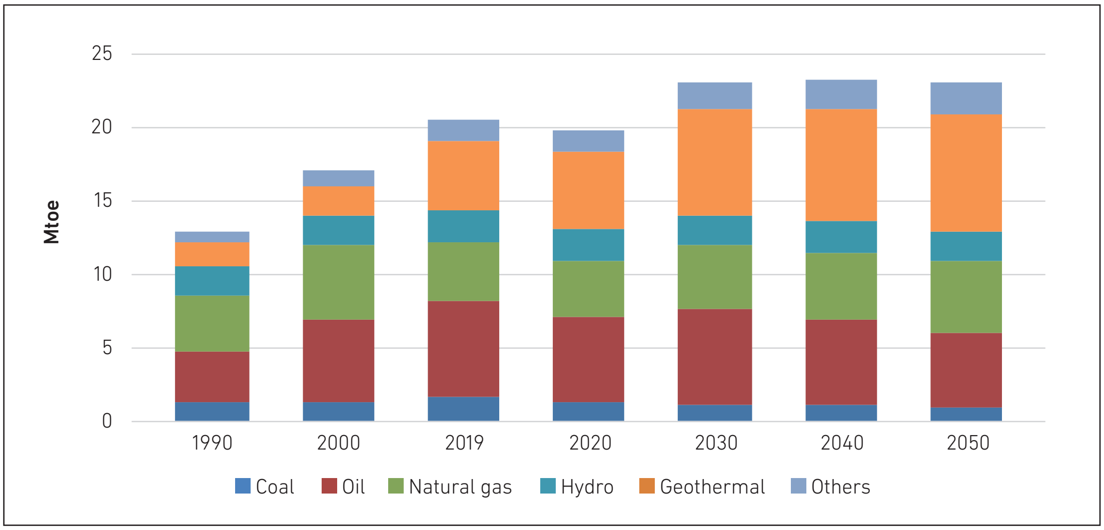
Source: Author's calculations.

3.1.2. Primary Energy Supply

Total Primary energy supply (TPES) in New Zealand grew at an average rate of 1.6% per year from 12.8 Mtoe in 1990 to 20.5 Mtoe in 2019. Geothermal and oil grew faster in 1990–2019. Geothermal share in TPES increased from 11.6% in 1990 to 22.8% in 2019, and oil's share in TPES increased from 27.3% to 32.6%. 'Other' energy sources, which include biomass, solar, wind, liquid biofuels, and biogas, increased their shares slightly from 6.2% to 7.0%. In 1990–2019, the share of natural gas decreased from 30.1% to 19.5%, hydro from 15.5% to 10.7%, and coal from 9.2% to 7.3%.

Under the BAU scenario, New Zealand's primary energy supply will grow at an average rate of 0.4% per year from 20.5 Mtoe in 1990 to 23.0 Mtoe in 2050. Geothermal energy is projected to contribute the most to the incremental growth of the primary energy supply between 2019 and 2050 and will account for 34.9% of the TPES in 2050. 'Others' primary energy will grow at an average rate of 1.4% per year, mainly reflecting the expected growth in wind power; and the share of 'Others' will account for 9.4% of the TPES in 2050. In contrast, coal will decrease slightly by an average rate of 1.7% and will account for 3.8% of TPES. Oil will decrease slightly, at an average rate of 0.9% and will account for 22.1% of the TPES. Hydropower for electricity generation will decrease at an average rate of 0.3% per year and will account for the remaining 8.6% of the TPES (Figure 13.4).

Figure 13.4 Primary Energy Supply by Source, Business-as-Usual, 1990–2050
(Mtoe)



BAU = business-as-usual; Hydro = hydropower; Mtoe = million tonnes of oil equivalent.

Note: 'Others' includes biomass, solar, wind, liquid biofuels, and biogas.

Source: Author's calculations.

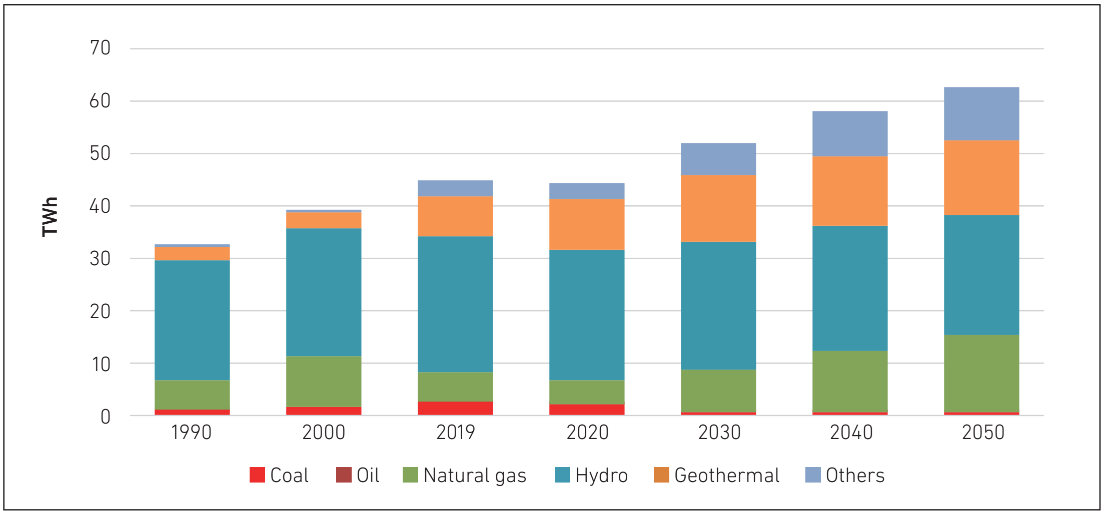
3.1.3. Power Generation

Under the BAU scenario, generation from renewable sources is projected to increase as new capacities for geothermal and wind will increase in the future. In 2020, some additional capacities of the Ngawha OEC4 geothermal plant and Waipipi wind farm have added to the market. Several companies made announcements on new plants to support a greater renewable generation mix. When these plants are complete, these plants will add 347 megawatts (MW) to the renewable electricity market (Ministry of Business, 2021).

Hydropower is projected to decrease slightly at an average rate of 0.3% per year from 2019 to 2050. Generation from natural gas-based plants is projected to increase slightly, at an average rate of 3.0% per year. Geothermal power generation will increase at an average rate of 1.8% per year and wind generation will continue to grow and account for 16.4% share of New Zealand's electricity by 2050 (6.8% share in 2019). In contrast, coal power generation will decrease at an average rate of 5.0% per year (Figure 13.5).

The thermal efficiency of gas- and oil-fired power plants may not increase so much in the future because there are no plans for new, large fossil fuel-based plants. Moreover, Genesis Energy – New Zealand's largest energy company – has decommissioned its coal-fired power plants by 2023.

Figure 13.5 **Power Generation by Source, Business-as-Usual**
(TWh)



BAU = business-as-usual; Hydro = hydropower; TWh = terawatt-hour.

Note: 'Others' includes biomass, solar, wind, and biogas.

Source: Author's calculations.

The Government of New Zealand implemented an emissions trading scheme in 2010. The New Zealand Emissions trading scheme (NZ ETS) helps reduce greenhouse gas emissions in New Zealand. The purpose of the NZ ETS is to help New Zealand meet its international obligations under the Paris Agreement and its 2050 target and emissions budgets (Ministry for the Environment, 2022).

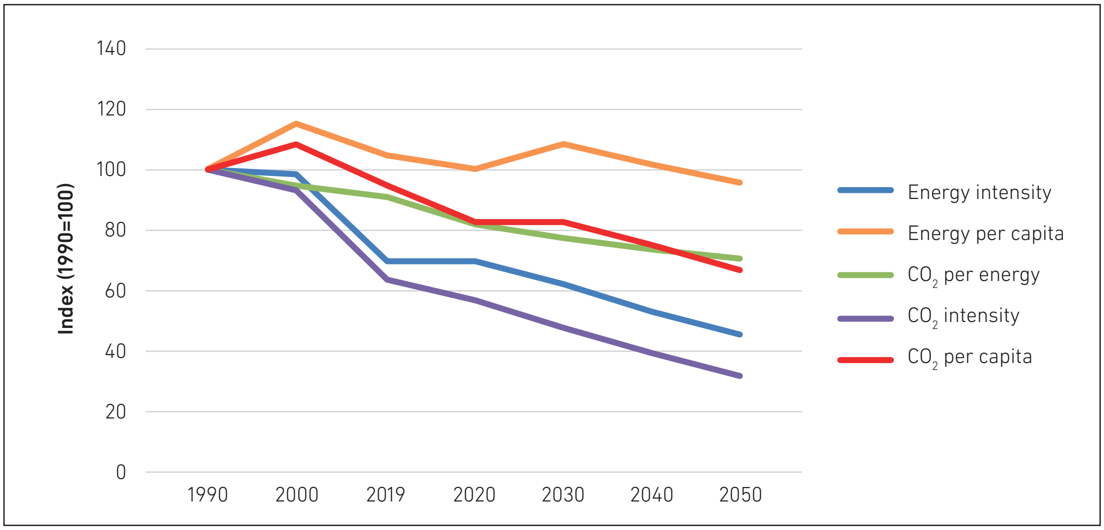
Through its Energy and Energy Efficiency and Conservation Strategies, New Zealand also set a target for 90% of electricity to be generated from renewable sources by 2025 (Ministry of Economic Development, 2011). The government also maintains a range of programmes to promote energy efficiency at home, work, and in transport, as well as the development and deployment of sustainable energy technologies.

3.1.4. Energy Indicators

Primary energy intensity is calculated as the ratio of TPES over GDP, which is the unit consumption of primary energy per million US dollars (constant 2015 US$). The lower growth of the primary energy supply relative to GDP growth will cause lower energy intensity in the future. From 102 tonnes of oil equivalent per million US dollars (toe/US$ million) in 2019, energy intensity will improve to 66 toe/ US$ million in 2050. Primary energy supply per capita will decrease from 4.0 toe per person in 2019 to 3.7 toe per person in 2050.

Carbon dioxide (CO_2) intensity – defined as the ratio of emissions over GDP – is projected to drop by an average rate of 2.2% per year in 2019–2050. Under the BAU scenario, all energy and CO_2 emissions indicators are projected to have similar declining trends (Figure 13.6).

Figure 13.6 Energy Indicators, Business-as-Usual, 1990–2050



CO_2= carbon dioxide.

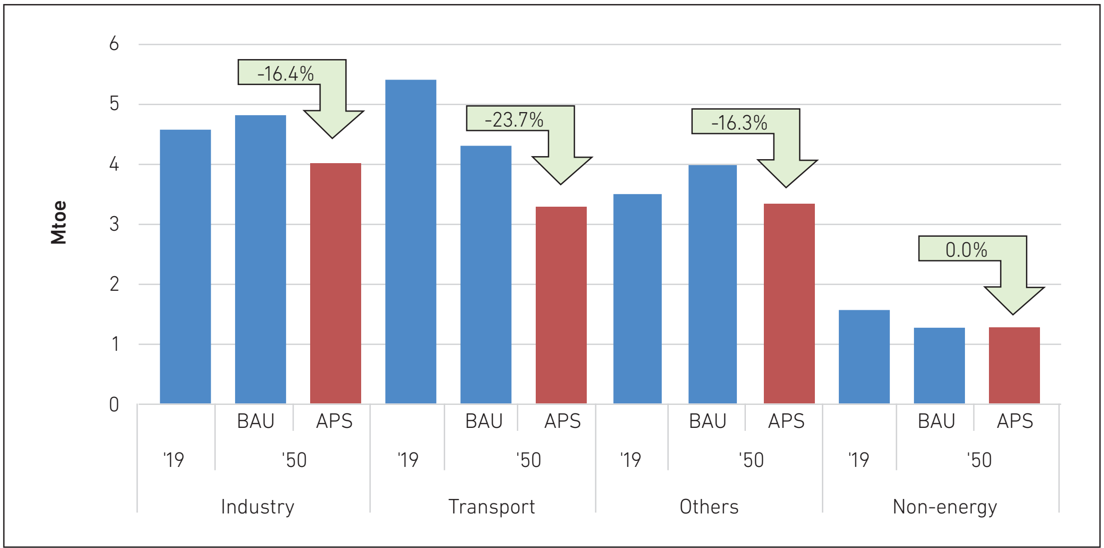
Source: Author's calculations.

3.2. Energy Saving and Carbon Dioxide Reduction Potential - Alternative Policy Scenario

3.2.1. Final Energy Consumption

The APS predicts the final energy consumption will decrease by an average rate of 0.8% per year in 2019–2050. When compared with the BAU scenario, the transport sector is expected to experience the most significant decline in energy use, with a reduction 23.7% in 2050 due to the shift to more energy-efficient vehicles electric vehicles. The industrial sector is expected to see a decrease by 16.4%, while the 'others' sector, including agricultural, residential, and commercial activities, is predicted to decrease by 16.3%. This reduction is attributed to the use of highly efficient appliances, heat pumps, and compact fluorescent lamp and light-emitting diode light bulbs in the residential and commercial sectors (Ministry of Business, 2019). The non-energy sector is projected to remain unchanged compared to the BAU scenario in 2050. Figure 13.7 shows the final energy consumption in 2019 and 2050 under both the BAU and APS.

Figure 13.7 **Final Energy Consumption by Sector, Business-as-Usual and Alternative Policy Scenario, 2019 and 2050**
(Mtoe)



APS = alternative policy scenario; BAU = business-as-usual; Mtoe = million tonnes of oil equivalent.

Note: 'Others' includes agricultural, residential, and commercial sectors.

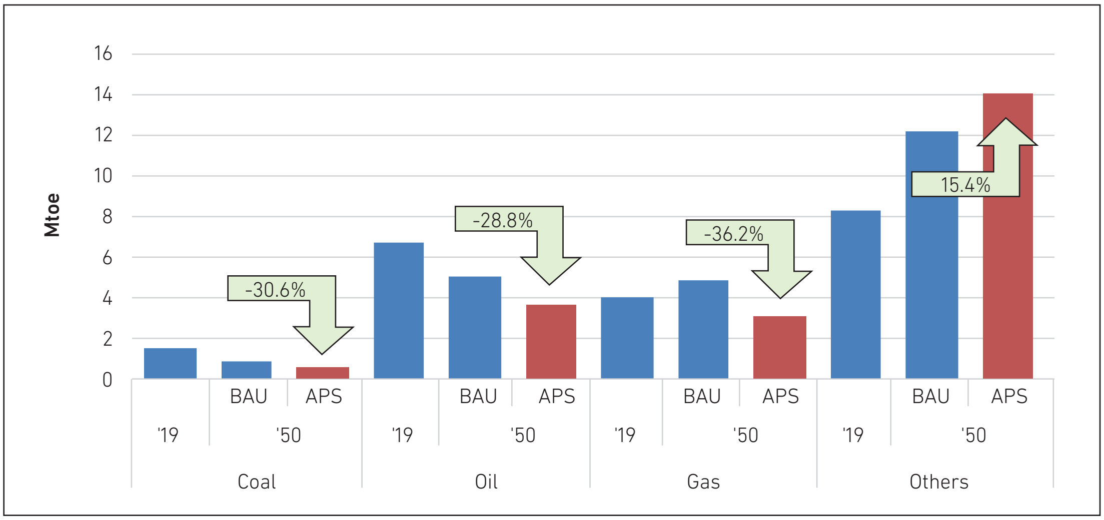
Source: Author's calculation.

3.2.2. Primary Energy Supply

According to projections for the APS, the primary energy supply is projected to grow at a lower rate of 0.1% per year in 2019–2050. In 2050, in comparison to the BAU scenario, the use of gas for primary energy in 2050 is expected to decrease by 36.2%, coal by 30.6%, and oil 28.8%. Primary energy categorised as 'Others', which includes renewable sources such as biomass, solar, wind, liquid biofuels, biogas, hydropower, and geothermal, is expected to grow by 15.4% in 2050, compared to the BAU scenario. Figure 13.8 shows the primary energy supply by source under the BAU scenario and APS.

Figure 13.8 Primary Energy Supply by Source, Business-as-Usual and Alternative Policy Scenario, 2019 and 2050

(Mtoe)



APS = alternative policy scenario; BAU = business-as-usual; Mtoe = million tonnes of oil equivalent.

Note: 'Others' includes biomass, solar, wind, liquid biofuels, biogas, hydropower, and geothermal.

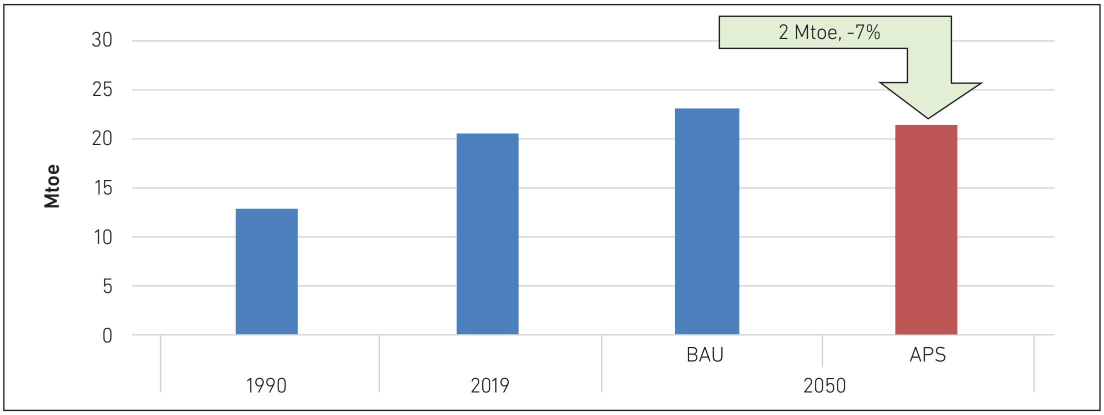
Source: Author's calculations.

3.2.3. Projected Energy Savings

In the APS, the primary energy supply is projected to save about 2.0 Mtoe or 7.0% less than under BAU scenario in 2050 (Figure 13.9).

Figure 13.9 Total Primary Energy Supply, Comparison of 2050 Business-as-Usual and Alternative Policy Scenarios to 1990 and 2019

(Mtoe)



APS = alternative policy scenario; BAU = business-as-usual; Mtoe = million tonnes of oil equivalent.

Source: Author's calculations.

The savings in primary energy are due to the adoption of more efficient vehicles, particularly electric ones, in transport. Additionally, with improved insulation, increased use of more efficient appliances, and a shift from incandescent bulbs to compact fluorescent lamp and light-emitting diode light bulbs in the residential and commercial sectors.

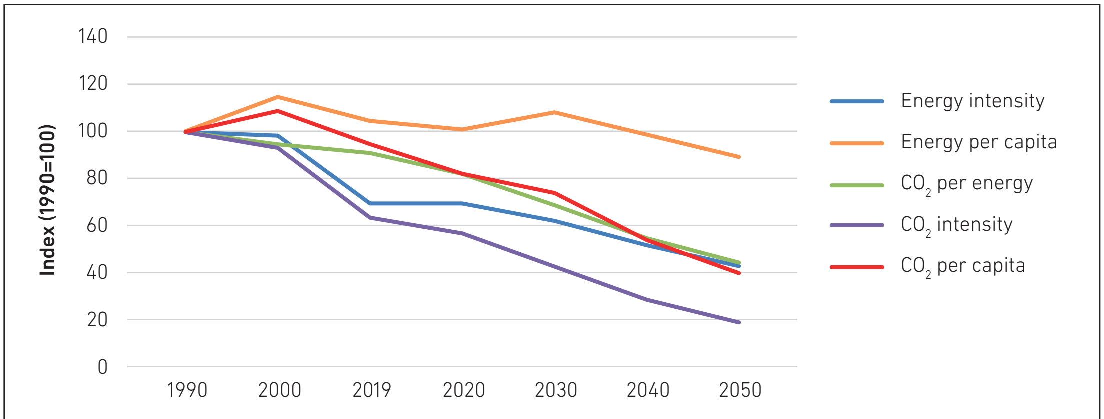
3.2.4. Energy Indicators

Under the APS, primary energy intensity is projected to decline at an average rate of 1.6% per year in 2019–2050. From 1990 to 2019, primary energy intensity declined and was 102 toe/US$ million in 2019. Primary energy intensity will improve to 62 toe/US$ million in 2050 compared with 2019.

Under the APS, a 3.9% annual average reduction in CO_2 intensity is projected from 2019 to 2050. In the BAU scenario, CO_2 intensity will reach 82 toe/US$ million in 2050, while the APS predicts CO_2 intensity will reach 48 toe/US$ million. This represents a 41% reduction in CO_2 intensity compared to the BAU scenario, which equals 34 toe/US$ million.

All energy and CO_2 emission indicators are expected to decline similarly, as shown in Figure 13.10, which displays their trends from 1990 to 2050 under APS.

Figure 13.10 Energy Indicators, Alternative Policy Scenario, 1990–2050



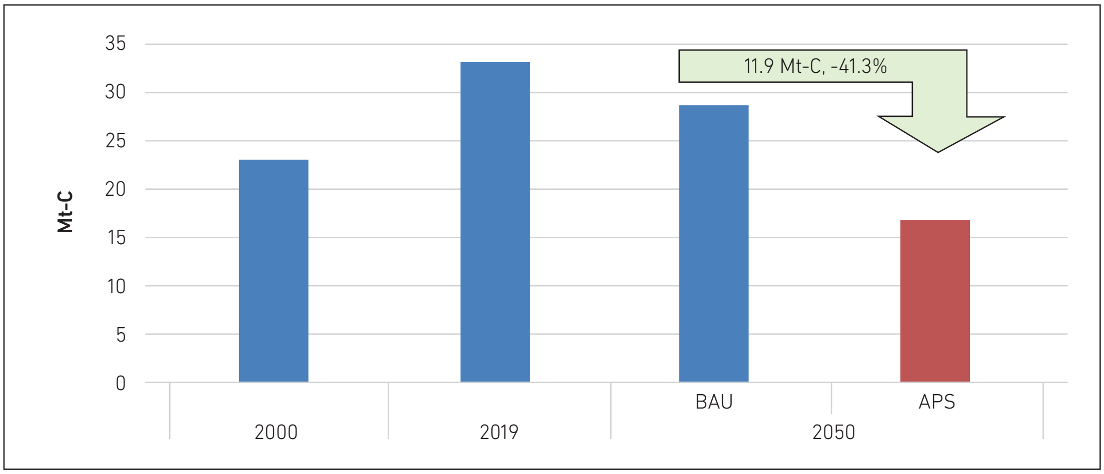
CO_2= carbon dioxide.

Source: Author's calculations.

3.2.5. Carbon Dioxide Emission Reduction

Under the BAU scenario, CO_2 emissions will decrease from 33.2 million tonnes of carbon dioxide (Mt-C) in 2019 to 28.7 Mt-C in 2050. Compared to the BAU scenario, the APS would result in a reduction of 41.3% in CO_2emissions, reaching 16.8 Mt-CO_2 in 2050. This decrease in emissions reflects the switch to renewable energy in electricity generation and the switch to electric vehicles in transport. Figure 13.11 provides a comparison in CO_2 emissions from fossil fuel combustion between the BAU scenario and APS in 2050 and levels recorded for 1990 and 2019.

Figure 13.11 Carbon Dioxide Emissions from Fossil Fuel Combustion, Comparison of 2050 Business-as-Usual and Alternative Policy Scenario to 1990 and 2019 (Mt-C)



APS = alternative policy scenario; BAU = business-as-usual; CO_2 = carbon dioxide; Mt-C = million tonnes of carbon dioxide.

Source: Author's calculations.

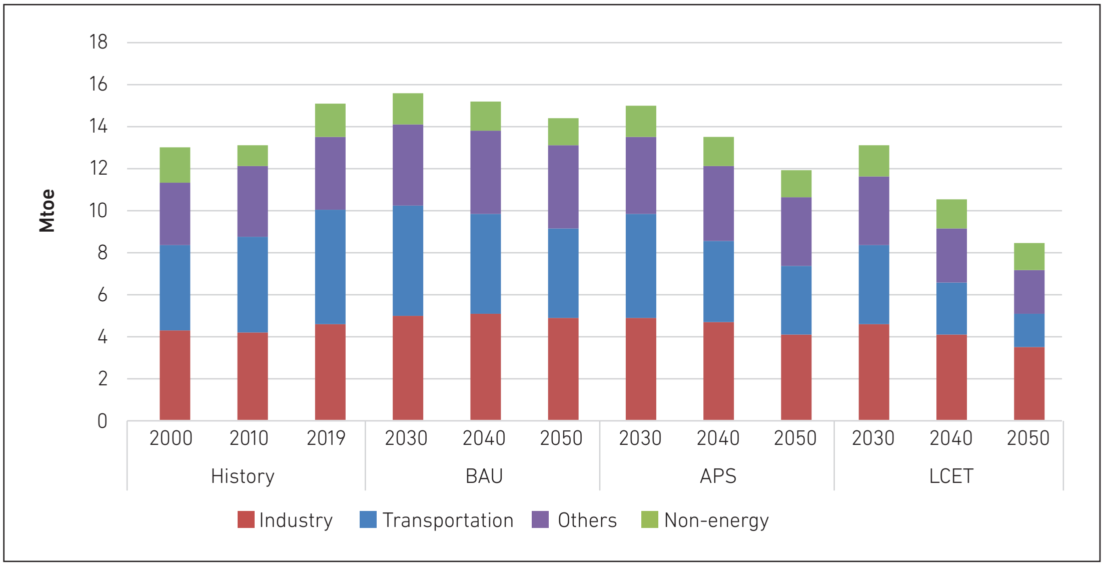
3.3. Low Carbon Energy Transition Scenario – Carbon Neutral

3.3.1. Final Energy Consumption

In the LCET scenario, the average annual decrease rate of TFEC will be 1.9% from 15.0 Mtoe in 2019 to 8.4 Mtoe in 2050. Throughout this period, TFEC will remain lower than in the LCET than in the BAU scenario (decreases 42% in LCET compared to BAU) and APS (decreases 30% in LCET compared to APS). The highest reduction in energy consumption will occur in transport, which will decrease by 70% between 2019 and 2050. The 'Others' sector, which includes agricultural, residential, and commercial, will decrease by 40%, industrial sector by 26%, and non-energy sector by 19% in 2050.

In 2050, the transport in the LCET is expected to decrease by 62% compared to BAU and 51% compared to APS. The 'others' category (agricultural, residential, and commercial) will decrease by 47% in BAU and 37% in APS, while industry is projected to decrease by 29% in BAU and 15% in APS. LCET's non-energy sector in TFEC is projected to remain unchanged, as shown in Figure 13.12.

Figure 13.12 **Final Energy Consumption by Sector, Low Carbon Energy Transition Scenario, 2000–2050**
(Mtoe)

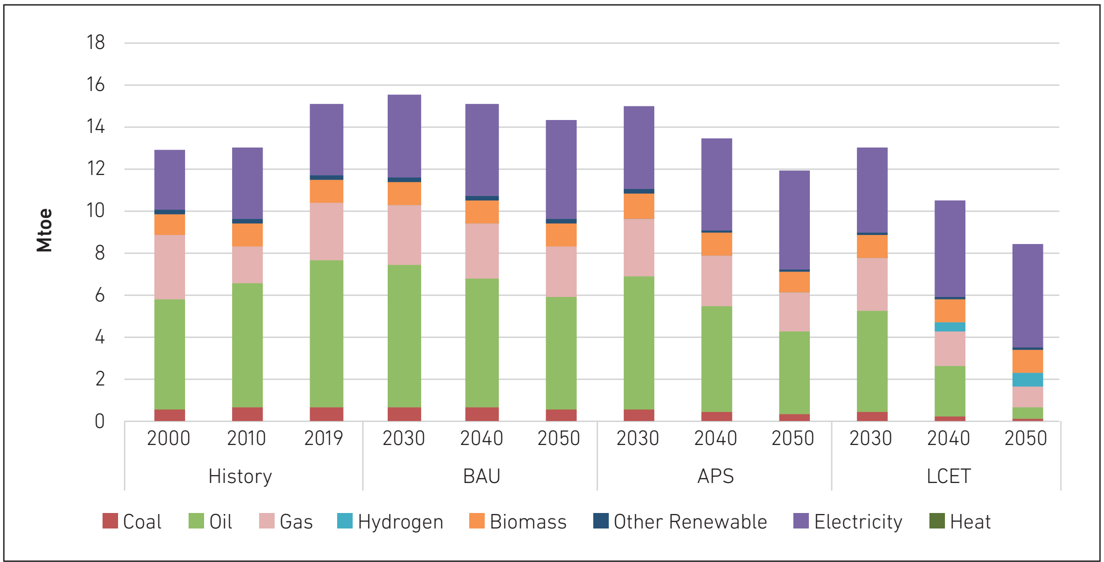


APS = alternative policy scenario; BAU = business-as-usual; LCET = low carbon energy transition; Mtoe = million tonnes of oil equivalent.
Note: 'Others' includes agricultural, residential, and commercial sectors.
Source: Author's calculations.

From 2019 to 2050, in the LCET scenario, TFEC reduction will come from oil at 0.6 Mtoe (92% decrease), coal at 0.1 Mtoe (85% decrease), gas at 0.9 Mtoe (65% decrease), and other renewable sources (geothermal, solar, and biogas) at 0.08 Mtoe (59% decrease). In the same period, electricity demand is projected to increase by 45% and biomass by 3.9%. Hydrogen demand is projected to increase from 0.2% in 2030 to 8.2% in 2050.

There will be a substantial reduction in oil consumption by 89% compared to the BAU scenario and 86% compared to the APS in 2050. Coal consumption will also decline significantly, with a decrease of 82% compared to BAU and 66% compared to APS. In addition, natural gas will decrease by 59% and other renewable consumption by 57% compared to BAU, and by 49% and 43% respectively compared to APS (Figure 13.13).

Figure 13.13 Final Energy Consumption by Source, Low Carbon Energy Transition Scenario, 2000–2050
(Mtoe)



APS = alternative policy scenario; BAU = business-as-usual; LCET = low carbon energy transition; Mtoe = million tonnes of oil equivalent.

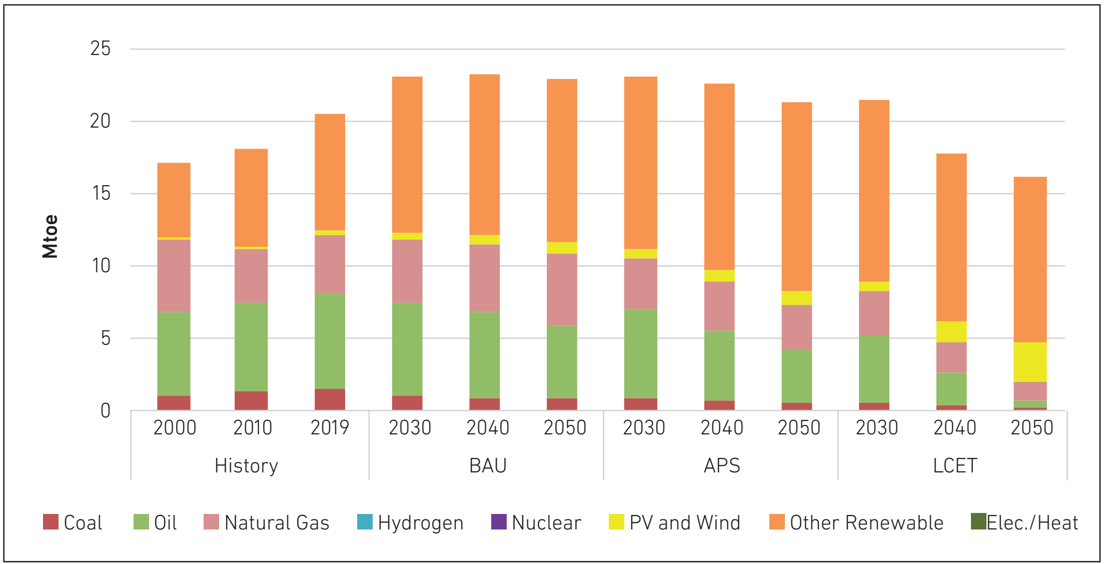
Note: 'Other Renewable' includes geothermal, solar, and biogas.

Source: Author's calculations.

3.3.2. Primary Energy Supply

In the LCET scenario, primary energy supply will decrease by an average rate of 0.8% per year from 2019–2050. In comparison, the increase in BAU is 0.4% and 0.1% per year in APS. Oil will decrease rapidly each year by 8.2% in the LCET scenario, by 0.9% in BAU and by 2.0% per year in APS. Coal will also decrease by 6.8% in LCET, by 1.7% in BAU, and by 2.9% per year in APS. Natural gas is projected to decrease by 3.6% per year, while other renewable sources, which include hydro, geothermal, biomass, solar, liquid biofuels, and biogas, are projected to increase by an average rate of 1.1% per year in 2019–2050 (Figure 13.14).

Figure 13.14 Primary Energy Supply by Source, Low Carbon Energy Transition Scenario, 2000–2050
(Mtoe)



APS = alternative policy scenario; BAU = business-as-usual; LCET = low carbon energy transition; Mtoe = million tonnes of oil equivalent; PV = photovoltaics.

Note: 'Other renewable' includes hydro, geothermal, biomass, solar, liquid biofuels, and biogas.

Source: Author's calculations.

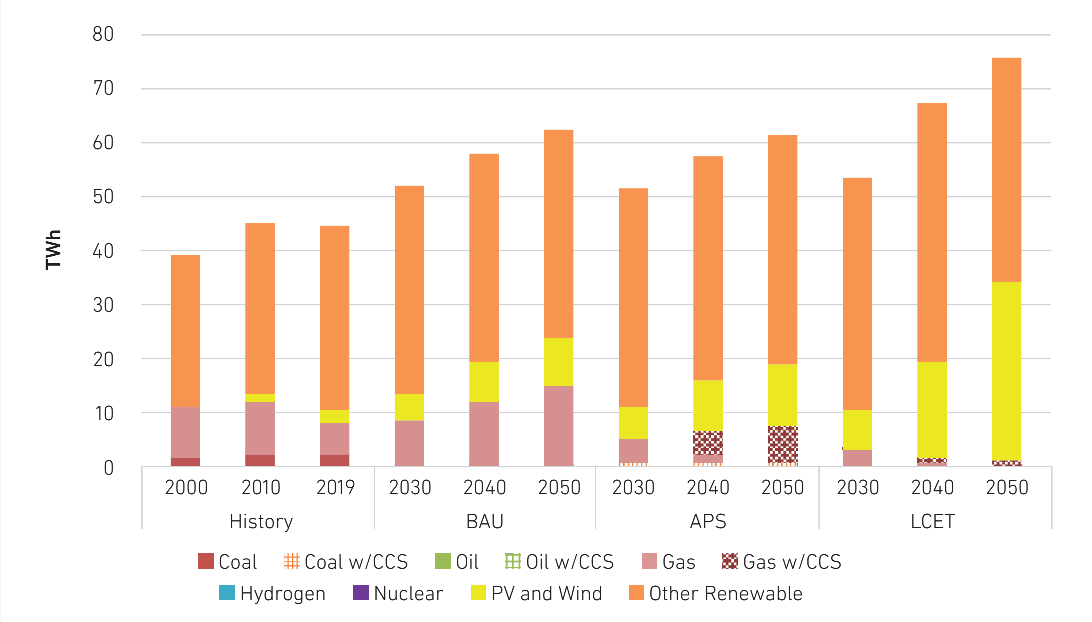
3.3.3. Power Generation

Figure 13.15 shows both the history of power generation in BAU, APS, and LCET scenarios for 2000–2019 and outlook in 2030–2050. All scenarios are projected to increase in power generation from 2030 to 2050. In the LCET scenario, power generation is projected to grow significantly at 69.1% in 2019–2050. In comparison to the LCET scenario, power generation increases only by 39.4% in the BAU and by 37.0% in the APS.

Under the LCET, power generation is projected to increase at an average rate of 1.7% per year, from 32.3 TWh in 2019 to 75.8 TWh in 2050. The share of other renewable sources is projected to fall from 76.4% in 2019 to 54.5% in 2050, but solar photovoltaics (PV) and wind are projected to grow from 5.4% in 2019 to 44.0% in 2050. The percentage of gas and coal will decrease significantly. Specifically, the share of gas, which was 13.1% in 2019, and the share of coal, which was 5.1% in 2019 are both expected to decline to 0.0% in 2050.

The APS projects that carbon capture and storage (CCS) will be used to generate 11.4% of the total power generated from gas and 1.0% of the total power generated from coal by 2050. The share of total power generated from gas that will utilise CCS under the LCET, accounts for 1.5% in 2050.

Figure 13.15 **Power Generation, Business-As-Usual, Alternative Policy Scenario and Low Carbon Energy Transition Scenarios, 2000–2050**
(TWh)



APS = alternative policy scenario; BAU = business-as-usual; CCS = Carbon capture and storage; LCET = low carbon energy transition; PV = photovoltaics; TWh = terawatt-hour.

Note: 'Other renewable' includes hydro, geothermal, biomass, solar, and biogas.

Source: Author's calculations.

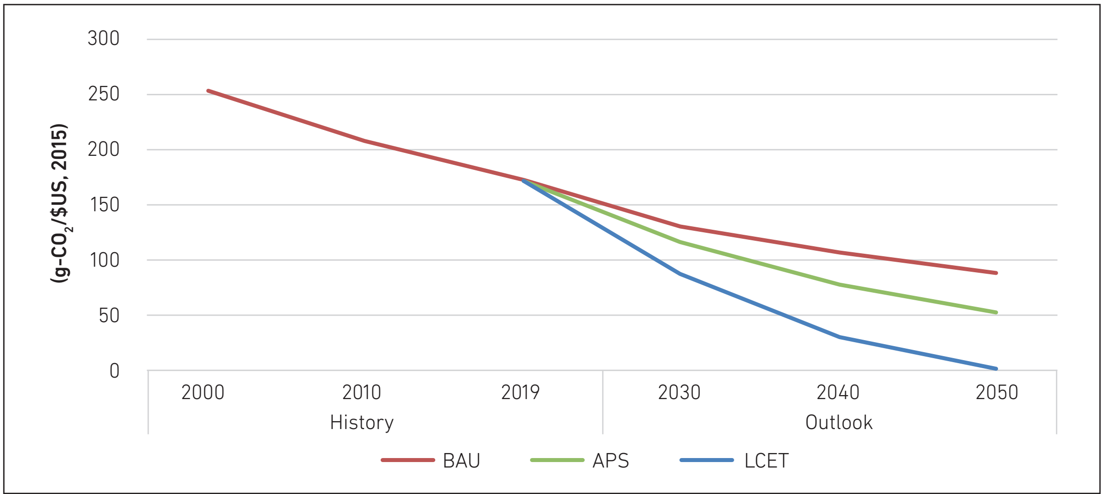
3.3.4. Energy Indicators

The ratio of emissions to GDP is used to measure CO_2 intensity, expressed as the unit of CO_2 emission per US dollar (g-CO_2/US$) at a constant 2015 US$ rate. Figure 13.16 shows CO_2 intensity in the BAU, APS and LCET scenarios from 2020 to 2050. The projections indicate that CO_2 intensity in all three scenarios will exhibit a declining trend from 2019 to 2050. Specifically, the LCET scenario anticipates a 15.7% average yearly reduction in CO_2 intensity in 2019–2050, which will result in net zero emissions in 2050. The Government of New Zealand has committed to reaching this target, along with a 24%–47% reduction in biogenic methane emissions by 2050.

In the APS, CO_2 intensity will improve from 173 g-CO_2/US$ in 2019 to 51 g-CO_2/US$ in 2050. This is faster than in the BAU scenario wherein it will reach 86 g-CO_2/US$ in 2050.

Figure 13.16 Energy Indicators, Business-as-usual, Alternative Policy Scenario and Low Carbon Energy Transition Scenario, 2020–2050

($g\text{-}CO_2$/$US, 2015)



APS = alternative policy scenario; BAU = business-as-usual; $g\text{-}CO_2$ = gram of carbon dioxide; LCET = low carbon energy transition.

Source: Author's calculations.

3.3.5. Saving of Fossil Fuel Consumption and Carbon Dioxide Reduction

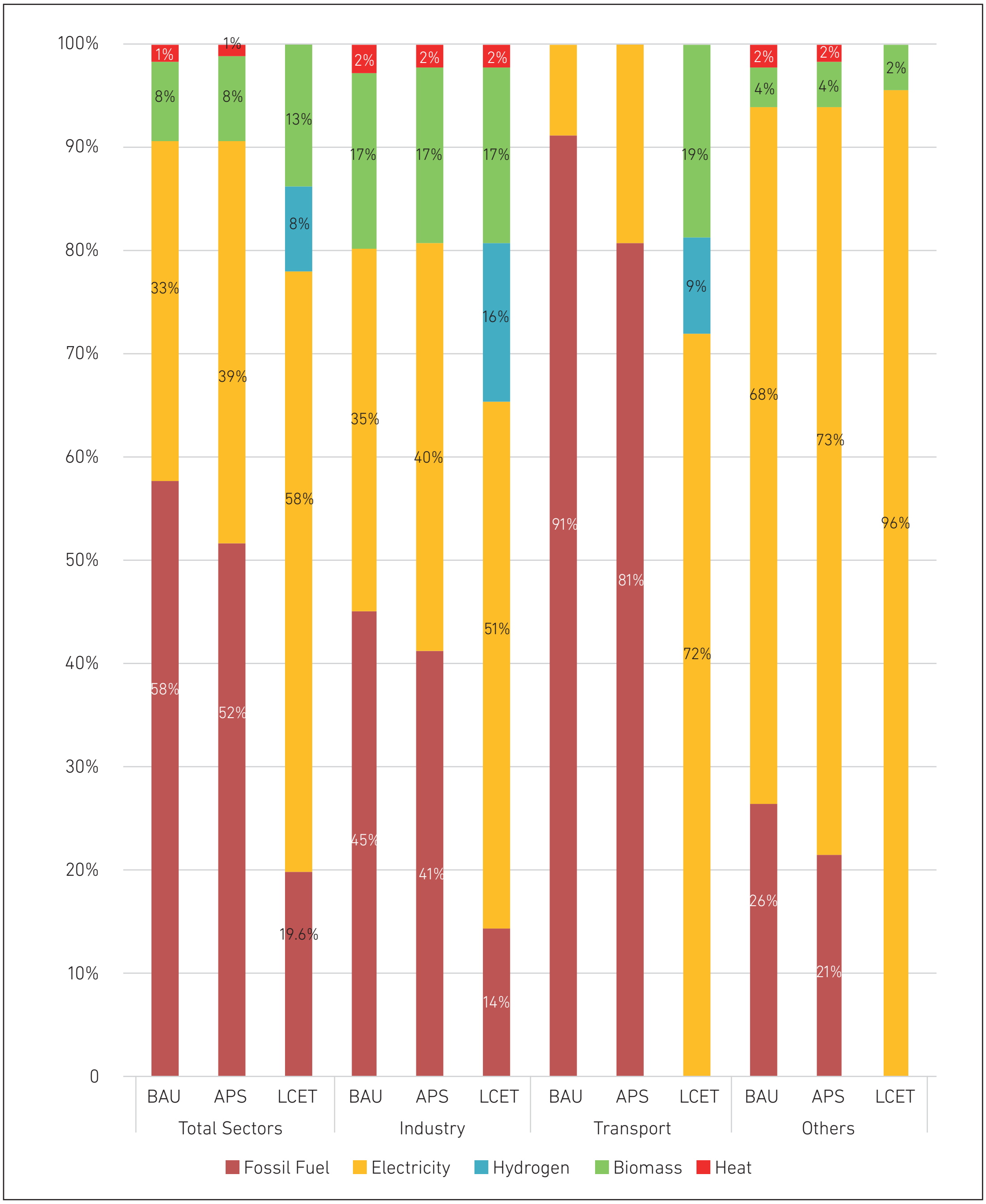
a. Saving of Fossil Fuel Consumption

Figure 13.17 shows the distribution of TFEC across sectors and sources in the BAU, APS, and LCET scenarios in 2050. The LCET scenario shows that fossil fuel consumption's share in TFEC is merely 20%, which is lower than its share in BAU (58%) and APS (52%) scenarios. In terms of sectors, the LCET scenario demonstrates a substantial potential for electrification in the 'others' category (96%), which includes agricultural, residential, and commercial sectors; transport (72%); and industry (51%) in TFEC. This electrification potential can help in reducing energy consumption and decarbonising the economy by 2050.

Under the LCET scenario, an increased share of hydrogen in the TFEC used for industry (16%) and transport (9%) in 2050 will also contribute to decarbonisation.

Figure 13.17 Savings of Fossil Fuel Consumption and Carbon Dioxide Reduction, 2050

(%)



APS = alternative policy scenario; BAU = business-as-usual; LCET = low carbon energy transition.

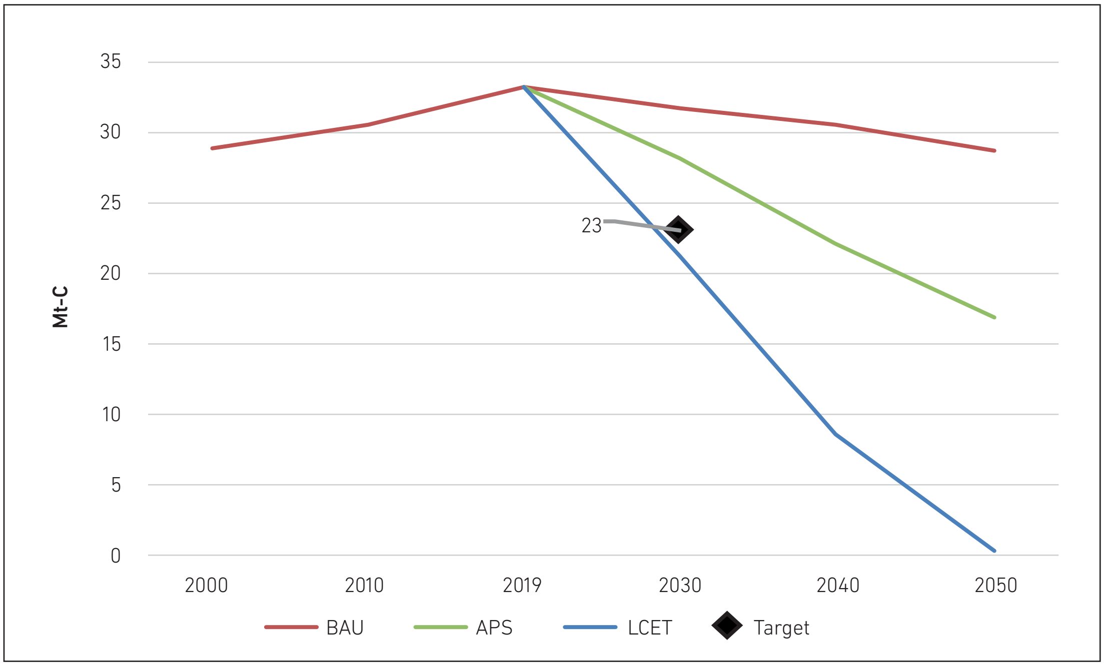
Note: 'Others' includes agricultural, residential, and commercial sectors.

Source: Author's calculations.

b. Carbon Dioxide Reduction

From 2019 to 2050, CO_2 emissions are expected to decline the BAU, APS, AND LCET scenarios are expected to decline. The LCET scenario projects a yearly reduction of 15.7% in CO_2 emissions from energy demand, leading to a decline from 33. 2 Mt-CO_2 in 2019 to around 0.2 Mt-CO_2 in 2050. Figure 13.18 shows the history of CO_2 emissions during 2000–2019 and outlook for 2030–2050 in the three scenarios, with a target to reduce CO_2 emissions by 30% in 2030 from 2005 levels.

Figure 13.18 Carbon Dioxide Reduction, 2020–2050
(Mt-C)



APS = alternative policy scenario; BAU = business-as-usual; LCET = low carbon energy transition; Mt-C = million tonnes of carbon dioxide.
Source: Author's calculations.

4. Implications and Policy Recommendations

Although New Zealand's primary energy intensity (energy per dollar of GDP) in the BAU scenario has been declining from 147 toe/US$ million in 1990 to 66 toe/US$ million in 2050, energy use continues to grow steadily due to factors such as economic growth, population growth, and increasing numbers of private road vehicles. However, in 2011, New Zealand set ambitious goals to generate 90% of its electricity from renewable sources by 2025 and reduce greenhouse gas emissions by 30% in 2005–2030 and 50% in 1990–2050. As of 2021, New Zealand was generating about 82% of its electricity from renewable sources, with solar generation up 28%, wind up 15%, and biomass up 2%, contributing to this increase (Ministry of Business, 2022). In contrast, non-renewable sources such gas fell 21.5%, despite a historically high coal consumption during that year.

The LCET scenario predicts a decline in the growth rate of the TFEC by 1.9% per year in 2019–2050. This rate of decline is faster than under APS (0.8%) and BAU (0.2%). By 2030–2050, New Zealand's CO_2 emissions are expected to be significantly lower in the LCET scenario than in 1990. However, 2019–2050, CO_2 emissions are projected to decrease only slightly in by 0.5% per year in BAU and 2.2% in APS. In the LCET scenario, CO_2 emissions are projected to reach net zero by 2050, with a yearly reduction of 15.7% in 2019–2050. The adoption of hydrogen in heavy vehicles and its use for electricity system support and export will further aid in decarbonisation (Castalia Limited, 2022). The LCET scenario forecasts the share of hydrogen in the TFEC to increase from 0.2% in 2030 to 8.2% in 2050.

The government has committed to reaching net-zero emissions of long-lived gases by 2050 and reducing biogenic (plant and animal) methane emissions by 24%–47% by 2050. In January 2021, the Climate Change Commission (CCC) provided preliminary recommendations to the government and outlined the policy direction necessary to meet the targets. Following this, the commission presented its recommendations to the Minister of Climate Change, and in June 2021, it was submitted to Parliament for consideration (Climate Change Commission, 2021).

In May 2022, the CCC was granted additional funding to help the government in making decisions about achieving Aotearoa New Zealand's emissions reduction goals and adapting to the effects of climate change (Climate Change Commission, 2022).

In July 2022, the Minister of Climate Change released regarding updates to the unit limits and price control settings for the New Zealand Emissions Trading Scheme (NZ ETS) over the next five years. Per this advice, '[t]he unit limits aim to cap the emissions allowed by the scheme, in line with the country's emissions reduction targets. The price control settings are guardrails to provide stability to the NZ ETS, while also enabling it to operate as an effective tool to reward low emissions choices' (Climate Change Commission, 2022).

The Commission's advice is now entering a new phase, which involves monitoring Aotearoa New Zealand's progress on reducing its emissions and on adapting for climate change.

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