

ANALYSIS



How Australia can break its foreign fuel dependence

A practical pathway to fuel security





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The Superpower Institute is a not-for-profit organisation dedicated to helping Australia seize the extraordinary economic opportunities of the post-carbon world.

The Institute's focus is on developing the policy settings, market incentives and practical knowledge necessary for Australia to become a major exporter of renewable energy and green industrial products. By leveraging the nation's comparative advantage, the Institute aims to elevate Australia's economic and climate ambition and secure its place as a leader in a decarbonised global economy.

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This report was authored and edited on the Traditional Lands of the Wurundjeri People of the Kulin Nation. We pay our respects to their Elders past and present, and acknowledge the enduring strength of their cultures, knowledge and custodianship.

As Australia advances toward a new era of clean energy trade, we recognise the vital importance of First Nations voices, rights and leadership. A just transition must ensure that First Nations communities share equitably in the benefits of new industries, and that their deep connections to Country inform how we shape a more sustainable and inclusive future.

Executive Summary

Australia can lift its fuel security from 17 per cent today to 87 per cent in 2040 by focusing efforts on electrification and low-carbon liquid fuels (LCLFs).

Australia is energy-rich, but fuel-poor. Almost none of the petrol, diesel and jet fuel that moves our economy is ‘sovereign’ – it is either imported directly, or made from imported crude oil.

About 77 per cent of Australia’s refined fuel is imported directly, while the remaining 23 per cent is produced by domestic refineries, using crude oil that is almost completely imported (83 per cent)¹. That leaves Australia 95 per cent reliant on foreign imports of fuel, with just 4 per cent refined locally from Australian crude oil. A further 1 per cent of fuel demand has been displaced by electrification.

This makes Australia highly exposed to global oil shocks, fuel price spikes and supply disruption.

Strategic stockpiles provide a buffer, and together with sovereign production determine Australia’s level of fuel security. Stockpiles add the equivalent of 12 per cent of annual fuel use – about 40 days – to Australia’s fuel security position. In addition to 5 per cent sovereign supply, this lifts total fuel security to 17 per cent. But stockpiles do not reduce Australia’s very high level of exposure to imported fuel that transit long, geopolitically vulnerable supply chains.

TSI analysis shows that Australia can achieve very high levels of fuel security by 2040 by focusing on two ‘levers’ that significantly reduce reliance on foreign imports.

The most effective lever is electrification, which can substantially replace petrol and diesel use in cars, trucks, mining equipment and agricultural machinery with domestically produced electricity.

The second is LCLFs, using domestic feedstocks to address ‘hard to electrify’ sectors, including aviation, maritime, and some remote land uses like heavy road freight, mining and agriculture.

A third lever – domestically sourced and refined crude oil – can make only a small contribution to fuel security, because Australia’s petroleum reserves are limited, declining and internationally uncompetitive.

Together with strategic stockpiles, these levers lift Australia’s fuel security to 34 per cent by 2031, 58 per cent by 2035 and 87 per cent by 2040. By 2040, only 1 per cent of demand is met by domestically sourced and refined crude oil, and around 74 per cent of liquid fuel needs are met or displaced through sovereign supply.

This paper sets out Australia’s pathway to fuel security. First, we introduce the three policy levers. The remainder of the paper examines each lever in turn, discusses the role of strategic stockpiles, and sets out some guiding policy principles for Australia to achieve fuel security.

Fuel security terminology

Condensate	A very 'light' petroleum liquid that condenses from natural gas into a liquid when extracted.
Crude oil ('crude')	The raw input into refined petroleum products like petrol and diesel. Crude oil ranges from 'light' to 'heavy' density.
Feedstocks	The main inputs to the production of liquid fossil fuels and low carbon liquid fuels.
Hydrocarbon	An organic chemical compound made exclusively of the elements carbon (C) and hydrogen (H). Hydrocarbons are the main component in liquid fossil fuels.
Imported fuels	We use the term 'imported fuels' for imported petrol, diesel, jet and marine fuels, together with imported crude oil that is refined into these products in Australia.
Liquid fuels	We use the term 'liquid fuels' to cover liquid fossil fuels and potentially low-carbon liquid fuels; in the context of current production it refers to liquid fossil fuels.
Liquid fossil fuels and 'fuel'	We use the terms 'liquid fossil fuels' and 'fuel' to refer to petroleum-based fuel.
Low-carbon liquid fuels (LCLFs)	Refined from plant, animal and waste feedstocks, or made with green hydrogen and renewable carbon.
Petroleum	A fossil-based mixture of hydrocarbons, including gases, solids, and liquids. Liquid petroleum includes condensate and crude oil.
Petrol, diesel, jet and marine fuels	Currently refined from petroleum feedstocks. The product mix depends on crude grade. Lighter crude and condensate yield proportionally more petrol, medium crude yields more diesel and jet fuel, and heavier crude yields marine fuel.
Sovereign fuels	We use the term 'sovereign fuels' to describe liquid fuels made entirely from Australian feedstocks that are refined in Australia.

Australia's fuel security levers



Australia's current economy depends on a steady supply of low-cost petrol, diesel, jet and marine fuels, and the crude oil to make them. Our supplies of these fuels are nearly all imported.¹ This makes our economy vulnerable to forces largely beyond our government's control. (See the Fuel security terminology guide for the language we use for fuel products.)

Closures in the Strait of Hormuz have highlighted Australia's vulnerability, with commercial shipping disrupted since February 2026. Longer-term outcomes are still uncertain. Under the Australian Treasury's central forecast of a speedy re-opening of the Strait, GDP growth is forecast to slow from 2.25 per cent in 2025-26 to 1.75 per cent in 2026-27, with inflation peaking at 5 per cent. The Treasury has also modelled a prolonged closure in which oil prices rise to US\$200 per barrel and GDP growth in 2026-27 falls to 1.25 per cent. Inflation rockets to 7.25 per cent in December 2026 and unemployment would hit 5 per cent in 2027-28, equivalent to 160,000 full-time workers idled.² Even if these forecasts prove too pessimistic, they demonstrate the scale of risk Australia carries from its structural dependence on imported fuel.




The economic pain is not shared equally. The costs fall hardest on those least able to bear it: during a 12 month disruption, the lowest income quintile households would spend three and a half times more as a percentage of their income on transport fuel and food than the highest-income quintile.³

There are three 'levers' for replacing imported fossil fuels with Australian energy sources that have not yet been employed at large scale or ambition. The first is electrification: replacing the vehicles and equipment that currently run on liquid fuels with electric alternatives. Second, Australia can produce low-carbon liquid fuels (LCLFs) from domestic feedstocks. And third, domestic refineries can process Australian crude oil into petrol, diesel, jet fuel, and marine fuel rather than using imported crude oil; we call this 'domestically sourced and refined crude oil'. A fourth component of fuel security — strategic stockpiling of fuels — does not increase sovereign supply but provides a buffer against short-term disruption.

¹ See Appendix A for more details on Australia's fuel security.

These three levers differ in their potential scale, time to production and the lifespan of the resource. Electrification and LCLFs are the levers that can make the largest contribution to fuel security, within the shortest timeframe, and with ongoing capacity to provide fuel security. They are also compatible with Australia’s emissions reduction commitments: reducing carbon emissions is an additional benefit of pursuing fuel security (Table 1).

TABLE 1
Summary of Australia’s sovereign fuel security levers

	 Electrification	 Australian LCLFs	 Domestically sourced and refined crude oil
Potential scale of contribution to fuel security	Large	Medium	Small
Time to contribute to fuel security	Immediate	Within 5-10 years	At least 10 years
Longevity of contribution to fuel security	Indefinite	Indefinite	7 years ⁴
Alignment with emissions reduction commitments	Strong	Strong	In conflict

TSI has modelled low, central and high ambition scenarios for applying the three levers in pursuit of fuel security. The central scenario, reported in this analysis, assumes accelerated take-up consistent with existing trajectories and reasonable policy interventions.

We report the outcomes of different levers as a percentage contribution to fuel security, based on the gigalitres (GL) of demand for fuel that is displaced by electrification or met with sovereign supply. These estimates account for underlying increases in demand through time.ⁱⁱ Our methodology and full results are available in Appendix B.

While electrification displaces demand for liquid fuels, we sometimes refer to ‘residual’ demand for liquid fuels. This residual demand is from hard-to-electrify operations that need energy-dense liquid fuels, mainly in the aviation and maritime sectors. LCLF or domestically sourced and refined crude oil are required.

ⁱⁱ 2 per cent average annual growth in demand.

Lever 1 Electrification



Replacing liquid-fuelled vehicles and equipment with electric alternatives directly reduces demand. Australia has natural advantages in this lever because of its abundant renewable energy resources.

Under the central scenario modelled by TSI, this lever can improve fuel security to 14 per cent by 2031, 32 per cent by 2035 and 58 per cent by 2040. It is by far the most effective lever for increasing fuel security.

Lever 2 Australian low-carbon liquid fuels



LCLFs can be produced with plant or animal-based biomass, or with renewable carbon. Australia has natural advantages in this lever: abundant sustainable biomass potential, existing waste feedstocks from our agricultural and forestry sectors, and large-scale renewable energy potential for processing.

Under the central scenario, domestic LCLF production can reach 2 per cent of total fuel demand by 2031, 10 per cent by 2035 and 15 per cent by 2040, addressing 35 per cent of residual fuel demand after electrification by 2040. This is the second most effective lever and the only one that can meet almost all of Australia's hard-to-electrify aviation residual demand.

Lever 3 Domestically sourced and refined crude oil

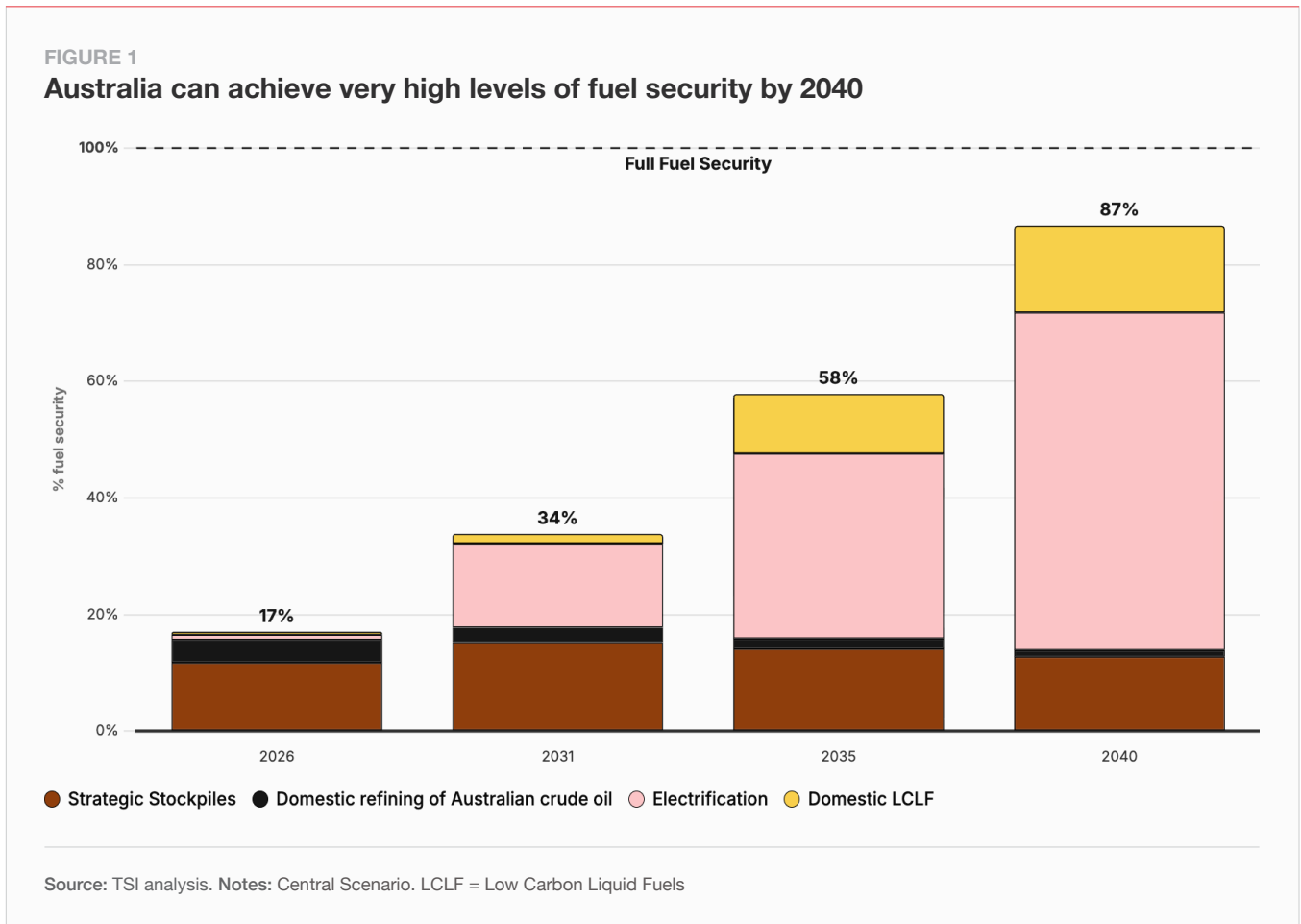


Most petrol, diesel and jet fuel refined in Australia is made from imported crude, which is as exposed to supply disruptions as imports of refined fuels.

Domestically sourced and refined crude oil currently provides 4 per cent of national liquid fuel demand.⁵ Under the central scenario, declining crude production reduces this share to 3 per cent in 2031, 2 per cent by 2035 and 1 per cent by 2040. This lever can only make very modest contributions to fuel security.

Australia can achieve very high levels of fuel security by 2040

Under the central scenario, total fuel security rises from approximately 17 per cent today to 34 per cent by 2031, 58 per cent by 2035 and 87 per cent by 2040. Sovereign supply — the share of demand met without reliance on imports — rises from 5 per cent today to 74 per cent by 2040 (Figure 1).



This dramatic growth in security and sovereign supply comes from electrification and production of LCLFs. Domestically sourced and refined crude oil contributes a declining share. After implementation of the government’s Australian Fuel Security and Resilience package, stockpiles contribute a constant absolute volume that represents a falling share of a growing demand pool. As electrification displaces the majority of fuel demand, constant stockpiles represent an increasing share of residual fuel demand and net imports (Table 2).

TABLE 2
Australia's fuel security and sovereignty trajectory, 2026-2040

	2026	2031	2035	2040
Electrification (share of total demand)	0.8%	14%	32%	58%
Australian low-carbon liquid fuels (share of total demand)	0.5%	1.6%	10%	15%
Domestically sourced and refined crude oil (share of total demand)	4%	2.5%	1.7%	1.1%
Sovereign supply (electrification + LCLF + refined domestic crude)	5%	19%	44%	74%
Strategic stockpiles (additional secure supply)	12%	15%	14%	13%
Total secure supply	17%	34%	58%	87%

Source: TSI analysis; Deloitte Access Economics.

Three observations frame the remainder of the analysis.

First, the public commentary on fuel security which calls for expanded domestic crude exploration and new refining capacity is focused on the wrong lever. Australian-refined domestic crude oil cannot solve, or even meaningfully improve, Australia's fuel security challenge. Geoscience Australia finds that even the most ambitious effort to source and refine domestic crude oil would peak at a contribution of around 5 per cent of fuel demand, lasting a few years before resource exhaustion.⁶

Second, the most effective lever also has the most immediate benefits. Electrification draws on technology that is already commercially mature for most applications, and is deployed through ordinary fleet turnover rather than requiring new industrial facilities. The constraint on electrification is policy and infrastructure, not technology, cost or availability.

Third, the three sovereign-supply levers are complementary rather than substitutable. Electrification handles the bulk of demand but cannot, with current technologies, displace demand from the aviation and maritime sectors. LCLF production handles hard-to-electrify sectors but cannot scale to total demand. Australian-refined domestic crude oil adds a small sovereign contribution but is quickly depleted. Strategic stockpiles, addressed separately below, provide a short-term buffer.

The remainder of this paper examines each lever in turn. Lever 1 is electrification, the most effective lever. Lever 2 is LCLFs, the means of meeting residual demand in hard-to-electrify sectors. Lever 3 assesses capacity to expand Australian-refined domestic crude oil and explains why resource scarcity, geology, and uncompetitive costs impose a ceiling on what it can deliver. A section on strategic stockpiles addresses their role and limits. The final section describes some policy options that will help Australia achieve greater fuel security.

Electrification can displace most of Australia's liquid fuel demand



The most effective way to reduce Australia's dependence on imported liquid fuels is to stop using liquid fuels where possible. Land-based uses of fuel collectively account for 79 per cent of Australia's liquid fuel demand: cars, light commercial vehicles and trucks (57 per cent), mining equipment (14 per cent), agricultural machinery (5 per cent) and rail (3 per cent).⁷ Electric alternatives exist in all these sectors, at various levels of maturity, supported by rapid advancements in battery, electric powertrain and charging technologies.

Every vehicle powered by domestically generated electricity, rather than imported diesel or petrol, directly increases Australia's sovereign fuel supply and permanently reduces import dependence. Electrification can be cost neutral if vehicles are replaced at end-of-life with an electric vehicle (EV).⁸

TSI's central scenario, informed by Deloitte Access Economics' fuel demand analysis and CSIRO's electrification projections,⁹ finds (Figure 1):

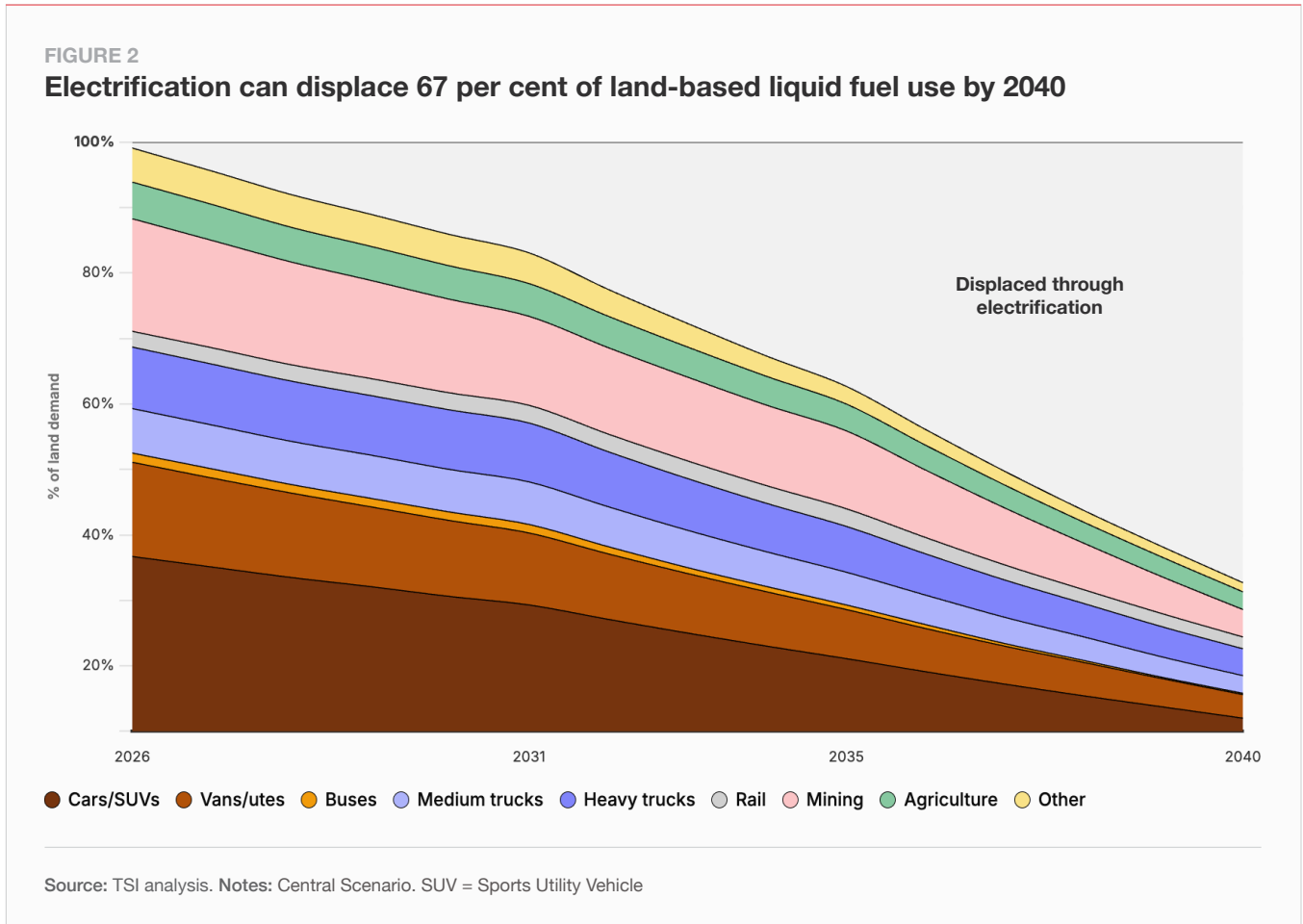
- By 2031: electrification displaces 14 per cent of liquid fuel demand each year (9.6 GL)
- By 2035: 32 per cent of liquid fuel demand is displaced each year (22.9 GL)
- By 2040: 58 per cent of liquid fuel demand is displaced each year (46.2 GL)

Electrification displacing fuel use in the economy is a case of steadily replacing existing fossil-fuelled machinery, beginning with light road vehicles. Light vehicles, covering both passenger vehicles and light commercial vehicles, currently consume 26 GL of fuel in a year. Light vehicle sales continue their momentum to 2031, with the fleet turning over through to 2040. After accounting for growth in the overall number of vehicles, they represent about 10.4 GL of fuel consumption in 2040.

Medium and heavy duty trucks and buses consume 8.9 GL of diesel in 2026, and will take longer to increase sales of electrified versions, due to near term infrastructure constraints. Following a delayed turnover and accounting for growth in trucking use, in 2040 there is a residual fuel demand of 4.5 GL.

Other land based uses of fuel, including mining, agriculture and rail are also limited by infrastructure. In 2026, about 15 GL of fuel is used for off-road purposes. The central scenario has limited progress to 2031 with just 2.7 GL of fuel displaced by electrification, largely from early movers in mining. By 2040, off-road fuel use reduces to 6.7 GL.

After 2040, electrification will continue to displace remaining demand for liquid fuel from the land transport and equipment fleets (Figure 2).

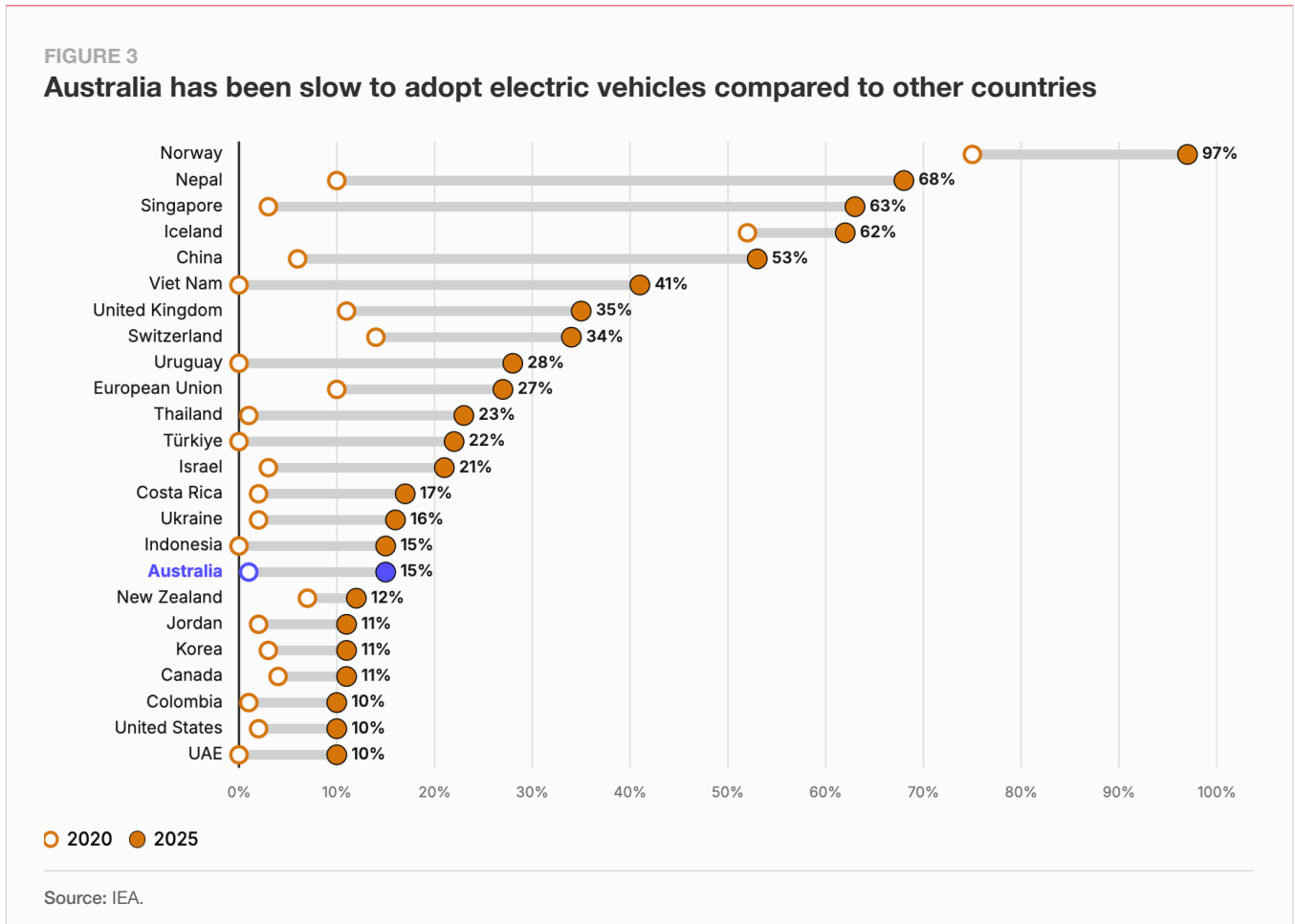


Australia has renewable resources on the scale required to support widespread electrification. Australia’s solar and wind resources are abundant, increasingly cheap and widely distributed across the country. As renewable generation and grid-scale battery investment expand, electrification allows Australia to replace imported fuel with domestically produced electricity.

Falling sales prices and significantly lower operating costs mean much of this electrification can happen at a lower total cost of ownership than fossil fuel alternatives.

Australia has been a slow adopter, but the pace is quickening

To date, electrification has displaced about 1 per cent of Australia’s liquid fuel demand — one of the lowest rates among comparable developed economies. Historically, Australia has had a poor EV uptake, which can be attributed to infrastructure gaps, policy settings and concerns about price and range (Figure 3).¹⁰

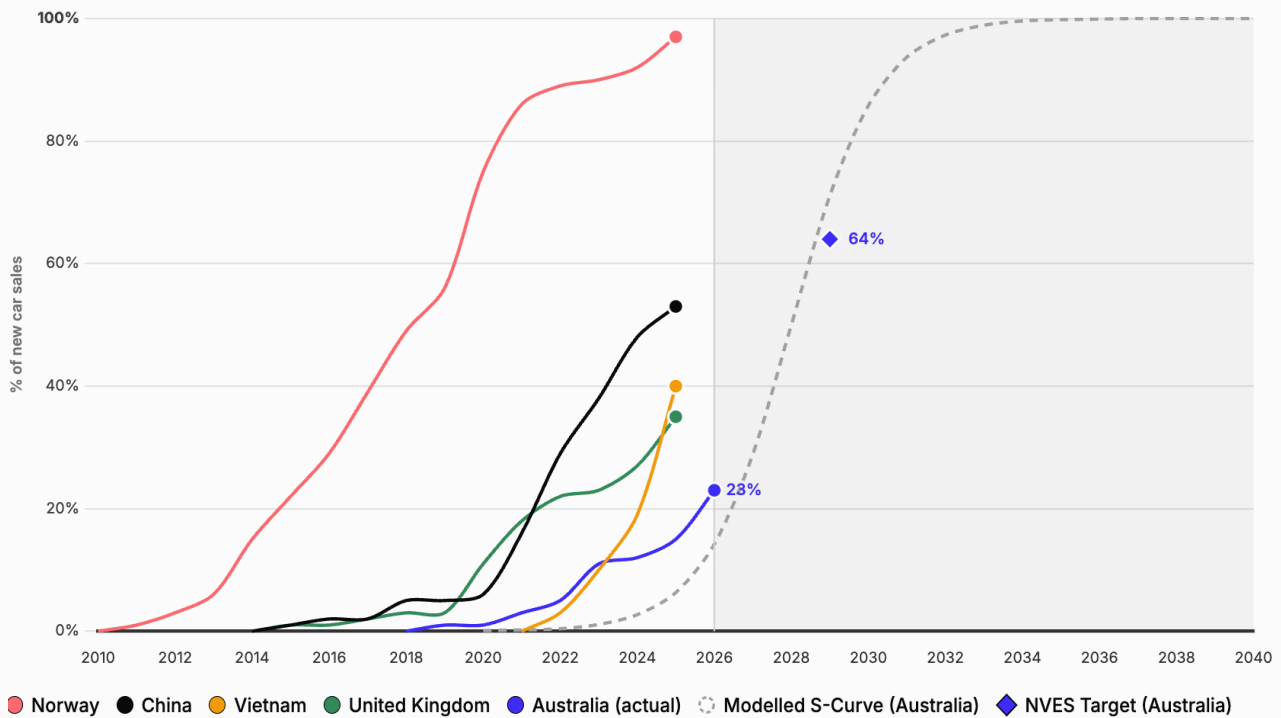


For passenger vehicles, this is shifting – EV uptake is accelerating. Passenger vehicles are the largest single component of fuel use in Australia, consuming about 19 GL of predominantly petrol, equivalent to 31 per cent of demand. Thanks to technological improvements and cost competitiveness, and nascent fuel efficiency standards bringing new models to Australia, recent EV sales have ticked up to 15 per cent.¹¹ Since the Hormuz closure, EV sales have jumped to 25 per cent in April 2026 and 30 per cent in May 2026.¹²

The adoption of a new successful technology is typically described by a stylised path called an S-Curve. It describes how the take-up rate of a new technology is limited to early adopters in the beginning, then rapidly accelerates when it reaches an inflection point of widespread popularity, and then slows down again as the final hold-outs convert.¹³

TSI has modelled EV take-up following a conventional S-curve, consistent with international examples and recent data (Figure 4).

FIGURE 4
Australian sales of passenger electric vehicles can be expected to follow international ‘S-Curves’



Source: IEA. Notes: NVES = New Vehicles Efficiency Standard; EV = light electric vehicle, including both battery electric vehicles and plug-in hybrid electric vehicles. ‘S-curves’ describe the adoption rate of new technologies, based on sales. Australia’s 2026 sales figure is the average sales through the year to May, based on reporting of VFACTS data

Our modelling assumes that the rate of vehicle retirement is consistent with the historical average. Box 1 explains how the rate of vehicle retirements replacing old vehicles affects the overall stock of vehicles that are operating (see Box 1).

BOX 1
How ‘stocks and flows’ affect fleet composition

The spread of a new technology through the economy has two notable dimensions: the stock of the old technology and the flow of the new. The stock of a technology describes all of the products already in use - for instance - Australia’s 20 million light vehicles. The flow is the new vehicles that are sold and the old vehicles that are retired.

When modelling how a new technology displaces an old technology, the flow is usually the focus, but it is changes to the composition of total stock that will change fuel consumption, based on vehicle retirements as well as sales. For example, in Norway 97 per cent of new cars sold are electric vehicles, but only a third of all cars on the road are electric. Fuel security will be determined by the number of cars on the road that continue to consume petrol and diesel.

The total cost of ownership for light EVs – cars, utes, and SUVs – is now lower, on average, than the total cost of ownership for the fossil-fuel based alternatives.ⁱⁱⁱ This is partly due to substantial reductions in the up-front cost of purchase from new Chinese-manufactured brands.¹⁴ Recent fuel price rises have also made consumers increasingly aware of and sensitive to the higher running costs for cars using petrol and diesel, making EVs progressively more attractive.

The priority for Australia's fuel security policy should be maintaining EV sales momentum. International comparisons illustrate the potential. The IEA observes rapid acceleration around the world, beyond Norway and Northern Europe. South and East Asian countries have seen accelerating sales, even before the fuel disruptions of the Iran conflict (see Figure 3). This widespread adoption is a result of battery prices falling approximately 85 per cent over the past decade, driving the widespread deployment of affordable and mass produced passenger electric vehicles.¹⁵

Heavy freight can electrify

Recent technical developments and falling prices mean electric freight vehicles are increasingly competitive in the medium and heavy duty freight segments.¹⁶

There are two dimensions to cost competitiveness in trucking: the upfront cost of the truck, and running costs which depend on the rate of utilisation.

For smaller electric trucks that operate in urban environments, such as supermarket home-delivery trucks, cheap models are competitive despite lower utilisation rates.¹⁷ These trucks can return to a depot to charge overnight.

For heavier electric trucks, higher up-front costs require higher utilisation rates for electrification to be cost-competitive. Improvements in battery performance and charging capacity, and innovations such as battery swapping and aerodynamic design, have cleared many technology barriers. Heavy electric trucks have also benefited from battery cost reductions: prices are falling, and more models are emerging. Australia has existing models of electric articulated trucks that match diesel alternatives on range and power at a lower total cost of ownership,¹⁸ and electric fleet operators are also emerging.^{iv}¹⁹ For operators with low utilisation rates, the price of heavy electric trucks will need to fall further before they are a cost-effective alternative to diesel-fuelled trucks.

There are regulatory and infrastructure barriers holding back electrification of heavy vehicles – especially vehicles used over long distances. For example, weight restrictions on heavy vehicles present a regulatory barrier to electrification, as the extra weight of these trucks reduces the freight that they can carry.²⁰ Reforming these restrictions removes a barrier to fleet operators electrifying sooner.²¹

ⁱⁱⁱ The average Australian drives around 12,000km per year and spends around \$2,500 on petrol; the same distance each year would cost around \$500 to charge. EV owners are estimated to save between \$300-\$400 every year in maintenance costs compared to an equivalent combustion engine vehicle. Over an average eight to ten years of car ownership, accumulated savings of about \$20,000 cover the historical price gap.

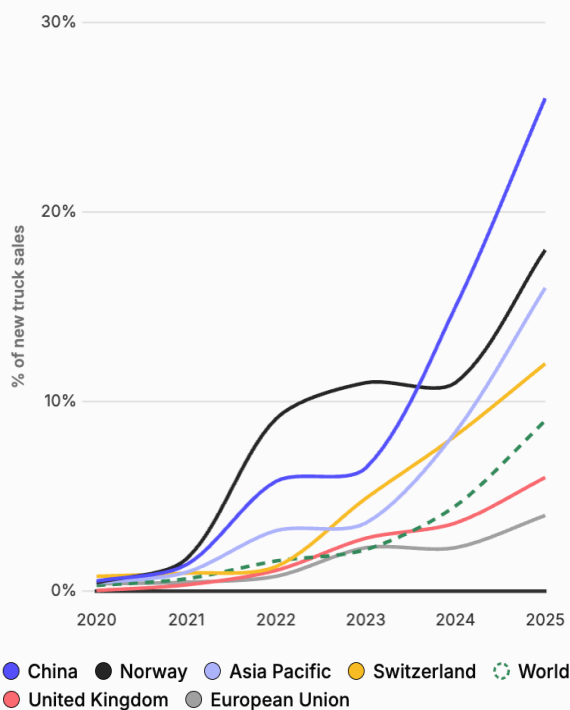
^{iv} For example, New Energy Transport specialises in trucks operating up to 500 kilometres per charge. Despite higher upfront capital costs, diesel savings at current prices produce payback periods under four years: Eden, 'Long Distance Electric Truck Plans Fast-Tracked'.

Gaps in charging networks are an infrastructure barrier, particularly for long-distance electric freight vehicles. Most charging of electric trucks will happen overnight at private depots, but interstate and regional trucking will be more reliant on common-use public charging infrastructure. This will be needed to support Australia's 140,000 articulated trucks, which consume much more diesel per vehicle than any other vehicle type – an average of 42,000L for each truck, each year.²²

The large capital cost of high-power megawatt-scale charging infrastructure requires high utilisation rates to justify investments.²³ The concentration of freight along key routes in Australia such as Melbourne to Sydney could provide this level of use, but early investors would need to pay for infrastructure before the heavy vehicle fleet contains enough EVs to support the investment.²⁴

Once regulatory and infrastructure barriers are cleared, the IEA has found that trucking can electrify faster than passenger vehicles.²⁵ Commercial pressures mean trucking companies are much more sensitive to operating costs. As fleets look to optimise their operations, the switch to electrification should accelerate in the right enabling environment.

FIGURE 5
Electric heavy vehicle sales are rising in other countries



Source: IEA.

There are international examples of increasing sales, and of infrastructure being built to facilitate adoption. Global sales of electric trucks are up to 10 per cent of heavy freight.²⁶ China leads the way; a quarter of all new heavy trucks sold in 2025 were electric, peaking at half of those sold in December 2025.

Europe is on a slightly slower timeframe as their vehicle manufacturers try to catch up to Chinese producers, but infrastructure investments are supporting sales growth (Figure 5).²⁷

“Australia has *existing models of electric articulated trucks* that match diesel alternatives on range and power at a lower total cost of ownership”

“Once regulatory and infrastructure barriers are cleared ... *trucking can electrify faster than passenger vehicles*”

Mining and agriculture have electric solutions but lack incentives

Mining has been one of the largest drivers of Australia's growing diesel use.²⁸ As mines are depleted, extraction becomes more diesel-intensive.²⁹ Mining diesel use has increased from around 6 GL in 2022 to 9 GL in 2026.

Despite significant purchasing power, and despite potential savings from avoiding diesel use, very few mining companies are building the infrastructure to electrify. Some miners have attributed this to challenges around the availability of equipment, the difficulty of providing energy to remote sites and the lack of incentives.

Some progress is being made, with mines investing in renewable energy to power their operations – for example, Liontown Resources in Kathleen Valley,³⁰ and Lynas Rare Earths in Mt Weld.³¹ First-mover companies like Fortescue Metals Group are using their purchasing power to introduce battery electric mining equipment, reducing costs for companies that do the same.³²

The agriculture sector experiences many of the same challenges as the mining sector, but it is less capital intensive and operations are often more dispersed. The need to run large machines in rural and remote areas, often with poor or constrained access to energy, has proved challenging. However, as the renewable energy rollout continues and more electricity infrastructure is built, these constraints will ease.

Although carbon emissions are not the focus of this analysis, it is important to note that the interaction between Australia's fuel excise and diesel fuel rebate creates a barrier to electrification, particularly in the mining and agricultural sectors. Liquid fossil fuels are extremely carbon-intensive, but because fuel taxes and rebates do not reflect the social cost of carbon, they do not create an efficient incentive to switch to lower-carbon – and sovereign – EVs or LCLFs. There is a clear role for government in addressing externalities from carbon emissions, which complements the goal of fuel security. The fuel excise should be reformed to separate the policy objectives of a road user charge and pricing pollutants.

Low carbon liquid fuels can close the security gap for hard-to-electrify sectors



Electrification can dramatically reduce Australia's foreign fuel dependence by 2040. But the aviation and maritime sectors are hard to electrify because batteries are not as energy dense as liquid fuels. This imposes range and cargo limitations which are most acute for long-haul aviation and shipping. Battery or hybrid electrification may serve short-range regional flights and some coastal or port maritime operations, but both sectors will require liquid fuels to meet the range and performance demands of commercial operations. 14 per cent of Australia's liquid fuel demand is from domestic and international aviation and 3 per cent from maritime shipping.³³

Australian-produced LCLFs, rather than direct electrification, are the realistic fuel security pathway for most aviation and maritime needs (Figure 1):

- By 2031: 1.6 per cent of demand, equivalent to 1.9 per cent of residual demand for liquid fuels (1.1 GL)
- By 2035: about 10 per cent of demand, equivalent to 15 per cent of residual demand (7.4 GL)
- By 2040: about 15 per cent of demand, equivalent to 35 per cent of residual demand (11.9 GL)

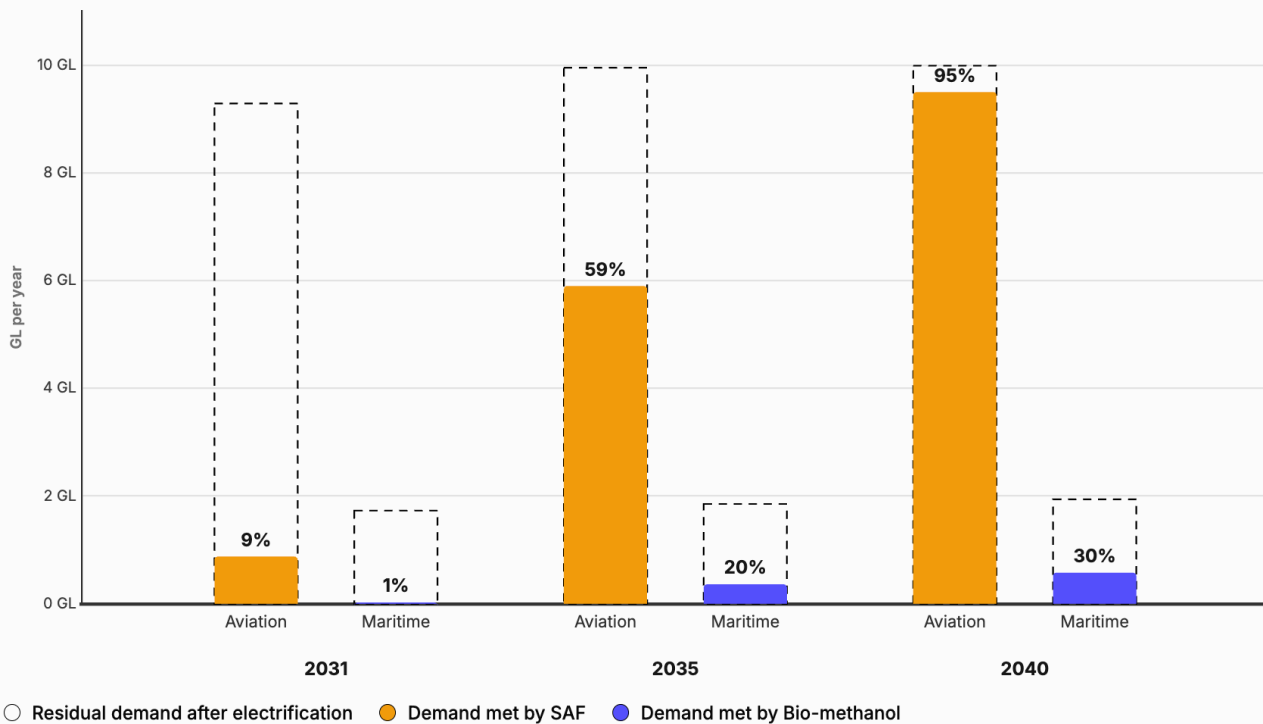
Low-carbon liquid fuels can meet almost all aviation demand by 2040

Our central scenario assumes 80 per cent of Hydroprocessed Esters and Fatty Acids (HEFA) and Alcohol-to-Jet LCLFs are used for sustainable aviation fuel (SAF), and 20 per cent for renewable diesel (RD) to fuel land uses. 80 per cent of gasification LCLFs are used for SAF via the Methanol-to-Jet process, with 20 per cent producing bio-methanol for shipping.

In 2031 LCLF production would meet 9 per cent of aviation fuel demand, 0.5 per cent of diesel demand and 1.5 per cent of maritime demand. By 2035, with significant expansion, LCLF production could meet 59 per cent of aviation, 3 per cent of diesel and 20 per cent of maritime demand. With further growth to 2040, LCLFs could meet 95 per cent of aviation demand, 7 per cent of diesel and 30 per cent of maritime demand (Figure 6):

FIGURE 6

Australian LCLFs can meet nearly all Australia’s aviation fuel needs by 2040



Source: TSI analysis. Notes: Central scenario. LCLFs = Low Carbon Liquid Fuels. GL = giga litres. Bio-methanol for maritime requires about 2.2 times the volume for the equivalent energy content of fossil marine fuels, which is accounted for in volume analysis. Bio-methanol production is 0.06 GL in 2031, 0.8 GL in 2035 and 1.3 GL in 2040. This scenario also produces increasing amounts of RD – up to 1.1 GL in 2040, equivalent to 7 per cent of residual diesel demand.

The same feedstocks could also be used to make a higher proportion of renewable diesel (RD) if the heavy vehicle fleet relies on it more heavily than the central scenario we model; California’s experience implementing the Low Carbon Fuel Standard was that renewable diesel played an important role in the early transition away from petroleum-based diesel. However, recent progress has been driven by electrification, rather than LCLFs.³⁴ TSI therefore sees a limited role for RD in the land sector, reflecting the lower cost of electrification. LCLFs are most likely to be used by the hard-to-electrify air and maritime sectors.

“With further growth to 2040, LCLFs could meet 95 per cent of aviation demand”

What are LCLFs?

LCLFs are alternatives to liquid fossil fuels. They can perform many of the same functions as liquid fossil fuels, but are made from lower-carbon, renewable plant- or animal-based carbon feedstocks – such as oils, sugars, and waste biomass – and renewable carbon dioxide and green hydrogen.

Their main value is that they retain the practical advantages of liquid fuels: high energy density, ease of storage and transport, and compatibility with much of the fuel infrastructure Australia already uses. This makes them especially important for sectors where batteries are unlikely to meet all commercial needs, particularly long-haul aviation and maritime shipping.

LCLFs can be produced in Australia with Australian feedstocks, reducing dependence on imported oil while producing significantly lower lifecycle greenhouse gas emissions than their fossil fuel equivalents.

There are three major LCLF products that together cover most hard-to-electrify applications in aviation, maritime, land transport and land-based machinery:

Sustainable aviation fuel, or **SAF**, is a low-carbon substitute for fossil jet fuel. It is chemically similar to conventional aviation fuel and can be used in existing aircraft engines and fuelling infrastructure.^v

Renewable diesel, or **RD**, is a low-carbon substitute for petroleum diesel. It is chemically similar to conventional diesel and can be used in existing diesel engines and fuel infrastructure.

Bio-methanol and **e-methanol** are low-carbon marine fuels suitable for use in modified marine engines. Bio and e-methanol can also be used as an input to produce sustainable aviation fuel.

Multiple pathways to multiple LCLFs

There is no single LCLF pathway. Different fuels can be made from different Australian feedstocks using different production processes (see Table 3).

Canola, tallow and used cooking oil can be refined into SAF and RD through the HEFA pathway. Sugarcane and bagasse can be converted into ethanol and then into SAF and RD through the Alcohol-to-Jet pathway. Forestry and agricultural residues can be converted into syngas through gasification, and then processed into various LCLFs. In the longer term, green hydrogen and renewable carbon dioxide can be combined to make synthetic fuels through power-to-liquid pathways.

“Australia has abundant renewable resources to support an enduring LCLF capability, helping to meet residual fuel demand while reducing import dependence.”

^v SAF currently has a certified blend ratio up to 50 per cent, and RD up to 100 per cent.

TABLE 3

A guide to LCLF feedstocks and production pathways

Example feedstock	Processing pathway	LCLF
Canola Waste tallow Used cooking oil	<p>● HEFA – Hydroprocessed Esters and Fatty Acids</p> <p>Uses hydrogen and refining processes to remove oxygen from oils and fats, then converts them into fuel hydrocarbons that are chemically similar to those in conventional jet fuel and diesel.</p> <p>HEFA is the most commercially mature LCLF pathway.</p>	● SAF
		● RD
Sugarcane	<p>● Alcohol-to-Jet</p> <p>Biomass is fermented into ethanol, then refined through a four-step process to produce drop-in sustainable aviation fuel and renewable diesel.</p>	● SAF
Bagasse (sugarcane waste)		● RD
Forestry and agricultural residue Green hydrogen	<p>● Gasification</p> <p>Gasification uses high heat and controlled oxygen or steam to convert solid biomass into syngas – a mixture of mainly hydrogen and carbon monoxide. Syngas can be converted to SAF and RD directly via the Fischer-Tropsch process, or synthesised into bio-methanol and then processed into SAF via the Methanol-to-Jet (MtJ) process.</p> <p>Adding green hydrogen roughly doubles fuel yield.</p>	● Bio-methanol
		● SAF
		● RD
Renewable carbon dioxide from industrial processes Green hydrogen	<p>Power-to-Liquid</p> <p>Power-to-Liquid combines green hydrogen with renewable carbon dioxide to make synthetic fuels. It is less constrained by biomass supply, but depends on low-cost renewable energy, green hydrogen and sustainable carbon dioxide.</p>	E-Methanol
		● SAF
		● RD

Notes: SAF - Sustainable Aviation Fuel, RD - Renewable Diesel.

Australia's LCLF production potential

Australia currently produces a small volume of legacy biofuels, mainly ethanol and biodiesel, equivalent to about 0.3 GL a year. However, it does not currently produce SAF or RD, the LCLFs most relevant to the fuel security pathway we modelled in this chapter.

Australia has abundant renewable resources to support an enduring LCLF capability, helping to meet residual fuel demand while reducing import dependence.

Australia currently exports about 80 per cent of its HEFA feedstocks, mostly to European and Asian refineries producing SAF and RD.^{vi} These exports include canola, tallow and used cooking oil. In our central scenario Australia diverts an increasing proportion of existing LCLF feedstocks to domestic production. Canola supply is also expanded under the central scenario, with Australia well positioned to increase production.³⁵ To do this without compromising other biodiversity and environmental goals, it will be important to certify and ensure the sustainability characteristics of different feedstock crops, in particular emissions from land-use change.

Under our central scenario for LCLF production, Australia produces just over 1 GL of LCLF by 2031. By 2035, total production climbs above 7 GL, and in 2040 production exceeds 11 GL. The three main processing pathways – HEFA, Alcohol-to-Jet, and Gasification for Methanol-to-Jet – all produce increasing volumes through time. HEFA dominates early production, representing about two thirds of production in 2031. By 2040 more than half of total production is from Methanol-to-Jet. Most LCLF production supplies the aviation sector, with smaller shares going to the land-based and maritime sectors (Figures 7a and 7b).

“To do this without compromising other biodiversity and environmental goals, it will be important to certify and ensure the sustainability characteristics of different feedstock crops, in particular emissions from land-use change”

^{vi} See Appendix B3 for further detail on LCLF feedstock availability.

FIGURE 7

By harnessing different feedstocks and production pathways, Australia can dramatically increase LCLF production by 2040

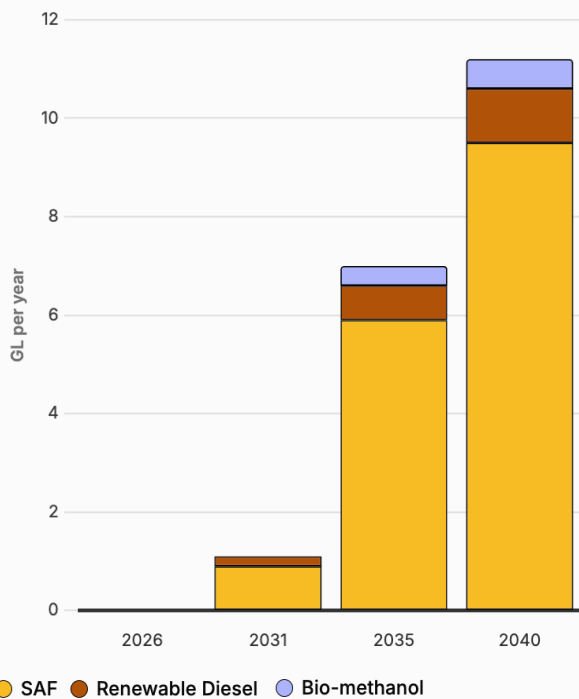


FIGURE 7a

The majority of LCLF production is SAF for the aviation sector

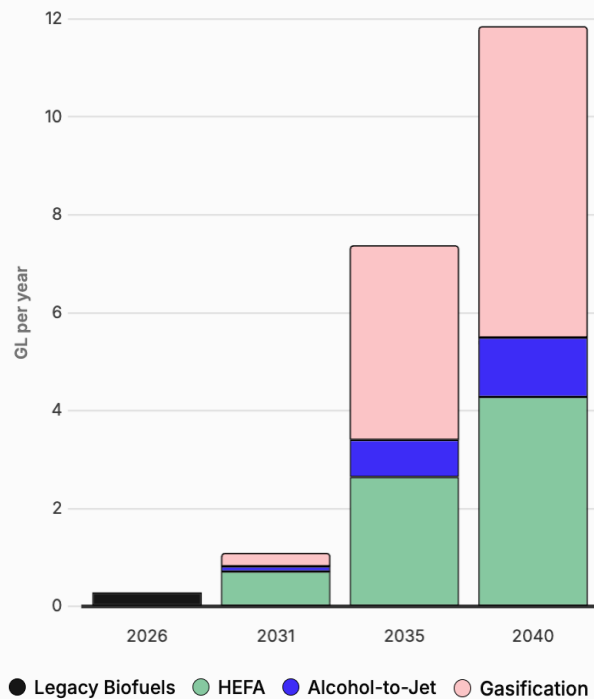


FIGURE 7b

LCLF production harnesses different feedstocks and pathways

Source: TSI analysis. Notes: Central scenario. HEFA (hydroprocessed esters and fatty acids). Legacy biofuels include ethanol and biodiesel. See Box 2 for more detail on production pathways. In Figure 7a the Bio-methanol volume is divided by 2.2 to account for the difference in energy density compared to the marine fuel that is being displaced. Actual bio-methanol production is 0.06 GL in 2031, 0.8 GL in 2035 and 1.3 GL in 2040.

Australia already has a substantial LCLF project pipeline of about 2.2 GL. The three main LCLF refining pathways – HEFA, Alcohol-to-Jet and Gasification for Methanol-to-Jet – are each represented by potential Australian projects at advanced stages of development.

As international decarbonisation lifts demand for LCLFs, and as broader sustainability concerns become more important, LCLF certification schemes will be essential for producing market-ready LCLFs. The government’s Guarantee of Origin (GO) certification framework creates opportunities for robust, transparent and Australian-specific carbon intensity factors based on lifecycles and land-use changes, rewarding sustainable practices. Well-designed certification that is inter-operable with international standards will allow the international market to correctly value Australian LCLFs.

Domestically sourced and refined crude oil cannot provide fuel security



Domestically sourced petroleum is the least effective lever to increase sovereign fuel supply.

Sovereign diesel, petrol, and jet fuels requires two things: domestic refining capacity, and a sufficient supply of suitable Australian crude oil and condensate ('crude oil'). But Australia's refineries rely on imported crude oil, Australia's existing reserves of crude oil are low and declining, and remaining resources are scarce and internationally uncompetitive.^{vii}

Domestically sourced and refined crude oil can only make a very small contribution to fuel security (Figure 1):

- By 2031: domestically sourced and refined crude oil provides 2.5 per cent of liquid fuel demand each year (1.7 GL)
- By 2035: 1.7 per cent of liquid fuel demand is provided each year (1.3 GL)
- By 2040: 1.1 per cent of liquid fuel demand is provided each year (0.9 GL)

Australia's refineries rely on imported oil

Expanding Australia's capacity to refine imported crude oil does not solve Australia's fuel security problems, because it is vulnerable to the same international supply disruptions and price spikes as refined fuel imports.

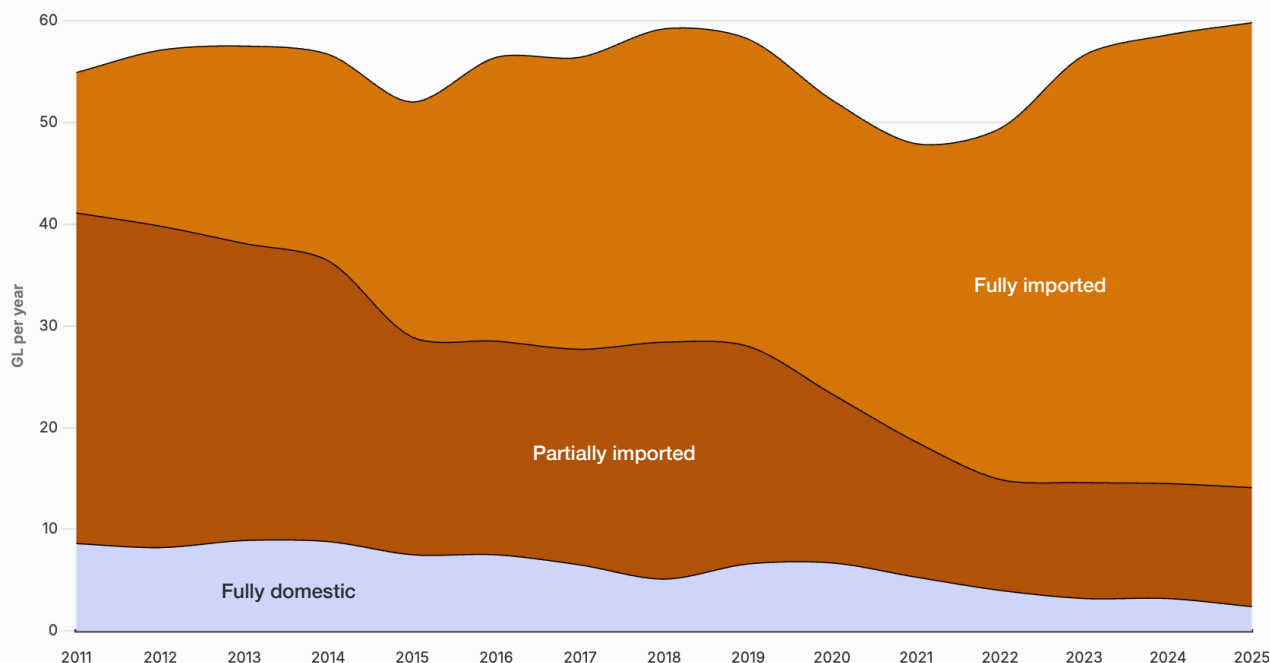
Australia imports 77 per cent of its refined fuels. Just three countries supply about 60 per cent of Australia's diesel (South Korea, Singapore and Malaysia) and over 70 per cent of aviation fuel (China, Singapore and South Korea).³⁶

Australia's two refineries are currently 83 per cent dependent on imported crude oil.³⁷ Even in 2011, when Australia had seven refineries producing 41 GL of refined fuels, this supply was neither sovereign nor secure, because only 21 per cent of the refinery feedstock was supplied by domestic crude oil.³⁸ Over the past 15 years Australia has been overwhelmingly reliant on imported crude oil to operate its refineries (Figure 8).

^{vii} Assessments that resources are 'internationally uncompetitive' are based on Geoscience Australia's commercial assessment of resources; see Geoscience Australia, 'Appendix 3'.

FIGURE 8

Australia relies on imported refined fuels and imported crude oil, with very low sovereign fuel supply



Source: Australian Petroleum Statistics Feb 2026,³⁹ IEA Australia Oil Data 2000 to 2024.⁴⁰ Notes: Fully imported - finished product. Partially imported - imported crude oil, refined in Australia. Fully domestic - Australian crude oil, refined in Australia.

“Australia’s domestic crude oil production continues to decline rapidly, and without new commercial discoveries, *production is projected to cease within the next 7 years.*”⁴¹

Refining a larger share of domestic crude oil is not a pathway to sovereignty

There are no fuel security benefits from domestic refining unless domestic crude oil displaces imported crude.

But Australia’s existing crude oil supplies are modest and declining. In 2025 Australian refineries processed 2.4 GL of domestically sourced crude oil, equivalent to only 17 per cent of their crude oil feedstock, and about 4 per cent of annual liquid fuel demand.⁴²

The Bass Strait fields that once underpinned eastern Australia’s oil supply are substantially depleted.⁴³ From 2020 to 2025 Australia’s crude oil and condensate production fell from 20.4 GL to 14.2 GL, an annual reduction of 7 per cent.⁴⁴

The majority of Australia’s production in 2023 was condensate from offshore gas fields,⁴⁵ with 94 per cent of crude oil, condensate and natural gas liquids exported because they are physically and contractually locked

into LNG production.⁴⁶ Condensate is a very ‘light’ petroleum and mostly produces petrol, yielding little of the diesel or jet fuel that Australia needs.

Even under a scenario in which all suitable Australian crude is diverted to domestic refineries, this lever could supply only 4.3 GL per year at peak, or around 7 per cent of current demand.^{viii}

Resource scarcity, geology and cost rule out a domestic crude oil revival

Expanding crude oil production by exploiting new resources cannot solve Australia’s fuel security problems.

The first challenge is time-to-production. Fuel insecurity is an urgent problem, but new oil and gas fields take an average of around 15 years from discovery to first output.⁴⁷

The more fundamental constraint is that conventional resources are scarce, and the Liquid Fuel Security Review Interim Report concluded that large new refineries in Australia are likely to be internationally uncompetitive.⁴⁸

In 2023, Australia’s total demonstrated resources of conventional oil, most of which is unsuitable for Australia’s fuel needs, was estimated as just over 20,000 PJ. This is equivalent to 565 GL, or a little over nine years of current demand. About 7,500 PJ are classified as ‘proven and probable’ reserves, equivalent to 209 GL, less than four years of current demand.⁴⁹

Crude oil production is not falling because companies aren’t searching for resources. Every year the federal government opens up offshore areas for oil and gas exploration, and companies continue to nominate areas of interest. Geoscience Australia provides data to de-risk explorations.⁵⁰ Exploration efforts have continued, without yielding commercial discoveries.

Cost is the barrier to expanded production: the lowest-cost conventional fields were developed first and are depleting. The Great Australian Bight is the clearest example: between 2016 and 2020, BP, Chevron and Equinor all abandoned plans to drill, with Equinor stating its approved well was not commercially competitive.⁵¹

Looking beyond conventional oil reserves, proponents of expanded domestic production point to the larger unconventional resource base, including shale oil, tight oil, oil shale and basin centred natural gas liquids. But the cost of extracting Australia’s larger unconventional resources is not internationally competitive.⁵²

80 per cent of Australia’s total demonstrated oil resource is oil shale,⁵³ a rock deposit requiring expensive surface mining and intensive processing. Geoscience Australia classifies oil shale resources under the subeconomic ‘paramarginal’ and ‘submarginal’ categories.⁵⁴ Other contingent unconventional oil resources are currently limited — about 900 PJ, or 25 GL, of condensate and liquid petroleum gas (LPG), which are not suited to domestic refining.⁵⁵ There are currently no unconventional oil reserves or production in Australia.⁵⁶

^{viii} Our central scenario assumes production of domestically sourced and refined crude oil through to 2050. Our low scenario assumes production ceases in 7 years, consistent with Geoscience Australia’s more conservative estimates. See Appendix B for further detail.

Strategic stockpiles can play a small role

Strategic stockpiles do not produce or replace fuel; they hold fuel in reserve as insurance against short-term supply disruption. The international benchmark is the IEA's 90-day stockholding obligation, which requires members to maintain emergency reserves equivalent to 90 days of net imports.^{ix} Stockpiles are necessary for any country exposed to import disruption, and their role in a fuel security framework is well established. They are not, however, a substitute for sovereign supply.

Australia currently holds approximately 52 days of strategic stocks, well below the IEA benchmark, equivalent to about 7 GL. The Government's recently announced \$10 billion Australian Fuel Security and Resilience package will add approximately 3 GL of strategic reserve storage to a total of 10 GL. This reduces the gap but is not sufficient to achieve fuel security.

In TSI's modelling, the absolute volume of strategic stockholding remains constant across the forecast period at around 10 GL, even as demand for fuel grows from approximately 60 GL today to 80 GL by 2040. As a result, the share of total demand covered by stockpiles falls over time even when the absolute reserve is unchanged, from approximately 15 per cent in 2031 when the expansion package is delivered, to around 13 per cent in 2040.

However, as electrification increasingly substitutes fuel demand, Australia's 10 GL strategic stockpiles represent a growing share of the residual fuel demand, rising from approximately 18 per cent in 2031 to 21 per cent in 2035 and 30 per cent in 2040.^x

Stockpiles are necessary but not sufficient. The larger Australia's import dependence, the larger and more expensive the stockpile needed to provide any given level of security. Conversely, reducing import exposure through electrification and domestic LCLF production reduces the size of the stockpile required for the same level of resilience. The two work together: sovereign supply addresses the underlying import exposure, while stockpiles manage the residual risk of short-term disruption.

^{ix} Australia has been an IEA member since 1979.

^x See Appendix C for more detail.

Policy options for Australia's fuel security

Australia's fuel security is a public good and so it is the government's job to meet Australia's fuel security objectives. People and businesses systematically underinvest in fuel security because they cannot capture its public benefits, face coordination problems in building shared infrastructure, discount low-probability catastrophic risks, and lack durable demand signals to underwrite long-lived investments in domestic alternative fuels.^{xi}

Like many long-term commitments in the national interest, committing to fuel security will incur costs alongside its many benefits.

Electrification is the lowest-cost pathway to fuel security. The cost of electrifying the transport fleet is coming down fast: many light EVs already have a lower lifetime cost than petrol and diesel-based alternatives, and an increasing share of heavy EVs are also cost-competitive.

Beyond electrification, costs will be higher, because LCLFs are not yet cost-competitive with liquid fossil fuels. But LCLF production is preferable to the alternatives: unlike Australian-refined domestic crude it can be produced in the near term, at scale, and production can be sustained over the long term; it also protects Australia from international markets, unlike strategic stockpiles of imported fuel. And as Australia works towards fuel security, the cost of LCLFs will come down as technologies mature and as markets emerge.

To support fuel security the government should commit to a number of actions that are within reach and realistic for introduction in the next year or two:

1. Resolve coordination failures: regulation and common-user infrastructure

The government should reform regulations on electric heavy trucks that are a barrier to sales and use. It should also fast-track efficient investments in common-user charging infrastructure for heavy vehicles, recognising that there is a coordination problem that holds back private investments in infrastructure and sales.

A domestic LCLF industry also requires shared infrastructure that no individual producer will build at an efficient scale: infrastructure for feedstock pre-processing and aggregation, blending and storage terminals at airports and ports, certification systems, and feedstock logistics networks.

There is a role for the government as an investor in and potential regulator of common-user infrastructure for LCLFs, supporting investments at an efficient scale and ensuring access is priced efficiently.

^{xi} Carbon emissions from fossil-based fuels are an externality that justify corrective policies, but this is addressed separately in TSI's broader policy work.

2. Provide innovation grants for positive spillovers: FOAK support

First-of-a-kind (FOAK) LCLF projects face higher costs and risks than subsequent projects. Because the benefits of technical learning and commercial demonstration cannot be captured by the first mover, there are positive knowledge spillovers that benefit later producers. Targeted capital grants for FOAK facilities that use Australian feedstocks are justified by these positive externalities. The FMIA Innovation Fund LCLF tranche and ARENA SAF Initiatives are steps in the right direction; the scale is insufficient.

3. Progress towards Australia's IEA 90-day strategic stockpile obligation

Australia's strategic stockholding remains structurally below the IEA benchmark, currently sitting at approximately 52 days against the 90-day requirement. The Government's recently announced \$10 billion reserves package recognises the importance of insuring against international supply shocks. However, stockpiles are only a stop-gap measure that complement rather than substitute for sovereign supply.

Reaching the benchmark requires either further investment in fuel storage, or a reduction in imports. Storage does not improve fuel sovereignty on its own, but reducing imports increases the security that any given level of storage provides. Progress towards the 90-day benchmark is a necessary part of the policy architecture, both for compliance with Australia's international obligations and as insurance during the period in which sovereign supply is being built.

4. Secure export markets through regional diplomacy

Australia's LCLF industry will be more attractive to investors if it supplies both domestic and export markets. Japan, South Korea, Singapore and several ASEAN economies are developing SAF and low-carbon maritime fuel mandates. Working with trade partners to align certification standards, harmonise mandates and establish green fuel trade corridors is a natural extension of Australia's broader Indo-Pacific strategy, and it mirrors the energy partnership Australia built with Japan for LNG and coal trade after the 1970s oil crisis.

5. Demand measures for sovereign fuel sources

The government should also introduce a demand mechanism for sovereign fuel sources. TSI has identified a suite of potential demand-side measures that would help displace imported fuel, focusing on the areas of most potential: electrification and LCLFs. TSI will produce detailed work on preferred demand mechanisms in the coming months.

Government policies, such as the Minimum Stockholding Obligation target, provide buffers and some limited fuel security, but not domestic supply. Government policies can be used to support electrification and LCLFs, harnessing market forces to deliver domestic supply at an efficient scale.

Current policies to support electrification are narrow in scope, time-limited, and could be more ambitious. The New Vehicle Efficiency Standard encourages electrification of light vehicles, but this policy only has targets to 2029 and there is no policy for heavy vehicles.

No Australian LCLF facility in Australia's pipeline has reached final investment decision (FID) because developers cannot secure offtake commitments. The industry is waiting for the government to implement policies that create demand, to enable progress to FID, construction and production. The government is aware of this barrier, flagging complementary policy in its Cleaner Fuels Program consultation and a demand mechanism in the 2026 Budget.

One demand-side policy option is an LCLF mandate, requiring fuel suppliers to incorporate a rising share of LCLFs into their product. There are several international precedents. While typically motivated by emissions-reduction goals rather than fuel sovereignty goals, the underlying mechanism is the same. One policy that explicitly targets both is the Renewable Fuel Standard in the US, introduced in the Energy Independence and Security Act of 2007.

A road-based demand mechanism would allow drivers to choose between EVs and vehicles fuelled by a mix of sovereign LCLFs and fossil-based fuels - such as California's Low Carbon Fuel Standard. For aviation, SAF mandates can lift demand for LCLFs; this is the approach being taken in the EU, UK, Singapore, South Korea, and elsewhere. A parallel marine fuel mandate would extend the same logic to shipping, especially if the International Maritime Organisation's Net-Zero Framework is not implemented.

The most successful international LCLF policies tie incentives to the policy's objective, not just production volume. In the case of a sovereign fuel policy, it would be a minimum share of Australian production using domestic feedstocks.

Another option would be to set a Fuel Security Target requiring an escalating proportion of Australia's fuels to be met by domestic sources (or a declining fuel import quota). Such a target could be met by any reduction in reliance on imported fuels, through electrification, LCLFs or domestically sourced and refined crude oil.

Conclusion

The Hormuz crisis has revealed the structural nature of Australia's fuel security problem. Australia is exposed to recurring supply shocks and price volatility because of its dependence on imported oil. Expanding domestic refining of Australian crude oil is not a credible solution: Australia's crude oil resources are too limited, slow and expensive to develop, and are not well suited to the fuels the economy needs most. Australia cannot drill its way to fuel security.

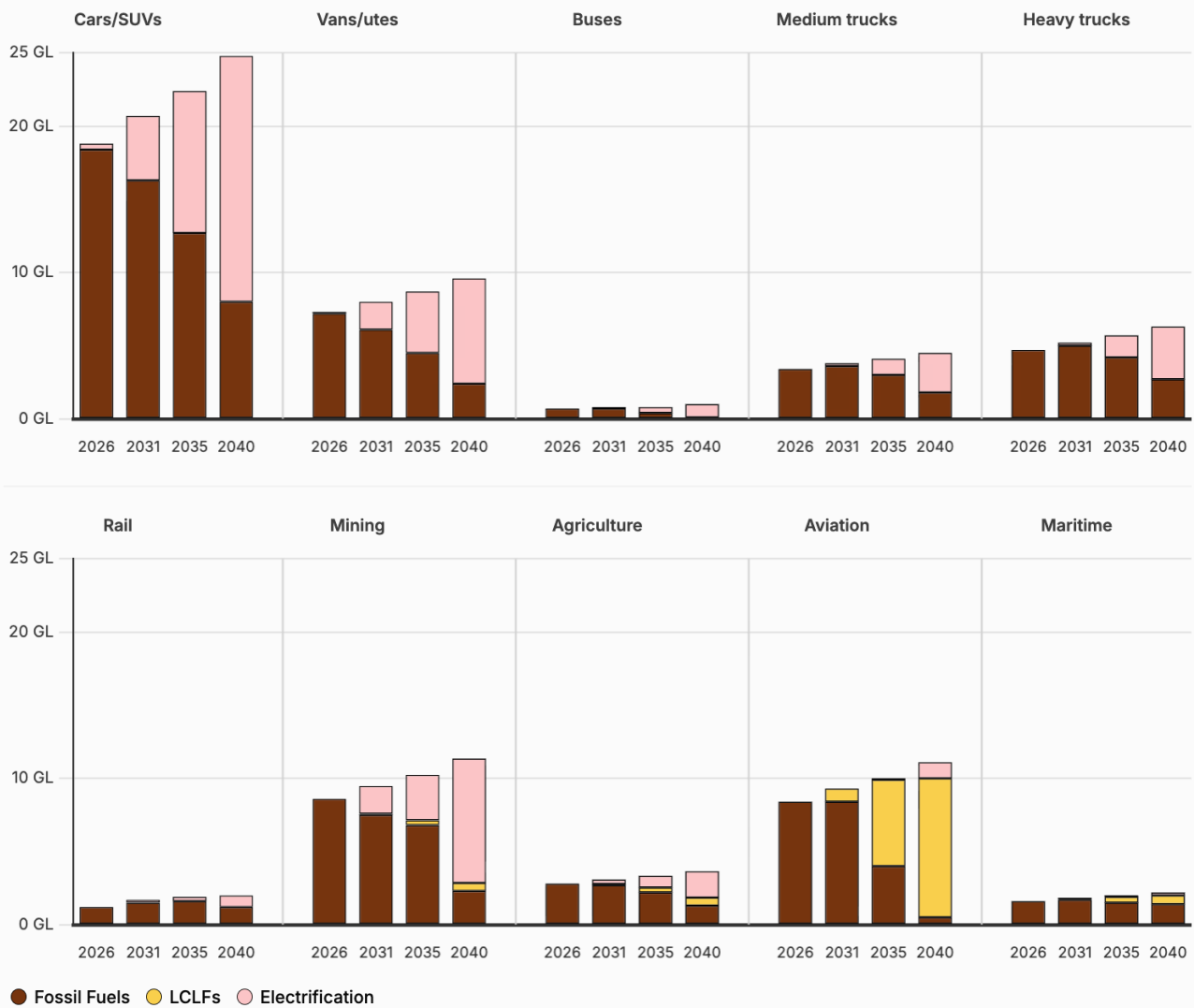
The practical pathway to fuel security is to reduce liquid fuel demand wherever possible through electrification, and to produce sovereign LCLFs where liquid fuels are still required. Strategic stockpiles remain necessary, but they are insurance against disruption, not a substitute for sovereign supply.

On this pathway, Australia can lift total fuel security from 17 per cent today to 34 per cent by 2031, 58 per cent by 2035 and 87 per cent by 2040. By 2040, around 74 per cent of liquid fuel demand could be met or avoided through electrification and sovereign LCLF supply, with strategic stockpiles providing the remaining buffer to end Australia's structural fuel vulnerability.

Across all sectors, electrification displaces the equivalent of roughly 46.2 GL each year by 2040 – 58 percent of total demand – with electrification of cars, SUVs, vans and utes accounting for around 24 GL per year of displaced fuel. Residual demand for liquid fuel falls from about 60 GL per year in 2026, to about 34 GL per year by 2040. LCLFs play an essential role, providing 9.5 GL per year for aviation by 2040, and 0.6 GL-equivalent per year for maritime.^{xii} Modest contributions in mining and agriculture total 1.1 GL per year. As a share of demand, liquid fossil fuels decline across all sectors (Figure 9).

^{xii} Note that bio-methanol production volume is adjusted by a factor of 2.2 to account for reduced energy content in comparison to marine fuel oil. Actual bio-methanol production is 0.03 GL in 2031, 0.4 GL in 2035 and 1.3 GL in 2040.

FIGURE 9
Electrification and LCLFs can meet rising demand across different sectors of the Australian economy



Source: TSI analysis. Notes: Electrification also has a role in 'other' small and miscellaneous sectors not displayed in Figure 9: in 2026, 2031, 2035 and 2040 electrification displaces 0, 0.3, 1.6 and 2.6 GL respectively, while fossil fuels contribute 2.6, 2.6, 1.6 and 0.9 GL respectively.

Appendix A:

Australian fuel security fact base

As of 2026, Australia's liquid fuel demand is 60 gigalitres per year (GL/year), composed of 56 per cent diesel, 28 per cent petrol, 14 per cent jet fuel (including all jet fuel supplied at Australian airports for domestic and international flights) and 2 per cent fuel oil.⁵⁹ Australia is 95 per cent reliant on foreign imports that transit long, geo-politically vulnerable supply chains. Only 5 per cent is sovereign supply.

As of 2025, a mere 5 per cent is sovereign supply. It is composed of 4 per cent domestic refining using Australian crude feedstocks and 1 per cent of fuel use substituted from electrification and a small volume of LCLF production (biodiesel).

The remaining 95 per cent is import dependent. Australian refineries produce 23 per cent of refined fuels, but as noted only 4 per cent is sovereign. 83 per cent of domestically refined fuels are made from imported crude oil and only 17 per cent from Australian produced crude oil.⁶⁰

77 per cent of refined fuels are imported directly, mostly from Asian countries including Singapore, South Korea, Malaysia and China. An estimated 50 per cent of upstream crude (composed of direct imports and feedstocks for refined fuels imported from Asia) transits the Strait of Hormuz and 50 per cent of refined fuel imports transit the South China Sea.

Australia's overwhelming fossil fuel import dependency is an ongoing economic, climate and national security risk. As demonstrated by the Hormuz crisis, Australia is a price taker exposed to costly global oil shocks. Unlike some sectors that are decarbonising, Australia's transport emissions have risen by 25 per cent since 2005.⁶¹ Australia's defence force depends on foreign diesel and jet fuel that is vulnerable to disruption, risking national security.

Appendix B:

Technical Notes and Supporting Data

B1. Fuel Sovereignty Scenario Assumptions

Liquid fuel equivalent demand (before electrification) is based on a starting point of 60.5 GL per year (2026 reference), consistent with 2022/23 DCCEEW Australian Petroleum Statistics, plus 0.5 GL displaced from electrification. Scaled at 2 per cent annual growth, it projects to 66.8 GL per year (2031), 72.3 GL per year (2035) and 79.8 GL per year (2040).

Residual liquid fuel demand (after electrification) is calculated from liquid fuel equivalent demand minus electrification.

Table A.1: Effect of electrification on demand for liquid fuel

Year	Unit	2026	2031	2035	2040
Demand					
Liquid fuel equivalent demand (before electrification)	GL/y	60.5	66.8	72.3	79.8
Residual liquid fuel demand (after electrification)	GL/y	60.0	57.2	49.4	33.6

The fuel sovereignty trajectory (from 5 per cent in 2026 to 74 per cent by 2040) has three components:

- Electrification: The breakdown of fuel uses by vehicle type for road-uses and by sector for non-road uses has been baselined against the Deloitte Access Economics and CEFC analysis. This analysis was corroborated using the BITRE yearbook, the ABS Survey of motor vehicle use and the Australian Petroleum Statistics, where possible. Electric vehicles include both full battery electric vehicles and plug-in hybrid electric vehicles, for consistent comparison with the data presented from the IEA EV Outlook 2026.
 - Light Electric Vehicle sales (both passenger and light commercial) is TSI analysis using a S-curve deployment of electric vehicles that has been calibrated against the CSIRO Electric Vehicle projections, 2025, commissioned for the 2026 Integrated System Plan. The profile of light vehicle uptake is in line with the accelerated uptake projections, and consistent with international benchmarks from countries that have experienced high EV uptake. The opening fleet size uses data from the BITRE Yearbook 2025, with new registrations as starting sales. These sales have been scaled at 2 per cent annual growth, consistent with assumed increase in fuel use. Retirements have been assumed to return to the pre-covid trend in vehicle de-registrations of about 4.5 per cent of the fleet, noting that this rate dropped during the pandemic and is returning to pre-pandemic levels. The modelling conducted for on-road fuel uses is static and does not consider behavioural changes beyond the initial set of assumptions.

- Some early adopter markets observed a pause in the deployment of the vehicles after the first cohort of adopters. However, given price decreases and the availability of affordable EVs available in each segment of the Australian car and SUV market, it is assumed the deployment of EVs is smooth.
- For heavy vehicles (rigid trucks and articulated prime movers), the modelling assumes supportive policy settings including the removal of regulations that deter investment in battery electric heavy vehicles (e.g. weight restrictions), expanded electric truck charging infrastructure and mechanisms that encourage the use of sovereign fuel sources. The S-curve is calibrated using international examples with similar supportive policies in place and is consistent with the uptake presented in the CSIRO Electric Vehicle projections. Fleet size was derived from the BITRE Yearbook 2025 and sales figures were collated from the Trucking Industry Council. Retirements have been calculated using a survival rate based on the average age from the Trucking Industry Council. This rate incorporates the ability of electric trucks to convert their drive train from diesel to electric. For this analysis, it is assumed that the replacement of vehicles with their electric alternative displaces the average equivalent of fuel, however it is likely that trucks operating in urban areas and regional routes will electrify first, with trucks covering further distances electrifying later.
- For non-road uses, the electrification of the different sectors is based on sectoral demand analysis and decarbonisation technology-split analysis of electrification potential, drawn from the Deloitte Access Economics and CEFC refined ambitions report. The following variations from these findings were made to reflect the changes to relevant technologies since that work was undertaken. Mining electrification has been brought forward to reflect public commitments of large mining companies, particularly Fortescue Metals Group. This is further supported by the deployment of electric heavy haulage mining equipment and the continued fall in battery storage costs, lowering barriers to mine sites commercially electrifying. Rail electrification has been increased in 2040, reflecting investments in battery-powered locomotives for large mining sites. In 2040, more fuel efficient planes and hybrid electric aviation on short and regional flights begin to deploy, and short maritime uses of fuel are electrified.
- Constraints on the use of electricity have not been considered for the purposes of this exercise, beyond situations where electricity infrastructure will likely impede electric deployment, such as agricultural and rail uses. For heavy vehicle rollout, it is assumed that charging infrastructure is able to scale with the growing fleet, with appropriate interim measures such as skid mounted charging units and on-site battery storage to mitigate grid connection processes.
- LCLF production: Based on Cyan / Mission Possible Partnership and TSI's analysis of Australia's current LCLF project pipeline, and TSI's analysis of Australia's biomass feedstock resource base for HEFA (canola, tallow and used cooking oil (UCO)), Alcohol to Jet (sugarcane and bagasse) and gasification (forestry residues, agricultural residues and organic solid waste). Refer to Table A.3.
 - The central scenario assumes by 2031 a 50 per cent conversion of the current 2.2 GL LCLF project pipeline. 2035 assumes 80 per cent conversion of HEFA

feedstocks and 50 per cent conversion of Alcohol-to-Jet and Gasification feedstocks from the total feedstock resource base, which is net of soil nutrient requirements, and practical collection factors. Gasification is augmented with hydrogen to double yield. This is consistent with HEFA feedstocks being lower on the cost curve and policy supporting diversion from current exports to domestic LCLF production. 2040 assumes 80 per cent conversion of the total feedstock resource base, reflecting maturing and increased competitiveness of the Alcohol-to-Jet and Gasification conversion pathways, with HEFA expanded by canola grain production increasing from 6.5 to 10 Mt and oil content increasing from 42 to 50 per cent.⁶²

- The high scenario assumes by 2031 a 80 per cent conversion of the current 2.2 GL LCLF project pipeline, based on Cyan MPP and TSI's analysis. 2035 assumes 100% conversion of total feedstock resource base. 2040 assumes 100% conversion of the total feedstock resource base, with canola grain expanded from 6.5 to 10Mt, and oil content increased from 42 to 50%. Gasification is augmented with hydrogen to double yield.
- The low scenario assumes by 2031 a 10 per cent conversion of the current 2.2 GL LCLF project pipeline. 2035 assumes LCLF volume based on feedstock resources restricted by existing uses. Gasification has no hydrogen yield upgrading. 2040 assumes 50 per cent conversion of the total feedstock resource base including canola grain expanded from 6.5 to 10Mt and oil content increased from 42 to 50%. Gasification has no hydrogen yield upgrading.
- Domestic crude refining: Based on Geoscience Australia AECR 2025 reserve data and Australian Petroleum Statistics February 2026 data.
 - The central scenario projects the current declining domestic crude oil and condensate production capacity, at 7 per cent average annual decline, and holds constant the current 17 per cent of domestically produced crude and condensate directed to Australian refineries.
 - The high scenario assumes for 2031, 2035 and 2040 the current Australian crude and condensate production volume of 14.2 GL stays constant, and the portion of domestically produced crude oil directed to Australian refineries increases from 17 per cent to 30 per cent.
 - The low scenario projects forward to 2031 the current domestic fossil volume multiplied by the current declining domestic crude oil production capacity using a 15 per cent average annual decline (calculated from 2020 vs 2025 data), and reduces to 10 per cent the portion of domestically produced crude oil directed to Australian refineries. 2035 and 2040 assumes that domestic production of refinery crude feedstock is exhausted, consistent with the Geoscience Australia estimate that crude oil feedstocks are exhausted within 7 years.⁶³

B2. Electrification Displacement of Liquid Fuels

Table A.2: Effect of electrification on demand for liquid fuel by sector

Sector (GL/Y equivalent)	2026	2031	2035	2040
Passenger and SUV	18.8	20.7	22.4	24.8
Electrified	0.4	4.4	9.7	16.8
Residual	18.4	16.3	12.7	8.0
Light commercial	7.3	8.1	8.7	9.6
Electrified	0.1	1.9	4.2	7.2
Residual	7.2	6.1	4.5	2.4
Buses	0.7	0.8	0.9	1.0
Electrified	0	0.1	0.4	0.9
Residual	0.7	0.7	0.4	0.1
Rigid trucks	3.4	3.8	4.1	4.5
Electrified	0	0.2	1.1	2.7
Residual	3.4	3.6	3.0	1.8
Articulated trucks	4.7	5.2	5.7	6.3
Electrified	0	0.2	1.5	3.6
Residual	4.7	5.0	4.2	2.7
On-road fuel use	34.9	38.6	41.8	46.1
Electrified	0.5	6.9	17.0	31.2
Residual	34.4	31.7	24.8	15.0
Mining	8.6	9.5	10.2	11.3
Electrified	0	1.9	3.1	8.5
Residual	8.6	7.6	7.2	2.8
Rail freight + regional passenger	1.2	1.7	1.8	2.0
Electrified	0	0.2	0.3	0.8
Residual	1.2	1.5	1.6	1.2
Agriculture	2.8	3.1	3.3	3.7
Electrified	0	0.3	0.8	1.8
Residual	2.8	2.8	2.5	1.8
Other	2.6	2.9	3.1	3.4
Electrified	0	0.3	1.6	2.6
Residual	2.6	2.6	1.6	0.9
Off-road fuel use	15.2	17.1	18.5	20.5
Electrified	0	2.7	5.7	13.7
Residual	15.2	14.5	12.8	6.7
Land-based Uses	50.1	55.7	60.3	66.6
Electrified	0.5	9.6	22.7	44.9
Residual	49.6	46.1	37.6	21.7
Aviation (domestic, jet fuel)	8.4	9.3	10.1	11.1
Electrified	0	0.0	0.1	1.1
Residual	8.4	9.3	10.0	10.0
Marine (domestic shipping)	1.6	1.8	2.0	2.2
Electrified	0	0.1	0.1	0.2
Residual	1.6	1.7	1.9	1.9
TOTAL RESIDUAL	59.6	57.2	49.4	33.6

B3. Australia's LCLF feedstock resources and production potential

Table A.3 summarises Australia's seven main biogenic LCLF feedstocks, their refining pathways, estimated mass, equivalent LCLF volumes,^{xiii} and carbon intensity.⁶⁴

The highlighted column of the table: LCLF Capacity - Excluding Current Uses, reflects the currently available feedstock resources, net of soil nutrient requirements, practical collection factors, current exports and domestic uses. This can be processed into approximately 7.5 GL per year of LCLF. This does not include the volume of feedstocks that are currently exported and have other domestic uses.

Approximately 80 per cent of HEFA feedstocks — canola, tallow and used cooking oil (UCO) — are currently exported, mostly to European and Asian refineries producing SAF and RD. Policies that redirect Australia's feedstocks to domestic LCLF production would increase fuel security, lower emissions and onshore the economic activity.

The fourth column in the table is the maximum resource potential if all current exports and domestic uses are diverted to LCLF production, while still accounting for soil nutrient constraints and practical collection factors. This can produce approximately 13.1 GL per year of LCLF, enough to supply 156 per cent of Australia's current jet fuel demand.

This is consistent with CSIRO's independent analysis which found Australia's near-term baseline biogenic feedstock resource base can produce 7.2 GL of LCLF per year and the maximalist feedstock resource base can produce 12.8 GL per year (plus an additional 5 GL per year from Power-to-Liquid).⁶⁵

The current resource of 3.7 Mt of canola oil, tallow and UCO is capable of supporting approximately 3.3 GL of HEFA SAF production per year at full development, around 40 per cent of Australia's annual jet fuel consumption.

Forestry and timber processing residues are a large potential source of low carbon intensity LCLF feedstock. The current resource of 6.9 Mt/year has the potential to produce 2.8 GL of LCLF per year nationally, around 33 per cent of Australia's annual jet fuel consumption.

Total sugarcane and bagasse resources can support up to 1.8 GL of AtJ SAF production per year, around 21 per cent of Australia's annual jet fuel consumption.

The final column represents the CORSIA Sustainable Aviation Fuel core Life Cycle Assessment value plus the Induced Land Use Change value in terms of gCO₂e/MJ. This number is assessed against a fossil-fuel jet fuel benchmark of 89gCO₂e/MJ⁶⁶ to understand the emission reduction of switching to a low carbon fuel.

^{xiii} TSI bottom up analysis.

Table A.3 - Australia’s current LCLF biogenic feedstock resource base and LCLF and production potential

Feedstock Resource	Refining Pathway	Total Dry Mass (Mt)	LCLF Capacity - Total Resource (GL/yr)	Available LCLF Capacity - Excluding Current Uses (GL/yr)	CORSIA Carbon Intensity (LCA + ILUC) (gCO ₂ e/MJ)	SAF Minimum Selling Price (nth) (\$/L) ⁶⁷
Canola oil	HEFA	2.7	2.5	0.6	73	\$2.0
Tallow, poultry fat, UCO	HEFA	0.9	0.9	0.3	14 to 34	\$2.3
Sugarcane	AtJ	30.0	1.2	0.24	33	\$2.3
Bagasse	AtJ	4.0	0.3	0.14	29	\$5.2
Agricultural residues	Gasification*	10.0	3.6	3.6	8	\$3.4
Forestry & sawmill residues	Gasification*	6.9	2.8	1.5	8	\$3.0
Municipal organic waste	Gasification*	4.4	1.6	1.0	5	\$2.5
NATIONAL TOTAL**	All pathways	58.9	12.8	7.4		

Source: TSI Analysis, CORSIA and ***Boeing and Washington State University

Notes: *TSI estimate of Australian LCLF production potential assumes hydrogen upgrading of gasification pathways. **Australia’s current exports of plantation woodchips could add an estimated 2.2 GL of additional LCLF production per year

B4. Key Data on Australia’s Existing Fuel Infrastructure

Two operating refineries as at 2026: Ampol Lytton (Queensland), 109,000 barrels per day (b/d); Viva Energy Geelong (Victoria), 120,000 b/d. Combined nameplate capacity: 229,000 b/d. Average utilisation 108 per cent in 2024, producing 41 per cent gasoline, 30 per cent diesel, 10 per cent jet fuel.⁶⁸

Crude oil and condensate production: 398,000 b/d in 2024 (of which 194,000 b/d condensate).⁶⁹ Declining trend expected to continue through to 2025 and beyond. Approximately 94 per cent of domestically produced crude and condensate was exported in 2022–23.⁷⁰

Crude oil and condensate imports: 154,000 b/d in 2024. Primary sources: Malaysia (23 per cent), United States (20 per cent), Brunei (14 per cent), Vietnam (11 per cent).⁷¹

Refined fuel product imports: approximately 77 per cent of total refined fuel demand in 2026;⁷² 65 per cent of diesel from three countries (South Korea, Malaysia, Singapore); 70 per cent of aviation fuel from China, Malaysia and Singapore.⁷³

B5. Fuel Sovereignty Central Scenario Results

Table A.4: Central Scenario Results

Supply (GL)	Unit	2026	2031	2035	2040
Lever 1 — Electrification displacement	GL/y	0.5	9.6	22.9	46.2
Lever 2 — Domestic LCLF	GL/y	0.3	1.1	7.4	11.9
Lever 3 — Domestic fossil	GL/y	2.4	1.7	1.3	0.9
TOTAL Sovereign Supply	GL/y	3.2	12.4	31.5	58.9
Lever 4 — Strategic Stockpiles	GL	7.1	10.2	10.2	10.2
TOTAL Secure Supply	GL/y	10.4	22.6	41.8	69.2
Supply (%) - Benchmarked to liquid fuel equivalent demand	Unit	2026	2031	2035	2040
Lever 1 — Electrification displacement	%	0.8%	14%	32%	58%
Lever 2 — Domestic LCLF	%	0.5%	1.6%	10%	15%
Lever 3 — Domestic fossil	%	4.0%	2.5%	1.7%	1.1%
TOTAL Sovereign Supply	%	5%	19%	44%	74%
Lever 4 — Strategic Stockpiles	%	12%	15%	14%	13%
TOTAL Secure Supply	%	17%	34%	58%	87%
Supply (%) - Benchmarked to residual liquid fuel demand	Unit	2026	2031	2035	2040
Lever 2 — Domestic LCLF	%	0.5%	1.9%	15%	35%
Lever 3 — Domestic fossil	%	4.0%	2.9%	2.5%	2.6%
Lever 4 — Strategic Stockpiles	%	12%	18%	21%	30%
Fuel Security Share	Unit	2026	2031	2035	2040
Fuel Security Share (inc. Stockpiles)	%	17%	34%	58%	87%
Sovereign Supply	%	5%	19%	44%	74%
Import Reliance	%	95%	81%	56%	26%

B6. Fuel Sovereignty High Scenario Results

Table A.5: High Scenario Results

Supply	Unit	2026	2031	2035	2040
Lever 1 — Electrification displacement	GL/y	0.5	11	29	54
Lever 2 — Domestic LCLF	GL/y	0.3	1.8	12.8	14.8
Lever 3 — Domestic fossil	GL/y	2.4	4.3	4.3	4.3
TOTAL Sovereign Supply	GL/y	3.2	17	46	73
Lever 4 — Strategic Stockpiles	GL	7.1	10	10	10
TOTAL Secure Supply	GL/y	10	28	56	83
Supply (%) - Benchmarked to liquid fuel equivalent demand	Unit	2026	2031	2035	2040
Lever 1 — Electrification displacement	%	0.8%	17%	40%	68%
Lever 2 — Domestic LCLF	%	0.5%	2.6%	18%	19%
Lever 3 — Domestic fossil	%	4.0%	6.4%	5.9%	5.3%
TOTAL Sovereign Supply	%	5%	26%	64%	92%
Lever 4 — Strategic Stockpiles	%	12%	15%	14%	13%
TOTAL Secure Supply	%	17%	41%	78%	105%
Supply (%) - Benchmarked to residual liquid fuel demand	Unit	2026	2031	2035	2040
Lever 2 — Domestic LCLF	%	0.5%	3.1%	26%	44%
Lever 3 — Domestic fossil	%	4.0%	7.5%	9%	13%
Lever 4 — Strategic Stockpiles	%	12%	18%	21%	30%
Fuel Security Share	Unit	2026	2031	2035	2040
Fuel Security Share (inc. Stockpiles)	%	17%	41%	78%	105%
Sovereign Supply	%	5%	26%	64%	92%
Import Reliance	%	95%	74%	36%	8%

B7. Fuel Sovereignty Low Scenario Results

Table A.6: Low Scenario Results

Supply	Unit	2026	2031	2035	2040
Lever 1 — Electrification displacement	GL/y	0.5	6.9	19	39
Lever 2 — Domestic LCLF	GL/y	0.3	0.2	4.4	7.4
Lever 3 — Domestic fossil	GL/y	2.4	0.6	0.0	0.0
TOTAL Sovereign Supply	GL/y	0.79	7.2	24	46
Lever 4 — Strategic Stockpiles	GL	7.1	10	10	10
TOTAL Secure Supply	GL/y	8	17	34	56
Supply (%) - Benchmarked to liquid fuel equivalent demand	Unit	2026	2031	2035	2040
Lever 1 — Electrification displacement	%	0.8%	10%	27%	49%
Lever 2 — Domestic LCLF	%	0.5%	0.3%	6%	9%
Lever 3 — Domestic fossil	%	4.0%	0.9%	0.0%	0.0%
TOTAL Sovereign Supply	%	5%	12%	33%	58%
Lever 4 — Strategic Stockpiles	%	12%	15%	14%	13%
TOTAL Secure Supply	%	17%	27%	47%	71%
Supply (%) - Benchmarked to residual liquid fuel demand	Unit	2026	2031	2035	2040
Lever 2 — Domestic LCLF	%	0.5%	0.4%	9%	22%
Lever 3 — Domestic fossil	%	4.0%	1.1%	0%	0%
Lever 4 — Strategic Stockpiles	%	12%	18%	21%	30%
Fuel Security Share	Unit	2026	2031	2035	2040
Fuel Security Share (inc. Stockpiles)	%	17%	27%	47%	71%
Sovereign Supply	%	5%	12%	33%	58%
Import Reliance	%	95%	88%	67%	42%

Appendix C:

The relationship between stockpiles and security

Table A.7: Australia’s IEA strategic stockpiles increase substantially between 2031 and 2040 due to decreasing net imports from increasing sovereign supply.

Central Scenario Strategic Stockpiles					
Year	Unit	2026	2031	2035	2040
Strategic Stockpiles	GL	7.1	10.2	10.2	10.2
Net imports	GL/Y	45.5	46.2	34.6	16.6
IEA Strategic Stockpiles	Days	52	73	97	202
Strategic Stockpiles - Benchmarked to liquid fuel equivalent demand	%	12%	15%	14%	13%
Strategic Stockpiles - Benchmarked to residual liquid fuel demand	%	12%	18%	21%	30%

Source: IEA Australia Oil Data 2000 to 2024 and TSI analysis.

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