



Renewable Diesel

What is renewable diesel?

Renewable diesel is an advanced biofuel made from sustainable biomass sources such as vegetable and waste oils and animal fats, reducing reliance on fossil fuels. It is renewable as it uses feedstocks that are naturally replenished. It also produces significantly less greenhouse gases over its lifecycle (up to 60–80% reduction compared to petroleum diesel), and reduces particulate matter, NO_x, and sulphur emissions, improving air quality.

Unlike first generation biodiesel which requires blending with conventional fuel or modification of vehicle engines, renewable diesel can directly substitute for conventional diesel and does not require blending.

Applications

The greatest opportunity exists for transport applications where barriers to electrification exist such as in the marine, long haul freight, agricultural and mining sectors. Renewable diesel provides significant emissions reduction and asset utilisation benefits for long-lived vehicle assets.

Technology Pathways

Hydrotreatment of vegetable oil, used cooking oil and animal tallow is the most commercially advanced process for renewable diesel production, however global supply of feedstocks is limited due to competition and sustainability concerns (e.g. use of palm oil). Second generation ethanol technology and high-temperature pyrolysis are emerging pathways which can exploit a much larger range of lignocellulosic feedstocks such as woody plants, grasses, crop and forestry residues.

Drivers and Opportunities

Renewable diesel helps fleets and industries meet net-zero and low-carbon mandates without needing new vehicles or infrastructure. It offers a short to medium-term decarbonisation pathway for sectors with transport electrification challenges related to long duty cycle and high-power requirements.

Reportable Scope 1 emissions are greenhouse gas emissions released as a direct result of activities. These can be reduced by as much as 96% in vehicles using renewable diesel in comparison with conventional diesel¹.

In Western Australia (WA), 22 per cent of heavy vehicles are 25 years old. Without policies to facilitate early retirement of the diesel truck fleet, it will remain at around 55 per cent of Australia's heavy vehicle fleet to 2050, locking in diesel emissions². Figure 1 shows the projected impact on a fleet without policy to encourage diesel trucks to retire early.

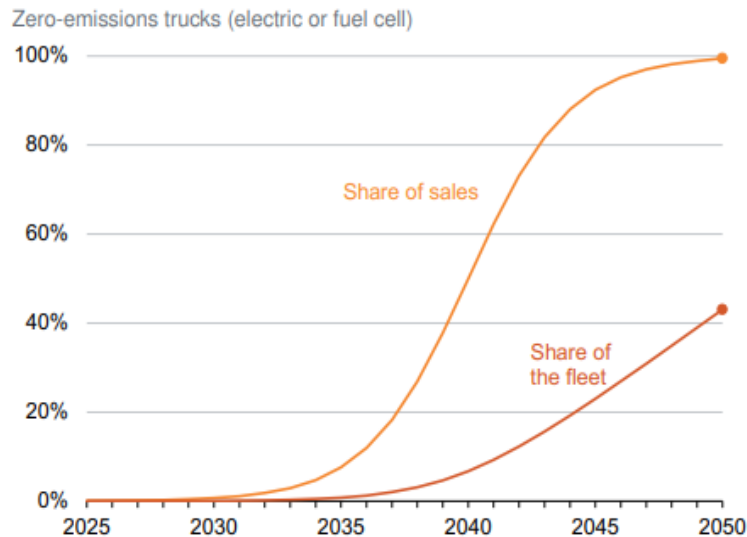


Figure 1: Slow uptake of zero-emission trucks could mean most of the fleet still uses diesel in 2050. ³

Australian governments are signalling support for renewable diesel through:

- The new paraffinic and renewable diesel standards effective from February 2025. This allows the supply and use of 100 per cent renewable diesel in vehicles.
- The Guarantee of Origin Scheme is an internationally aligned assurance scheme designed to track and verify emissions associated with products made in Australia. Renewable diesel has been shortlisted for inclusion in the scheme, which will enable producers to make low emissions claims to domestic and international markets.
- The National Greenhouse and Energy Reporting Scheme is moving to a market-based method for estimating Scope 1 emissions from “drop-in” renewable liquid fuels. Instead of having to prove the physical proportion of renewable diesel combusted when blended and moved through shared supply chains (terminals, pipelines, tanks), entities will be able to attribute emissions using contractual instruments/certificates that reflect what they purchased.
- The Australian Government has allocated \$250 million from the Future Made in Australia fund to support the production of low carbon liquid fuels.
- The WA Government will deliver the Advanced Biofuels Strategy which will support and attract projects to supply low carbon fuels such as renewable diesel.

¹ Under the National Greenhouse and Energy Reporting Scheme the emissions factor for renewable diesel is 0.5 kgCO₂e/GJ (Schedule 1, Part 4, Div 4.1, item 59B) compared to 70.4 kgCO₂e/GJ for conventional diesel.

² Towards net zero – Practical policies to reduce transport emissions, Grattan Institute 2021

³ Adoption curve is stylised, based on a logistic function. It assumes sales of zero-emissions trucks reach 1% by 2030, 50% by 2040 and 100% by 2050. Trucks are assumed to be retired due to age only, at a rate of 4.1% per year (consistent with average vehicle turnover between 2015 and 2020): ABS (2020b)

Performance of renewable diesel

Renewable diesel is approved by a wide range of original equipment manufacturers (OEM)s and can be used in existing diesel engines without modification. It has equal or slightly better engine performance than conventional diesel, including combustion efficiency, cold-start behaviour and injector cleanliness. Its hydrocarbon structure (HVO) is reported to burn cleaner and more completely when compared with petroleum diesel.

Conventional Diesel vs Renewable Diesel (HVO)

Renewable diesel is a hydrocarbon produced through hydrotreatment, which provides a more uniform molecular structure than fossil diesel. This leads to smoother engine operation, improved power output and reduced engine noise. Renewable diesel is resistant to oxidation and water absorption, making it a more stable fuel and safe to store long term. It typically has a higher cetane number (often 70–90) compared with petroleum diesel (40–55). A higher cetane number indicates how easily it ignites under compression and can lead to:

- Improved cold-start reliability
- Reduced cranking time. Cranking time is the duration the starter motor is engaged to turn the engine over, allowing it to run independently.
- More complete burning which can lead to improved fuel efficiency and cleaner engines.

Renewable diesel contains no aromatics or sulphur, and as a result, has fewer soot particles, less injector fouling and cleaner exhaust gas recirculation (EGR) and diesel particulate filters (DPF) systems. This can translate into longer maintenance intervals and more stable long-term engine performance. It meets the same specifications as conventional diesel and is fully compatible with:

- Modern high-pressure common-rail engines
- Older diesel engines
- Off-road, marine and heavy-duty applications.

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