AUSTRALIAN CONSTRUCTORS ASSOCIATION

MAY 2025

Fossil Fuel Free Construction

Guidance for Clients, Project Teams, Subcontractors and Suppliers

Contents

About this report

This report is a practical guide, created by members of the Australian Constructors Association (ACA), to help the construction industry transition to fossil fuel-free construction by reducing Scope 1 emissions. It draws on the real-world experiences of ACA members who are already adopting electric machinery and equipment and using biofuels like renewable diesel and biodiesel when electric options aren't available.

The report aims to encourage collaboration between project teams, suppliers and clients to accelerate the shift to decarbonising construction activities.

Executive Summary

Construction activities are responsible for approximately 23% of global greenhouse gas emissions and roughly 5.5% of these emissions are directly caused by liquid fossil fuels that power construction machinery and equipment, such as mineral diesel[1].

To reduce Scope 1 emissions, construction projects can prioritise the use of electric construction machinery and equipment and use biofuels such as biodiesel and renewable diesel where electric options are not available.

Quick facts

- Biodiesel and renewable diesel are renewable fuels collectively made from animal fats, vegetable oils and agricultural waste.
- Renewable diesel is chemically identical to mineral diesel, making it a direct substitute. It can be used as a 100% drop-in fuel in most construction machinery and equipment without impacting warranties.
- Biodiesel can be used up to a 5% blend with mineral diesel, called B5, in all diesel machinery and equipment and 20% biodiesel blend, B20, in some machinery and equipment.
- Members of the Australian Constructors Association (ACA), which includes the nation's major contractors, are already using renewable diesel extensively in Australia and internationally to replace mineral diesel.
- The increasing cost of carbon offsets is making electrification more economically viable on construction projects with renewable energy costs decreasing as the grid 'greens'.
- Equipment suppliers are supportive of this journey, recognising future trends and investing in new electric alternatives.

What about hydrogen?

Hydrogen-powered construction machinery and equipment are currently not preferred as there is a lack of model availability for most construction activities.

Hydrogen's opportunity as a zero-carbon-emission fuel source is constrained by current and medium-term availability of renewable hydrogen that is manufactured using renewable electricity.

The majority of hydrogen available in Australia is grey and brown hydrogen, which is made using fossil fuels and does not provide carbon emission reductions.

Additionally, construction sites would need new and custom infrastructure to store and manage hydrogen use safely.

[1]Adhikari, D., Whitehead, J. and Hickman, M. (2022). Planning a Transition to Low and Zero Emission Construction Machinery. doi:https://doi.org/10.14264/93110de

What have we learnt?

Implementing electrification and biofuel initiatives on the ground, ACA members have learnt that collectively, when compared with diesel construction machinery and equipment fuelled with mineral diesel:

Electric options:

- are available for some larger models such as 250t mobile crane, mobile piling rig and stationary concrete pump
- have substantially lower operational costs and lower energy consumption, higher capital expenditure costs
- lower total cost of ownership (data analysed for concrete pump case study)
- give significant carbon emission savings, even zero emissions with renewable electricity
- can be used in combination with battery technology to overcome grid constraints and substitute diesel generators
- can match the power of diesel-powered equivalent machinery
- solar and battery combinations can provide viable alternatives to diesel generators for site-based offices.

Renewable diesel:

- delivers significant life cycle carbon emission savings
- performs just as well as mineral diesel, with no noticeable change in how equipment operates or how much fuel it uses
- works with existing equipment with no need for modifications or additional maintenance
- currently costs more due to being imported and not subsidised like mineral diesel – this remains a key challenge.

Biodiesel:

- also performs comparably to mineral diesel – no difference in equipment performance, fuel use or compatibility.

What can you do?

Electrification

For Clients:

- Align procurement policies with carbon reduction targets and policy statements.
- Include and incentivise construction decarbonisation requirements in tender criteria and assessments.
- Advocate for low carbon liquid fuel policy and development of renewable diesel industry.
- Work with project teams and supply authority to prioritise early grid connection to enable electricity use from day one on site.

For project teams:

- Engage with suppliers and subcontractors to prioritise the use of electric construction machinery and equipment for high diesel consuming activities, where options are available.
- Leverage battery technology to reduce peak loads on the electricity grid and as a buffer where there are grid constraints to maximise electric outcomes.
- Use batteries to replace generators where mains power is not available on-site (minimum 32 Amps required) and to reduce peak loads on the grid.
- Work with clients and supply authority to prioritise early grid connection to enable electricity use from day one on site.
- Avoid oversizing generators for site sheds and construction activities and combine batteries with generator systems to cover night loads.
- Consider hybrid battery/diesel equipment where fully electric options are not feasible.
- Replace diesel 4x4 utes that are not used for off-road purposes with electric on-road vehicles.
- Undertake Estimating Practices to understand energy needs using first principles approach.
- Undertake Total Cost of Ownership calculation for equipment and machinery costs (including operational costs).
- Use of 100% renewable electricity where grid connection is available

For subcontractors and suppliers:

- Buy electric machinery when you are ready to replace assets.
- Offer electric machinery options to projects during the procurement process.

Biofuels – renewable diesel and biodiesel

For project teams, subcontractors and suppliers:

- Utilise a 5% biodiesel and 95% mineral diesel blend (B5) in diesel machinery and equipment on your projects and a 20% biodiesel and 80% mineral diesel blend (B20 where Original Equipment Manufacturers (OEM) allow.
- Explore options for renewable diesel as a substitute for mineral diesel where electric alternatives are not feasible.
- Subcontractors and suppliers, make sure your machines can take biodiesel and renewable diesel (check OEM warranties).

[2]Adhikari, D., Whitehead, J. and Hickman, M. (2022). Planning a Transition to Low and Zero Emission Construction Machinery. doi:https://doi.org/10.14264/93110de

Creating fossil fuel free construction sites is a challenging, but necessary ambition.

Did you know construction activities are responsible for 23% of global greenhouse gas emissions?

Roughly 5.5% of these emissions are directly caused by liquid fossil fuels that power construction machinery and equipment.[2]

The construction industry primarily uses mineral diesel in construction equipment and machinery.

Construction projects can reduce Scope 1 emissions by prioritising the use of electric construction machinery and equipment and using biofuels such as biodiesel and renewable diesel where electric options are not available.

[2]Adhikari, D., Whitehead, J. and Hickman, M. (2022). Planning a Transition to Low and Zero Emission Construction Machinery. doi:https://doi.org/10.14264/93110de

Our journey towards fossil fuel free construction in Australia has started, and we're already making significant progress.

What are ACA members doing?

- ACA members are actively using renewable diesel to substitute mineral diesel in both international and Australian projects.
- Renewable diesel has been successfully integrated without any operational or productivity issues across a full range of construction activities.
- Members are adopting electric construction machinery and equipment.
- Members are also using batteries to substitute diesel generators and help manage grid limitations.
- ACA members are providing clients with low carbon options for consideration.

What have we learnt?

A recent research partnership between the University of Queensland and Lendlease explored all options for eliminating Scope 1 emissions in construction and concluded that electrification is the most promising option to decarbonise construction plants and equipment.[3]

However, electrification faces challenges such as:

- Limited availability of electric machinery and equipment, especially in larger models.
- National electricity grid constraints.
- The technology needed to electrify construction sites is unlikely to be extensively available until after 2040.
- Where electric options are not yet available, biofuels such as biodiesel and renewable diesel offer the most feasible low-emission pathway to transitioning construction in the short-term.
- The main barriers to renewable diesel adoption include a lack of domestic production and the high cost of imported fuels.

What is the impact?

We're seeing deep interest and collaboration between Australian contractors, the supply chain and customers to deliver fossil fuel free construction initiatives.

What is our plan?

1. Prioritise the use of electric construction equipment and machinery on construction projects.
2. Prioritise the use of biodiesel and renewable diesel on construction projects where electric options are not available.

[3]Stepping Up the Pace: Fossil Fuel Free Construction, (2022) https://www.lendlease.com/contentassets/7575de40ed72446d93a55f3adf78bfd4/11834_ll_building--decarbonisation-report_d10.pdf

Electrification

Electrification

Why Electrification?

We know that electrification is key to decarbonising our industry and a great place to start is prioritising the use of electric machinery and equipment on construction projects. We are seeing the construction industry rapidly transitioning to electric machinery and equipment solutions, and for good reason – the benefits are significant.

Benefits

- More efficient
- Cheaper to run
- Quieter
- No air pollution which improves air quality
- Zero emissions (with renewable electricity)
- Fuel security

Challenges

- Electricity grid constraints
- Supply chain is in the early stages of the journey
- Currently limited availability to electric equipment in larger models
- Charging infrastructure
- Capital expenditure is higher for some electric machinery models than for diesel models

Opportunities

- Financial support for supply chain to invest in electric machinery
- Upgrades to electricity grid

CASE STUDIES: ELECTRIFICATION

Construction machinery and equipment

Construction machinery and equipment

Project

One Sydney Harbour, Waterman's Residences (NSW)

Use of electric machinery and equipment to construct a 30-level residential building.

Electric machinery and equipment included a concrete pump, two tower cranes, two hoists, elevated work platforms and formwork hoist.

Impact: With the use of an electric pump in partnership with Azzurri Concrete, construction achieved up to 94% fossil fuel-free operation. Compared to a diesel concrete pump, analysis confirmed the electric concrete pump produced zero emissions (powered by renewable electricity), reduced energy consumption by 67%, lowered operational costs by 59% and remained 51% cheaper to operate, even with energy and carbon costs (carbon offsets and Renewable Energy Certificates). With similar purchase prices, the electric concrete pump offers lower maintenance and servicing costs, greater long-term savings, making it more cost-effective over its lifetime than a diesel equivalent (total cost of ownership)

Click here to read a two-page summary of our findings and here for the full report.

Project

Rozelle Interchange – WestConnex (NSW)

Use of the world's first 100% electric shotcrete machine.

The excavation of the Rozelle Interchange's 22.4km of tunnels required structural support, typically achieved by drilling rock bolts and applying a shotcrete lining. This project trialled the world's first 100% electric shotcrete machine, the NORMET Spraymec 8100 VS SD, which runs on battery power when moving in the tunnel and charges via a 1000-volt cable during spraying. Once complete, it can be unplugged and moved to the next location.

Impact: The elimination of the 120-kW diesel engine reduces diesel particulate emissions in the tunnel. The electro-hydraulic, self-propelled sprayer integrates SmartScan for more efficient concrete use and reduced waste. It also generates less noise compared to traditional diesel rigs.

Construction machinery and equipment

Project

Southern Program Alliance's Kananook Train Stabling Yard (VIC)

Purchase and use of Australia's first fully electric piling rig, the Liebherr LB 30 Unplugged.

The Liebherr 'LB 30 Unplugged' rig, the world's largest capacity fully battery-operated drill rig, is reducing emissions and noise pollution at the Kananook Train Stabling Yard, part of the Level Crossing Removal Project. This piling rig has been in operation exclusively using onboard battery power and a supplementary Battery Energy Storage System (BESS), but can also be connected to conventional electricity supply where conditions allow.

Impact: The rig eliminates diesel emissions, reducing greenhouse gases on the project by an estimated 48.2 tCO2 (or 18,000L of diesel) over the course of a year. When charged with renewable energy, such as GreenPower, its carbon footprint is further minimised. It matches diesel-powered rigs in performance while operating silently, improving work conditions and reducing community impact.

Project

Sydney Metro – Western Sydney Airport Station Boxes & Tunnelling Works (NSW)

First use of the 250-tonne electric crawler crane, the Liebherr LR1250 Unplugged.

This is Australia's first project to use the 250-tonne electric crawler crane. The crane has been used to lower segments and other materials into the tunnels. It runs on battery for 8–10 hours after charging via mains power.

Impact: Real-time data shows the crane operates silently with zero emissions, saving 18,750L of diesel and cutting 50tCO2e annually.

CASE STUDIES: ELECTRIFICATION

Batteries and solar

Batteries and solar

Project

Coomera Connector Central – Helensvale Road to Smith Street Motorway (QLD)

Use of a Battery Storage Solution (PRAMAC 45KVA) to store excess energy from project Gensets.

A 60KVA generator was integrated with a new 45KVA PRAMAC Battery Pack to power Fulton Hogan's large, temporary office for upwards of 150 staff. The generator powers the site office when the battery charge drops below 30%. During this time, any excess capacity from the generator is used to recharge the battery. Once the battery charge exceeds 90%, the system switches back to battery-only operation.

Impact: Over a six day working week, the hybrid system cut diesel use by an average of 60%, saving $1,593 in fuel costs and reducing emissions by 1.9 tCO2e.

Project

In-house Plants & Assets (NSW/ACT)

Design and build of new Solar Hybrid Energy Supply power solution.

CPB Contractors, in collaboration with EIC Activities, developed a modular Solar Hybrid Energy Supply solution to replace diesel generators on project sites. The system includes 66kWp solar panels, a 60kW battery inverter, and 123kWh of battery storage, providing scalable, zero-emission power for any site.

Impact: On a Western Sydney project, the solution is expected to save $7,335 annually (including rental and fuel savings), reduce diesel use by 32,850L, and eliminate 88.7 tCO2e. The adaptable, OEM-supported system is a cost-effective, easy-to-transport alternative to diesel-powered generators.

Batteries and solar

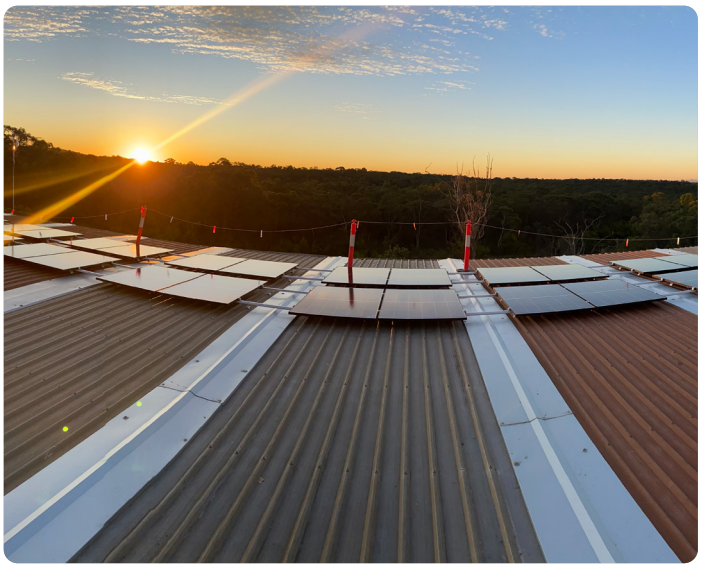
Project

Heathcote Road (NSW)

Design and use of a portable green power office setup.

Fulton Hogan designed a portable green power office setup that included a 45kVA equivalent (57kWh) battery, a 13.3kW rooftop solar array and a 60kVA backup. This setup efficiently powered a 36x12m office, lunchroom and amenities for upwards of 35 staff.

Impact: The battery optimised generator use by charging while powering the office and reducing diesel use once charged, plugging the gaps for when the sun was not shining. The system avoided approximately 85% of expected Scope 2 emissions and saved diesel costs and the assets, by project end, were fully written down, yielding a residual benefit of over $30,000. The assets were transferred to the next project to continue generating savings and reducing emissions.



Batteries and solar

Project

Fulton Hogan

Bruce Highway Upgrade: Caboolture–Bribie Island Road to Steve Irwin Way (QLD

acciona

Various Bridge Replacements (SA)

Design and use of a portable green power office setup.

Acciona replaced diesel generators with Makinex hybrid solar generators to harness solar energy and store it in high-capacity batteries, using diesel sparingly as a backup.

Fulton Hogan used the Makinex Hybrid to replace a 20kVA diesel generator, using solar and battery technology to generate, store, and produce reliable clean power without needing to be connected to the electricity network.

Impact: During Acciona's three-month pilot, the hybrid generator reduced diesel usage by over 95%, providing reliable, uninterrupted power for remote site operations. Fulton Hogan's hybrid system used 85% less fuel than a diesel generator, saving 260 litres of fuel and avoiding 0.7tCO2e per week. It also reduced refuelling needs and provided clean, silent power close to site amenities.

Projects

Built

Wellington Street (QLD)

MULTIPLEX

Grove (WA)

lendlease

New Performing Arts Venue (QLD)

Use of batteries to power electric tower cranes and hoists.

Built replaced two 270kVA diesel generators with a battery system for stable power for tower cranes and hoists at the Wellington Street project. Multiplex installed Australia's first AMPD Entertainer lithium-ion battery for an electric tower crane on Grove, while Lendlease used a battery to power the project's third electric tower crane at the New Performing Arts Venue.

Impact: Built cut 157 tCO2e, saved 74,800L of diesel, and improved efficiency with less fuel logistics and maintenance. Multiplex reduced CO2 emissions by 85% and cut fuel costs by 80%. Lendlease saved 27,000L of diesel, reduced emissions by 73 tCO2e, and lowered costs by 8% versus a 500 kVA diesel generator. All three companies reported improved on-site health and safety from reduced diesel particulate matter and noise, along with additional benefits such as less congestion and the elimination of diesel handling.

CASE STUDIES: ELECTRIFICATION

Off grid site sheds

Off grid site sheds

Project

Knights Road (AUSTRALIA/NEW ZEALAND)

Use of solar as an alternative power solution to diesel fuel generators at site compounds.

Fulton Hogan

Fulton Hogan replaced diesel generators with solar-powered portacoms, providing energy autonomy for remote sites across Australia and New Zealand. The solar sheds are equipped with battery storage, power air-conditioning, kitchenettes, lights, laptops, and workstations without mains power.

Impact: This initiative reduced emissions by 0.42 tCO2e per 40-hour week, equating to a 20tCO2e reduction over a 48-week year. The solar sheds also lowered operational costs, reduced noise compared to diesel generators, eliminated environmental discharges, and achieved their investment return in less than 1.5 years.

Project

Multiple (NSW/ACT)

Australia's first zero-emission, self-sufficient mobile site office.

CPB CONTRACTORS

CPB Contractors has launched its first zero-emission, self-sufficient mobile site office, fully powered by renewable energy and designed for minimal environmental impact. The office features a 5.55kW solar system, a 24.6kW battery (expandable for larger sites), and an 8kW inverter, eliminating the need for a backup generator. It also includes a 545L rainwater tank and a 24m² collection area, capturing up to 24,000L of drinkable water annually. The repurposed shipping container is equipped with energy-efficient appliances, sensor-activated lighting, climate control, tinted windows, thermal insulation, and remote power and weather monitoring systems, ensuring long-term sustainability.

Impact: Each site shed is estimated to reduce diesel consumption by approximately 27kL annually, cutting 73 tonnes of CO2e compared to a 12kVA diesel generator.

Biofuels

Renewable diesel and biodiesel

Biofuels: renewable diesel and biodiesel

What are biofuels?

Biofuels are replacement liquid fuels such as bioethanol, biodiesel, renewable diesel and sustainable aviation fuels, made from sustainable biological resources. Everything from wood offcuts to agricultural by-products, used cooking oil or tallow and even algae can be turned into biofuels.

Biodiesel and renewable diesel biofuels can be used in diesel engines and provide the most promising substitute for mineral diesel where electrification options are not available.

Like mineral diesel, biodiesel and renewable diesel must meet quality standards required by Australian Fuel Standards and Original Equipment Manufacturers (OEMs). All biodiesel and renewable diesel used on projects has met these fuel quality requirements and confirmation of compliance can be provided by the fuel distributor.

Biodiesel and renewable diesel are both currently being used on construction projects in Australia.

Benefits

- Reduced pollutants which improve air quality.
- Local economic benefits.
- 75-95% carbon emission reduction over life cycle compared to mineral diesel.
- Improves Australian fuel security.

Challenges

- Renewable diesel not currently commercially available in Australia.
- Renewable diesel does not receive fuel subsidies like mineral diesel
- High cost of importing renewable diesel.

Opportunities

- Use a biodiesel B5 (5% biodiesel and 95% mineral diesel blend) in all diesel machinery and equipment on projects (where biodiesel is available).
- Use of higher biodiesel blends of B20 (20% biodiesel and 80% mineral diesel blend) where OEMs warrant.
- Use of imported renewable diesel in partnership with clients and Government.

[4]https://www.neste.com/products-and-innovation/neste-my-renewable-diesel (viewed 16/10/24).

What is renewable diesel?

Renewable diesel is a Scope 1 game-changer with 75 - 95% reduced carbon over its lifecycle. It's an advanced biofuel made from animal fats, vegetable oils and agricultural waste and is chemically identical to mineral diesel.[5]

It's clear, odourless, non-toxic, bio-degradable, less flammable, and has 34% less particulate matter.[6] It can be used as a 100% drop in fuel, directly replacing mineral diesel without machinery needing any modifications. Renewable diesel offers a critical transition fuel for the industry to substitute mineral diesel while we transition to electrification.

Renewable diesel can be made from a range of processes and Hydrotreated Vegetable Oils (HVO) is currently the most common type of renewable diesel imported for use in Australia.

What is biodiesel?

Biodiesel is made from used cooking oil and tallow in Australia and is used as a blended fuel with mineral diesel.

The use of biodiesel in construction machinery is typically restricted to a B20 blend (20% biodiesel and 80% mineral diesel) by Original Equipment Manufacturers (OEMs). Although biodiesel provides carbon savings, it is less effective than renewable diesel because it needs to be blended with mineral diesel. Despite this, biodiesel is currently available in Australia and can be used to achieve carbon savings until renewable diesel is domestically produced.

[5]Adhikari, D., Whitehead, J. and Hickman, M. (2022). Planning a Transition to Low and Zero Emission Construction Machinery. doi:https://doi.org/10.14264/93110de.

[6]Western Washington Clean Cities Coalition (2024) Renewable Diesel https://www.wwcleancities.org/_files/ugd/64dc1a_33c2292edd0841c1bf4b4d310a9557eb.pdf

CASE STUDIES: RENEWABLE DIESEL AND BIODIESEL

Renewable diesel in construction machinery and equipment

Renewable diesel in construction machinery and equipment

Project

MacIntyre Wind Farm

Use of renewable diesel as a diesel alternative for earthmoving fleet and site equipment.

Acciona piloted the use of HVO on articulated dump trucks, dozers, excavators, gensets and compressors.

Impact: The use of 46,000L of HVO showed negligible differences in fuel consumption and power compared to traditional diesel, with no equipment compatibility issues. It reduced lifecycle CO2 emissions by about 90% compared to mineral diesel. The main challenge is cost, driven by reliance on imported HVO due to lack of domestic production, source certification, and logistical challenges.

Project

Melbourne Quarter West – 45-level build-to-rent apartment building (VIC)

Use of renewable diesel to power a stationary concrete pump

Renewable diesel (HVO) is being utilised to power a stationary concrete pump. The project will use approximately 23,000 m³ of concrete to complete the structure, with the highest concrete pour reaching 144 meters above ground level.

Impact: During project delivery, an estimated 15,000 litres of renewable diesel will be used – which will eliminate 40.47tCO2e.

Renewable diesel in construction machinery and equipment

Project

Metronet – Byford Station Construction (WA)

Trial of renewable diesel to power on-site pieces of equipment.

A trial of renewable diesel (HVO100) was completed in January 2025, which powered on-site equipment, including a ute, a Kobelco excavator, a Hydreama water cart and a hybrid 30-tonne excavator. Conducted in partnership with METRONET and the Department of Transport, the trial assessed fuel efficiency and engine impact, providing data to support broader industry adoption.

Impact: The project will substitute 30,000L of mineral diesel with renewable diesel (HVO), which is expected to reduce lifecycle CO2 emissions by 95% (7.9 tCO2e), as well as other noxious gases while delivering the same level of performance.

Project

Powerhouse Museum / New Sydney Fish Market

First use of renewable diesel in Australia.

In 2022, Lendlease and Multiplex collaborated to use renewable diesel (HVO) to power heavy-lifting tower cranes on two NSW Government projects: the Powerhouse Parramatta (Lendlease) and the new Sydney Fish Market (Multiplex). This was done in partnership with cranage supplier Marr Contracting and fuel distributor Refuelling Solutions.

Impact: By June 2024, the projects had used 182,540L of renewable diesel (HVO100), saving 492.52 tCO2e with no performance issues. Of this, 86,182L was used by Multiplex and 96,358L by Lendlease.

Renewable diesel in construction machinery and equipment

Project

Sydney Metro – Western Sydney Airport Project, St Marys Station footbridge (NSW)

Use of renewable diesel in piling construction machinery.

AnewX, a specialist civil and foundation contractor, trialled 100% renewable diesel (HVO) in their piling machinery after a successful test in Ford Ranger Utes. The trial was extended to GEAX, XD9, and DTC20 piling machines, with fuel supplied by Refuelling Solutions

Impact: AnewX reported no adverse effects, with consistent engine performance and seamless transitions between mineral and renewable diesel, following expert technical guidance. The primary challenge was the higher cost of renewable diesel compared to mineral diesel.

Project

Upper South Creek Advanced Water Recycling Centre and Pipelines

Use of renewable diesel to power the project's construction compound.

The initiative replaced 1,762L of mineral diesel with 100% renewable diesel (HVO) in two generators (70 kVA and 25 kVA) powering the project's construction compound. The renewable diesel-fuelled generators for EV chargers, site sheds, and ablution blocks.

Impact: Using renewable diesel (HVO) avoided 5.6 tCO2e and reduced lifecycle CO2 emissions by approximately 95% compared to mineral diesel. The site, projected to consume 439KL of diesel during construction, has the potential to save 1,218 tCO2e. Engine output and efficiency remained unchanged, with no filter clogging. Key benefits: operates in extreme cold (-22°C), usable at 100% or blended, long storage life without quality loss or water absorption, and free of sulphur, oxygen, and aromatics.

Renewable diesel in construction machinery and equipment

Project

Victorian Level Crossing Removal Project, Webb Street (VIC)

Use of renewable diesel as a direct drop-in replacement for mineral diesel in Franna crane.

A trial was conducted using 1,900L of 100% renewable diesel (HVO) as a direct replacement for mineral diesel in a Franna crane over four weeks of operation. The goal was to assess the viability of renewable diesel for moving equipment and gather data for its use in Australia.

Impact: The trial focused on air quality, fuel economy, engine performance, and operator feedback. It successfully built workforce confidence in renewable diesel, with no noticeable differences in performance or engine impact.

CASE STUDIES: RENEWABLE DIESEL AND BIODIESEL

Biodiesel in construction machinery and equipment

Biodiesel in construction machinery and equipment

Project

Botany Rail Duplication

Use of renewable diesel as a direct drop-in replacement for mineral diesel in Franna crane.

A B20 biodiesel fuel tank was used on-site, enabling the use of a 20% biodiesel and 80% mineral diesel blend to help reduce emissions. This fuel powered plant, equipment, and off-road light vehicles.

Impact: To date, approximately 2,000L of B20 has been used, reducing emissions by around 1 tCO2e. High-blend biodiesel (B20 or above) can clean fuel systems by removing sediment from fuel tanks. To prevent clogging, it is recommended to change filters after the first tank of B20 and schedule an additional filter change at the first service of the plant or equipment.

Project

NEXTDC A1

Use of a B20 biodiesel blend to power construction tower cranes and generators.

In partnership with NEXTDC and Reds Global, Lendlease powered construction tower cranes and generators with B20 biodiesel (20% biodiesel, 80% mineral diesel).

Impact: Between July 2023 and June 2024, this reduced emissions by 61 tCO2e—the equivalent of 3,050 trees' yearly carbon sequestration. Leveraging experience from other regions, Lendlease overcame supply challenges to establish new biofuel supply chains in South Australia.

CASE STUDIES: RENEWABLE DIESEL AND BIODIESEL

Biodiesel in generators

Biodiesel in generators

Project

Caboolture Hospital Redevelopment (QLD)

Use of B20 biodiesel blend-powered generators for construction equipment.

Two diesel generators from Green Power Solutions powered major on-site equipment, including tower cranes, concrete booms, and hoists, using 95,000L of locally sourced B20 biodiesel from Eco Tech.

Impact: The trial showed that using B20 reduced emissions by 43 tCO2e, delivering a 14% net reduction in greenhouse gases. Analysis suggests B20 could lower community health costs by reducing pollutants. Expanding Australian-made biodiesel use could also cut diesel imports, enhance energy self-sufficiency, and support local jobs in fuel production and distribution.

Project

Heasville-KooWee Rup Road (VIC)

Use of B50 biodiesel blend to power generators.

GreenPower Solutions supplied B50 biodiesel to power 20kVA–100kVA generators for cribrooms where grid connection was unfeasible.

Impact: Between April 2022 and May 2024, 53,448L of B50 was used, reducing emissions by 152.88 tCO2e. No operational differences were observed.

Biodiesel in generators

Project

Level Crossing Removal – Caulfield to Dandenong (VIC)

Use of B20 biodiesel blend in the generators operating gantry cranes.

B20 biodiesel-powered generators operating gantry cranes to move over 2,000 precast concrete segments for the elevated rail line. The project team partnered with Green Power Solutions to explore alternative fuels.

Impact: Concerns about performance and reliability were addressed through a controlled on-site trial with backup generators on standby. The trial confirmed B20's efficiency under demanding conditions, leading to its full integration. This switch reduced emissions by an estimated 105 tCO2e.

Project

Sydney Metro West – Surface Civil & Alignment Works (NSW)

Use of biodiesel blends of B20 for generators and B5 for all other machinery.

CPB Contractors and United Infrastructure mandated B5 or B20 biodiesel across all 1,000+ plant and equipment items, with B20 for generators and B5 for all other machinery.

Impact: To date, 1.7 million litres of biodiesel blends have been used, cutting emissions by 258 tCO2e. This amounts to taking 89 cars off the road. The project also engaged subcontractors and hire companies previously hesitant to use biodiesel.

Summary

What can you do to transition to fossil fuel free construction?

Clients in the construction sector have the greatest influence—and therefore the biggest responsibility—for making sure infrastructure is delivered in line with decarbonisation goals. As the ones who lead early planning and procurement, clients are in a unique position to set priorities from the start and send clear signals to contractors about what's required.

Project teams, subcontractors, and suppliers all play a vital role in the shift to fossil fuel–free construction and in meeting decarbonisation targets. Each part of the supply chain can take a few key actions to support this transition:

Electrification	Biofuels
Project Teams, Subcontractors and Suppliers	
Use electric construction machinery and equipment for high diesel using activities, where options are available.	Use B5 biodiesel in diesel machinery and equipment on your projects and B20 biodiesel in generators and cranes (check OEM warranties).
Use battery technology as a buffer where there are grid constraints to maximise electric outcomes.	Explore options for renewable diesel to substitute mineral diesel where electric options are not available.
Use batteries to substitute generators where mains power is on-site.	-
Undertake a battery risk assessment in consultation with stakeholders such as the local fire brigade and site safety representative's.	-
Consider hybrid battery/diesel equipment where fully electric options are not feasible.	-
Project Teams	
Undertake the Fossil Fuel Free Construction Leadership Challenge for Green Star and gain innovation points.	
Work with clients and supply authority to prioritise early grid connection to enable use of electricity from day 1 on-site.	-
Significantly reduce diesel use, costs and emission by ensuring: ▶ Don't oversize generators e.g., use 300kVA instead of 500kVA for site sheds and construction activities. Involve an electrician to correctly model and size the generator to improve efficiency. ▶ Combining a battery and/or solar with your generator system to cover night loads e.g. security lighting.	-
Estimating practices to understand energy needs, using first principles approach.	-
Whole of use calculation for equipment and machinery costs (including operational costs making savings on cap ex costs).	-
Replace diesel 4x4 utes that are not used for off-road purposes with electric on-road vehicles.	-

Electrification	Biofuels
Subcontractors and Suppliers	
Buy electric machinery when you are ready to replace.	Make sure your machines can take biodiesel and renewable diesel (check OEM warranties).
Offer electric machinery options to projects during the procurement process.	-

Clients

- During project planning, estimate the proposal's carbon footprint and identify low-cost ways to cut emissions. Apply these measures consistently across all contractors bidding for the work.
- Set clear contract requirements for using low-emission electricity, electric machinery, and biofuels (such as biodiesel or renewable diesel), in line with carbon reduction targets from government or your organisation. These should at least match science-based reduction goals.
- Go beyond the minimum by setting stretch targets for decarbonisation and linking them to incentives and performance indicators (KPIs).
- Clearly communicate how decarbonisation will be evaluated in tenders by outlining the criteria and weighting used to assess sustainability outcomes. This sends a strong message about its importance.
- Work with supply authority to prioritise early grid connection to enable electricity use from day one on site.

Thank you for taking action!

Thank you for putting our plans into action on your project.

By transitioning to fossil fuel free construction, we:

- Are tackling climate change together.
- Will reduce noise pollution.
- Will grow local industries and jobs.
- Are supporting stronger national energy security.
- Will be ready for a low carbon economy.

We have an opportunity and responsibility to transition to fossil fuel free construction. It's not always going to be easy, but it will be worth it. And the best news is, we're already doing it.

Resources

ACA Sustainability Page	View Link
Lendlease report - Stepping up the Pace: Fossil Fuel Free Construction	View Link
Refuelling Solutions Biodiesel Fact Sheet and FAQs – Accelerating the transition to clean energy	View Link
Frontier Impact Group / Renuleum – What is Renewable Diesel?	View Link
Neste website (My Renewable Diesel) – Leaders in sustainable and renewable fuels	View Link
Benefits of B20 biodiesel blend with Biofutures Queensland and Qld Government	View Link
GBCA: How fast can we move towards fossil fuel free construction?	View Link
One Sydney Harbour Concrete Pumping Report	View Link
Refuelling Solutions (2023) Original Equipment Manufacturer Positions on Biodiesel & Renewable Diesel	View Link