

**MISSION  
ZERO**



# **FOSSIL FUEL FREE CONSTRUCTION**

Guidance for Lendlease Australia Project Teams,  
Subcontractors and Suppliers.

December 2023



# We're transitioning to fossil fuel free construction, and we need your help to get there.

## This document has been prepared to:

1. Provide a short-form summary of our fossil fuel free construction plans, progress and practical guidance [page 3](#)

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2. Further outline:
  - Our fossil fuel free construction plans [page 5](#)

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  - Details on electrification including project examples [page 7](#)

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  - Details on the use of biofuels (biodiesel and renewable diesel) including project examples [page 10](#)

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  - Practical guidance to project teams [page 14](#)

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  - Additional resources for further information [page 16](#)

## Acknowledgment of Country



We acknowledge the Traditional Custodians of the land and pay our respect to them and their Elders, both past and present. As a business that works across many locations, we have a responsibility to listen, learn, and walk alongside First Nations peoples to ensure our activities support the ongoing connection to their land, waters, cultures, languages and traditions. We value their custodianship of 65,000 years.



# EXECUTIVE SUMMARY

One of our Mission Zero goals is to eliminate the use of fossil fuels in construction by 2030, directly impacting our Scope 1 emissions.

We are working towards this goal 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.

Over the last two years, we have made significant progress, including:

- Introducing the first renewable diesel to Australia in collaboration with partners.
- Conducting trials of battery power solutions to substitute diesel generators.
- Using renewable diesel on several Lendlease projects.
- Initiating fossil fuel free pilot projects to trial prioritisation of electric construction machinery and equipment.

## What have we demonstrated and learned?

At One Sydney Harbour's Waterman's Residences project, the implementation of an electric concrete pumping solution resulted in:

- Zero emissions when powered by renewable electricity.
- A 67% reduction in energy consumption, using only a third of the energy compared to its diesel counterparts.

Deploying a battery power system at the New Performing Arts Venue (NPAV) in Brisbane for a new tower crane estimated diesel savings of 27,000 litres over a year, resulting in a 73tCO<sub>2</sub>e reduction in carbon emissions.

We have also shown renewable diesel can effectively substitute for mineral diesel in the

absence of electrification options. We have demonstrated this at Powerhouse Parramatta, NPVA, and other projects with a 75-95% reduction in carbon emissions compared to mineral diesel over its lifecycle<sup>1</sup>.

## Quick facts and interesting stats

- Biodiesel and renewable diesel are both renewable fuels, collectively made from animal fats, vegetable oils and agricultural waste.
- Renewable diesel is a direct substitute for mineral diesel as it is chemically identical to mineral diesel and can be used as a 100% drop in fuel without impacting equipment 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.
- It has been a requirement since 2021 for all Lendlease Construction projects to use biodiesel B5 (as a minimum), where available.
- Lendlease Construction Australia is currently carbon neutral, offsetting all Scope 1 (fuels we burn) carbon emissions and purchasing renewable electricity for Scope 2 emissions (power we consume).
- The increasing cost of carbon offsets is making electrification more economically viable on our projects as renewable energy costs decrease as the grid greens.
- In the UK, our construction business is already 'fossil fuel free' by using renewable diesel in all their construction operations.
- Our suppliers are supportive of our journey, recognising future trends, and investing in new electric equipment alternatives.

## What can you do?

### Electrification

For project teams

- Engage with suppliers and subcontractors to prioritise the use of electric construction machinery and equipment for high diesel-consuming activities, such as cranes and concrete pumping, where options are available.
- Leverage battery technology as a buffer where there are grid constraints to maximise electric outcomes.
- Utilise batteries to replace generators where mains power is available on-site (minimum 32 Amps required).
- Collaborate with clients to prioritise early grid connection for electricity use from day one on site.
- Avoid oversizing generators (e.g., use 300kVA instead of 500kVA) for site sheds and construction activities and combine batteries with generator systems to cover night loads, such as security lighting.

For subcontractors and suppliers

- Buy electric machinery when you are ready to replace.
- Offer electric machinery options to Lendlease 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 all diesel machinery and equipment on your projects and a 20% biodiesel and 80% mineral diesel blend (B20) where OEMs 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).

### Resources

- Consult with the Regional Sustainability team, Regional Operations Manager or project Construction Manager to explore new innovations and opportunities.



# 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.<sup>1</sup> At Lendlease, we primarily use mineral diesel in our construction equipment and machinery.

One of our Mission Zero goals is to eliminate the use of fossil fuels in construction by 2030, directly impacting our Scope 1 emissions. We're doing this 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.

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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>.

# Our journey in Australia has begun, and we are already making progress.

## What are we doing?

- Introduced the first renewable diesel to Australia in collaboration with partners.
- Started using renewable diesel on several Lendlease projects.
- Selected pilot projects to trial electric construction machinery and equipment.
- Started trialling electric concrete pumps and batteries to substitute diesel generators.

## What have we learnt?

- Through research collaboration with the University of Queensland in Australia, we learnt that electrification is the most promising option for eliminating construction emissions.
- Challenges to electrification include availability of electric machinery and equipment, especially in larger models, and national electricity grid constraints.
- We learnt that where electric options are not available, the best solution is to use biofuels such as biodiesel and renewable diesel in the short-term as the industry transitions to electrification in the longer-term.
- The challenge is that we need a domestic renewable diesel industry to make it more cost competitive.

## 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?



**Prioritise the use of electric construction equipment and machinery on our projects.**



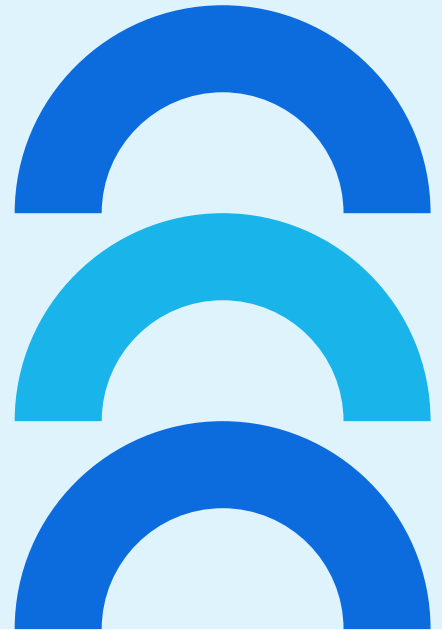
**Prioritise the use of biodiesel and renewable diesel on our projects where electric options are not available.**



# ELECTRIFICATION

## What is 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 all our projects. We are seeing the construction industry rapidly transitioning to electric machinery and equipment solutions, and for good reason - the benefits are significant.



### Benefits

1. More efficient
2. Cheaper to run
3. Quieter
4. No air pollution which improves air quality
5. Zero emissions (with renewable electricity)
6. Fuel security



### Challenges

1. Electricity grid constraints
2. Supply chain is in the early stages of the journey
3. Currently limited availability to electric equipment in larger models



### Opportunities

1. Financial support for supply chain to invest in electric machinery
2. Upgrades to electricity grid

# Electrification case study: One Sydney Harbour, Waterman's Residences, NSW



Waterman's Residences is a 30-level residential building and our first pilot fossil fuel free construction project.

We've substituted diesel machinery and equipment for electric alternatives across all construction activities where options are available.

Electric machinery and equipment included:

- A concrete pump
- Two tower cranes
- Two hoists
- Elevated work platforms; and
- Formwork hoist.

Once the electric concrete pump joined the project, the works achieved up to 94% fossil fuel free.

Activities that still required fossil fuels included brazing which uses acetylene, a large LPG forklift, and a 2.98T diesel Maeda spider crane used for façade installation (electric options were only available up to 2T at the time of procurement).

The pump, supplied by Azzurri Concrete, is powered by renewable electricity, and has helped make our concreting activities quieter and more efficient. Analysis of the energy use, operational costs and carbon emissions of the diesel and electric concrete pumps has confirmed that the electric concrete pump:

- Creates **zero emissions** when powered by renewable electricity.
- Provides a **67% reduction** in energy consumption, using only a third of the energy compared to its diesel counterparts.
- Has substantially lower operational costs, with a **59.1% reduction** in energy costs.

When considering both energy costs and carbon costs (carbon offsets and Renewable Energy Certificates), the electric concrete pump is still 50.8 % cheaper to operate.

An electric concrete pump proves more cost-effective over its lifetime than a diesel concrete pump (total cost of ownership), even when factoring in infrastructure costs such as upgrades and battery technology. This is due to similar upfront purchase costs and reduced operating, maintenance, and servicing expenses.

Grid constraints are localised, and infrastructure upgrades may not be required for use of an electric concrete pump on other Lendlease projects. Grid capacity needs to be assessed on a project-by-project basis. We have learnt since that batteries provide an effective buffer to grid constraints and could potentially be used instead of grid upgrades on future projects.



# Electrification case study: New Performing Arts Venue (NPAV), QLD



The NPAV project successfully deployed a battery to power a tower crane to substitute a diesel generator as grid capacity had been fully utilised for other construction equipment. The battery was able to overcome the grid capacity constraints and enabled the project to electrify a third tower crane on site. This was a critical initiative in understanding how to manage grid constraints, a key barrier to electrifying our construction sites.

The outcomes of this initiative were significant:

- **Carbon Emission Reduction:** Diesel savings are estimated to be 27,000 litres over the year of operation, resulting in a substantial reduction of 73tCO<sub>2</sub>e in carbon emissions.
- **Safety:** No handling of diesel required and no tank trucks, reducing site congestion and enhancing safety.
- **Cost:** Our initial estimates indicate that renting the batteries resulted in an 8% lower overall cost compared to a 500 kVA diesel generator.
- **Time:** Reduced maintenance and nil refuelling.
- **Capacity:** Initially the crane did not maximise the full capacity of the battery and so additional equipment was added later in the project.

# BIOFUELS: RENEWABLE DIESEL AND BIODIESEL

## What are biofuels?

Biofuels are replacement liquid fuels such as bioethanol, biodiesel, renewable diesel and sustainable aviation fuels, made out of 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 our 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 Lendlease projects in Australia.



### Benefits

1. Reduced pollutants which improve air quality.
2. 75-95% carbon emission reduction over life cycle compared to mineral diesel<sup>1</sup>.
3. Improves Australian fuel security.
4. Local economic benefits.



### Challenges

1. Renewable diesel not currently commercially available in Australia.
2. High cost of importing renewable diesel.



### Opportunities

1. Our requirement to use a biodiesel B5 (5% biodiesel and 95% mineral diesel blend) on our projects (where available).
2. Use of higher biodiesel blends of B20 (20% biodiesel and 80% mineral diesel blend) where OEMs warrant.
3. Use of imported renewable diesel in partnership with clients and Government.

**What is renewable diesel?**

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

It's clear, odourless, non-toxic, bio-degradable, less flammable, and has 30% less particulate matter. 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.

**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.

It has been requirement since 2021 for all Lendlease Construction projects to use biodiesel B5 (as a minimum), where available. We also used B20 (20% biodiesel and 80% mineral diesel) in generators power construction activities at Caboolture Hospital Redevelopment (QLD) and in tower cranes on Sydney Metro Martin Place (NSW).

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>.



## Renewable diesel case study: Powerhouse Parramatta, NSW

One of the first projects in Australia to use renewable diesel was Powerhouse Parramatta. We are using renewable diesel to power tower cranes on site. This was achieved in partnership with our client, the NSW Government, supplier Marr Contracting and the fuel distributor Refuelling Solutions.

The renewable diesel was imported from Rotterdam in the Netherlands. It demonstrates the viability of renewable diesel as a transition fuel for our industry and highlights the critical need for a domestic industry.

The project is expecting to use 95,000 litres of diesel in the cranes and to substitute 90% of this with renewable diesel. When the cranes have finished on the project, this is estimated to save 230 tCO<sub>2</sub>e.

## Renewable diesel case study: New Performing Arts Venue (NPAV), QLD

Queensland's first ever 230 tonne mobile crane to be powered by 100% renewable diesel is being used to install large structural steel beams and precast concrete panels at Brisbane's New Performing Arts Venue (NPAV).

Through partnering with the Queensland Government and BSF Mobile Cranes, the use of renewable diesel in the mobile crane substituted 3,880L of mineral diesel, which will save 10.5tCO<sub>2</sub>e, and will reduce greenhouse gas emissions by up to 75 - 95% over the life cycle<sup>1</sup> of the fuel compared to mineral diesel.



## B20 biodiesel case study: Caboolture Hospital Redevelopment, QLD



We trialled the use of biodiesel at the Caboolture Hospital Redevelopment. Two diesel generators used to power major on-site construction equipment (cranes, concrete booms, and hoists) were fuelled with B20 sourced from a local bio diesel provider, Eco Tech.

The project used 95,000 litres of B20 diesel in the generators and the trial confirmed substituting 20% biodiesel in the B20 blend of mineral diesel saved 43tCO<sub>2</sub>e and delivered a 14% net reduction in greenhouse gases compared with mineral diesel.

Analysis confirmed that the difference in pollutant emissions when using B20 would likely reduce community health costs, and increasing the use of Australian made biodiesel could reduce imports of diesel, improve energy self-sufficiency, as well as supporting local employment in fuel production and distribution.

[Click here](#) to read the full report.

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

Project teams, subcontractors and suppliers are all integral to helping us reach our fossil fuel free construction and decarbonisation targets – it's a journey we can't undertake alone and there are a few key steps you should take:

## ⦿ Electrification

## ⦿ Biofuels

### Project teams, subcontractors and suppliers

Use electric construction machinery and equipment for high diesel using activities (e.g., cranes, concrete pumping) where options are available.

Use biodiesel B5 on your project. It has been requirement since 2021 for all Lendlease Construction projects to use biodiesel B5 (as a minimum), where available.

Note: This only applies when using more than 1500L a month and in regions where biodiesel supply is available (VIC, NSW, SA and SE Qld)

Use battery technology as a buffer where there are grid constraints to maximise electric outcomes.

Use B20 in generators and cranes (check OEM warranties).

Use batteries to substitute generators where mains power is on site (min 32 Amps needed).

Explore options for renewable diesel to substitute mineral diesel where electric options are not available.

### Project teams

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:

- You don't oversize generators e.g., use 300kVA instead of 500kVA for site sheds and construction activities.
- Combining a battery with your generator system to cover night loads e.g. security lighting.

Undertake the Fossil Fuel Free Construction Leadership Challenge for Green Star and gain innovation points.

If you're yet to do so, do your Mission Zero training! Link to training in Resources on page 16.

### 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 Lendlease projects during the procurement process.

# 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.

## Key contacts

For further information about how you can use fossil fuel free construction initiatives on your project, it's recommended you contact your Regional Operations Manager or Project Construction Manager. If you require further technical advice or guidance, please don't hesitate to reach out to your Regional Sustainability Manager.

For further information on using biodiesel and renewable diesel on your project, we also recommend speaking to Refuelling Solutions who have supplied these fuels to several of our projects including Powerhouse Parramatta, Caboolture Hospital Redevelopment and NPAV.

## To ensure discounted pricing, contact:

Simon Roycroft  
Future Fuels Manager  
Refuelling Solutions

M: +61 418 831 585

E: [sroycroft@rfs.com.au](mailto:sroycroft@rfs.com.au)

# Resources

## Fossil Fuel Free Construction

Lendlease report - Stepping up the Pace: Fossil Fuel Free Construction	<a href="#">Link here.</a>
Refuelling Solutions Biodiesel Fact Sheet and FAQs – Accelerating the transition to clean energy.	<a href="#">Link here.</a>
Frontier Impact Group / Renuleum – What is Renewable Diesel?	<a href="#">Link here.</a>
Neste website (My Renewable Diesel) – Leaders in sustainable and renewable fuels	<a href="#">Link here.</a>
Benefits of B20 biodiesel blend with Biofutures Queensland and Qld Government	<a href="#">Link here.</a>
GBCA: How fast can we move towards fossil fuel free construction?	<a href="#">Link here.</a>
B5 Requirement for projects*	GreenBook <a href="#">link here.</a>
Fossil Fuel Free Construction Leadership Challenge for Green Star*	GreenBook <a href="#">link here.</a>

## Mission Zero

Lendlease website	<a href="#">Link here.</a>
Mission Zero Progress Report	<a href="#">Link here.</a>
Australian Mission Zero Roadmap	<a href="#">Link here.</a>
Mission Zero Ready training on Workday*	<a href="#">Link here.</a>






**Author**


**Abigail Heywood**


National Sustainability Manager,  
Strategic Projects

Lendlease Australia  
[abigail.heywood@lendlease.com](mailto:abigail.heywood@lendlease.com)

[www.lendlease.com](http://www.lendlease.com)

 @lendlease

 @lendleasgroup

 @lendlease

