Line Haul Road Transport

Navigating the Scalability of Technology Pathways in Australia

November 2025

CLIMATE LEADERS COALITION

The Climate Leaders Coalition (CLC) acknowledges and pays our respects to Aboriginal and Torres Strait Islander peoples as the First Peoples of Australia, whose ancestral lands and waters we work and live on. We honour the wisdom of and pay respect to Elders past and present and acknowledge the cultural authority of all Aboriginal and Torres Strait Islander peoples across Australia.

Foreword

Australia's freight industry underpins our economy as a critical factor in connecting regions, industries, and communities. Yet, it is also one of the most complex sectors to decarbonise, while facing growing challenges around fuel security. Within this system, line haul road transport stands out as particularly challenging: long distances, heavy payloads unique to Australia, and limited refuelling infrastructure make the transition to net zero difficult, with no clear pathway yet established.

For the first time in Australia, leaders across the entire line haul value chain – from freight operators and customers to energy providers and financiers – have mobilised to engage on a viable path to decarbonisation. Since 2024, nine CLC member CEOs took a significant step forward in collectively reviewing and assessing different technologies, with an agreed focus on renewable diesel (RD), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV).

The scope of the work extends beyond a theoretical assessment. The project partners have collaborated on and explored practical deployment of the technologies along the 900km long Sydney to Melbourne corridor. With this, they aim to prove the concept of heavy duty line haul decarbonisation technologies, obtain operational and commercial learnings to the benefit of the industry and government, demonstrate tangible progress, and build industry momentum and demand signalling to the market.

This journey has brought clarity to the specific "key unlocks" needed to achieve commercial viability in line haul, from technological advances and infrastructure development to supportive policy frameworks and investments. Whilst RD is "ready now", albeit with some challenges to scale, both BEV and FCEV require further developments to become operationally and commercially viable.

Whilst this report marks the conclusion of this phase of collaboration of the project partners, it is just the beginning of a longer journey. For RD, the deployment simulation confirmed the technology's feasibility; however, current fuel pricing (~250% of conventional diesel) creates a structural commercial gap that is limiting adoption. Policy support could contribute to immediate scaling. RD is identified as a near - mid term solution to reduce lifecycle carbon emissions. For BEV and FCEV, the learnings from the pilot design and deployment simulations gave clarity on detailed commercial feasibility as well as the technology advancements required to tip the balance toward accelerated scaling. Project partners will continue to monitor technology maturity and reconvene in mid-2026 to align on-ground pilot activation with the arrival of next-generation heavy-duty assets, and re-assessment of FCEV viability. In the meantime, partners will leverage learnings from existing pilots in smaller settings (e.g., intrastate) to optimise the future pilot design for line haul.

The journey to net zero line haul will not be simple, but we believe it is achievable. By acting as one – industry value chain and government – we can build a system that is cleaner, more resilient, and future proof.

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Decarbonising heavy duty line haul in Australia

What are the key unlocks needed to accelerate decarbonisation and transition to a more resilient line haul landscape?

Australia's line haul road transport is one of the nation's hardest-to-abate sectors, but also one of its biggest opportunities. Transport produces 20% of national emissions, with line haul accounting for ~15% of that. The sector's dependence on imported diesel also exposes the economy to price shocks and fuel insecurity. New pathways provide options to position the sector for growth and resilience.

Starting in 2024, the Climate Leaders Coalition (CLC) convened nine major organisations across freight, energy, and finance to identify suitable decarbonisation pathways, design pilots for real-world trials, and develop a scalable roadmap. This marks the first end-to-end value chain engagement on practical decarbonisation for Australian line haul freight.

Three key lessons have emerged.

1. **Three pathways are identified as preferable for deployment at scale to advance decarbonising line haul in Australia and position the sector for growth and resilience: RD, BEV, and FCEV.** A rigorous assessment of decarbonisation pathways across key criteria identified renewable diesel (RD), battery electric vehicle (BEV), and fuel cell electric vehicle (FCEV) as the most promising pathways. All three technologies have been investigated further for piloting and long-term pathways. **RD is "ready now"** as a drop-in fuel with limited modifications to fleet and infrastructure, but faces **supply constraints** at scale and limited potential to decarbonise as it reduces lifecycle carbon emissions**. BEV is a rapidly maturing, net-zero solution** that provides energy security, but requires **technology advances** to be suitable for scaled heavy duty line haulage. **FCEV is a net-zero technology with suitable characteristics** for heavy duty line haul, but would need to overcome significant **infrastructure availability challenges**. Although BEV and FCEV may offer favourable long-term Total Cost of Ownership (TCO) vs. conventional diesel, **all technologies currently face price barriers**, whether it be mainly upfront cost (BEV prime mover), fuel cost (RD), or both (FCEV).

2. **There is now greater clarity on "critical unlocks" required for commercial viability at scale.** The renewable diesel pilot design and deployment simulation demonstrated that the technology is technically viable but the **RD price premium** (vs. conventional diesel, ~250%) would need to be **brought down significantly for large-scale adoption**. In parallel, additional **local production or import** needs to be secured to overcome forecasted supply constraints. BEV deployment simulation along the 900km Sydney-Melbourne corridor shows that current battery capacity and combined ~3-hour total enroute charging times prevent typical line haul loads from being transported within regulated driver hours. **Next-generation BEV trucks** – expected to be available in Australia in 18-24 months - could enable a scalable solution due to expected range improvements (400+ km B-double) and charging power (1 MW) provided significant investments in **infrastructure to support fast charging** (e.g., **Megawatt Charging System** along key corridors). **FCEV** currently lacks **access to portable hydrogen refuelling stations**, preventing on-ground pilot deployment for now. Commercial viability will also hinge on **hydrogen production costs being reduced to ~$5-6/kg** ideally through localised generation near Sydney on top of already existing facilities near Melbourne. Both **BEV and FCEV will be re-assessed for on-ground deployment in mid 2026**.

3. **Collaboration across the industry value chain, as well as industry-government partnership are a non-negotiable.** No single organisation can transition alone, which is underpinned by our pilot design findings. Joint investment and aligned policy will be critical to **overcome the "chicken and egg" dilemma of new product, vehicle and infrastructure economics**. Industry value chain collaboration will be key to integrate and jointly plan roll-out of new pathways as well as pool technology, fuel, and infrastructure demand to ensure timely and affordable access. Finally, government support will be needed to de-risk early capital expenditure and define supporting policies to help accelerate timelines.

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Nine leading organizations have come together as part of the Climate Leaders Coalition to accelerate progress in transitioning line haul road transport in Australia

Project sponsor

Context of working group

- Since **2024**, nine organizations have collaborated on a **ground-breaking effort to deploy their collective resources** to accelerate decarbonization in line haul
- The organizations represent stakeholders **across the entire value chain:** freight operators, energy providers, customers, financers, and other key stakeholders

Freight owners requiring **movement of goods** over long routes (e.g., from warehouse to distribution centres)

Woolworths, Schneider Electric, Blackmores

Logistics providers operating **line haul trucking services** to **transport those goods**

Toll (project sponsor), Ron Finemore Transport

Energy players supplying or enabling access to **low-emission fuel and infrastructure** to **power the trucks**

Ampol, EnergyAustralia, Viva Energy Australia

Financial institutions providing **support and advice** regarding financing of pathways

Commonwealth Bank

Project objectives

- **Jointly identify most suitable decarbonisation technologies** for heavy duty line haul trucking incl. prioritisation of technologies for piloting
- **Prove the concept** of heavy duty line haul decarbonisation technologies in **Australian context**
- **Develop insights** on freight operations, fuel supply & infrastructure, economics, and supply chain dynamics for **novel technologies**
- **Demonstrate tangible progress in short/medium term** and design **pathway to scale**
- **Build industry** momentum for critical unlocks

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Decarbonising Australia's line haul freight is critical to curb rising emissions, enhance energy security, and build stability and resilience – all of which will require industry coordination and collaboration to unlock viable pathways

Transport currently emits **~20% of total Australian emissions** (98 MTCo2-e p.a.) and is likely to be the largest contributor to Australia's total GHG emissions from 2028. **Road freight line haul** contributes to **~15% of total transport emissions** (~13 MT CO2-e), making it one of the most material and hardest-to-abate segments, and therefore a **critical focus for national decarbonisation.**

While decarbonisation is the catalyst, the strategic **rationale to transition extends beyond climate impact**. Nearly every business depends on the freight and logistics industry, which underpins the Australian economy and accounts for approximately 9% of GDP. Australia's freight network is highly exposed to imported diesel, with **less than a month fuel supply** covered, exposing the economy to fuel security risk and global price shocks. With fuel typically accounting for **25-40% in line haul operating costs (#1 variable input)**, volatility in these markets directly drives **cost instability** for transport operators, industries, and consumers. At the same time, freight transport customers are increasingly demanding low-emission logistics to meet emission reduction targets or consumer demand, creating **competitive pressure to adapt.**

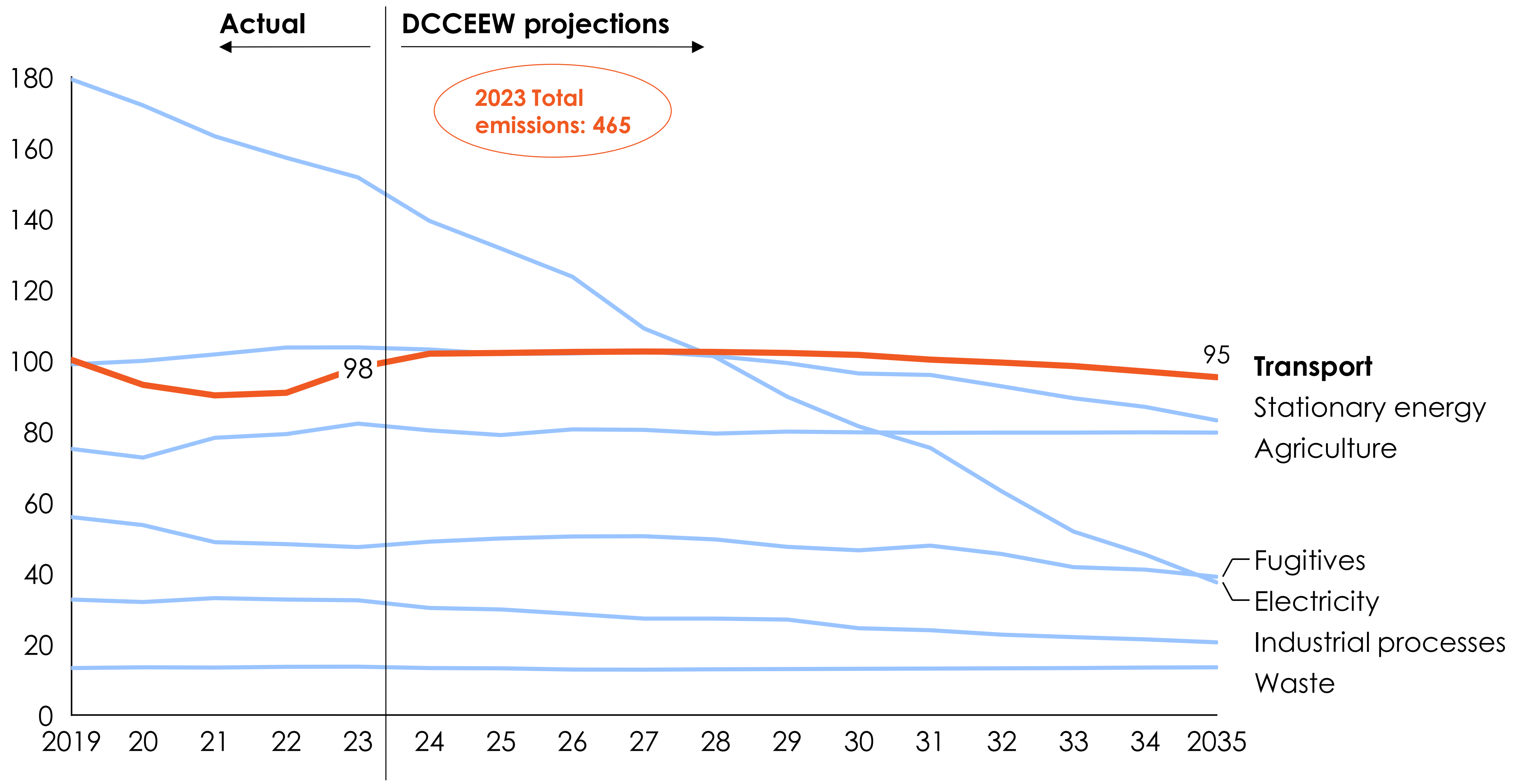
There are a number of **open questions about the solution in the Australian context**: whilst solutions are rapidly emerging for various transport modalities and pilots are underway around the world, there is currently no clear solution for tackling this in **Australia's unique conditions with large distances and heavy loads**, underpinned by a lack of Australia-specific performance data and practical operating and infrastructure knowledge along the value chain.

Industry coming together and **mobilising across the end-to-end value chain** will be critical to **create confidence and ensure an efficient, scalable pathway.**

Source: Climateworks Centre, Delivery Freight Decarbonisation (Oct, 2023)

Transport is forecast to become the largest contributor to Australia's carbon emissions by 2028

DCCEEW emissions projections 2023 - Emissions by sector in Australia 2019-2035, Mt CO2-e



As per DCCEEW Australia's emissions projections 2023, Transport, which currently emits **98 MTCo2-e (20% of total emissions)**, is likely to be the **largest contributor to Australia's total GHG emissions from 2028**

1. Freight assumed as rail, articulated trucks, rigid rucks and light commercial vehicles as per DCCEEW data

Source: Climateworks Centre, Delivery Freight Decarbonisation (Oct, 2023), DCCEEW, Australian Emissions Projections (June, 2023)

Moving to localised energy supply reduces exposure to global oil shocks, import disruptions, and price shocks, as Australia's freight network currently largely runs on imported diesel with less than a month's supply

Consumption cover, # days

Aviation turbine fuel	20
Diesel oil	24
Automotive gasoline	28
Crude oil and refinery feedstocks	38
Lubricating oils, greases & basestocks	51
Liquefied petroleum gas	71
Fuel oil	74
Aviation gasoline	156

- Almost **70% of diesel is currently imported** to meet Australian demand, leaving Australia's freight network **highly exposed to import risks and currency / price volatility**
  - Diesel only has **24 days of consumption cover**, meaning line-haul trucking would be severely constrained within three to four weeks of a major import disruption
  - Fuel typically represents ~**25-40% in line haul operating cost**, meaning even small price volatility directly erodes margins or feeds through to end customers via inflation
- **Localising energy supply** helps build **energy security**, enhance **price stability**, and strengthen **supply-chain resilience**
  - Local production and use of alternative fuels anchors **control within Australia's borders**
  - Australia is **well positioned to develop and scale** low-carbon freight fuels, with its vast land availability, high solar irradiance, and strong wind capacity factors

Source: Department of Climate Change, Energy the Environment and Water, Australian Institute of Petroleum, NTI

Large Australian line haul customers are actively demanding low-emission logistics to meet targets and respond to customer expectations

Emissions visibility has become mandatory, with climate disclosures now requiring large Australian companies to report and assure Scope 3 emissions, triggering **accountability loops and expectations for progress**

Corporates are increasingly cascading their reduction targets to logistics suppliers, embedding carbon performance into procurement and supplier evaluation frameworks (e.g., BHP integrates sustainability considerations into procurement and logistics, Telstra is working with suppliers to reach its goal of reducing Scope 3 emissions by 50% by 2030)

Consumer brands are integrating "green delivery" as part of their value proposition using low-emission logistics to meet consumer demand and build competitive advantage (e.g., nearly 85% of IKEA truck orders in Australia in October 2025 were delivered in net-zero vehicles)

While regulatory developments in Australia have **established the minimum requirements** for emissions actions, **corporate ambition** and **consumer expectations** are driving the transition beyond compliance.

Coordinated industry and government action can position Australia to build a globally **competitive low-emission line haul ecosystem** that meets evolving market and policy demands.

Source: Company websites of IKEA, BHP, EY, Telstra, Engeny

Since the start of the journey in 2024, significant progress has been made through the collaboration of the participating companies with the Climate Leaders Coalition and with the support of partners

Complete | 2026+

A Strategic assessment and pathway prioritization

Prioritisation of the 3 most promising Line Haul technologies via an in-depth strategic assessment against 8 lenses and 17 criteria: Renewable Diesel (RD), Battery Electric Vehicle (BEV), and Fuel Cell Electric Vehicle (FCEV)

B Pilot design

Detailed design for pilots based on core design principles, including maximising emission reduction and accelerating timelines

C Pilot deployment simulation

Simulated pilot outcomes by modelling detailed pilot scenarios and testing operational feasibility, cost implications, and critical success factors under real-world conditions

D Pilot on-ground implementation

Execution of real-world pilots to test technology performance, gather operational and commercial insights, and inform scaling strategies.

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Through extensive trade-off analysis and modelling, the project partners collaboratively selected three pathways for further detailing for piloting: Renewable Diesel, BEV, and FCEV

Initial pathways[1]	**Pathway availability**	**Environmental impact**	**Holistic trade-off analysis on initial shortlist**	**Outcome on pathways**
Assessment	Is the technology sufficiently mature for imminent usage in long distance, heavy truck haulage? Do OEMs have interest to cater the Australian market (e.g., develop trucks with sufficient payload)?	Does the technology have the ability to significantly reduce CO_2-e emissions vs. diesel ICE? Is there any other impact on the environment associated with this technology (e.g., water usage)?	***Detailed trade-off assessment*** *of remaining shortlisted technologies / pathways*[2] ***across holistic set of lenses and underlying criteria*** *in order to prioritise technologies* *More* ***detail on strategic assessment follows on next pages***	***Selected for further detailing for pilots***
Pathway prioritisation for further exploration	✗ **Biodiesel:** Limited contribution to CLC decarbonisation ambition (blending limit at ~20%) ✗ **NH3 ICE:** Limited use cases of NH3 in trucking; additional CO_2-e emissions vs. H2 ICE (e.g., NOx) ✗ **NG ICE:** Limited contribution to CLC decarbonisation ambition and limited use cases of natural gas (NG) in trucking		✓ Renewable diesel ✓ BEV ✓ FCEV ✓ H2 ICE (blend and full H2)	**Prioritised pathways:** • Renewable Diesel • BEV • FCEV

1. Renewable diesel, biodiesel, BEV, FCEV, H2 ICE, NH3 ICE, NG ICE
2. Renewable diesel, BEV, FCEV, H2 ICE

The project partners considered a broad range of decarbonisation fuel technologies that could potentially be viable and feasible for heavy duty line haul

Fuel type: Diesel | Electricity | Hydrogen | Other

Technology	Powertrain description	Typical use case
Renewable Diesel (RD)	**Combustion engine** powered by combustion of **hydrocarbon fuel** produced from hydrotreating vegetable oils (HVO)	**Long-haul transportation**, especially in **use cases** in which **low to moderate amounts of CO2-e reduction** (abatement potential dependent on blend) in **near-term** is required (renewable diesel is a "drop-in" fuel)
Biodiesel	**Combustion engine** powered by combustion of a blend of **conventional diesel and FAME (fatty acid methyl ester)**, which is produced from esterification of vegetable oils	**Long haul transportation and/or agriculture,** especially in regions with access to biodiesel (e.g., agriculture), and in **use cases** in which **low amounts of CO2-e reduction** (maximum of 20% in blend) in **near-term** is required (biodiesel is a "drop-in" fuel)
BEV	**Electric motor** powered by **electricity** drawn from a **battery**	**Urban commuting**, with increasing adoption in **short-haul trucking**, especially in regions with **existing recharging infrastructure** or in **net-zero use cases** where **technology readiness** is important
FCEV	**Electric motor powered** by converting **hydrogen** to electricity by a **fuel cell**	**Medium-to-long haul transportation and heavy-duty applications**, especially in regions **suitable for hydrogen production / with existing infrastructure** or in **net-zero use cases** where **quick refuelling** is important
H2 ICE – Dual fuel	**Combustion engine** powered by combustion of **diesel and hydrogen**	**Long haul transportation,** especially in regions **suitable for hydrogen production / with existing infrastructure infrastructure** or in use cases where **quick refuelling and/or limited vehicle retrofitting/investment** is important
H2 ICE – Full H2	**Combustion engine** powered by combustion of **hydrogen**	**Urban commuting and short-haul transportation**[1], especially in regions with **existing hydrogen infrastructure** or in **net-zero use cases** where **quick refuelling** is important
NH3 ICE	**Combustion engine** powered by combustion of **ammonia**	**Agricultural and maritime sectors**, especially in regions with **existing NH3 infrastructure** (agriculture)or relying on relatively **high energy density** for long distance transportation (maritime), with **potential to reach carbon-neutrality**[2]
NG ICE	**Combustion engine** powered by combustion of **natural gas** (either dual-fuel combustion or full natural gas)	**Long haul transportation or heavy-duty applications** (e.g., construction equipment), typically leveraging **existing NG infrastructure**, with **trade-offs between cost of retrofitting and ability to abate CO-2e emissions**

1. Typically used for shorter distances than FCEV due to reduced energy efficiency
2. No full net-zero CO2-e due to NOx emissions

Source: NREL, Quantron, IEA, ADFC, Green Production Guide, Chemical Engineering Transactions, Gas Research, European Union, Kleinman Center for Energy Policy

The four shortlisted technologies were assessed across 8 dimensions and 17 criteria

Lenses	Criteria	Unit
A **Technology availability**	Technology readiness	*Qualitative*
	OEM readiness	*Qualitative*
B **TCO**	TCO	A$/km
C **Environmental impact**	Carbon emissions impact	g CO_2-e/km
	Other nature impact	*Qualitative*
D **Investment required**	Upfront investment	A$
	Ability to get gov't support	*Qualitative*
	Ability to get loan/funding	*Qualitative*
E **Safety**	Safety	*Qualitative*
F **Operational performance**	Payload	T
	Range	km
	Transit time	hours
	Reliability	*Qualitative*
	Resilience	*Qualitative*
G **Fuel chain availability**	Fuel / energy availability	*Qualitative*
	Infrastructure availability	*Qualitative*
H **Scalability**	Scalability	*Qualitative*

Four technologies were shortlisted from the initial long list based on technology availability and environmental impact, and then evaluated through holistic trade-off analysis to enable further technology prioritisation

Fuel type: Diesel | Electricity | Hydrogen

Technology		Key advantages	Key constraints
Renewable diesel (RD)		RD provides the **lowest cost and risk for the pilot, and most ready to roll out** in the near term to reduce line haul emissions (e.g., only limited infrastructure upgrades required)	RD100 offers **lower carbon reduction** (~70-90%[1] lifecycle fuel CO_2 abatement) with minor reduction in fuel efficiency of renewable diesel compared to conventional diesel. Potentially higher **long-term costs** due to **feedstock limitations** in Australia and **competition from other hard-to-abate sectors** (aviation, mining). However, import options, PtL advancements and supportive policies could ease feedstock constraints
BEV		Represents a **mature Net Zero emission vehicle and charging technology**, with **technology evolving** for heavy-duty-trucks (HDT). Required infrastructure might have synergies with EV passenger vehicles and could be **lowest cost** technology in 2035	Vehicle technology **does not meet key operational requirements in the near-term** (due payload restrictions, no. of stops, and driver requirements), with some restrictions potentially still present in 2035, and scaling would require **significant infrastructure upgrades** to serve (competing) demand
FCEV		Represents a **new Net Zero emission vehicle and fuel technology** which likely **meets key operational requirements in near-term,** and is expected to have **TCO on par with BEV** by 2035	**New vehicle and fuel technology** with **limited at-scale testing** for line haul and in Australia, with associated risks. **High upfront CAPEX required** to build the required H2 infrastructure, and scaling **beyond the pilot** would require **further build-out of still nascent hydrogen supply chain.** Further, large amounts of **(sea) water consumed for the process** (~250k litre of H2O per truck p.a.)
H2 ICE	**Retrofit (2026)**	**Lower vehicle CAPEX investments vs. FCEV and full H2**, with **flexibility** to blend H2 with diesel and/or RD whilst H2 infra is built out	**Retrofit potentially not backed by OEMs** and dependent on local service provider, and **not a Net Zero technology** (~60% lifecycle fuel CO_2 abatement). **High upfront CAPEX required** to build the required H2 infrastructure, and expected **slow scaling of the fuel chain**
	Full H2 (2035)	Represents a **new Net Zero emission vehicle and fuel technology** which **meets key operational requirements**	**Likely not a 2035 technology as 20-30% less efficient than FCEV**

1. Scope 1 offsets (100%) eligible for Safeguard Mechanism credits

Source: Hydrogen Insights, GEP, CLC, Expert interviews, IEA, CSIRO, GHD Advisory

RD may offer a low-risk bridge, whereas BEV and FCEV indicate strongest long-term potential but with challenges in nascent technology and supply chain; H2 ICE not a likely long-term solution

Relative performance More favourable | Moderately favourable | Less favourable

To be tested in real-world conditions during pilot

Lenses	Diesel ICE	Renewable Diesel 2026 (RD100)	Renewable Diesel 2035 (RD100)	BEV 2026	BEV 2035	FCEV 2026	FCEV 2035	H2 ICE 2026 – Retro (40%)	H2 ICE 2035 – Full H2 (100%)
A Technology availability		More favourable	More favourable	Less favourable	Moderately favourable	Moderately favourable	More favourable	More favourable	More favourable
B TCO A$/km Payload adj.	~1.4-1.9	Less favourable	Less favourable	Less favourable	Moderately favourable	Less favourable	Moderately favourable	N/A	
C Environmental impact, kg CO2-e/km	1.41 (tailpipe)	Less favourable		More favourable		More favourable		Less favourable	More favourable
D Investment required and financing		More favourable		Less favourable		Less favourable		Less favourable	
E Safety		Different 'system of controls' required to develop risk mitigation measures – to be tested in pilot							
F Operational performance		More favourable	More favourable	Less favourable	Moderately favourable	Moderately favourable	More favourable	Moderately favourable	More favourable
G Fuel chain requirements		More favourable	Less favourable	More favourable	Moderately favourable	Moderately favourable	Moderately favourable	Moderately favourable	Moderately favourable
H Scalability		Less favourable		More favourable		More favourable		Moderately favourable	
Assessment summary		**Existing technology with low cost and risk to pilot with moderate learnings.** Potentially higher **long-term costs** in TCO compared to BEV/ FCEV alternatives but evolving policies/ tech may offset this		**Mature EV technology with long term potential, and substantial learnings from pilot.** However battery technology and infrastructure but not yet mature in B Doubles for large distances		**New technology with long-term potential, and substantial learnings from pilot.** Indications suggest likely **to meet key operational requirements in near-term (to be tested)**		**Existing technology with low vehicle cost and risk to pilot with moderate learnings.** Long-term less efficient solution (20-30% less efficient than FCEV)	

Source: Hydrogen Insights, GEP, CLC, Expert interviews, IEA, CSIRO, GHD Advisory

Three out of the four shortlisted technologies were selected by the project partners for further detailing out for piloting: Renewable Diesel, FCEV, and BEV

Technology		Project partners' position	Implication for pilot selection
Renewable diesel (RD)		**Interest in further exploring RD pilot** due to ability to rapidly mobilise, lower risk and ability to use as demonstration of mobilising together as industry partners	✓ **Selected for further detailing out for piloting**
BEV		**Interest in further exploring BEV pilot** due to long-term potential incl. common infrastructure benefits, however contingent on advances in BEV technology to deliver operational needs	✓ **Selected for further detailing out for piloting**
FCEV		**Interest in further exploring FCEV pilot** due to significant learnings with novel technology (e.g., FCEV B-Double configuration), operational suitability, and long-term potential contingent on supply chain developments	✓ **Selected for further detailing out for piloting**
H2 ICE	**Retrofit (2026)**	**Preference to pilot other H2 technologies** for learnings and CO2-e impact	✗ **Not selected** – no further exploration of technology to be progressed
	Full H2 (2035)	**Preference to pilot other H2 technologies** for learnings and CO2-e impact	✗ **Not selected**– no further exploration of technology to be progressed

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The purpose of the pilots is to test for operating and financial outcomes of the technologies (relative to conventional diesel) in heavy duty line haul to inform prioritisation and scaling planning

Example KPIs

Financial outcomes
- Total Cost of Ownership
- Energy unit input costs (A$ per km)
- Payload adjustment
- Incremental operating cost (including secondary impacts such as site usage impacts)
- Investment requirements (capex)

Operating outcomes
- Operational incidents
- Modifications on operational value chain
- Impact on cargo weight
- Journey time
- Vehicle maintenance costs
- Safety compliance

Market information
- Customer Service Level Agreement compliance (e.g., on time pick up and delivery)
- Willingness to pay from customers for cost premium (if applicable)
- Customer prioritization of net zero outcomes

Environmental outcomes
- Carbon emissions reductions
- Other emissions reductions
- Estimations on Scope 1 and 3 carbon savings

Ecosystem information
- Compliance with regulations (e.g., Basic Fatigue Management (BFM), load limits, any other non-negotiable compliance limitations)
- Technology availability
- Refuelling / recharging Infrastructure gaps and investment required
- Fuel chain requirements
- Scalability

For final pilot modelling, the project partners built each pilot on a 'best possible' scenario with an overlay of realistic, existing operations to test the upper bounds of feasibility

'Best possible' scenario assumptions

Vehicle: Highest-performing vehicles currently on the market

Infrastructure: Existing national infrastructure with implementable **upgrades and additions**

Operations: Optimal operational conditions (e.g., weather, traffic, etc.)

Rationale for using 'best possible' scenario assumptions

- Provides ability to test the upper bounds of **commercial and operational feasibility**
- Offers clear view of which technologies are **viable to scale today**, vs. which require **further system-level unlocks**, and which remain **out of reach** in the short term

The performance of all pilot technologies would be **benchmarked against conventional diesel** on core criteria (e.g., time, payload, cost) across identical lanes and into **realistic, existing operations**

Pilots were designed for the three prioritised technologies

		Renewable Diesel (RD)	BEV	FCEV
Pilot design	**Vehicle** (#)	Mercedes Benz Actros (1)	Windrose EV (2)	HDrive FCEV TS70-310 (2)
	Fuel/Energy Source	Renewable Diesel (HVO100)	100% renewable energy	Green hydrogen
	Lane	Sydney <> Melbourne (~900 km)		
	Number of refuelling stops (excl. start / end point)	0 stops required	3 stops required	2 stops required
	Refuelling method	Portable tank (leased) placed in 1 location	Dedicated heavy haulage charging infrastructure	Portable hydrogen refuelling sites
	Fuel cost ($/km)	-	~1.5	~3.3
Timeline	**Pilot duration**	11 weeks (Fuel volume governed, 69K litres)	6-12 months	3 months
Data capture / anticipated learnings		**Driveability,** freight transported **lubricating oil analysis**, **vehicle and driver** identification data	**Range / charging time**, **payload** performance, **BEV operation and servicing**, cost and lead time to **upgrade grid**	**Costing and operational impact** of hydrogen refuelling **infrastructure**, **FCEV operation and servicing**, **energy consumption** variability
Considerations		Relatively **easy integration** into existing freight operations ("drop-in" fuel) and minimal disruption to existing infrastructure, but no fully net-zero potential **Logistical decisions** and work required around storage tanks, certification, and assurance	Vehicle **range and charging time** need to be sufficient to meet **driver hours regulations** (BFM) **Payload** often compromised due to heavy battery Timeline and cost associated with **infrastructure upgrades** **High variation in charger infrastructure cost** **Prime mover premium** vs. diesel ICE	Availability and pricing of **refuelling infrastructure** Availability and pricing of **green hydrogen** along the Hume Highway **Prime mover premium** vs. diesel ICE

Pilot design and deployment simulations highlighted pilot readiness for RD (despite immediate scaling limitations), and ideal timing for BEV and FCEV pilots being from mid 2026 to enable testing of scalable next gen tech and infrastructure

	Renewable Diesel (RD)	**BEV**	**FCEV**
Corridor and load	Sydney <> Melbourne (~900 km) with B-Double load (~68t GCM trucks)		
Pilot status & timelines	**Currently insufficient pricing support / customer willingness to pay for immediate commercial progression –** Pilot design and deployment simulation demonstrated that the technology is technically viable but insufficient market willingness to pay premium and lack of pricing mechanisms to support commercial viability	**Reconvening mid 2026 to decide on timing of activation of pilot** – BEV technology shows strong momentum but currently not practical and feasible considering current range and charging times of BEV models for B-double line haul	**Reconvening mid 2026 for re-assessment of viability** of FCEV pathway - pending resolution of critical infrastructure and supply chain gaps that currently prevent operation and renewed assessment of its competitiveness compared to other pathways
		Currently working with **industry and government partners** on **'critical unlocks'** Closely **monitoring existing pilots** in other settings to inform future pilot design	
Core advantages	**"Ready now"** as a drop-in fuel that **integrates easily into existing fleets and supply chains** with minimal mechanical or operational change (provided OEM approval)	**Likely higher fuel security and price stability** (vs. conventional diesel) due to **local production of energy source** **Fast-growing momentum** supported by advancing technology, rapid uptake in adjacent transport sectors, and emerging policy incentives	**Fuel technology is ready** to support B-double line haul requirements (e.g., only 1 stop needed with ~15min refuelling time)
Core challenges for commercial uptake	**Steep price premium at 250%** (vs. conventional diesel) on an input which accounts for ~40% of total operating costs (fuel), combined with **insufficient commercial mechanisms or policy incentives** to bridge the green premium gap **Limited available feedstock** volumes for scaling **RD government funding focused on local RD production** (vs funding import-based fuel pilots)	**Current BEV prime mover battery capacity and charging times** push modelled journey time (~16 hours) above **regulated driver hours (14 hours on log book):** modelling indicated **five chargers** would be required (full charge at end points; three top-ups enroute with total ~3 hour charging time) **Lack of suitable charging infrastructure** (e.g., Megawatt Charging System (MCS)) **Upfront capital cost of prime mover** (up to 20-50% more than conventional diesel)	**Limited to no hydrogen refuelling infrastructure** on Sydney <> Melbourne corridor **Lack of supply of portable hydrogen refuelling stations** (capable of storing hydrogen at 700 bar) to Australia in lieu of permanent hydrogen hubs **Hydrogen price barrier** (up to **~3x cost** per km vs. conventional for diesel) **Upfront capital cost of prime mover** (up to 300% more than conventional diesel)

Source: Participating companies

Pilot status: Deployment simulation confirmed currently insufficient pricing support / customer demand for scaling

Renewable Diesel: Detail on pilot design

Design element			Design choice
Pilot design	**Prime mover and freight selection**	**Vehicle** (#)	Mercedes Benz Actros 2653 (1)
		B-Double range (km)	Up to 1800 km
		GCM (t)	64 - 68t
		Transportation good	Grocery
	Fuel / energy	**Fuel / energy source**	Renewable Diesel (HVO100)
		Emissions reduction (vs. diesel ICE, %)	~90% reduction on Greenhouse Gas Emissions on Lifecycle basis. Based on Standard fossil fuel comparator (94gCO2e/MJ)according to EU RED Standard Methodology
	Network design and infrastructure strategy	**Lane** (km)	Sydney <> Melbourne (~900 km)
		Number of refuelling stops (excl. start / end point)	0 stops required, contingency measures in place through fuel level notification system and on-site inspections
		Refuelling method	Portable tank placed in 1 location (Midpoint for trial)
	Financial	**Expected cost** ($)	-
		Fuel cost ($/km)	-
		Infrastructure ownership	Leased
		Anticipated funding	Funding is key barrier to progress
	Core relevant regulation & safety topics		ISCC certification for Renewable Diesel OEM approval
Timelines	**Commencement**		Deployment simulation sufficient (on-ground pilot not required)
	Duration		11 weeks (Fuel Volume governed @ 69,000 litres)
Data capture / anticipated learnings			Driveability (e.g., utilisation, moving duration, #stops, fuel consumption), freight transported lubricating oil analysis, vehicle and driver identification data

Considerations:

- **Drop-in fuel:** integrates easily into existing fleets and supply chains with minimal mechanical or operational change, but no fully net-zero potential
- **Limited infrastructure needs:** requires only minor adjustments for tank storage, cleaning, and segregation
- **Assurance:** certification and traceability of feedstock and fuel quality are critical to claim emissions reductions credibly

Pilot status: Deployment simulation confirmed currently insufficient pricing support / customer demand for scaling

Renewable Diesel: Supply chain can be readily established within existing infrastructure, with some action required on refuelling sites, product assurance, operational control, and commercial & technological enablement

Topic	Outcomes
Refuelling sites	• Portable storage tanks **leased and located at customer site** for direct vehicle dispensing • Site assessment required to ensure **adequate footprint and vehicle turning radius** • **Single fill expected** during pilot; refill managed via **cloud-connected tank monitoring** system and site inspection
Product Assurance & Certification	• Renewable diesel supply **ISCC-certified up to the portable tank inlet** under current scope • **Ownership transferred at inlet** (rather than taking ownership at storage facility / vessel) to avoid additional site certification burden for project partner • **Opening the isotainer not considered as "transport"** as long as some detail can be provided on sampling procedure and reason
Operational Controls & Compliance	• **Dangerous Goods storage obligations** to be addressed (SafeWork notification, SDS availability, integration into company processes). • Protocols required for **refilling, monitoring, and safety management** (e.g., standardised protocol for site inspection)
Commercial & Technological Enablement	• **OEM approvals obtained** for use of renewable diesel in participating fleet • **Customer contracts updated** to reflect renewable fuel use

Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

BEV: Detail on pilot design

Design element			Design choice
Pilot design	**Prime mover and freight selection**	**Vehicle** (#)	Windrose EV (2)
		B-Double range (km)	255
		GCM (t)	68
		Transportation good	Autoparts, groceries
	Fuel / energy	**Fuel / energy source**	100% renewable energy
		Emissions reduction (vs. diesel ICE, %)	100%
	Network design and infrastructure strategy	**Lane** (km)	Sydney <> Melbourne (~900 km)
		Number of refuelling stops (excl. start / end point)	3 stops required
		Refuelling method	Dedicated heavy haulage charging infrastructure (XX MW)
	Financial	**Expected cost** ($)	Not evaluated due to lack of viability
		Fuel cost ($/km)	~$1.5 (based on ~2.1kWh/km, ~$0.7/kWh)
		Infrastructure ownership	Requires third party investment of multiple charger locations
		Anticipated funding	Not evaluated due to lack of viability
	Core relevant regulation & safety topics		Vehicle design & access approval (e.g., ADR compliance) BEV safety and infrastructure design (e.g., high-voltage systems) Basic Fatigue Management guidelines (BFM) Green electricity certification (e.g., REGO)
Timelines	**Commencement**		Work in progress (see chapter "Where to from here")
	Duration		6-12 months
Data capture / anticipated learnings			Range / charging time performance, payload performance, BEV operation and servicing, cost and lead time to upgrade the grid

Considerations:
- **Operational fit:** range and charging time must align with driver fatigue and hours-of-service limits (BFM compliance)
- **Payload trade-off:** heavy battery packs reduce payload capacity on long-haul routes
- **Infrastructure challenge:** significant grid and depot upgrades required; high upfront vehicle cost vs. diesel
- **High variance in charger infrastructure cost**: Requires viable business case for third party providers.
- **Vehicle premium**: high upfront investment for vehicle (20-50% higher than comparable diesel ICE)

Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

BEV: Deployment simulation revealed today's 'best case' BEV solution is not viable for scaling B-Double line haul operations; on-ground pilot to be implemented in ~18 months leveraging scalable next generation technology

Key modelling assumptions

BEV prime mover

- 38t GCM (vs max 68t)
- 90 km/h max speed
- ~700 kWh battery capacity
- 400 kW charge speed (vs max 870 kW)
- ~670 km OEM-rated range (WLTP)[1]

Time (~16h incl. 2.5h rest time)

- 11h total driving time
- 2.5h total charge time during route; combined with rest time
- 0.75h total connect/disconnect time
- 1-1.5h total start/end-of-trip time

Driver policy

- Basic Fatigue Management guidelines (BFM)

Insights

Current BEV technology does not meet requirements as it can **push driver hours above the 14 hours permissible** in a 24-hour period

- The **standard truck driving time** between Melbourne and Sydney is **~11 hours**, which is already a challenge for driver Basic Fatigue Management (BFM)
- Iterative BEV modelling estimated an additional vehicle charging time of ~**2.5 hours per time** (excl. 45 min connect/disconnect time)
- Conflicts with BFM hours common on the route as the 'standard'

Note: The scenario was modelled using **optimistic assumptions**, implying BEV technology and infrastructure would need to **close a considerable gap to become viable for heavy duty line haul** – with key assumptions including:

- **Availability of enroute 400 kW chargers** (as well as origin and destination chargers), whereas as of 2025, the largest highway chargers **planned are 200 kW and only in a subset** of the locations
- **Low-weight B-double route** at 38t GCM (atypical load weight) to see if there is a viable BEV use case[2] (standard GCM is 64 to 67t for B-Double)

Next steps

Project partners will reconvene mid 2026 to decide timing of activation of pilot

- **Next-generation BEV prime movers**, with improved range and charging speed, are expected to be available in Australia in 18-24 months
- With availability of **megawatt charging** (1000 kW) and **doubled battery capacity** (1430 kWh), BEV simulation shown to be compliant and operationally viable at trip completion in 11.7 hours

1. Real-world range typically ~20% lower than WLTP; in addition, range is speed, terrain, and gross mass dependent and may vary with weather conditions and driver behaviour
2. Various other weights at 62.5t and 55t were also modelled with only relatively small impacts on the charge location and time needed

Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

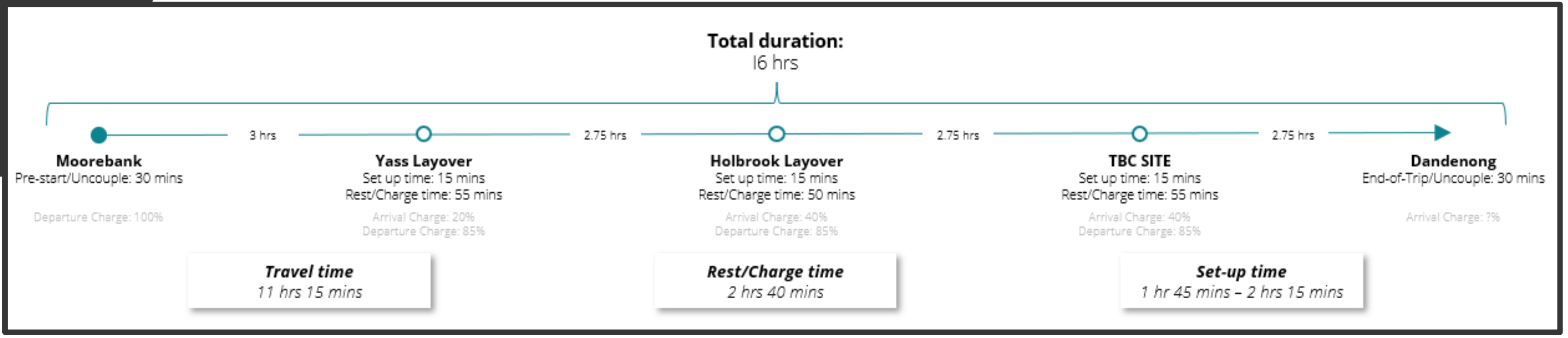
BEV: Visualisation of modelled interstate routes and potential charging points – example for SYD to MEL

Route example: Sydney - Melbourne

Loading/off-loading   Charger location

Modelling results for original pilot design

- Modelling of the initially proposed **BEV B-double trial route** from Sydney (Moorebank) to Melbourne (Dandenong) generated a **total trip duration of 16 hours**
- The modelled trip **exceeded the 14 hours permissible** under the Advanced Fatigue Management Scheme (AFMS – regarded as the "standard" for this route), largely driven by a **total charge time of ~2.5 hours**



Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

BEV: Even though prime movers are not viable for most use cases today, the evolving landscape could quickly shift the equation provided Australian purchasing scale is sufficient to get access

		Generation 1[1]	Generation 2	Generation 2+[2]
Estimated time of deployment[3]		Current	Mid 2026	18-24M
Maximum GCM (t)		44	68	74
Battery (nominal kWh)		540	729	875
Useable charge (%, KWh)		60%, 324	90%, 656	90%, 788
Max charge power (kW)		250	870	1,000
Min charge time (h)		1.30	0.75	0.79
Single trailer	**Payload** (t)	24.6	24.7	24.7
Single trailer	**Energy consumption** (kWh/km)	1.6	1.25	1.25
Single trailer	**Range** (km)	203	525	630
B-Double	**Payload** (t)	N/A	40.1	40.1
B-Double	**Energy consumption** (kWh/km)	N/A	1.85	1.85
B-Double	**Range** (km)	N/A	355	426
Price ($)		~630,000	~$450,000	~$430,000

Single trailer: Not considered for pilot due to B-double load requirement

1. Not suitable for B-Double line haul, but existing generation 1 pilots are happening now and will inform interstate pilot
2. Best estimate
3. Requires purchasing scale for Australian businesses to get access

Source: OEMs

Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

BEV: Viability in heavy duty line haul also challenged by lack of heavy duty haulage charging infrastructure, which typically comes with 12+ months timeline and associated costs and risks

Activity	Stakeholders	Timing	Estimated cost per 400 kW charger capacity
1. Site identification	Landowners / Lease holders	4-6 weeks	**Charger**: ~$800k **Switchboard**: ~$200k **Transformer**: ~$125-375k
2. B-Double accommodation	Landowners / Lease holders	1-2 weeks	
3a. Grid Offer – No augmentation needed	Distribution business	2-4 months	
3b. Grid Offer – Augmentation needed (likely case)	Distribution business	3-6 months	
4a. Fixed Price Install contract - Design	EPC	1 month	
4b. Fixed Price Install contract – Install contract	EPC	1 month	
Total (may vary widely on the circumstances)		**Typical timelines: ~12+ months**	**~$1.1 – 1.4M**

On top of infrastructure timeline and costs of construction, specific context and associated risks also need to be taken into account

Source: EnergyAustralia

Pilot status: Reconvening mid 2026 for re-assessment of viability

FCEV: Detail on pilot design

Design element			Design choice
Pilot design	**Prime mover and freight selection**	**Vehicle** (#)	HDrive FCEV TS70-310 (2)
		B-Double range (km)	~435km (85% of tank capacity used)
		GCM (t)	68
		Transportation good	Grocery, other
	Fuel / energy	**Fuel / energy source**	100% green hydrogen
		Emissions reduction (vs. diesel ICE)	Net-zero fuel, but effective reduction estimated up to 85% depending on transport requirements
	Network design and infrastructure strategy	**Lane** (km)	Sydney <> Melbourne (~900 km)
		Number of refuelling stops (excl. start / end point)	2 stops required
		Refuelling method	Portable hydrogen refuelling sites
	Financial	**Expected total cost** ($)	Not evaluated due to lack of viability
		Fuel cost ($/km)	$3.30/km based on 6.5 km/kg, $22/kg ex gate, excl transport
		Infrastructure ownership	Not evaluated due to lack of viability
		Anticipated funding	Not evaluated due to lack of viability
	Core relevant regulation & safety topics		Vehicle design & access approval (e.g., ADR compliance) Hydrogen safety / infrastructure design (e.g., 700 bar storage) Green electricity certification (e.g., REGO)
Timelines	**Commencement**		Work in progress (see chapter "Where to from here")
	Duration		3 months
Data capture / anticipated learnings			Costing and operational impact of hydrogen refuelling infrastructure, FCEV operation and servicing, energy consumption variability

Considerations:

- **Infrastructure constraint:** Limited green hydrogen refuelling network with high cost barriers and limited availability
- **Fuel availability and cost** – Limited production sites leading to delivered hydrogen cost price spikes
- **Vehicle economics:** Prime mover premiums can be up to 2x as high vs. comparable diesel ICE, with total cost competitiveness dependent on hydrogen price and utilisation rates

Where to from here

The findings of the pilot design and deployment simulation phases gave insight into the critical unlocks needed to make the pathways viable and scalable

▌ Immediate limiting factor

	Renewable Diesel (RD)	BEV	FCEV
Identified challenges to scale	▌ **Price premium** over conventional diesel (~**250%** multiplier) with customer demand being relatively **nascent and price sensitive** **Supply constraints** limiting available feedstock volume for scaling (only a problem once market reaches maturity) Market is new, requiring funding opportunities to be **prioritised towards local manufacture** rather than import-based pilots	▌ **Insufficient BEV technology capability** to accommodate operational demands of line haul B-Double (incl. driver hours) **Lack of Megawatt Charging System (MCS)** to enable line-haul practicality **Capital upfront barrier for prime movers** (up to ~20-50% more than conventional diesel) despite lower TCO over time	▌ **Lack of critical infrastructure** in Australia (i.e., **portable hydrogen refuelling stations and equipment**, capable of delivering hydrogen at 700 bar) **Green hydrogen price barrier** identified as next challenge, especially **up along Hume Highway to Sydney** (**2.9x cost** per km vs. conventional for diesel) **Capital upfront barrier for prime movers** (can be 300% more expensive than conventional diesel)
Critical unlocks	**Policy support** on RD investment **Incentives** for **overcoming demand side economics** increasing customer need (e.g., Safeguard facilities are a potential demand source)	**Collective action across industry and government** will be required to scale technologies that carry an "early adoption" cost premium and lack supporting infrastructure **Higher range** with **B-double load (~800km)** **Improved charging time** to align with mandatory breaks (**~500-600km range in ~30 min or less)** **Manageable upfront costs** (BEV prime mover)	Increased **availability of affordable portable hydrogen refuelling stations** in Australia (700 bar) **Improved green hydrogen pricing** (~$5-6/kg) **Manageable upfront costs** (FCEV prime mover)

Pilot status: Deployment simulation confirmed currently insufficient pricing support / customer demand for scaling

RD: Whilst the renewable diesel operations are feasible, the products ability to scale will depend on overcoming fuel cost barriers and obstacles to customer demand

Challenge	Critical unlock	Explanation	Underlying change required
Fuel cost	**Fuel cost more closely aligned** with conventional diesel (≈ 250% estimated premium)	Currently renewable diesel carries a price premium of **≈ 250%** over conventional diesel, making it **commercially challenging in the absence of commercial mechanisms or policy incentives** to bridge the price gap (and carbon cost)	**Policy support on RD pricing** and / or **supply increase** to bring opex in line with conventional diesel
Supply constraints	**Supply constraints** limiting available feedstock volume for scaling. Only a problem once market reaches maturity.	Feedstock for renewable diesel also has alternative uses including sustainable aviation fuel. As demand increases globally it will be increasingly difficult to source feedstock.	**Developing a resilient supply chain** through **supply** and **manufacturing capability.** **Securing feedstock supply** with long-term contracts.
Customer Demand	Customer uptake is **constrained by the economic viability** of the unsubsidised fuel premium. **Market is new** requiring opportunities to be prioritised towards local manufacture.	Market demand is largely unquantified given the restricted availability and commercial barriers. It is also a new market. Renewable Fuels projects are competing to obtain the needed resources from a limited pool to serve an emergent market.	Incentives to **bridge the economic gap**, enabling customers to convert sustainability targets into commercial procurement. Existing mandates have predominantly focused on FAME (fatty acid methyl ester) and excluded RD. Including RD could broaden the customer base. Safeguard facilities are a potential demand source.

Scaling renewable diesel depends on coordinated market formation rather than technology readiness. Progress will require alignment across fuel producers, distributors, and freight buyers to provide demand certainty that **can** meet a **developing customer need.**

Government intervention should target structural constraints and investment.
Policy focusing on building customer demand will develop the market.
Incentives should also target supply chain resilience through infrastructure modifications and feedstock security critical to establish reliable, long-term renewable diesel supply

Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

BEV: Momentum is accelerating, but at-scale viability hinges on roughly doubling BEV battery capacity and charging speed, investing in high-powered charging infrastructure, and mitigating upfront cost barriers

Challenge	Critical unlock	Explanation	Underlying change required
Vehicle range (example on next page)	**Improved range** (~400+km) with **B-Double load**	Whilst current long-haul BEVs may deliver ~600 km range under ideal conditions and lower payload, **heavy loads, terrain, and weather** conditions significantly **reduce the "nameplate" performance**	Advancement in **battery technology** with improved density (minimum initial target of ~400 Wh/kg) and capacity
En-route charging (example on next page)	High-powered charging to provide **~500-600km range in ~30min or less** at strategic sites (requires C-rate of close to 2.2C (i.e., 2.2 x battery's capacity; takes 30 minutes for a full charge or discharge); charging at **~$0.50/kWh for diesel parity**	Current modelled charging times are significantly **longer than mandatory driver rests breaks**, eroding utilisation and pushing total travel time; current commercial charging rate close to ~$0.70/kWh	Acceleration of **Megawatt Charging Systems** (MCS) or equivalent **Dual Combined Charging System** (CCS) across **strategically selected sites** along major freight corridors Substantial **upgrades to grid infrastructure, advanced thermal management, and robust connector designs**
Upfront investment	Upfront capital requirements more **closely aligned with ICE** (currently **~20-50% BEV premium**)	Despite estimated **lower TCO**, BEVs currently carry a ~20-50% **higher upfront cost** compared to their diesel counterparts, posing significant barriers to smaller operators ("premium paradox") – incl. some concern about residual value of first generation BEV	Innovative **financing models, grant programs,** or other purchase incentives Lower market prices due to **technological advancements or increased competition** A **cost on carbon** would improve any TCO calculations

BEV momentum is accelerating, but scalability remains constrained by technology and infrastructure. While BEVs may deliver both **decarbonisation and energy security**, large-scale deployment requires advances in vehicle capability and charging infrastructure to achieve commercial viability

With capable "third generation" BEVs expected in 18-24 months, industry and government must act now. Joint action is essential to accelerate rollout of high-powered charging infrastructure and establish the policy frameworks needed to enable large-scale deployment

Pilot status: Reconvening mid 2026 to decide on timing of activation of on-ground pilot

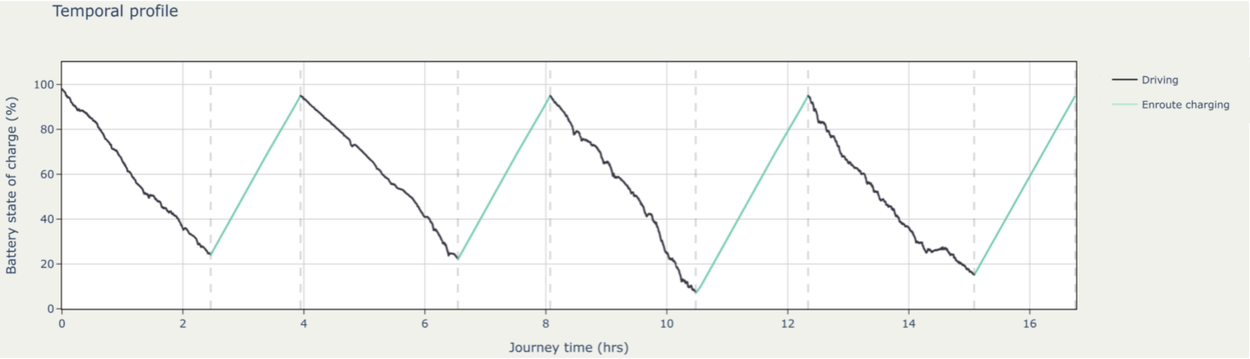
BEV: In a possible future state with doubling of battery capacity and availability of megawatt charging, the Melbourne – Sydney trip can become compliant with permissible driver hours and operational requirements

Scenario

Current

700 kWh battery capacity

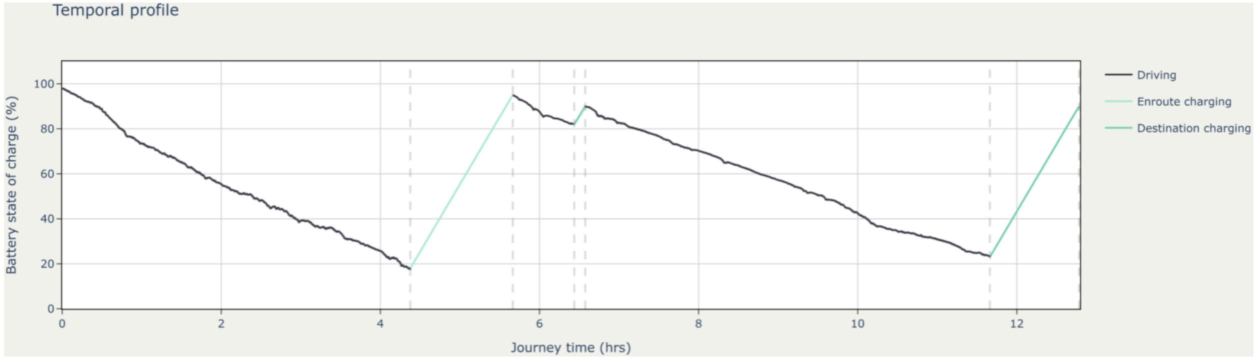
400 kW charge power



Example possible future state

1430 kWh battery capacity

1000 kW charge power



Implications

- In a possible future scenario with **improved battery capacity and charging**, the Melbourne <> Sydney trip can be **completed in under 12 hours**, making it compliant with driver hours and operational requirements
  - In the **current scenario**, the battery capacity and charging speed necessitates **~3 hours of charging time** along the route, pushing it above the permissible hours
  - In a possible future scenario, **number of stops and charging time can be sufficiently reduced** to make it **viable provided driver breaks are aligned with the charging time**
  - Alternate solutions could involve **trailer swapping between multiple BEVs, or a combination of BEV and ICE vehicles**
- The feasibility relies on the **availability of multiple megawatt charging stations** to implement this concept at scale
  - As of 2025, the largest highway chargers are 200 kW, and only in limited locations
  - Recent tests conducted in **China and Europe** have demonstrated promising results, with **megawatt charging system capabilities now believed to be nearing commercialisation**

Pilot status: Reconvening mid 2026 for re-assessment of viability

FCEV: Major infrastructure gaps currently limit the pathway for FCEV, with lack of availability of refuelling stations and associated significant cost barriers

Challenge	Critical unlock	Explanation	Underlying change required
Infrastructure	Availability of affordable storage tanks able to operate at a pressure of 700 bar, supported by compatible hydrogen delivery infrastructure	There is a **lack of critical infrastructure** in Australia, with no access to affordable, **portable hydrogen refuelling stations and equipment** capable of delivering hydrogen at 700 bar (note: permanent station ~$200M capital investment) - slower infrastructure development **risks FCEV readiness relative to potentially faster-moving alternatives**	Increased **availability / market players in portable hydrogen refuelling stations** in Australia, driven by large scale / transport hydrogen demand to underpin capital cost
Fuel cost	**Hydrogen price of ~$5-6/kg** to become more cost competitive with diesel ICE	Hydrogen comes with a high price premium, especially **up along Hume Highway to Sydney** (**2.9x cost** per km vs. conventional for diesel) due to limited production around Sydney and high transportation cost	**Pooled demand** for green hydrogen production, transportation, and storage across **key points of corridor** – supported by government incentives
Upfront investment	Upfront capital requirements more **closely aligned with ICE** (currently **~3x higher cost**)	FCEV vehicles cost circa **$1.1 m per vehicle, compared to $320k** for a comparable B-Double rated diesel prime mover	Innovative **financing models, grant programs,** or other purchase incentives Lower market prices due to **technological advancements or increased competition** A **cost on carbon** would improve any TCO calculations

FCEV needs to overcome major infrastructure gaps. Streamlined collaboration across OEMs, fleet, hydrogen providers, infrastructure and shippers/customers is the only way to break the **"chicken and egg" deadlock** and create the confidence and demand needed for scale

The next hurdle is cost. FCEV trucks, hydrogen production and infrastructure remains expensive, and policy and funding support are essential to **de-risk early investment**, **standardise frameworks**, and **accelerate infrastructure build-out**

To address the 'critical unlocks' required to accelerate large-scale deployment, five opportunities have been identified that would require coordinated action across the freight ecosystem

Priority area	Next step	Ideal outcome (~12 months)
Demand aggregation	**Pool demand** for prime movers, fuel production, and corresponding infrastructure to solve "chicken and egg" problem and provide producers with **confidence and demand needed for scale**	Shared **EOI / procurement framework developed and submitted** to relevant players (e.g., OEMs, hydrogen producers) Initial **offers received on hydrogen fuel and portable stations** along Hume highway
Infrastructure	**Secure joint infrastructure commitments (e.g., MOUs)** between core value chain players and government to deliver first high-power charging nodes and (portable) hydrogen refuelling stations (HRS) on Hume corridor	Minimum of **five (BEV) or three (FCEV) confirmed, strategic public-private infrastructure sites** with delivery timelines in next 12-24 months Secured **partnership with portable HRS players**
Investment mobilisation	**Develop co-funded (pilot) investment framework** with government / state to de-risk first commercial deployments **Review capital turnover timeline and prepare business cases** for net-zero technology alternatives	Aligned **funding mechanism with government** (e.g., fuel opex subsidy, prime mover grant, infrastructure investment) Defined **roadmap incl. allocated company budgets** for net-zero alternatives
Policy & Regulation Reform	**Define priority regulatory unlocks** with the government to accelerate policy reforms (e.g., tax treatment, harmonised refuelling / recharging sites permitting)	**Regulatory roadmap agreed** with relevant government bodies
Measurement & Reporting	**Establish a sector baseline and progress tracker** for decarbonisation efforts and related policy shifts	**Public "Progress Tracker"** by mid 2026 with annual updates

Progress will depend on each segment of the value chain taking coordinated, targeted actions to address the identified priority areas and remove key barriers to scale

Value chain player	Action	Relevant priority areas
Freight owners	**Embed low-emissions logistics requirements** into procurement **Provide green delivery options** for end customers (with willingness to pay for green premium) **Publicly report** on decarbonisation progression in logistics / freight	Investment mobilisation Measurement & Reporting
Logistics providers	**Pool purchasing intent** across freight companies for next-generation BEV (and possibly FCEV trucks) with right hand drive to secure OEM delivery slots in Australia **Pool refuelling infrastructure** demand along Hume Highways and other key corridors (and possibly hydrogen production once feasibility confirmed) **Publicly report** on decarbonisation progression **Work with government** and other value chain players on policy reforms needed	Demand aggregation Investment mobilisation Policy & regulation reform Measurement & reporting
Energy players	**Understand core locations of fuel / energy demand** for line haul across key corridors through collaborating with other value chain players **Identify and commit to corridor-based supply points** for renewable diesel, charging infrastructure (and possibly green hydrogen production / refuelling)	Demand aggregation Infrastructure
Financial institutions	**Design green financing products** to lower capital barriers for early adopters (e.g., discounted loan rates on prime movers)	Investment mobilisation
OEMs / technology partners	**Accelerate availability timelines for Gen-2+ BEVs** (and FCEVs) suited to Australian line haul conditions (e.g., right hand drive, increased range for BEV) **BEV – Deploy (public) megawatt charging** infrastructure/stations in the required locations on the Melbourne to Sydney corridor. **FCEV - Introduce portable green hydrogen refuelling stations** in AUS market	Demand aggregation Infrastructure

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