Centre for Future Work

Briefing Paper

In it for the long haul:
The role of rail freight in an era of energy uncertainty

Phillip Toner and Jim Stanford

The latest conflict in the Persian Gulf unleashed an unprecedented disruption in global energy supplies. Closure of the Strait of Hormuz blocked about 20% of global oil supply, and significant quantities of other vital commodities – including liquefied natural gas, urea, helium, and chemicals.

The impacts have been dramatic on prices and supplies of many products, including refined petroleum products, fertilisers, pharmaceuticals, and semiconductors. Even if the conflict ends and the Strait reopens immediately (a scenario which seems unlikely), these supply disruptions will continue for months. This is due to long time lags in transcontinental shipping of oil and other products, war damage to export infrastructure across the Persian Gulf, and continued volatility in expectations and risk premia in energy futures markets.

Australia is far from the site of the conflict and is a large net exporter of energy. Nevertheless, our economy was also threatened by the conflict and its side-effects. Domestic prices for petroleum products skyrocketed after war broke out. Security of supply was further jeopardised by international competition to firm up deliveries, despite the looming global shortage. This was reflected in rising domestic costs, shortages, and hoarding.

Wholesale diesel prices surged to over $3 per litre, more than doubling from pre-war levels. Interventions by the federal government helped to stabilise markets and calm fears, but the shock from higher fuel prices and uncertain supplies will last for months to come. Even once the Strait reliably reopens, it will take months before global supply chains and prices return to pre-war norms – if ever.

Diesel fuel constitutes one of the greatest points of vulnerability for Australia's economy. Australia relies more intensively on diesel fuel than virtually any other major industrial economy, used in long-distance road transport, commercial transport, and for consumer uses. Since most petroleum refining in Australia has been shut down in the last quarter-century (due to trade liberalisation and corporate relocation), Australia depends on imports for almost all its domestic diesel supply. Indeed, Australia is the world's largest importer of diesel.[1]

The war in the Persian Gulf thus quickly translated into an economic emergency for Australia. And while all nations hope for sustained peace in that region, and the restoration of normal global trade, Australia cannot forget this near miss. Reducing our dependence on imported fossil fuels is an

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[1] Amandine Denis-Ryan, 'Managing Australia's diesel squeeze,' Institute for Energy Economics and Financial Analysis, 23 April 2026, https://ieefa.org/resources/managing-australias-diesel-squeeze

important priority, for economic, national security, and environmental reasons. And this need is no more apparent than with diesel fuel.

In this context, the superior energy efficiency of freight rail offers an enormous and underutilised opportunity for Australia to reduce fuel costs, reduce our vulnerability to global shocks, save consumers billions in freight fees, and reduce carbon emissions. The Persian Gulf conflict should thus be a wake-up call for Australian policy makers, encouraging them to recommit to the long-run expansion of Australia freight rail infrastructure.

Unfortunately, policy is moving in exactly the opposite direction, with the shocking announcement by the federal government to suspend work on the northern leg of the Inland Rail project.[2] This critical rail link will now stop at Parkes, NSW, depriving the system of an east coast port connection that is essential to its full potential as a freight transport corridor linking the most populous regions in the country. This short-sighted decision will reinforce Australia's unusually high dependence on road freight transport – and exacerbate vulnerability to future disruptions in global diesel supplies, and future spikes in fuel prices.[3]

This paper investigates the potential for financial and environmental savings from the expansion of freight rail capacity in Australia. It quantifies the energy savings from meeting the future growth of freight transport through rail rather than truck services. This is especially true for long-haul freight transportation, including both bulk commodities and containers, which can move especially efficiently by rail.

To be sure, road transport is the most appropriate option in many applications, including medium-range and 'last mile' shipping (of smaller volumes of freight delivered to specialised locations). But maximising the use of rail where it is appropriate would be an economically and environmentally optimal strategy. The added benefit, critically important in this unstable geopolitical era, is reducing Australia's exposure to global energy shocks.

The paper reviews the advantages of rail freight transportation, including improved energy efficiency, reduced emissions, and lower costs. It then quantifies the aggregate fuel savings resulting from meeting future growth of freight transportation through expanded rail services, rather than continued growth in trucking on Australia's already busy highway system. The conclusion considers implications for national transportation, infrastructure, and energy policy.

The rail advantage

Rail is a highly efficient means of transporting large volumes of freight over long distances. It is comparatively cheap and fuel-efficient, with lower carbon emissions. Increased use of rail for freight transport can support a more energy-efficient transport system, with reduced carbon emissions, reduced reliance on imported fuels, and reduced road traffic congestion.

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[2] Krishani Dhanji, 'Albanese government abandons beleaguered inland rail project connecting NSW with Queensland,' *The Guardian*, 5 May 2026, https://www.theguardian.com/australia-news/2026/may/05/albanese-government-abandons-beleaguered-inland-rail-project-connecting-nsw-with-queensland

[3] Phillip Laird, 'After dumping Inland Rail, Australia has no plan to stop relying on diesel trucks for freight,' *The Conversation*, 10 May 2026, https://theconversation.com/after-dumping-inland-rail-australia-has-no-plan-to-stop-relying-on-diesel-trucks-for-freight-282276

Australia's total domestic freight 'task' is expected to grow by 26% between 2020 and 2050.[4] In a base case projection (under existing policies), road freight transportation over this period is projected to grow by 77%, while the projected growth in rail freight is just 6%. Almost 90% of rail freight (measured in tonne-kilometres) is associated with bulk exports of iron ore and coal. Interstate non-bulk internal rail freight is the third largest category of rail freight use. Non-bulk rail freight grew steadily from 1970 through 2005 but has stagnated since then. Some 32 billion tonne-kilometres of non-bulk freight travelled by rail in 2024-25, virtually unchanged over the previous decade (despite steady economic and population growth).[5] This stagnation, alongside sustained growth in the overall freight task, highlights the underutilisation of Australia's freight rail capabilities. In contrast, non-bulk road freight transport has grown rapidly, and now moves over 4 times as much tonne-kilometres of freight as non-bulk rail transport.

Ideally, different modes of transport should be treated as complements. Trains are more efficient than trucks for moving large volumes of goods long distances. Road transport has other advantages, such as greater flexibility to respond to variable supply chain needs and in 'last mile' transport getting goods to businesses and consumers. Intermodal systems, which rely on trains for long-distance travel, and then trucks for final delivery to specific destinations, combines the best of both modes.

To attain maximum economic and environmental efficiency, therefore, a balanced use of different modes of transport is needed. Attaining that proper balance, however, requires foresight and planning by government, as well as appropriate fiscal settings and incentives. It will never be achieved via privatised market choices alone.

Public underinvestment in railways has contributed to Australia's dependence on road transport, which benefits from less visible but still expensive public subsidies (for highways and other infrastructure). Moreover, road freight imposes externalised costs on other Australians (through traffic congestion, safety issues, and pollution). Shippers have access to Australia's extensive road network for well-below its true cost – with road infrastructure and maintenance covered by government, offset only partly by fuel taxes, tolls, and registration fees. In contrast, railways must cover virtually all their core infrastructure costs themselves, and then seek to recoup them from their customers in higher fees.

These distorted fiscal parameters (which subsidise road transport while making the rail option seem unduly 'expensive'), along with chronic underinvestment in rail infrastructure, have contributed to the underutilisation of the rail freight system. To take one example, as recently as 1995 over one-quarter of non-bulk freight shipped between Melbourne and Sydney travelled by rail; in 2024, that had fallen to just 2%.[6]

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[4] National Freight Data Hub, *Navigating Australia's Freight Future*, Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts, 2026, https://datahub.freightaustralia.gov.au/updates-insights/insights/navigating-australias-freight-future. The freight 'task' refers to total tonne kilometres of freight transport.

[5] Bureau of Infrastructure and Transport Research Economics (BITRE), *Australian Infrastructure and Transport Statistics Yearbook 2025*, https://www.bitre.gov.au/sites/default/files/documents/bitre-yearbook-2025.pdf

[6] Laird (2026), op cit.

In addition to achieving greater efficiency, an increased contribution from rail freight would also contribute to diesel fuel supply security, by reducing the overall fuel consumption of freight transport. In 2024-25 the overall rail system delivered almost twice as much freight (both bulk and non-bulk) in tonne-kilometres as road transport.[7] However, rail requires only 15% of the combined energy use of road and rail to complete this task.

In part this efficiency reflects the different roles played by rail and road transport in moving freight. About 90% of rail freight in Australia consists of bulk commodities (mostly iron ore and coal) moved over long distances (mostly to export ports). Longer-distance transport is inherently more energy efficient than moving variable loads to multiple destinations over short distances. But even comparing equivalent freight tasks – such as non-bulk interstate shipping by rail versus road – rail transport is more energy-efficient, safer, and less polluting.

Comparison of energy intensity in freight transportation

Evaluation of the comparative energy efficiency of rail and road freight transport can be conducted on the basis of data provided by the Bureau of Infrastructure and Transport Research Economics.[8] Relevant data is summarised in Table 1.

Table 1

Energy Intensity of Freight Transportation

	Road	Rail	Total
Freight task (billion tonne-km)	252.9	446.8	699.7
Share road & rail total	36.1%	63.9%	
Energy use (PJ)	315.5[1]	53.9[2]	369.4
Share road & rail total	85.4%	14.6%	
Energy intensity (PJ/billion t-k)	1.25	0.12	

Source: Calculations from BITRE (2025).

1. Includes articulated and rigid trucks; excludes light commercial vehicles.
2. Excludes electric trains.

Measured in tonne-kilometres of freight transported, rail comprises 64% of the total freight task of the road and rail freight sectors combined. Data on the annual energy use of various transportation modes is also reported by BITRE, expressed in petajoules (PJ). Energy consumption data is not broken down according to task (freight versus passenger). However, this decomposition can be proxied based on the type of vehicle or train used. To proxy road freight transport energy use, we include rigid trucks and

[7] BITRE (2025), op cit.

[8] BITRE (2025), op cit.

articulated trucks. According to ABS data,[9] rigid trucks and articulated vehicles accounted for 96% of total tonne-kilometres of freight transport; moreover, 99.8% of such vehicles use diesel fuel. Hence these 2 vehicle types account for almost all road freight, almost all of which relies on diesel. For rail freight, we exclude energy used by electric trains (reported separately by BITRE), which are mostly used for passenger transportation. As with road freight, therefore, the main energy source for rail freight is diesel fuel.

From this data on the quantity and distribution of freight across the road and rail freight sectors, and corresponding data on their respective energy use, we can calculate energy intensity coefficients for each mode. Road freight consumes 1.25 PJ per billion tonne-kilometres moved. Rail freight consumes just 0.12 PJ per billion tonne-kilometres moved. Rail freight is thus 10 times more energy efficient than road transport, in aggregate.

As noted above, some of this efficiency advantage results from the concentration of existing rail freight in bulk long-distance transport (primarily export shipments of iron ore and coal). However, the overarching energy efficiency of rail transport is based on factors fundamental to the technology of rail transport: reduced rolling resistance, superior aerodynamics, and higher weight-bearing capacity. Thus, the inherent energy advantage of rail applies to non-bulk and container shipping, as well. Other published studies that have attempted to control for the differing composition of rail freight still find substantial energy savings from rail freight, reporting that rail is at least 3 to 6 times more energy efficient than road transport per tonne-kilometre.[10]

Based on the aggregate energy efficiency comparisons described in Table 1, we can estimate the total energy savings that could be attained by prioritising rail freight to meet the future growth of freight transport services in Australia. We consider a quantity of future freight task equivalent to 10% of the current shipping provided by the combination of rail and road transport. In other words, we simulate the energy savings from directing the next 10% of growth in total freight transport to the freight rail system. Since the 2 modes currently account for 700 billion tonne-kilometres of total freight transport, this 10% increase in freight would represent 70 billion tonne-kilometres of work.

Based on average energy intensities, shipping that incremental volume by rail would require 8.4 PJ of energy; road transport would require 87.3 PJ. Shipping that volume by rail would thus reduce energy use by 79 PJ of energy (a 90% saving). Even assuming a more conservative energy efficiency advantage for rail (5-to-1, half the size of the advantage described in Table 1, and within the range of the published estimates cited above), shipping the incremental freight by rail rather than road would reduce energy consumption by 70 PJ (or 81%).

This energy saving can then be expressed in terms of diesel fuel quantities, since both modes of freight transport at this time rely almost exclusively on diesel (and hence the energy content of the 2 modes can be directly compared). The energy content of fuels differs with specific grades of fuel being

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[9] Australian Bureau of Statistics, Survey of Motor Vehicle Use, Australia, 2020.

[10] See, for example, Ashis Parajuli, *Modelling Road and Rail Freight Energy Consumption: A Comparative Study*, Queensland University of Technology, 2005, https://eprints.qut.edu.au/16193/; or Rail Futures Institute, 'Reducing emissions in Australian domestic freight transport' July 2024, https://www.railfutures.org.au/wp-content/uploads/2024/07/240718-RFI-Submission-Reducing-emissions-in-freight-final-2.pdf

considered. In general, a litre of diesel fuel contains 36-38 megajoules (MJ) of energy.[11] Using the midpoint of those conversion factors (37MJ per litre), and the low and high case estimates of fuel savings explained above, results in the following estimates of diesel savings (Table 2).

Table 2

Energy Savings from Expansion of Rail Freight Transport

	High Case (10:1 efficiency)	**Low Case** (5:1 efficiency)
Energy saved (PJ)	78.9	70.4
Diesel saved (billion litres)	2.1	1.9
Cost savings ($billion)	$4.3	$3.8

Source: Calculations from BITRE (2025) as explained in text.

1. Based on aggregate energy efficiencies calculated in Table 1.
2. Assumes efficiency advantage half as large as Table 1.
3. Assumes energy content of diesel of 37 MJ per litre.
4. Assumes wholesale diesel price of $2/litre.

Based on demonstrated average energy intensities, allocating the next 10% of future freight growth to rail rather than road transport would save 2.1 billion litres of diesel consumption per year. At wholesale prices of $2 per litre, this would reduce diesel fuel expenses by $4.3 billion per year. Keep in mind that wholesale diesel prices peaked at well over $3 per litre earlier this year, so these financial savings could well be larger in the event of another global energy shock in the future.

Even in the low case scenario (assuming an energy efficiency advantage of 5-to-1, half the actual average aggregate efficiency advantage reported in Table 1), allocating the next 10% growth in freight transport to rail rather than road saves 1.9 billion litres of diesel per year, with cost savings of $3.8 billion.

Of course, given recent global events, it is not just the cost of imported diesel that is a concern to the transport sector, but also security of supply. For context, consider that the 2.1 billion litre saving from transporting future freight via rail rather than road is equivalent to 6.3% of annual Australian diesel consumption (which equalled some 33.5 billion litres in 2025[12]). That is equivalent to 23 days of additional supply. Current domestic inventories of diesel fuel were only sufficient to cover 33 days of

[11] See, for example, Websters Group, 'Energy Efficient Communities Program,' https://www.webstersgroup.com.au/energy-efficient-communities-program-are-you-eligible-as-a-high-energy-using-business/; or U.S. Energy Information Administration, 'Energy Conversion Calculators,' https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php

[12] Department of Climate Change, Energy, the Environment and Water, 'Australian Petroleum Statistics 2026,' https://www.energy.gov.au/publications/australian-petroleum-statistics-2026

demand, according to most recent official government statistics;[13] the diesel fuel savings from allocating the next 10% of freight transport growth to rail would thus be equivalent to increasing effective inventories by 70% (from 33 days to 56 days). That dramatises the potential impact of expanded rail freight in reducing Australia's vulnerability to future global energy shocks.

Policy implications

The war in the Persian Gulf has highlighted Australia's extreme dependence on imported petroleum products, and diesel in particular. That dependence arises from several factors:

- The disappearance of most domestic petroleum refining capacity, due to globalisation and corporate relocation decisions.
- Australia's unusually heavy use of diesel fuel in many applications (including consumer, commercial, freight, and industrial uses).
- Underinvestment in upgrading and expanding Australia's freight rail network.
- A fiscal playing field that has been skewed to artificially reduce the apparent costs of road freight services (through public subsidies for highway and other infrastructure, and the non-costing of externalities such as pollution and congestion).

Because of these factors, Australia's rail freight system is not making its full potential contribution to Australia's overall transportation needs. Non-bulk interstate rail freight, in particular, has stagnated in recent years, as Australia's highways become ever busier with rapid growth in road freight transport. While trucking is the optimal mode choice for certain uses (smaller batches; medium- and short-range delivery; specialised destinations), the potential and inherent efficiency of rail freight needs to be recognised and utilised. There are many benefits to be attained from prioritising the expansion of rail to meet Australia's growing demand for freight transport services: energy efficiency, reduced pollution, better safety, and enhancing Australia's national and economic security in a world beset by geopolitical instability.

For all these reasons, Australia's energy and transportation policies need to commit to the expansion of interstate rail freight services and infrastructure. Key priorities in this regard should include:

- Moving ahead quickly to complete the full Inland Rail system, to facilitate efficient rail freight linkages between Victoria, New South Wales, and Queensland (including port connections at either end).
- Investments to improve quality and reliability on existing freight rail lines.
- Ensuring that fiscal settings do not penalise rail shipping as an option for shippers, including by providing equivalent public subsidies for rail transport infrastructure to level the competitive playing field relative to road freight (which benefits from hidden subsidies for highways and related infrastructure).
- Supporting the electrification of freight rail services in Australia, through introduction of battery-electric and/or hydrogen-hybrid locomotives. This would further reduce costs and

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[13] Department of Climate Change, Energy, the Environment and Water, 'Measures of liquid fuel stocks,' 22 April 2026, https://www.dcceew.gov.au/energy/security/australias-fuel-security/measures-of-liquid-fuel-stocks

emissions in freight rail and further reduce Australia’s reliance on imported petroleum products.

The suspension of work on the northern leg of the Inland Rail system will only make these problems worse, intensifying Australia’s overreliance on road freight transportation. In the interests of consumers, the environment, road safety, and national security, the federal and state governments should recommit to upgrading and expanding the rail freight network quickly, to reduce Australia’s vulnerability to the next global energy shock – which will come sooner or later. Electrifying rail freight would further enhance the economic and environmental benefits of rail. And the establishment of a neutral fiscal playing field, in which all the comparative costs and benefits of alternate modes of transport are fully and accurately reflected, will help to direct shippers to choose the modes most appropriate to their needs.