Rail Futures Institute

Reducing emissions in Australian domestic freight transport

July 2024

Summary

This submission responds to the Australian Government's Transport and Infrastructure Net Zero Consultation Roadmap. It addresses:

A. the challenge of transport decarbonisation in the context of more freight on rail;

B. responses to selected questions; and,

C. the achievement of improved rail productivity, competitiveness and energy efficiency through selective investment in improved rail infrastructure as a key enabler of more efficient rail. Particular emphasis is given to the important Sydney-Melbourne corridor.

As noted by Minister King below, on a tonne-kilometre basis and over similar distances, rail is three times more fuel efficient than road in moving freight. This has important implications for reducing emissions in freight transport.

Freight trains save fuel, reduce road damage, emissions and road crashes. They also reduce adverse residential amenity impacts and other environmental effects. Increased use of rail freight as the freight task grows has significant economic benefits, including reduced supply chain costs.

Although this submission primarily addresses domestic freight transport, the Rail Futures Institute also notes the valuable potential of rail to reduce emissions in domestic passenger transport.

A. The Transport Emissions Challenge

In 2022-23, Australian transport accounted for 98 million (m) tonnes of emissions[1]. This is 21% of all Australian emissions. As recognised by Minister Catherine King at a Rail Decarbonisation Conference held in September 2023 at Melbourne, "transport is our third largest source of carbon emissions and is on track to be the largest by 2030." The Minister also highlighted that rail is three times more fuel efficient than road in moving freight.

Two "additional measures" have been introduced to reduce emissions from transport in Australia. These are the National Electric Vehicle Strategy and New Vehicle Efficiency Standards. With these, 2030 transport emissions are expected to reduce by 7m tonnes. However, this will be significantly offset by increased emissions from road freight (but not rail) notwithstanding road industry ongoing improvements in productivity and efficiency. By 2030 these are expected to increase by 5m tonnes pa[2]:

	2020	2030
Articulated trucks	12	14
Rigid Trucks	8	10
Light Commercial Vehicles	17	18
Railways (mostly freight)	4	4

In the 10 years to 2030, road freight emissions are expected to increase from 37m to 42m tonnes whilst emissions from railways remain at 4m tonnes. This is unsustainable.

Freight may be either bulk or non-bulk. Freight tasks are measured in tonne-kilometres (tkm). Since the 1970s, Australia's rail and road freight tasks have shown large increases. The overall rail freight

[1] Annual Climate Change Statement 2023 (https://www.dcceew.gov.au/climate-change/strategies/annual-climate-change-statement-2023)

[2] https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2023, Table 20

task has shown strong growth, mainly due to bulk freight including iron ore exports (895m tonnes) and coal (338m tonnes) in 2022-23[3].

The road freight task has also shown exceptional growth, mainly due to non-bulk freight (including consumer goods) rising from about 29 billion tkm (btkm) in 1976-77 to 163 btkm in 2021-22.[4]

During this time, the non-bulk rail freight task increased from about 10 btkm to only 34 btkm.

On the basis that rail is three times more energy efficient than road in moving freight, if the emissions from articulated and rigid trucks were (say) to be reduced from 20m tonnes to 18m tonnes (instead of rising to 24m tonnes) by transfer of some road freight to rail, the increase in rail emissions would be 2m tonnes. The net decrease would be 4m tonnes.

It is recognised that road freight will increase its energy efficiency for some freight tasks. This has been addressed in Australia[5] and overseas[6]. However, major reductions in emissions require selected modal shifts of freight from road to rail and for rail freight to improve its own energy efficiency.

Securing modal shifts from road to rail (including some freight that used to go by rail and due to highway upgrades and larger trucks[7] now goes by road) will need policy work on relative access pricing for heavy trucks on public roads, and for freight trains on rail tracks.

Private sector transport operators and major freight users have shown keen willingness to play their part in a rail freight revival. By way of example, this includes making substantial investments in new locomotives and wagons and in new interstate terminals at Moorebank and another currently under construction at Somerton[8] in Melbourne's northern suburbs.

Crucially however, trains won't complete terminal to terminal journeys any faster nor compete effectively with interstate trucking without complementary investment in track upgrades.

In turn, this will need a better balance between federal funding for roads and federal funding for rail track than in the past.[9]

Australia's major non-bulk freight route is between Melbourne and Sydney. Over several decades, the rail share of this freight has progressively slipped to a current miniscule 2%. The contrast between a high standard multiple lane Hume Freeway and a railway struggling with an early 20th Century 'steam age' alignment could not be starker.

We address this in Section C.

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[3] https://www.industry.gov.au/publications/resources-and-energy-quarterly-december-2023

[4] (https://www.bitre.gov.au/publications/2022/australian-infrastructure-and-transport-statistics-yearbook-2022).

[5] https://www.climateworkscentre.org/news/decarbonising-short-haul-road-freight-could-halve-australias-freight-emissions

[6] https://www.oecd-ilibrary.org/sites/0c13b23d-en/

[7] The BITRE report (https://www.bitre.gov.au/publications/2022/australian-aggregate-freight-forecasts-2022-update) gives reasons for this increase in road freight including: "Investment in the National Highway System … [such as] continued upgrade and duplication of significant parts of the system" and 'Several rounds of incremental reforms to heavy vehicle dimension and mass limits, which resulted in progressively broader network access for larger dimension and higher mass freight vehicles."

[8] A private sector consortium, owned by a major superannuation fund, is investing in the new Somerton Intermodal Terminal at a cost of $400 million. The terminal is well located with a major Coles Distribution Centre on site and another DC to be constructed there for Bunnings. An Amazon DC is nearby as is the Melbourne Wholesale Fruit and Vegetable Market. The terminal is planned to open in late 2025 or early 2026.

[9] The outlay on roads by all levels of government now exceeds $30 billion a year [https://www.bitre.gov.au/publications/2022/australian-infrastructure-and-transport-statistics-yearbook-2022]. Past road funding, by way of grants, has allowed reconstruction of the entire Hume Highway by 2013 to modern engineering standards at a cost of roughly $20 billion, with a similar outlay to reconstruct most of the Pacific Highway by 2020. By way of stark contrast, the outlay of the Australian Rail Track Corporation (ARTC) in 2021-22 on the entire interstate rail network was a meagre $153m [https://www.artc.com.au/about/reports/annual-reports].

B. Answers to selected questions regarding freight

Question 1. *Do you agree with the proposed guiding principles?*

We support items 1, 3, 4 and 5 but ask that consideration be given to changing part of item 2

- FROM "This includes incentivising the private sector to leverage their capital, innovation and effort to achieve net zero."

- TO "This includes incentivising the private sector to leverage their capital, innovation and effort to achieve net zero ***with priority given to public sector infrastructure investments that will reduce transport emissions."***

Question 2. *Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?*

Yes.

Question 6. *The Australian Government has already engaged in consultation on the 2023 review of the National Freight and Supply Chain Strategy (NFSCS) and those consultations will also inform the final Roadmap and Action Plan. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?*

Additional actions would depend on the final strategy, which is yet to be released. However, the actions that the Rail Futures Institute would like to see, as per our 2023 submission to the review include the following:

- The new NFSCS should include a smart freight program with selected rail infrastructure improvement measures that have a positive impact on rail productivity, competitiveness and energy efficiency, incentivising more freight on rail.

- Priority for long overdue interstate rail corridor upgrading should be for specific projects which will have a strong impact on rail productivity, energy efficiency and rail competitiveness. First up should be the Wentworth deviation on the Albury-Sydney corridor (Menangle to Mittagong), including urgent action to protect the corridor from encroaching urban development.

- Selective investment to improve rail infrastructure (especially on grain lines) is key to enhanced rail competitiveness, the outcome being reduced emissions, less road damage, increased road safety and reduced supply chain costs.

- Policies designed to reduce the external costs of land freight transport deserve a lot more attention in the revised NFSCS than they get in the present strategy.

- Legislation be initiated requiring transport industry operatives to supply essential information for collection of data relating to rail and road freight tasks, including differentiation between non-bulk and bulk, as well as between interstate and intrastate freight tasks, as well as energy use.

- in addition to actual road and rail freight task data, associated energy use and emissions data be collected, analysed and disclosed in an accessible manner.

- The revised NFSCS should provide a mechanism to capture road and rail data for freight movements to and from principal ports.

- An updated NFSCS should seek to resolve gauge and track condition issues (such as those

in the Murray Basin and Maroona-Portland line[10] in Victoria) and incentivise the relevant parties to actively seek 'win-win' agreements that overcome the negative impacts on rail freight demand.

- The new NFSCS should include consideration of the potential benefits of Short Lines in the Australian rail context and whether their emergence should be facilitated.

Question 9. *Do you agree with the proposed net zero pathway for heavy road vehicles?*

Yes, but with serious qualifications.

Firstly, as noted on page 41, "Heavy vehicles make up almost a quarter of Australia's transport emissions." This is of concern as are the projections that the emissions from articulated trucks and rigid trucks are projected to increase not only between 2024 and 2030 but also on to 2035.

As also noted "The high upfront cost of switching to low and zero emission trucks, together with the potential impact these heavier trucks will have on our road pavements, will remain challenging, …"

Rail Futures Institute notes there has been an appreciable increase in road freight productivity since the 1990s. This has also been noted by BITRE[11]. This has also led to an increase in energy efficiency in road freight operations, in some cases to an extent where further gains in energy efficiency may be hard to come by, unless at the expense of even heavier axle loads which will come at the cost of an appreciable increase in road maintenance costs.

Given the fact that, for many land freight operations, rail uses one third of the energy than road does, Rail Futures Institute recommends more attention be given to making more rail more productive and energy efficient.

This in turn will reduce emissions on two fronts, inducing modal shift from road to rail (see for example a recent ABC article[12]), and making rail more energy efficient.

Question 13. *Do you agree with the proposed net zero pathway for rail?*

Generally yes, but with the following qualifications.

The key points as listed on page 48 and as below are important:

- In 2023 rail emissions were 4 Mt CO2-e.
- Rail is a low emissions mode of transport. Despite moving 57% of national freight and 4% of passenger traffic, Australia's rail network accounted for only 4% of transport emissions in 2023.
- An efficient and integrated rail system that supports Australia's passenger and freight tasks is crucial to our wellbeing and economic outcomes.
- Decarbonisation of our rail sector requires the roll-out of infrastructure to support hydrogen and battery-electric trains, and strong economic incentives to shift demand away from diesel locomotives. Low carbon liquid fuels (LCLFs), like renewable diesel, may be deployed for larger

[10] The Commonwealth's May 2024 Budget has allocated $150 million for catch-up maintenance and upgrading of the Maroona-Portland line to allow increased axle loads and higher train speed.

[11] The BITRE report (https://www.bitre.gov.au/publications/2022/australian-aggregate-freight-forecasts-2022-update) gives reasons for this increase in road freight including: "Investment in the National Highway System … [such as] continued upgrade and duplication of significant parts of the system" and 'Several rounds of incremental reforms to heavy vehicle dimension and mass limits, which resulted in progressively broader network access for larger dimension and higher mass freight vehicles."

[12] https://www.abc.net.au/news/rural/2024-05-27/transporting-freight-by-rail-not-road-reducing-emissions/103764752

payloads and distances until the supporting infrastructure for electrification and hydrogen is in place. Increasing the share of freight moved on rail can also contribute to reducing freight emissions.

Whilst each of the three proposed measures of battery electric, hydrogen fuel cell and low carbon liquid fuels are important to reduce emissions, Rail Futures Institute suggest that other measures are also needed.

First and foremost are track upgrades to support faster and heavier freight trains (outside of the iron ore railways of the Pilbara). It is a fact that the Class I railroads of Canada and the United States are appreciably more energy efficient in moving freight than the rail freight operations over the Australian Rail Track Corporation (ARTC) leased and owned tracks.

Much of the mainline track of six Class I railroads operating in Canada, Mexico and the United States are capable of moving freight trains with 32 tonne axle loads and can move them quickly (at 70 mph or 112 km per hour) on a more extensive network cleared for double stacking. These trains are also longer (over 3 km compared to the ARTC standard of 1.8 km). This is assisted by past and present capital expenditure of $25 billion p.a.

Most of the ARTC network allows 21 tonne axle loads at speeds up to 110 km/h, but for heavier trains, up to 25 tonnes axle load, speeds are capped at 80 km/h. In contrast to three decades of relaxation of mass and dimension limits for heavy trucks operating over upgraded highways, there is been little progress, if any, in lifting speed and weight performance over the interstate rail network.

The Class I railroads now have a high energy efficiency of nearly 500 ton-miles per (US) gallon of fuel.[13] In metric terms, this works out to about 192 tonne km per litre (tkm/litre). This is far better than current Australian interstate rail freight operations that appear to be approximately 140 tkm/litre[14]. In turn, this is better than the 2019-20 average fuel use of articulated trucks in Australia of about 40 tkm/litre.

Question 16. *What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce rail emissions?*

As above, there is a need to continue improving the efficiency of freight train operations including speed, axle load, train length, double stacking capability, easing steep track gradients and straightening track alignments (to shorten the track and reduce friction) of interstate mainline track and track used for exports including minerals and grain towards North American standards.

C. Improving rail freight productivity and efficiency

This can be achieved in many ways, including the use of modern locomotives, better driving assisted by modern systems that can advise a driver whether to coast, apply more power or braking applications. However, to achieve higher energy efficiencies, in many mainlines, the track needs to be upgraded to allow for faster and heavier freight trains.

In 1997 a special meeting of the Australian Transport Council (ATC)[15] was held where the nation's transport Ministers held a Rail Summit. This meeting gave a commitment for the interstate network to provide a minimum level of service by 2002 including:

- less than 2% of track subject to temporary speed restrictions;
- up to 21 tonne axle load (TAL) average speeds of 80 km/h; and
- between 21 – 25 TAL average speeds of 60 km/h.

[13] https://www.aar.org/issue/freight-rail-climate-change/

[14] Australian Rail – The 2008 Industry Report

[15] See *Revisiting the 1997 National Rail Summit*, Railway Digest, August 2022, p. 44-45.

The ATC also agreed to additional longer-term "stretch" goals to deliver an improved level of service on the interstate network, including:

- up to 21 TAL average speeds of 100 km/h;
- between 21 – 25 TAL average speeds of 80km/h; and
- increased clearances to allow double stacking of containers.

However, despite state and/or federal funding towards achieving the 2002 targets on the interstate network (including longer trains, concrete sleepers, rail replacement, removal of some critical constraints in urban areas and the Inland Rail Project) key strategic gaps remain including non-removal of 'steam age' alignments. The most impactful examples are the existing 'steam age' alignments on the Sydney-Melbourne corridor which contains far too many tight radius curves. These constraints continue to keep average speeds low and lengthen transit times.

As a result, average speeds for freight trains on the East Coast (Melbourne-Sydney-Brisbane) interstate network continue to fall well short of the ATC's modest five-year targets. Today, the average speed of freight trains between the respective terminals in Melbourne and Sydney is around 68 km/h, largely constrained by the legacy meandering rail infrastructure in New South Wales.

It is recognised that completion of the Inland Rail Project will reduce freight emissions. This project has the potential by 2050 to reduce emissions by 750,000 tonnes per annum.[16] Even Inland Rail's 24-hour Melbourne-Brisbane transit time would only give an average speed of about 70 km/h.

In the meantime, there is a need to upgrade the existing interstate mainline track, particularly the existing Melbourne-Sydney rail corridor. Bypassing sections of tight curvature which severely restrict train speed will provide a virtuous circle of reduced freight transit time, reduced fuel use and emissions and lower rail operating costs, enabling trains to achieve increased competitiveness with trucks.

With the recent introduction of new rail freight services in the corridor coupled with the National Intermodal Corporation's major new terminal investments at Moorebank (Sydney) and (pending) at Beveridge (near Melbourne), the potential for rail to claw back market share is significant. This potential has been enhanced by the rail freight industry's acquisition of new locomotives[17] and rolling stock. These investments by the private sector are likely to continue and potentially embrace some of the latest innovations in rolling stock occurring overseas but rely on positive signals from government that complementary improvements to corridor infrastructure will be forthcoming. For the Melbourne-Sydney corridor, the potential to improve market share and reduce emissions is largely dependent on the benefits to be gained from bypassing the corridor's steam-age rail alignment in key sections between Menangle in Sydney's outer south and Cootamundra.

Upgrading the Sydney-Melbourne Railway to a Competitive Standard

Australia's busiest corridor for moving non-bulk freight is between Sydney and Melbourne – our two largest cities. Currently, some 98% of contestable non-bulk freight on this corridor is moved by road – only a paltry 2% is on rail.

There are many reasons for this but key is the many thousands of trucks (mainly B-doubles) moving each day on this corridor which do so on a well-engineered multi-lane Hume Freeway, built over several decades involving billions of dollars of government investment.

By comparison, the Sydney-Melbourne railway, with few improvements over the same period is about 100 km longer than the Hume Freeway with almost half of the rail track on 'steam age' alignments with numerous sharp curves. These alignments restrict speed, inflate operating cost, increase fuel

[16] https://www.artc.com.au/uploads/Environmental-Social-Governance-Report-2022.pdf

[17] All modern diesel-electric locomotives acquired by Australian rail operators over the past decade employ US technology which complies with US Environmental Protection Agency Tier 4 standards requiring implementation of advanced emission control systems.

usage and hence increase emissions. Terminal to terminal train transit times on average are 3 to 4 hours slower than road making rail uncompetitive for most freight.

Studies have shown that rail corridor alignment improvements in specific sections, coupled with modest operational changes and new intermodal terminals coming on stream, would reduce end to end freight train trip times from the current 14-16 hours to an average of 12 hours. The principal improvements are in three sections in New South Wales with potential to shorten the rail corridor by 60 km.

Industry considers this, coupled with the rail industry's own investments and terminal developments noted above, will improve rail's competitiveness on this corridor to a potential rail market share of between 20% and 25%. This would significantly contribute toward multiple government objectives:

- More freight on rail
- More productive use of existing transport assets
- Increased energy efficiency resulting in reduced transport emissions
- Less dependence on imported oil supplies

Some commentators consider that, with the necessary track upgrades and addressing road and rail access pricing, rail could achieve an even higher market share.

Specific Rail Upgrading Proposals

In 2007, the House of Representatives Standing Committee on Transport and Regional Services, in its definitive report "The Great Freight Task: Is Australia's transport network up to the challenge?" observed that *"... the greatest need for Australia is the reconstruction and realignment of the main freight networks."*

As noted by in 2008 by the ARTC[18] ***"For rail to move to the next step in competitiveness, or even in fact to maintain competitiveness against a constantly improving road network, there is no alternative but to start to consider deviations of the current poorly aligned sections of the network.***"

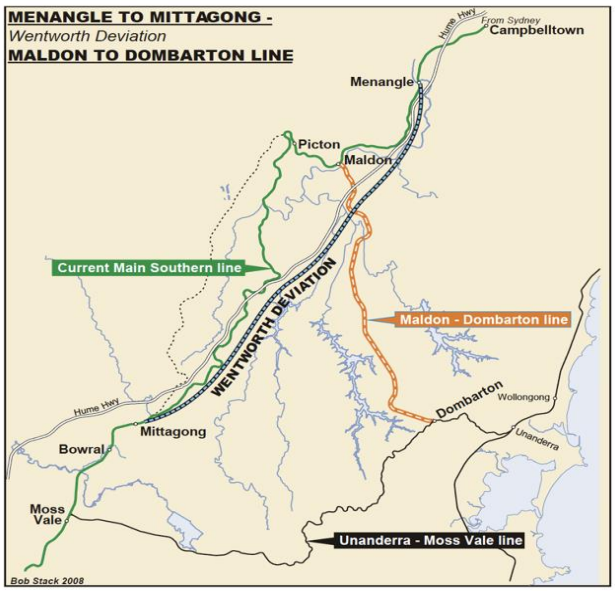
Given that completion of Inland Rail between Melbourne and Brisbane has been delayed to the 2030s, there is a case for a start in this decade on the three major deviations in the Melbourne-Sydney corridor identified in ARTC's 2001 *Interstate Track Audit*[19]:

- Wentworth (near Macarthur to Mittagong, 48 km);
- Centennial (near Goulburn to Yass, about 70 km); and
- Hoare (near Yass to Cootamundra, about 80 km).

The 2001 Track Audit gave the estimated cost of these three works at about $800m. Further details are given in a 2002 conference paper and as below.

[18] Australian Rail Track Corporation, 2008. 2008-2024 Interstate and Hunter Valley Rail Infrastructure Strategy

[19] Australian Rail Track Corporation, April 2001. Interstate Rail Network Audit, Final Report



Comparison between existing rail alignment and proposed Wentworth Deviation

With other minor works, the three deviations would replace 260 km of steam-age alignment with 200 km of new track built to modern standards. Freight train transit times would fall by two hours with further passenger train time savings along with reduced crew costs, fuel usage and emissions. It would reduce to 40 km the distance by which the rail corridor length exceeds that of the Hume Freeway from 100 km currently.

For the first of these deviations, an urgent need exists to secure the 48 km corridor between Menangle and Mittagong (the Wentworth deviation) in the face of rapid urban encroachment around Appin and Wilton. This deviation will benefit all rail users, freight and passenger, between Sydney, Melbourne, Canberra and the Southern Highlands; also Sydney-Perth freight trains which generally operate via Cootamundra.

Planning, including corridor finalisation and protection, necessary property acquisition and design needs to progress as soon as possible driven by the Commonwealth Government in consultation with New South Wales and local government. The aim should be to secure a funding commitment during the next term of government and have all the necessary works completed within 10 years.

Further detail of these NSW and other Main South rail deviations is given in a 2023 report by Fastrack.[20] Design standards for these deviations should be consistent with those required in future for fast or very fast trains.

The scope and cost of these deviations pale into insignificance when compared with today's equivalent of $20 billion for total reconstruction of the Hume Highway to modern engineering standards completed by 2013.

A brief background to these proposals, related history of the corridor and deviation option considerations are in Appendix A to this submission.

Conclusions re Sydney to Melbourne

The efficiencies and consequent improvement in rail service delivery from replacing the extensive lengths of 'steam age' alignment between Sydney and Melbourne with high quality rail infrastructure will materially alter the competitive dynamics of rail and trucking between Australia's two largest cities.

[20] https://www.fastrackaustralia.net/freight-and-high-speed-rail

Commitment to these works will provide a clear demonstration to freight generators and rail operators that the government is serious about getting freight back on rail.

Rail Futures Institute recommends priority for specific long overdue interstate rail corridor upgrading projects which will have a strong impact on rail productivity, energy efficiency and competitiveness. First up should be the Wentworth deviation on the Sydney-Albury corridor (Menangle to Mittagong), including urgent action to protect the corridor from encroaching urban development.

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President
Rail Futures Institute Inc

22 July 2024

The Rail Futures Institute (RFI) is an independent non-partisan group. RFI was formed in 2013 to advocate cost-effective rail and intermodal solutions for public transport and freight problems based on sound commercial, economic and social reasoning. Rail Futures Executive Committee and members include experienced rail professionals, urban planners, engineers and economists.

Appendix 'A' NSW Main South Railway and Deviation Options

In 1881, the NSW Main South line reached Albury.[21] It had been constructed in stages under the direction of John Whitton who, having to make economies, opted for steep ruling grades (generally 1 in 40) and single track. In response to growing traffic, duplication work commenced in the 1910s along with deviations to ease ruling gradients for loaded north-bound trains to 1 in 75 (or 1 in 66 when compensated for curvature). This work was completed in stages over a decade.

[21] This section is taken from Laird, P 2022 Bringing the Melbourne to Sydney railway up to standard, AusRail Brisbane and Laird, P., Michell, M. and Adorni-Braccesi, G., 2002. Sydney–Canberra–Melbourne High Speed Train Options, Australasian Transport Research Forum, Canberra

However, these NSW Main South deviations completed between 1912 and 1922 led to the overall length of track being extended by some 24.6 km.

By way of example, the section between Goulburn and Yass was extended in length from 84.6 km to 93.1 km after duplication on a new alignment. However, this then new track had a total of 39 curves of radius 400 metres (20 chains) or less (with 7 curves as tight as 280 metres) whilst the Whitton alignment it replaced had a ruling curvature of 400 metre radius applying at only 7 curves. Not only was the track longer by 8.5 km, but by the time diesel-electric locomotives were introduced, they were being slowed by the 'steam age' alignment.

The extent of the slowing down was demonstrated in 1991 by M-Train simulation finding that a superfreighter moving over the original 19th Century alignment between Goulburn and Yass would give transit time savings of 12% when compared with the present track. The Whitton alignment would also give fuel savings of 12% over the present track.

Further analysis shows that an upgraded Whitton track between Goulburn and Yass would give transit time savings of 25% and also give fuel savings of about 20% when compared with freight trains moving over the present track.

A version of the "Wentworth" rail deviation was costed in a Maunsell McIntyre report as part of the 2001 ARTC Track Audit at $218 million (for single track) and it would reduce route length by 19.6 km and save an average of 19 minutes.

Various options exist for deviations from between Goulburn and Yass. These include the "Centennial Deviation"[22] that would take higher ground south of Gunning and which was costed in the Maunsell McIntyre report at $255 million. A further option is the upgraded Whitton track.

The Maunsell McIntyre report also examined the "Hoare Deviation" (item 5.21 in the Maunsell report, p 65), with new construction at 93.3 km in length between Bowning and Frampton at a broadly estimated cost of at $300 million. A former Rail Infrastructure Corporation officer found that it would be more cost effective to construct a major 77 km deviation from Bowning to North Cootamundra.

Each of these options would also benefit freight moving from Sydney to Perth via Parkes.

Furthermore, the ARTC Track Audit [5, p63] noted four potential smaller rail deviations near Maldon, Werai, Cullerin and Harden.

The combined length of three larger deviations from Menangle to Aylmerton, Breadalbane to Yass, and Bowning to Cootamundra is 164 km and they would replace 219 km of track on "steam age" alignment. Coupled with two other smaller deviations: the five deviations would require construction of 197 km of new track. The new track would then replace about 257 km of 'steam-age' alignment which require trains to traverse about 50 circles of curvature.

The appreciable benefits for a 'reference' intermodal freight train with three NR Class locomotives include a time saving of 105 minutes, **and a fuel saving of about 2000 litres of diesel.**

A truly upgraded Sydney-Melbourne railway, with deviations as outlined in the 2001 ARTC Track Audit and a minimum curve radius of 1200 metres would allow for far more efficient and competitive freight train operations. In turn, this would curb the growth of truck numbers on the Hume Freeway with substantial savings in maintenance, crashes, medical expenses and emissions.

There would also be the capability of running tilt passenger trains at speeds of up to 200 km/h.

A further four small proposals for the NSW main south line are worth mentioning.

The first is track reconfiguration at each end of Moss Vale station so that south bound freight trains do not have to reduce speed to wind around a curved platform.

[22] Laird, P., and Adorni-Braccesi, G 1994 'Access, capacity and efficiency, the changing challenges for rail freight', Tenth Int. Rail Track Conference, Brisbane

The second would have been at Werai for the new crossing loop in the Southern Highlands project to be built on an improved alignment.

The third would be to install bi-directional signaling between Cootamundra and Junee to allow for trains with high power to weight to avoid the Bethungra Spiral.

The fourth is to have a minimum ruling curve radius of 800 metres. There are some sections of track to the north and south of Wagga Wagga with curves as tight as 400 metres. Worse still, some of these curves are ‘reverse curves’. These should be straightened prior to the introduction of the operation of double stacked container trains on the southern part of Inland Rail, due to be completed by 2027.