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Melbourne-Brisbane rail upgrading options: inland or coastal

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Abstract:

In recent years, there has been a growing interest in developing an inland standard gauge rail track between Melbourne and Brisbane

The paper outlines the characteristics of the current "coastal" route through Goulburn, Sydney, and Grafton, and the existing components of an inland route in NSW from Cootamundra to Boggabilla via Parkes, Werris Creek and Moree, and in Queensland from Goondiwindi to Brisbane via Toowoomba. Particular attention is paid to gradients and curvature of the existing rail track, and reference is made to track upgrading options in both NSW and Queensland. The option of a new rail tunnel under the Liverpool Ranges in NSW to facilitate Gunnedah basin coal exports via Newcastle is also considered along with the movement of Sydney-Brisbane freight by rail.

The paper shows that development of an inland route by use of current NSW lines with minor upgrading, and substantial upgrading of southern Queensland lines, would allow for a saving in Melbourne-Brisbane freight train running times from about 28 to 21 hours, with an average speed of about 90 km per hour. Double stacked container capability would be much easier than with the existing coastal route. However, detailed economic analysis would be needed to ascertain whether developing an inland route would be a stronger option than upgrading the existing coastal route.

If the existing rail system is not upgraded, rail will be condemned to ever decreasing modal shares of interstate land freight. It is up to the rail industry to be more proactive in removing speed, weight and height restrictions of its mainline interstate track in order to improve the performance of its freight trains.

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Introduction

In recent years, there has been a renewed interest in developing an inland standard gauge rail track between Melbourne and Brisbane. Proposals for the upgrading of existing inland lines to form a more direct Melbourne - Brisbane route are outlined in references including McFarlane (1986), Laird (1986, 1992, 1996), Rimmer and Dick (1992), Laird and Adorni-Braccesi (1993), Davidson (1994), Progressive Rail Association (1994), Endersbee (1994), Bureau of Transport and Communications Economics (BTCE - 1996a), and Queensland Rail (1997).

Rimmer and Dick (1992) noted that "*.. an inland Brisbane-Melbourne rail link could be achieved at moderate cost by connecting from Cootamundra along wheat lines to the existing New England line and completing a new line beyond Tenterfield to Fisherman Islands terminal. This new link could be eventually upgraded to carry double-stack containers. Such a development would open the way for a major rail interchange in western New South Wales at the intersection of the East/West and North/South lines. The immediate justification would be to facilitate domestic goods movements but scope would be created for redistribution of international freight.*" In this context, particular reference is made to trade with Asia.

A Melbourne - Brisbane railway going through Parkes, Dubbo, Moree and Goondiwindi (and near the Newell Highway) would traverse much easier terrain and hence have a higher energy efficiency than would one going through Wallangara. A railway near the Newell Highway would be an even more attractive option should a tunnel (proposed in 1984 by the then Queensland Premier) be built under the Toowoomba Range. However, such a tunnel could be contingent on sustained levels of coal exports from the Darling Downs. In addition, if the tunnel had good clearances with standard gauge or dual gauge track, and if improvements in clearances were made between Melbourne, Cootamundra, Parkes, Moree, and Brisbane, it would allow for double stacked container operations.

Implementation of an upgraded Melbourne - Brisbane railway through Moree would also allow for improved rail access for agricultural products from northern NSW to Fisherman Islands Port near Brisbane. In this regard, the Cotton Yearbook (1996, p138) notes the construction in 1995 of an intermodal transport facility at Narrabri that would make use of a future link between Moree and Goondiwindi for export through Brisbane.

The proposals of Endersbee (1994) for construction of an improved inland railway from New South Wales to Queensland are part of a proposal to construct a Melbourne - Narrabri - Goondiwindi - Mt Isa - Darwin railway. The advantages of such a route included that the railway would pass near to the three major black-coal basins in NSW and Queensland, which also "*... improves access to the extensive mining provinces at Mt Isa and McArthur River.*" As well, Davidson (1996) has proposed a Melbourne - Darwin railway via Queensland, and this concept has since been taken up by an Australian Transport and Energy Company Pty Ltd. Although such proposals are of topical interest, as is the fact that proposals for a Melbourne - Darwin railway via Queensland are long standing (Ball, Langry and Stevenson, 1985), the remainder of this paper shall be concerned with Melbourne - Brisbane, and Sydney - Brisbane land freight.

Rail's modal share of Melbourne - Brisbane land freight, as shown by BTCE (1990) data, have been low for many years. As noted by the National Transport Planning Taskforce (NTPT - 1995, p11): *"A comparison between the Melbourne - Brisbane and Adelaide - Perth corridors illustrates some of the factors in determining modal splits. Rail moves some 80 per cent of the freight on the Adelaide - Perth corridor where the longer distance favours rail and the quality of the rail infrastructure is relatively good. Double stacking is possible. The road length between Melbourne and Brisbane is 1 570 km, a distance over which rail should be competitive. However, rail only carries 21 per cent of the long-distance freight. Rail traffic has to pass over more difficult terrain than road, through Sydney, and over a distance 24 per cent longer than road. Road traffic travels along the Newell Highway, covering the door-to door distance in 22 hours, compared with rail which requires 37 hours from terminal to terminal."*

The existing interstate track through Sydney

Melbourne - Brisbane rail freight on standard gauge track is effectively constrained to move through Sydney. As well as adding extra distance (a total of 1906 kilometres for direct trains via Sydney) as compared with road (1570 km), rail has the disadvantage of having to use the congested Sydney network and the poorly aligned Sydney - Melbourne and Sydney - Brisbane rail tracks. Melbourne - Brisbane rail freight has gained limited benefits from the initiatives of National Rail in upgrading of rail terminals and obtaining new locomotives, and the work on the Sydney - Melbourne and Sydney - Brisbane rail tracks under the 'One Nation' program. However, rail's modal share remains low on this corridor.

The North - South corridor between Melbourne, Sydney and Brisbane has track traversing difficult terrain with generally poor 'steam age' alignment. Between Albury and Sydney, there is a steep ruling gradient of 1 in 40 and many curves with radius less than a preferred minimum of 800 metres which allows for through running of trains at 110 km per hour. Whilst the North Coast line in NSW has easier grades, the curvature is worse than the Main South line. More detail follows in Table 1, which also shows that the East-West corridor linking Melbourne, Adelaide and Perth is generally much better aligned than the North - South corridor. Road has much higher modal shares than rail on the North - South corridor. Indeed, the NTPT (1995, p 63) notes for Sydney - Brisbane rail that *"Transit times, reliability and costs are so poor that the corridor may not survive as a commercial freight alternative unless improvements are implemented."*

Major upgrades of the Brisbane - Sydney - Melbourne mainlines have two main options, which are examined in more detail later.

A. Rail deviations near the existing track to realign the "worst" track in terms of gradients and curvature - for up to twenty percent of the existing track in NSW. This would be in a manner similar to Queensland's Mainline Upgrade (MLU) project.

B. Construction of new links to reduce point to point distances on the Albury - Sydney - Brisbane track by a total of 125 km (BTCE, 1996 b), by use of major deviations.

Table 1 Aggregate lengths of rail track with gradients steeper than 1 in 66 and/or curve radius tighter than 800 metres

Section of Track	Length km	Grades steeper than 1 in 66	Curves less than 800 m radius	Steep grades on tight curves	Steep grades and/or tight curves
North - South Corridor: Melbourne - Brisbane					
Melbourne - Cootamundra					
Melbourne - Albury	312	40.8	5.6	2.8	43.6
Albury -Junee	160.7	10.9	2.2	0.0	13.1
Junee - Cootamundra	55.9	8.3	18.0	3.1	23.1
Sub - total	528	60.0	25.8	5.9	79.8
Cootamundra - Glenlee					
Cootamundra - Yass	111.6	22.6	38.1	8.4	52.3
Yass - Goulburn	93.1	17.1	30.4	5.5	42.0
Goulburn - Glenlee	164.9	2.1	49.9	0.0	52.0
Sub total	369.6	41.7	118.4	13.9	146.2
Total	898	101.7	144.1	19.8	226.0
Strathfield - Acacia Ridge (Brisbane)					
Strathfield - Maitland	181	31.4	56.7	13.8	74.3
Maitland - Grafton	506	0	237.5	0	237.5
Grafton - Border Loop	175	21.0	68.0	9.4	79.6
B.Loop - Acacia Ridge	99	17.9	34.2	4.4	47.7
Sub-total	962	70.3	396.4	27.6	439.4
Total for corridor	1860	172.1	541.0	47.4	666.0
Percentages		9 %	29 %	2 %	36 %
East West Corridor Melbourne - Perth					
Melbourne - Adelaide	835	85.3	49.0	25.9	108.4
Adelaide - Perth	2641	0	49.9	0	49.9
TOTAL	3476	85.3	98.9	25.9	158.3
Percentage of corridor		2 %	3 %	1 %	4 %
Caboolture - Rockhampton: Post MLU					
Sub-total	587	42.6	83.0	10.8	114.7
Percentages		4 %	11%	1 %	14 %

Reference. Laird and Adorni-Braccesi (1994, 1996) and Laird (1998). Compiled from State Rail and Queensland Rail computer file data with aggregate data rounded to 100 metres, and Bethungra Spiral excluded on Main South. The Grafton - Border Loop section includes the Lawrence Rd and Rappville deviations that were commissioned in 1995.

Glenlee -Chullora = 40 km. Chullora -Strathfield = 8 km. Brisbane -Caboolture = 53 km

Table 2 North - South 1998 transit times and average speeds

Corridor	Train	Transit time hours min.	Average speed km per hour
Melbourne - Sydney	MS 4	13: 40	69
Sydney - Melbourne	SM 5	13: 40	68
Sydney - Brisbane	SB 7	18: 20	53
Brisbane - Sydney	BS 8	20: 10	48
Melbourne - Brisbane	MB 4	33: 50	56
Brisbane - Melbourne	BM 4	34: 50	55

Reference: Times are from timetables current at March 1998, and distances are from simulation track data files These times are transit times and are inclusive of wayside stops en route. These stops are not significant between Melbourne and Sydney, but add up to over two hours between Sydney and Brisbane. Sydney area pathing constraints, crossing other trains and archaic safeworking practices north of Casino are the main offenders. Average transit speeds between Sydney and Brisbane could be realistically raised to 60 km/h on the existing track, by better managing standing time on this line.

Table 2 gives transit times and terminal to terminal average speeds for some National Rail intermodal 'superfreighter' type trains. Whilst they represent marginal improvement over train operations five years ago, and whilst further minor improvements are underway, the rail transit times remain much longer than competing truck times.

Upgrading options for the existing North - South track

The National Transport Planning Taskforce (NTPT - 1995, p69) identified two competitive goals for rail. The first goal was to improve reliability and transit times, and to reduce interstate rail freight full unit costs down to 3 cents per net tonne km (tkm) - from a 1994 level of about 5.5 cents per tkm for Sydney-Brisbane). In respect to transit times, an average speed of 80 kilometres per hour was stated. This goal was adopted by the Australian Transport Council (ATC - 1997) at its 'Rail Summit' for all trains with an axle loading of 21 tonnes and for implementation within five years (i.e. by 2002).

The second NTPT goal was to get rail freight costs down to 2 cents per tkm, and for freight trains with an axle load of 21 tonnes to maintain an average speed of 100 kilometres per hour. This speed was adopted as a ten year objective by the ATC in 1997. In respect of the second competitive goal, the NTPT (1995, p57) BTCE report notes *"About $3 billion of investment is estimated to be warranted over the next 20 years"* including about $1 billion for the Sydney Melbourne corridor, and another $1 billion for the Sydney Brisbane corridor. These investments include $300 million for realignments of the Sydney - Brisbane track (as a Goal 1 project), and a total of $205 million for Sydney - Melbourne (including grade easing).

The NTPT (1995, p 57) BTCE report also notes that the estimated cost of maintenance over the next twenty years for the mainline interstate track plus Brisbane - Cairns is likely to be $3.5 billion if the $3.2 billion investment is made; however, if this investment is not made, then maintenance costs may be expected to be about $1 billion more The $3.2 billion rail investment compares with an estimated warranted expenditure for widening and adding lanes, with town bypasses on intercity highways of $11.3 billion to 2014-15, and a projected outlay on maintenance to 2014-15 as $6.5 billion (NTPT, 1995, p 35).

As part of the rail reform package, and in conjunction with the formation of an Australian Rail Track Corporation at the September 1997 Rail Summit, the Commonwealth made an offer of $250 million over four years. However, as stated by Queensland Rail (1997), this offer *"... is most unlikely to achieve the kinds of infrastructure performance targets"* for mainline interstate track including an average speed of 80 km per hour for trains with axle loads up to 21 tonnes A recent report (Maunsell, 1998, pages 64 and 111), acknowledges the five year goal to have service levels including an average speed of 80 km per hour for trains with 21 tonne axle loads, low market share on the North - South corridor (as 20 - 30 per cent), and, physical limitations that restrict net payloads and add to unit costs such as the number of long crossing loops, height restrictions, heavy gradients along with slow average speeds due to curves and curfews on Sydney freight train movements. Although this report (Maunsell, 1998, p111) notes that *"... major improvements are needed just to provide a threshold for competition"*, no detail is given as to the nature of such improvements, and it is suggested that priority be given over the next twelve months to measures including (pxiii)
identify priority crossing loop and gradient improvements; ...
determine areas for improvement in track axle load/speed restrictions; and, ...
identify potential corridor for double stack operation Melbourne - Brisbane

There have been few, if any, deviations to improve track alignment on the North - South rail corridor over the last four decades, save for two small ones north of Grafton as part of the Federal Government's 'One Nation' rail capital works program from 1992 to 1995 The scope for improvement of mainline interstate track alignment in NSW has been recognised for some time, and no fewer than 10 proposals were made from 1977 to 1993 for upgrading the existing Albury - Sydney track (Laird and Adorni-Braccesi, 1996). More recently, in evidence to the NSW Legislative Assembly Public Works Committee examining high speed rail, proposals to reduce Sydney - Gosford - Newcastle XPT times from 132 to 90 minutes were outlined. These included (Sydney Morning Herald, February 11, 1998) deviations north and south of the Hawkesbury River, and *" ... places importance on improving those sections which are currently slow, and travelling as quickly as possible over the remaining unimproved sections of the route."*

In addition, increasing attention has been given to the need to reduce conflicts between freight and passenger trains in the Sydney metropolitan area, with ATC (1997) noting *"... a plan will be developed for the provision of a dedicated freight track through the metropolitan system."* As a partial remedy, and to avoid future problems with cancellation of some freight trains such as occurred during the 1998 Royal Easter Show, priority will be given to grade separation of freight and passenger trains near the new Olympic Park station

By way of contrast to the delays in improving NSW intercity mainline track alignment, successive Queensland Governments have committed funds to upgrading existing mainlines so as to straighten out curves and fix the steeper grades for their mainline track. As a result, over the last 12 years, the Brisbane - Rockhampton freight train loads per locomotive have been doubled (760 tonnes in 1986 to 1500 tonnes in 1996), whilst the transit times of the passenger trains will be halved (from 14 hours in 1986 to 7 hours) when the new tilt trains start operations later in 1998.

Some Cootamundra - Glenlee and Hornsby - Brisbane rail upgrading options follow. For the Glenlee - Goulburn section of track, most, but not all, of the bad curvature is confined to Menangle - Aylmerton. This 60 km section of track could be replaced for most of its length by a major deviation near the Hume Highway. Such a deviation could reduce the point to point distance by some 18 km. From Mittagong to Goulburn, to improve minimum curve radius to 800 metres would require realignment of, at most, 14 km (some 15 per cent) of the 93 km of track.

Between Goulburn and Yass, the present average speed for superfreighters is less than 70 km per hour. Upgrading options have been discussed by Laird and Adorni-Braccesi (1994) who then estimated that the cost of bringing this section to Fast Freight Train (FFT) standards was $95 million. This amount is some 20 per cent of the cost of Hume Highway upgrading between Goulburn and Yass with bypasses. It is of note that for the operation of modern locomotives, the present Goulburn - Yass track which dates back to the 1910s has worse performance in terms of transit time and fuel use than the original line built by John Whitton in the 1870s. Between Yass and Cootamundra, the average speed for southbound superfreighters is less than 75 km per hour. Again, a reworking of the old Whitton alignment would be better for modern diesel electric locomotives than the current alignment.

The 'Short North' line between Sydney and Newcastle is characterised by very difficult country as far as Gosford and then rather easier terrain through which the railway follows an outmoded alignment. Opportunities exist to clear the section from just north of Gosford to Cockle Creek in the southern suburbs of Newcastle for 100 km per hour plus track speeds with several minor and three major deviations. These latter would be at Morisset, Dora Creek to Awaba, and Fassifern to Teralba, eliminating sections of heavy gradients at the same time as improving horizontal alignment. A freight cut off line from Teralba to Hexham (of length about 20 km) would save about 8 km for long distance trains as well as providing easier access for coal trains to the Hunter ports.

The North Coast line beyond Maitland is a succession of curves which severely retard train performance on this corridor. Apart from "big bang" projects such as a direct line Hexham to Taree, or Coffs Harbour to Grafton there are a number of sections where an approach similar to the Queensland MLU project would pay dividends. Sections that would benefit include Wingham to Johns River (53 km), Wauchope to Eungai (88 km), Nambucca Heads to Coffs Harbour (37 km), and Glenreágh to Brisbane excluding Grafton and the border range crossing (267 km). Something approaching 40 km would be shaved off the distance, and transit times would be reduced by at least 2 hours with these improvements.

The inland route upgrading options

This section will consider the options of utilising secondary lines west of the Great Dividing Range through Parkes, Dubbo and Moree in NSW and the upgrading, with dual gauging or gauge standardisation, of selected lines in Southern Queensland. Some data on present track alignment for these lines is given in Tables 3 and 4.

As noted in the introduction, the concept of an inland route dates back to at least the 1980s, and was given increasing attention in the early 1990s. Despite this, the NTPT (1995) report and BTCE (1995) Working Paper did not take it as a serious option and did not seek to quantify the benefits and costs of a new Melbourne-Brisbane link. Instead, the BTCE (1996a) made a separate evaluation. In summary, the BTCE (1996a) noted that a Queensland Rail proposal for an inland standard gauge railway linking Brisbane and Melbourne had the potential to reduce distance by 182 km from the present route via Sydney, reduce transit times from 33 to 23 hours, and reduce unit costs from $23.16 to $17.56 a tonne. A further benefit would be to improve port access for agricultural produce from northern NSW. However, the BTCE, (1996a, p.xiv) concludes, with qualifications, "*...the proposed inland railway emerges as an investment of uncertain economic merit for implementation in the near future.*" also, it is unclear "*...whether the inland railway makes more economic sense than investing a similar amount in the existing coastal railway, which would make the proposed inland railway partly redundant.*"

Undeterred by such comment, and in a positive move, Queensland Rail (1996) commissioned an internal study for "*... a future upgrade of the railway linking Helidon and Toowoomba (as) the current corridor is built to low engineering standards that are inappropriate to a modern railway*". The new standards required grades of 1.5 per cent (1 in 67), no curve tighter than 2200 metres, and, a new tunnel under the Toowoomba Range. Although it is noted that construction of the Toowoomba bypass '*...could commence in the next 10 to 30 years*', QR has worked to reserve a new corridor to service future demand. However, this process has resulted in a number of local objections leading to variations of the original proposal, and at the time of writing, delays in determining the final choice of a new alignment.

Queensland Rail has also investigated possible new alignments to cross the Little Liverpool Ranges between Grandchester to Laidley, to replace the existing line with substandard alignments. It is possible that this project, because of the more modest cost, and significant benefits in train operations, could proceed ahead of a new tunnel under the Toowoomba Range.

In addition, Queensland Rail has raised the option of extending rail operations into NSW by construction of a bridge over the MacIntyre River some 20 kilometres east of Goondiwindi. Queensland Rail (QR - 1997) has noted rail's modal share of Melbourne - Brisbane freight is 19 per cent and that this low share is due to "*...the poor standard of the existing interstate rail link to Brisbane and in particular, severe congestion in the Sydney area*". The main obstacle to development of an inland rail route is seen as the present crossing of the Toowoomba Range, and QR is progressing a new route, with a tunnel. However, "*...the new range crossing is obviously a high cost item which no*

Table 3 Aggregate lengths of rail track with gradients steeper than 1 in 66 and /or curvature tighter than 800 metres (basic FFT standards)

Section of Track	Length km	Grades steeper than 1 in 66	Curves less than 800 m radius	Steep grades on tight curves	Steep grades and/or tight curves
Cootamundra - Parkes	200.70	0 0	9.66	0 0	9.66
Parkes - Dubbo	146.89	4.14	3.34	0.0	7.48
Dubbo - Binnaway	141.32	0 68	27.63	0.20	28.11
Binnaway - Werris Creek	149 13	0 20	21.43	0	21.63
Sub total	*638.04*	*5.02*	*62.06*	*0.20*	*66.88*
Werris Creek - Moree	255 54	2.11	8.79	0	10.90
Moree - Boggabilla	130.65	0	4.57	0	4.57
Total	**1024.23**	**7.13**	**75.42**	**0.20**	**82.35**
Percentage of corridor		0.7 %	7 %	0 %	8%
Goondiwindi -Inglewood	83.79	0.0	0.89	0 0	0.89
Inglewood- Wyreema	194 52	33 60	48.25	10.78	71.07
Wyreema - Helidon	63.65	20.04	32.12	10.34	31.83
Helidon - Ipswich	76 63	5 85	12.44	3 30	14 99
Total	**418.59**	**59.48**	**93.70**	**24.40**	**128.78**
Maitland - Werris Creek	217.83	27.71	22.96	9.34	41.33

Table 4 Aggregate lengths of rail track with gradients steeper than 1 in 90 and /or curvature tighter than 2200 metres (QR MLU standards)

Section of Track	Grades > than 1 in 90	Curves less than 2200 m radius	Grades on curves	Grades and/or curves
Cootamundra - Parkes	10.73	31.42	4 82	37.33
Parkes - Dubbo	12.45	20.97	2.16	31.26
Dubbo - Binnaway	20.94	50.65	9.30	62.29
Binnaway - Werris Creek	0.48	47.07	0 16	47.39
Sub total	*44 60*	*150 11*	*16.44*	*178.27*
Werris Creek - Moree	18.67	43 82	3.63	58 86
Moree - Boggabilla	0	14.71	0	14.71
Total	**63.27**	**193.93**	**20.07**	**237.13**
Percentage of corridor	6 %	19 %	2 %	23 %
Maitland - Werris Creek	80.61	76.18	36.09	120.70

Reference: Compiled from NSW and QR track file data Ipswich-Acacia Ridge = 34 km

single user or traffic can support. The crossing is also the single most expensive component of the Melbourne - Brisbane route. Once the Toowoomba range crossing is completed, the rest of the proposal becomes much more affordable."

From Table 3, the Cootamundra - Werris Creek - Boggabilla track is about 1024 km in length. This track, with few isolated exceptions, has easy ruling gradients and good horizontal alignment. Indeed, only 0.2 km are 'red sectors' (steeper than 1 in 66 on curves tighter than 800 m radius), and some 82.35 km (8 per cent) fails to meet basic FFT standards with grades 1 in 66 or easier and no curve tighter than 800m. This compares with some 38 km of 'red sectors' and 538 km (44 per cent) failing to meet FFT standards of the 1233 km of track from Cootamundra to Glenlee, and Strathfield to Border Ranges on the North - South corridor (see related data in Table 1).

Moreover, as shown in Table 4, 77 per cent of the Cootamundra - Werris Creek - Boggabilla track meets the more demanding QR Mainline upgrade standards of no gradient steeper than 1 in 90 and no curve radius tighter than 2200 metres.

The Inland route between Cootamundra and near Boggabilla has three locations where a new link line would be needed to avoid reversing trains. These are at Parkes, Binnaway, and The Gap (near Werris Creek). Provision of these links would shorten the existing distance by 23 km, but more importantly would shave about three hours off the transit time. These minor upgrades have been assumed as part of the "Basic Inland" concept.

Although most of these lines are well aligned, there are some places where curve easing or deviations would be warranted as part an upgraded Inland line. A total of 17.5 km of sharp curves (< 80 km/h) could usefully be realigned as well as 40.5 km of curve easing on wider radius curves to give long uninterrupted sections capable of 115 km/h running. These improvements would allow time savings of over four hours. A reduction of a further one and a half hours would be achieved by a direct route between Dubbo and Narrabri via Coonamble and Wee Waa.

In Queensland the existing narrow gauge (1067mm) line from Goondiwindi follows a somewhat indirect route via Warwick and Toowoomba. Several significant sections of this route are quite simply incapable of being converted to standard gauge, so any consideration of an Inland route must involve substantial route improvements in Queensland. Proposals following Davidson (1994) are for a new line between Inglewood and Millmerran linking two existing narrow gauge lines, then a very substantial new route through the Toowoomba Range to reach Brisbane via Ipswich. A 22 km cross border line from a point about 20 km east of Goondiwindi to a point 9 km south of Boggabilla would serve to complete the Inland network. This route would shorten the distance to Brisbane by 90 km, but more importantly would reduce running times (i.e. time exclusive of intermediate stops for narrow gauge trains from 11.5 hours to 5.5 hours), and would allow even faster times for higher speed standard gauge freight trains. The Melbourne - Brisbane distance via this basic inland route would then be 1889 km, which some 17 km shorter than the coastal route. However because of the easier alignment, the Inland route would save substantial time. Details are given in Table 5.

Table 5 North - South simulated transit times, average speeds and fuel use for northbound trains

Corridor	Distance km	Transit time hours min.	Average speed km per hour	Fuel use (litres)	Notes
Melbourne - Cootamundra					
Existing lines	533 2	6: 52	78	8105	
Victoria improved	533.2	6: 38	80	8273	1
Cootamundra - Brisbane					
Existing coastal lines	1372.5	21: 09	65	21 102	
Improved North Coast	1334.5	19: 10	70	19 102	2
Basic inland lines	1358.4	18: 20	74	18 481	3,4
Improved inland lines	1354.4	14: 19	95	17 876	5
Dubbo - Narrabri direct	1248.1	12: 51	97	17 484	6
Sydney - Brisbane					
Existing coastal lines	970.0	14: 35	66	14 846	
Improved North Coast	932.0	12: 36	74	12 846	2
Basic inland lines	1146.1	15: 36	73	16 879	3,7
Improved inland lines	1141.6	14: 03	81	17 086	5,8

Notes: 1. Victorian track cleared for 115 km/h running (currently 100 km/h)
2. Improvements between Maitland and Brisbane only
3. All inland route options assume a new direct line in Queensland
4. Cootamundra - Parkes - Dubbo -Werris Creek - Moree - near Boggabilla
5. Basic lines improved to 115 km/h running with some realignment
6. Dubbo to Narrabri linked via Coonamble and new line via Wee Waa
7. Maitland - Werris Creek - Moree - near Boggabilla
8. Includes new route and tunnel through Liverpool Range west of Murrurundi
(see Legislative Council of NSW, Standing Committee on State Development, 1998)
Reference: Simulations were performed by SAMROM Pty Ltd using Train PC, a model based on a modified Davis resistance formula and using detailed track data files as described in the text All simulations were for a "standard" freight train comprising two older 4000 hp locomotives with a 2600 tonne trailing load of 1200 metres length Maximum train speed was 115 km/h, modified by lower track speeds where appropriate.

Sydney - Brisbane

If the inland route via Moree proceeds, it would provide an alternate route for Sydney - Brisbane rail freight, using the existing Maitland - Werris Creek line to connect into the Inland route The distance would be 1146 km as compared to 970 km via the coastal route. Transit times of 14 - 15 hours achievable via either route. Elimination of the difficult Liverpool Range crossing near Murrurundi could shorten the Inland route by at least 3 km, and save 14 minutes for each train, as well as eliminating the majority of "red sectors" beyond Maitland However, the major beneficiary of such a project would not be interstate traffic, but rather coal from the Gunnedah coal fields heading to Newcastle.

Retained lines

If the Inland route were put into place, the existing Sydney - Melbourne line would clearly need to be retained. **Retention of the Maitland - Brisbane coastal route would be more problematic**, with demand for passenger services balanced against loss of interstate freight traffic. Some track upgrading would be required, particularly south of Sydney but also on the short north line to Newcastle. A total of 27.6 km of 'red sectors' remain on these lines (Table 1), although there are many other short comings that need to be rectified to allow rail to be part of a competitive playing field. There are a number of areas between Hornsby and Newcastle where realignment would have considerable benefits. These improvements, along with a Teralba - Hexham cut off, would benefit Sydney - Brisbane rail freight, regardless of the route north, while at the same time allowing a long overdue upgrade of the busy interurban passenger services on this line. On the Main South, the sections from Menangle to Mittagong and Goulburn to Bethungra stand out as needing attention. A point of note is that some work on the main line south of Cootamundra would benefit for either Brisbane route, there being specific sites where attention is needed to bring this section to a reasonable standard.

It is also possible to have Melbourne - Brisbane freight trains move through Cootamundra, Parkes, Dubbo, Merrygoen, Gulgong, and Muswellbrook to Maitland. This route was used for a time for Perth/Adelaide - Brisbane freight trains. However, for Melbourne - Brisbane trains, such freight train operations are at the cost of an additional 190 km in distance, with other disadvantages. These include the present lack of through running at Merrygoen, and conflicts with coal trains from Ulan to Port Waratah.

Competitive neutrality

The issue of relative Federal funding of the National Highway System (NHS) and interstate mainline railways, and, the relative road and rail track pricing for land freight operators are topics in their own right. These topics were also raised in many submissions to the 1997-98 Inquiry into the Role of Rail in the National Transport Network conducted by the House of Representatives Standing Committee on Communications, Transport, and Microeconomic Reform. However, some remarks pertinent to infrastructure funding for road and rail between Melbourne, Sydney and Brisbane are included. The first is, as noted by Laird (1996, p19) *"The disparity between NHS funding and rail capital works over the last twenty years is highlighted by the important Sydney - Melbourne corridor. The total amount expended on Hume Highway construction by the Federal Government to 30 June 1994 was approximately $2.7 billion in today's terms, and, the net Commonwealth expenditure on the Sydney - Melbourne railway since 1974 was estimated to be less than $30 million."*

"The Federal outlays from 1974 to 1995 in improving the NHS between Melbourne, Sydney, Brisbane and Cairns is estimated, in present day terms, to be in the order of $6000 million. The net Federal outlay in improving the main railway lines linking these cities, over this period of time, is estimated not to exceed $200 million. The relative outlay of 30 to 1 is not a good example of "competitive neutrality" and shows the

*problems that the Federal Government has had in attempting to treat competing transport modes on an even handed basis. These include the observations in the 1984-85 Annual Report of the Department of Transport that the Australian Land Transport Program would ensure "....**a comprehensive approach towards land transport investment**" including interstate mainline railways, and, a 1994-95 Annual Report (p3) statement that the Department will be "....**adopting a multi-modal, corridor based approach to maximising returns from Commonwealth funding in land transport**" "*

Despite such lofty sentiments, the lack of Government interest in a basic inland rail route stands in contrast with the interest in developing the Newell Highway as a heavy road haulage route. A Roads and Traffic Authority of NSW (1991) study noted, inter alia, *"Road and rail do not compete directly in the Melbourne - Brisbane corridor. The small market makes it uneconomic for the rail operators to orientate their services to provide competitive transit times. Therefore any shifts in road/rail market shares will be small and will not affect any strategies developed for upkeep or upgrading of the Newell Highway."*

In 1995, consultants, Nelson, English, Loxton and Andrews, (1995) for the Federal Department of Transport considered expenditure of $1 billion to 2014 was warranted on the Newell and Gore Highways, with priority works including removing impediments to full access for B-Doubles and road trains, along with flood mitigation and relocation of roads in the vicinity of Goondiwindi. It could be added that with good planning this could be combined with rail construction and a new bridge over the Macintyre River.

Federal funding has also been advanced in 1996 - 97 to investigate new highways near Toowoomba. This was followed up by a decision of the Federal Government in 1998 to allocate $100,000 for a study of highway upgrading needed to allow the use, in a safe manner, of road trains on the Newell Highway (as opposed to rail trains on tracks)

Energy savings and greenhouse gas reductions

Upgrading mainline interstate rail track to FFT standards, along with improved road cost recovery, would lead to reduced rail freight operational costs, reduced road system costs, fewer road crashes, and an estimated (Laird, 1996) annual saving of 262 million litres of diesel by the year 2015. It was also noted (Laird, 1997) that annual savings of 100 million litres a year in diesel would now have been likely if the NSW interstate mainline rail track had been upgraded in a manner similar to the Queensland Mainline Upgrade program, and, recommendations of the Inter-State Commission (1990) for mass - distance type charges for heavier long distance trucks had been implemented. Such a saving would correspond, via BTCE (1996b, p388) conversion factors, to a reduction of 269 000 tonnes of carbon dioxide per year.

It is also noted that based on the modal shift from rail to road on the Sydney - Melbourne corridor following the reconstruction of the Hume Highway without improvements to rail track, upgrading the Pacific Highway to four lanes, without rail track upgrading, will by the year 2005 lead to the use of an extra 45 million litres of diesel a year (Laird and Adorni-Braccesi, 1993, p103). This is an extra 121,000 tonnes of carbon dioxide a year.

The BTCE (1996b, p xxviii) notes that combined implementation of five "no regrets" measures could reduce projected base case cumulative transport emissions by 5 to 10 per cent by 2015. One of these five measures is shifting intercapital freight from road to rail. The BTCE estimates are regarded as conservative as they do not include the potential for improving rail freight energy efficiency through track upgrading, and, that they do not include certain bulk haulage tasks (eg. some 5 million tonnes of coal road hauled to Newcastle Ports in 1996).

With the improved inland route, from Table 5, a 2600 tonne trailing load train from Melbourne to Brisbane would use 26,149 litres of diesel. This train could have a net payload of 1700 tonnes. Using a mixture of six axle articulated trucks and B- Doubles, an estimated diesel use is 69,145 litres. The saving is some 43,000 litres of diesel for this freight task. As well, if rail was to lift its modal share of an estimated (NTPT, 1995) 1 8 million tonnes per annum of Melbourne - Brisbane freight from 20 per cent to 65 per cent, the reduction in diesel use would be some 20 million litres per year. This is equivalent to a reduction of about 54,000 tonnes of carbon dioxide per year.

Conclusions

The paper has demonstrated that development of a basic inland route by use of current NSW lines with minor upgrading, and substantial upgrading of southern Queensland lines, would allow for a saving in Melbourne - Brisbane freight train running times from about 28 to 21 hours, with an average speed of about 90 km per hour. Double stacked container capability would be much easier than with the existing coastal route.

Road freight is continuously improving its efficiency, with advances in truck technology and better roads. Road authorities always have forward plans and designs for road upgrading and new construction, well ahead of funding. On the other hand, rail has taken advantage of some of the opportunities for efficiency gains with rolling stock and locomotives, but with few notable exceptions, has been sadly lacking when it comes to track improvement. Rail track upgrading plans are rarely ready in advance of funding whilst strategic long term planning appears to be barely existent at a national level.

As this paper illustrates, there are severe shortcomings in the rail infrastructure on the North - South corridor linking Australia's three largest cities. Moreover, there is no clearly articulated long term plans or design toward resolution of these shortcomings.

Rail is going to have to make more efforts to take charge of its own future. To this extent, the rail industry should be developing a framework for strategic planning, detailed evaluation and design of future national developments, in cooperation with owning Governments and transport policy makers. The incentive and momentum should come from the rail industry, and recognition of the need for a long lead advanced planning process would be a significant part of this. The Keating Government's "One Nation" rail track upgrading program was reduced in scope and not repeated, partly as a result of the excessive lead time from announcement to completion. This was a direct consequence of the lack of forward planning and preparedness by the then rail authorities.

The issue of track improvement to contemporary mainline standard in the eastern half of the country is becoming a matter of long term rail survival. The rail industry must take the lead in quantifying, proposing, planning and designing for the future to ensure both its survival, and in a broader sense to level the elusive playing field to provide a national transport system that works in the nation's best interests.

However, there is also a clear role for the Federal Government, in conjunction with the NSW and Queensland Governments, in evaluating rail track upgrading proposals to remove speed, weight and height restrictions along with improving competitive neutrality. To this end, there is scope by these Governments to undertake a detailed study that would examine the relative merits of upgrading the existing rail links, or developing an inland route, with any necessary gauge standardisation and double stacked container capability, from Cootamundra to Brisbane through Parkes, Dubbo, Moree and near Goondiwindi. Such a study should also explore the costs and benefits of a new tunnel under the Liverpool Ranges in NSW as well as a tunnel near Toowoomba

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