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A competitive interstate rail freight and passenger network

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A competitive interstate rail freight and passenger network

Abstract

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Keywords

freight, network, rail, passenger, interstate, competitive

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A COMPETITIVE INTERSTATE RAIL FREIGHT AND PASSENGER NETWORK

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SUMMARY

An outline is given of the East - West rail corridor linking Melbourne, Adelaide and Perth, and the North South corridor between Melbourne, Sydney and Brisbane. The competitiveness of freight services on the North South corridor is limited due to 'steam age' alignment and low clearances. Both corridors have lower axle loads and restricted train lengths when compared with mainlines of the two Canadian Class I railroads.

The Brisbane Cairns corridor is cited as an example of where rail deviations completed during the 1990s have allowed for faster and heavier freight trains and the effective introduction of tilt trains. Proposals for an inland railway are also noted along with the impact on rail of the reconstruction of the Hume and Pacific Highways. Continuing to improve rails share of land freight on the East West corridor (now over 80 per cent) and lifting the low shares on the North - South corridor (lower than 10 per cent on the shorter corridors) would deliver substantial savings in diesel use along with reductions of greenhouse gas emissions, and result in appreciably lower external costs.

INTRODUCTION

This paper shall be mainly concerned with the East-West rail corridor linking Melbourne, Adelaide and Perth, and the North-South corridor between Melbourne, Sydney and Brisbane. Brief comment is given on proposals for an Inland Railway and other issues such as 'highway subsidization'.

Most of the interstate mainlines are now under the control of the Australian Rail Track Corporation (ARTC) and allow the operation of freight trains with a 23 Tonnes Axle Load (TAL) at speeds up to 80 km/h, or with a 21 TAL at speeds up to 115 km/h. In addition, freight train speeds on most of the North-South corridor, and the Adelaide Hills section of the East-West corridor are constrained by track laid down in the 'steam age' with excessive tight radius curvature. There are also constraints on the moving of trains with double stacked containers on interstate tracks to west of Adelaide and Parkes.

Such speed-weight and load flexibility conditions fall far short of the standards that apply to the mainlines of Canadian and United States Class I railroads. Here wagons at 286,000 pounds gross weight, which

corresponds to 31.9 TAL can move on some track at speeds of up to 129 km/h (80 mph). Double stacking of containers is also standard.

The lengths of crossing loops on the East-West and North-South corridors is a further issue. Here, the current limit is 1800 metres (and in some cases 1500 m; with the exception of 'passing lanes' between Junee and Melbourne). This length does not compare well with that of crossing loops on the mainlines in Canada with 10,000 feet (3000 m) and increasingly 12,000 feet (3600 m). In addition, Western Canada has had two transcontinental routes since 1920 whereas Eastern Australia has just one such route.

It is of note that axle loads of up to 40 TAL are used in the iron ore railways of the Pilbara region of Western Australia, whilst the Hunter Valley track in New South Wales (NSW - managed by ARTC) has 30 TAL.

SETTING THE SCENE

A central finding of a 1989 Parliamentary Committee [1] examining rail was that: "...*The plain fact is that a greatly increased amount of freight could be carried across the continent by rail more efficiently and with greater safety*

than it ever could be by road. ... If rail were more efficient and carried the amount of freight it should, lives would be saved, less non-renewable resources would be used and less pollution would be generated.....Australia is paying the price of neglect and bandaid solutions in an endeavour to solve problems in its rail systems. ... Rail has been starved of funds and rendered inefficient. "

Although some progress has been made on the past 25 years on further improving the efficiency of rail (including management and work practices), the gains have been mixed. On the one hand, the East West corridor has been significantly improved and rail now wins over 80 per cent of the interstate land freight in and out of Perth.

On the other hand, on the North South corridor linking Australia's three largest cities, rails share of land freight has been going backwards since 1989. More detail on this is given later.

In 1992, as a result of an inter-governmental agreement, a National Rail Corporation was formed to move interstate freight. Detailed studies since 1992 addressing the interstate network include those of National Transport Planning Task Force (NTPT) [2] and in 2001, a Track Audit [3] for the ARTC. Both studies included proposals to improve the efficiency of the interstate rail network and included the construction of some deviations to ease gradients and curvature along with extending the ability to run double stacked containers.

In a 1994 report, the NTPT [2, 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) over a few years.

The second goal, and a longer term goal, was to get these costs down to 2 cents per tkm. In respect of the second competitive goal, the NTPT [2, p57] BTCE report noted *"About \$3 billion of investment is estimated to be warranted over the next 20 year"* including about \$1 billion (bn) for the Sydney Melbourne corridor, and another \$1 bn for the Sydney Brisbane corridor. These amounts excluded maintenance, which would be less with upgraded track.

At its September 1997 meeting, the Australian Transport Council (ATC - being the Ministers of Transport from Australia's Federal, State

and Territory Governments) agreed to adopt certain measures to make [4] *"...dramatic improvements in the performance of interstate rail"* in order to overcome a situation where rail has *"...failed to compete effectively with road transport"* and rail *"...has not realised its potential contribution to the national economy"*

The measures, which were supported by the findings of the NTPT, included average speeds for freight trains with 21 tonne axle loads TAL per hour as a five year goal, and 100 km per hour as a 'longer term' goal.

In addition, the scope of works for implementing the NTPT goals, including some track realignment, were endorsed by a House of Representatives Committee [5]. The thrust of the Committee's report was that the existing mainline interstate track was in urgent need of upgrading, with an investment of \$1 bn over the next three years, and after 2001, a further \$2 bn.

However, the ATC agreed measure of lifting the average speed of freight trains with 21 TAL to 80 km/h has proved elusive. In 1998, average actual speeds for intermodal trains on all sectors of track [6], ranged from 48 km/h (Brisbane Sydney due to excessive 'dwell' time of five hours) to some 70 km/h.

The average speeds reflect transit times, and for rail to be competitive, it is necessary to reduce these times for various sectors. This includes reducing Sydney Melbourne from a long standing 13.5 hours (even when hauled by steam locomotives in the early 1960s) to 12 or less hours.

Comparing 1998 actual average speeds [6], and recent ones as noted by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) [7, Table 13], between 1998 and 2010, there was little or no improvement on either the East West or the North South corridors. The situation for transit times has improved in recent years on the North South corridor with the completion of a NSW North Coast curve easing project in 2011 (\$106m) and a somewhat delayed South Sydney Freight Line in early 2013 (\$960m - which has also improved the reliability of freight train operations).

Between Brisbane and Cairns some 120 kilometres of deviations were constructed during the 1990s, as part of a Queensland Rail \$590 million Mainline Upgrade (MLU) program [8,9]. This included deviations to ease grades

and curvature, mostly with easy ruling grades of 1 in 90 and curves of 2200 metres radius, along with upgrading old bridges and acquiring modern locomotives and wagons.

The reasons for the Queensland MLU project [8] included: *"Without substantial upgrading, the quality of rail freight services possible could not keep pace with the quantum improvements enjoyed by our major competitor, road transport. Rail would continue to lose market share, compounding the losses from having to retain services. The Mainline Upgrade Project is targeted at improving services and picking up market share, and reducing the costs of providing these services to enable rail to compete more effectively on price."*

The average cost of these deviations, all built to modern engineering standards, was just \$1.3 million per kilometre [9]. These, and other deviations pre and post MLU, allowed the weight of a freight train behind a locomotive to be increased from 750 to 1500 tonnes, and for Brisbane - Cairns freight transit times to be cut from 40 to 27 hours.

Along with faster and heavier trains, the completion of MLU resulted in the improved reliability of freight train movements, and supported competition between rail operators on the Brisbane - Cairns corridor. By 2008, intermodal rail freight on this corridor had grown to over 3 million tonnes per annum (mtpa). There now remains scope for further deviations on the Brisbane - Cairns track [9].

In addition, as of 1998, MLU supported the introduction of passenger tilt trains. Moving at speeds up to 160 km/h, they were well received by the travelling public.

This approach of major track reconstruction for faster and heavier trains is now overdue for the interstate mainlines. In this regard, a Parliamentary Committee noted in 2007 [10, p 128] that: *"... the greatest need for Australia is the reconstruction and realignment of the main freight networks. This would:*

**allow faster speeds and greater axle loads;
*clear the way for longer trains and double stacked containers;
*make it possible to reduce the steepness of grades, straighten lines and remove loops; and
allow for the elimination of many level crossings."

Indeed, as noted in a 2008 submission by the ARTC [11, p20] *" For rail ...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."

THE EAST WEST CORRIDOR

As noted above, rail now wins over 80 per cent of the land freight between the Eastern States and Perth.

This high modal share has been supported by 'fit for purpose' infrastructure that is capable of supporting competition between rail freight operators. In July 1995 freight forwarder SCT started their Melbourne - Perth rail freight service to compete with National Rail's freight trains. This was an early application of National Competition Policy and a weekly 600 metre train with 22 louvre vans and hired locomotives was placed into service [12]. Now, SCT run four and sometimes five trains per week with each train having a length of up to 1800 metres, using AC traction locomotives, from Melbourne to Perth.

Between 1998 and 2007, the freight task doubled on the East - West rail corridor. Underpinning this strong growth were three major Federal initiatives:

- * Kalgoorlie-Perth gauge standardisation including a new route through the Avon Valley,
- * The formation of Australian National and their Adelaide-Crystal Brook gauge standardisation project plus concrete resleepering in South Australia and,
- * The Keating Government's Melbourne-Adelaide Rail Standardisation (MARS) project.

The upgraded standard gauge line between Perth and Kalgoorlie, with dual-gauge track along the Avon Valley, was completed in 1968. It allowed Kalgoorlie-Perth freight train times to be reduced from 31 hours to 13 hours, and passenger train times from 14 to 8 - both significant gains.

The formation of the Australian National Railways Commission or Australian National (AN) was an initiative of the Whitlam Government.

Starting in 1978, AN worked hard to provide reliable and competitive freight and passenger train services, and made an economic case for extending standard gauge into Adelaide. Here, AN found that the benefits would exceed the costs over 25-years by a factor of 2.8. However, the Fraser Government required AN to raise loans for the conversion of a broad

gauge line to standard gauge from Crystal Brook near Port Pirie to Adelaide, on improved alignment. Freight services started in 1983, with passenger trains in 1984.

A further AN initiative (1987-93) was track upgrading with the specific aim of providing for 23 tonne axle loads at a speed of 80 km/h for freight on the existing mainly 47 kg/m rail whilst allowing for increases to 115 km/h on sections progressively re-laid with 60 kg/m rail. The upgrading consisted of concrete resleepering, dip weld straightening and rail profile grinding on their interstate lines. This work was in conjunction with signalling improvements and crossing loop extensions.

As then seen by AN [13] *"Good quality track is the bedrock on which fast, efficient freight operations are based"*.

To further extend standard gauge, a national approach was again needed. Although MARS had been favoured by AN in the early 1980s, it took until 1995 to complete the work. This was assisted by a House of Representatives Standing Committee 1989 report [1] that held, into alia, that: *"Considerable benefits would flow to the nation from the standardisation of the Melbourne-Adelaide route."*

The Hawke Government made a negative response to this finding in 1990. Fortunately, a wider view prevailed and in February 1992 Prime Minister Keating announced a 'One Nation' \$450m rail programme to include MARS. In early 1993, it was agreed standard gauge would proceed via Geelong.

The MARS project was officially opened on 4 June 1995 at Melbourne's Dynon intermodal terminal by Prime Minister Keating (at a cost of \$166.7m) who later observed [14] completion of MARS was: *"...not just a big strike for rail but an even bigger strike for the country."*

To improve operations on the East-West corridor, further work was needed. Since 1998, this has been done by the ARTC who also introduced a wayside monitoring program, and a noise detector array in the Adelaide Hills. Recent work includes separation of freight and passenger train paths in the Adelaide urban area, a new train control system along with attention to crossing loops on the Adelaide to Tarcoola rail corridor. ARTC is also supporting Brookfield Rail's re-railing program between Koolyanobbing and Kalgoorlie and gaining a more reliable and seamless connection on the east-west corridor.

Additional enhancements

Along with the desirability of extending double stacked container ability from Adelaide to Melbourne, lengthening of crossing loops, and eventually re-railing the East West corridor with 60 kg/m rail (as noted by the NTPT [2]), two further options are noted.

The first is grade and curve easing on the Eastern slopes of the Adelaide Hills. As noted in a 2005 paper [15], the section of track over the Adelaide Hills has some of the worst gradient/curvature characteristics between Melbourne and Perth. To address this, a 1997 proposal of M. Michell advocated realignment of the 65 km Murray Bridge - Mt. Lofty section to ease the present severe ruling gradients for west bound trains to eliminate the need for banking locomotives for the heavier west bound freight trains.

This proposal includes minor work between Murray Bridge and Callington, followed by a major deviation between Callington and Nairne, and smaller deviations between Nairne and Mt. Lofty. Given that a detailed study in 2010 effectively ruled out a major rail bypass of the Adelaide Hills, some grade and curve easing of the existing route could now usefully be addressed.

The second option is a Horsham Rail bypass built to good standards. One such option proposed in 2009 by G. Smith and M. Michell [16] is a deviation of some 28 km between two locations: Jung at 307.5km and near Wail at 351.2km; a current distance of 43.7km. As well as reducing point to point distance by some 17km, the deviation with easy ruling grades and curvature would save at least 10 minutes of transit time and 200 litres of fuel for each 1500 metre intermodal train.

THE NORTH SOUTH RAIL CORRIDOR

As noted above, rail freight struggles and is not competitive with road freight on the North South corridor. Both the Melbourne - Sydney and Sydney - Brisbane tracks have excessive length (at least 60 km on each line) along with tight radius curvature. For further comment on this corridor, with technical details, by this writer, see [17].

In 2004, when 30 per cent projections for rail on this corridor were made by ARTC and repeated by the Department of Transport and Regional Services, provision had been made in both the federal budget and the AusLink

White paper for deviations on the NSW North Coast line. These did not proceed.

However, as from overseas perspective [18] *Competitive trains need competitive tracks*.

In 2001, and in 2008, the tracks linking Australia's three largest cities were rated as F (*Inadequate for current and future needs*) by Engineers Australia [19] in an Infrastructure Report Card, and, by Len Harper on behalf the Chartered Institute of Logistics and Transport [20].

In 2004, after protracted negotiations a 60-year track lease was signed between ARTC and the NSW and federal governments for the Hunter Valley coal lines and interstate mainlines in NSW (including from Macarthur to Albury and from Broadmeadow to the Queensland Border). By late 2006, Sandgate grade separation near Newcastle was completed. Since then, many projects have been undertaken by ARTC, including grade easing, to increase capacity and efficiency of coal train movements on the Hunter Valley network.

Work has also proceeded on a \$2 billion package to upgrade the interstate mainlines in NSW. This includes the opening in early 2007 of a new bridge at Wagga Wagga to remove a 20km/h speed restriction, signalling modernisation and transfer of train control on the NSW inter-state network to two new ARTC train control centres and by mid 2008, the long overdue installation of CTC between Casino and Acacia Ridge in Brisbane. Further work included the laying of some two million concrete sleepers and the extending and or upgrading of passing loops.

Despite this and other work on the North-South corridor, there is poor performance of rail on this corridor. A major question for the next stage of North - South Rail upgrading will be to further improve Melbourne - Brisbane rail freight. There are two main options.

A Construct an inland route through Parkes by extensive use of existing Victoria and New South Wales track with new construction in Northern NSW and South-East Queensland

B In the absence of development of an East Coast High Speed Rail (HSR) network, a major upgrade of the coastal route with extensive track straightening and strengthening.

HSR has been the subject of detailed studies over the years (see for example [21]), the most

recent including that released by the Australian Government in 2013 [22].

For these options, land will need to be acquired. One way forward for both HSR and conventional railways is that identified by official High Speed Rail Advisory Group with recommendations including the formation of a High Speed Rail Authority [23].

Melbourne - Sydney

A Sydney Melbourne draft AusLink strategy [24, p12] noted that this corridor is "...at the heart of the Australian transport system"; also substantial population growth is expected in Sydney, Melbourne, Canberra and regional centres; thus transport growth is expected for both passengers and freight, and this, with increasing commuting will pose road congestion problems. By 2006, there were 3000 heavy trucks moving freight each day and night on the Hume Highway (with 5-6000 due by 2025).

Currently, there is now over 10 mtpa of intercity Melbourne - Sydney road freight and less than one mtpa of intercity rail freight.

The excessive curvature on the NSW Main South line is mostly due to a series of deviations constructed between 1912 and 1922 as part of duplication to ease ruling gradients for loaded north-bound trains from 1 in 40 to 1 in 75 [17]. This was at the expense of increasing point to point distance by 24.5 km and more curvature.

A particular case in point is the section between Goulburn and Yass. This was extended in length, c1920, from 84.6 kilometres (km) to 93.1 km as a result of duplication and deviations. Along with an extra 8.5 km the "new" alignment had numerous tight curves. On the other hand, the Whitton alignment that it replaced had few tight curves.

Indeed, train simulation has demonstrated that a modern superfreighter moving over the 19th Century alignment would give transit time savings of 12 per cent and fuel savings of 12 per cent when compared with the present track that was designed for steam trains. Moreover, upgrading this section to modest Fast Freight Train standards (with a ruling gradient of 1 in 66 and no curve tighter than 800 metres) would give 25 per cent savings in time and fuel for freight trains.

In fact, trains moving between Melbourne and Sydney traverse some 72 circles of curvature

(excluding the 1946 Bethungra Spiral) [17]. About 16 per cent of this track fails to meet a basic Fast Trains Standard of having and ruling curvature of 800 metres. The corresponding percentage for the Melbourne - Perth "East - West" rail corridor, is 3 per cent.

For the NSW Main South line, there are five potential major deviations:

- Glenlee - Mittagong (Wentworth),
- Weral to Penrose
- Goulburn - Yass (Centennial),
- Bowning - Frampton/Cootamundra
- A bypass of the Bethungra Spiral

Construction of 196 km of new track, in these five locations would replace about 256 km of 'steam-age' alignment [17]. The current track the deviations would replace requires trains to traverse about 50 circles of curvature (ie most of the 72 circles of curvature noted above). For an intermodal freight train with two 4000 HP locomotives, the benefits of the 196 km of new track include a time saving of 105 minutes, a fuel saving of about 1340 litres of diesel and a cost saving per train of at least \$1700.

A further issue has been the problems associated with conversion of a broad gauge line to standard gauge in Victoria between Seymour and Albury (west track). Here, the ARTC had done well, c2000, in upgrading the standard gauge line (east track) with a five step 'holistic approach' that included attention to the formation.

In 2008, the ARTC started work on west track as part of a \$501m North-East Rail Revitalisation Project with the intention to construct [25] "...an interstate rail freight super-highway and deliver major passenger rail service improvements ..."

However, the initial outcome was quite different, leading to much service disruption, adverse media comment, and an inquiry by the Australian Transport Safety Bureau [26]. To this writer, it appears that the ARTC was unduly cost constrained and the national interest would have been better served by sufficient funding to allow for a complete rebuilding of the decades old Seymour - Albury broad gauge track at standard gauge.

Sydney - Brisbane

There are severe constraints on the Sydney to Broadmeadow line. In addition, the Maitland to Kyogle rail track is basically a string of branch

lines built to steam age alignment and joined together in the early twentieth century. Concrete resleepering, and curve easing in lieu of deviations, has not really addressed the substandard alignment. Here, a train moving between Sydney and Brisbane negotiates a total of about 177 circles [17]. This reflects the original 'Branch Line' status of this 'long and winding' track. No less than 47 per cent of the Maitland - Grafton track has curvature of radius less than 800 metres.

As a case study, the Neville Committee [10] noted the benefits of construction of a new 67 line from Hexham to Stroud Road. This would get rid of 97 km of 'steam age' alignment (with 18 circles), cut train transit times from 82 to 42 minutes, and, reduce fuel use in the track section by 40 per cent.

Other work underway to improve rail on the Sydney to Brisbane corridor has included: RailCorp Clearways Projects with platforms to allow freight and inter-city trains to by-pass terminating passenger trains at Berowra and Hornsby and Acacia Ridge level crossing grade separation at Beaudesert Road.

Further benefits will result from increased capacity between Strathfield and Hornsby (\$834m committed during the 2007 federal election campaign and now \$1.1 bn) and from increased intermodal terminal capacity within Sydney. Limitations on intermodal freight terminals were noted in 2007 [10].

Despite the work done to date, observations made c2006 in an AusLink Sydney - Brisbane strategy [27, page 14] are still relevant. *"The rail network is heavily capacity constrained for freight services, particularly between Sydney and Newcastle, ... Freight trains are timetabled outside of the morning and evening peaks due to the priority given to passenger trains. ... In addition, performance issues also arise from track curvature, alignment and gradients which limit capacity and wheel loads of trains, and there are several bridges with structural deficiencies. Steep hills to the north of Sydney at Cowan Bank also make it difficult for freight trains as their heavier loads mean they travel more slowly than commuter trains and their greater length adds to line congestion."*

In looking to 2030, this draft strategy [27, page 14] noted that " *Train paths on the rail corridor, presuming it continues to serve Melbourne to Brisbane, will be limited because of the single track north of Maitland, conflicts with passenger trains in Sydney and Newcastle*

and, in northern Sydney, track congestion, gradients and environmental limitations like National Parks and waterways. Insufficient intermodal capacity in Sydney and Brisbane also needs to be addressed in the early part of the strategy period."

An inland railway

Proposals for an inland route from Melbourne to Brisbane go back to at least 1979 [28] with 1979 by Ken Thomas.

Further proposals were made in the 1980s, and in part based on train simulation, a paper [29] found factors supporting an inland rail route including Sydney - Newcastle rail congestion; also, that if Melbourne - Brisbane rail services are not substantially improved, there will need to be massive investment in the Newell Highway.

In 1995, the NTPT [1, p11] noted *"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 [covers...] the door-to door distance in 22 hours, compared with rail which requires 37 hours from terminal to terminal."*

The inland route was further reviewed as part of the 2001 ARTC track audit [2]. In 2004, a new rail corridor, with ruling curvature of 2200 metres, to include a 6 km tunnel, was reserved from Gowrie to Grandchester by the Queensland Government.

In 2006 a major study [30] was released by the federal Government. The study identified four possible options for a Melbourne Brisbane railway including upgrading the existing lines. The study concluded that the most cost-effective option - needed by 2019 - was what it called the 'far western sub-corridor', which would involve building the railway through Parkes and western New South Wales.

In 2008, the ARTC was commissioned to oversee a study to include location of optimum alignment of the inland railway and the likely order of construction costs. An initial report received some criticism and in 2011 a revised Inland Rail Alignment Study (IRAS) was released [31], albeit with a ruling curvature of just 800 metres. This was for a 1731 km route

via Albury, Junee, Parkes and Moree with transit times of 20.5 hours.

A Great Australian Trunk Rail System (GATR) proposal, via Shepparton rather than Albury, and with improved alignment north of Parkes (including a tunnel under the Toowoomba Ranges and a protected corridor with a ruling curvature of 2200 metres cf just 800m of the IRAS) would be 1595 km long, on a better alignment and offer 19 hour transit times with the prospect of 15 hour rail express services [32]. The GATR proposal also offers fuel savings over the ARTC/IRAS option.

In regards to a choice of route, which could be an initial hybrid approach (eg existing track from Melbourne to Junee as per IRAS and the GATR route from Junee to Brisbane). Here, in the context of an inland railway as noted [10, p viii], the comment of the former head of Queensland Rail, Vince O'Rourke is appropriate: *"We are doing too much patching. Why don't we build some really good railways?"*

Whichever alignment is finally adopted, a corridor will need to be identified and protected. As demonstrated by the road agencies in their highway upgrades, detailed advanced planning including environmental impact assessment and land acquisition does take time.

The issue of corridor protection has also been addressed in HSR studies [22,23] and the securing of the entire Alice Springs to Darwin rail corridor was a major reason why the project, once contractual arrangements were made, could be constructed in the relatively short time of 29 months. As noted [33] in 2005 by Queensland Transport Minister, Hon Paul Lucas MP, there is a need to *"...reserve rail corridor land before it becomes a costly issue."*

Regional fast rail

As demonstrated by Queensland on its North Coast Line, the provision of 160 km/h regional passenger services can be effectively achieved in tandem with faster and heavier freight trains through track straightening. Victoria's Regional Fast Rail included some 500 route km of track being upgraded to modern standards (with an 8.2 km deviation). The new V/LOCITY trains (made in Victoria), and again moving at speeds up to 160 km/h, were very popular.

On the Sydney - Melbourne line, with deviations as above, modest powered tilt trains, services from Sydney taking some 81

minutes to Moss Vale, 2.5 hours to Yass, 3.75 hours to Wagga Wagga and 6.5 hours to Melbourne would be possible [17].

THE BIG PICTURE

In 2006, the Bureau of Transport and Regional Economics [now BITRE, 34, p61] gave past data and forward projections for road and rail freight on various intercapital city corridors with caveats, including on the North South Corridor. For 1989 (the year of a definitive report [1]), the respective rail shares of land freight on each of the Melbourne Sydney, Sydney - Brisbane, and Melbourne - Brisbane sectors were 21.3, 40.7 and 19.3 per cent.

Using projections [34] for 2014, rails modal share of intercapital city intermodal of land freight on each of the Melbourne Sydney, Sydney - Brisbane, and Melbourne - Brisbane sectors would be just 6.8, 9.2 and 33.3 per cent. However, even these conservative projections have not been attained.

On the other hand, a quantum improvement in rail freight efficiency and competitiveness from construction of a 'fit for purpose' North South railway combined with improvements in intermodal terminals and the application of 'user pays' and 'polluter pays' road and rail track pricing could well see rail win 50 per cent of Melbourne Sydney and Sydney - Brisbane rail freight.

The goal of rail's share being 50 per cent on such corridors by 2017 was adopted in 2007 by the Australasian Railway Association [35].

By 2014, 50 per cent mode share of line haul intercapital city freight, would save 155 million of litres of diesel each year as well as reduce greenhouse gas emissions by about 400,000 tonnes per annum by 2016 [17]. It would also reduce transport costs and improve road safety with an estimated potential reduction in external costs of about \$275m per year.

The fuel savings result from the fact that rail is approximately three times more energy efficient than road for line haulage of non-bulk freight. The estimates of external costs are based on those similar to those considered in 2011-12 by the NSW Independent Pricing and Regulatory Tribunal of New South Wales [36]. Instead, the Australian and NSW governments have strongly supported the reconstruction of the Hume and Pacific Highways, with low access pricing for heavy trucks and limited internalization of social and environmental

costs - indeed 'highway subsidization' on many fronts. In 1974, when full Federal funding commenced for the Hume Highway between Melbourne and Sydney, it was a basic two lane sealed road connecting towns with some steep grades and winding sections. By 2013, the Hume Highway had been totally reconstructed with dual carriageways and all towns bypassed. The estimated cost of reconstructing the Hume Highway plus maintenance over the 40 year period to 2013 was approximately \$10 billion in 2013 terms.

The benefits to the road freight industry of the reconstruction of the Hume Highway have included the use of faster and heavier trucks, a reduction in transit time for Melbourne - Sydney line haul road freight from about 15 to 10 hours, and heavier loads (from 36 tonnes Gross Vehicle Mass (GVM) in 1970 to the option of B-Doubles with a GVM of 65 tonnes). There are now advanced proposals, with qualified support from Transport for NSW, to run B-Triple trucks on the Hume Highway [37].

In 1996 some 65 km, or 9 per cent, of the Pacific Highway from Maitland to the New South Wales/Queensland Border (total length 672km) had four lanes. By March 2008, 263 km were dual carriageway standard, and by Oct 2013 this had increased to 368 km (some 56 per cent of highway) with a further 73 km under construction [38]. The remaining kilometres are either approved for construction or have had a preferred route identified. The cost for reconstruction of the entire highway, for many years, held as a 2016 goal, will appreciably exceed \$10 billion.

However, in 2012, Infrastructure NSW [39, p143] noted the due to relatively low traffic volumes on the remaining sections, the economic merit of their reconstruction is much lower at 0.8 (Benefit Cost Ratio) than that of the Highway as a whole; also "*...given competing priorities for NSW and Commonwealth Government funds, the high cost and relatively limited benefits of these remaining sections raises questions ... appropriate scope of works and priority for those sections with relatively light traffic.*"

As noted [17], the question of using tolls to expedite Pacific Highway upgrades was raised in a 2005 agreement between the NSW and Federal Government to undertake economic and financial analysis to include options to accelerate completion such as tolls and private sector involvement.

In addition, shared road - rail corridors feature extensively in Perth and in Queensland. Despite the issue being considered by a NSW Parliamentary inquiry [40] with a submission by the RTSA, the NSW government declined to date to make provision for shared road - rail corridors with Pacific Highway upgrades in two suitable locations: Moorland to Herons Creek, and Kempsey to Eungai.

Oil vulnerability

This topic is addressed in the 2013 Queensland Freight Strategy [41, p28], a strategy whose first set of priorities is to 'expand the use of rail freight' and which also gives positive support for an inland railway.

Given rail's superior energy efficiency to road, and has an ability to use electricity for traction, it is worth while, where traffic warrants, in investing in rail. In this regards, a recommendation of a 2007 report of the Senate Rural and Regional Affairs and Transport Committee Inquiry [42] is of note: *"... that corridor strategy planning take into account the goal of reducing oil dependence ... Existing Auslink corridor strategies should be reviewed accordingly.*

CONCLUSIONS

Since the 1960s, the East West corridor has been improved to the extent that rail now wins over 80 per cent of the interstate land freight in and out of Perth. However, on the North South corridor linking Australia's three largest cities, rails share of land freight has been going backwards since 1989.

The ARTC work the North - South Corridor since 2004, at a cost in the order of \$3 billion, has delivered many benefits. However, in part due to funding constraints, the result has been more of 'patch up plus' rather than 'catch up' to the reconstruction of the Hume, and now the Pacific Highway, on a much improved alignment.

Progression of an inland route is recommended during 2014-19, and in the absence of a commitment to High Speed Rail, some track straightening on the NSW interstate mainlines linking Australia's three largest cities is also recommended. Extension of crossing loop lengths and double stacked container capability, along with allowing for heavier axle loads, is recommended for all interstate mainlines.

On five fronts (axle loads, speeds, containers, longer crossing loops and a second transcontinental line), Canada's Class I mainline rail track is superior to that of Australia's interstate mainlines.

In addition, a more balanced approach to funding interstate mainlines (and Brisbane-Cairns) and highways by the federal and respective state governments, and access pricing for rail and road freight, is appropriate.

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