AUSTRALIAN FREIGHT RAILWAYS AND COMMODITY EXPORTS

Philip Laird, University of Wollongong

Setting the scene

Since the mid 1990s, there have been significant changes to ownership of rail freight assets and operations within Australia. The changes have been for the most part due to the implementation of National Competition Policy driven by the Coalition of Australian Governments (CoAG) which required, inter alia, third party access to Government rail track, and supported rail freight privitisation. This paper outlines the changes that have occurred during two seven year periods (1995-2002 and 2002-2009) and gives a brief outline of bulk commodity exports. Energy efficiency is also noted.

In June 1995, rail freight services were offered by six Government and several private operators. The Government rail systems were four State systems (Queensland, New South Wales Victoria and, Western Australia), a federal system (Australian National that operated, inter alia, rail services in South Australia and Tasmania) and National Rail (formed in 1991 to provide interstate rail freight services, and jointly owned by the Federal, NSW and Victorian Governments). The aggregate rail freight task in 1994-95 of these systems was 61.6 billion tonne kilometers (btkm). About one half of this freight task was the movement of coal in Queensland and NSW. More information on this and other freight tasks is given in Table 1. For more information on these systems, their improved performance during the 1990s, and the steps to privatization, see Laird (2001).

The main private operators in 1995, each with freight tasks in excess of 10 btkm per annum, were two iron ore railways in the Pilbara region of WA owned by BHP Iron Ore and Hamersley Iron.

TABLE 1 AUSTRALIAN LAND FREIGHT TASKS

Billion tonne kilometres

	1994-95	2002-03	2006-07
Rail			
Coal	28	44	53
Iron Ore – Pilbara	47.3	67	91
Subtotal 'Govt.' rail	61.6	41±	na
Interstate rail	16.6	26	31.5
Total rail freight	**109.8**	**158**	**198.7**
Road			
B-Doubles	9	35	59
Road trains	15	19	24
All articulated trucks	89	116	143
Interstate road	26	37 ±	na
Total road freight	**119**	**153**	**184**

References: For 1994-95, see Laird (2001) that also notes severe data deficiencies. For rail, various Annual Reports, Australasian Railway Association (ARA - 2008) and some estimates (±).
For road. Australian Bureau of Statistics Survey of Motor Vehicle Usage Catalogue No 9208.0

Australia continues to have a multiplicity of railway gauges. Standard gauge (1435 mm or 4 ft 8.5 in) is mainly used in New South Wales, but now connects to all mainland State capitals and is used in the WA iron ore railways. A broad gauge (1600 mm or 5 ft 3 in) continues to be used in Victoria and parts of South Australia. Queensland mainly uses narrow gauge (1067 mm or 3 ft 6 in) as does Tasmania along with parts of SA and WA.

The growing land freight task

In Australia, since 2000, largely due to the growth in iron ore and coal exports, the rail freight task has exceeded the total road freight task. Freight forecasts from the Bureau of Transport and Regional Economics (BTRE) predicted the domestic land freight task (rail and road transport) between 2000 and 2020 will almost double increasing from 268 to 523 btkm. This is often referred to as "Twice the task".

The 2006-07 rail freight task can be divided into two components (ARA, 2008): Ancillary at 91.7 btkm - where most of this was the movement of iron ore in the Pilbara region of WA, and, hire and reward at 106.9 btkm including both intra-state bulk freight (72 btkm) undertaken by various private operators and Queensland Rail and inter-state non-bulk freight (22.7 btkm).

The Australian road freight industry has sectors that operate at world best practice. For many years, truck operators have taken advantage of relaxation of mass and dimension limits, and increased expenditure on roads by all levels of Government. Road pricing for heavy trucks is an important and ongoing issue in Australia for rail freight operators (see, for example, ARA, 2005, Laird, 2006 and the Productivity Commission, 2006) but is outside the scope of this paper. The large increase in the road freight task performed by B-Doubles (articulated trucks with two trailers with a total of 7, 8 or 9 axles) from 9 btkm in 1994-95 to 59 btkm in 2006-07 is of note.

Rail freight changes 1995-2002

In 1997, an Inter-Governmental Agreement (IGA) between the Commonwealth and the mainland States provided for competition in rail freight by providing open-access to Australia's interstate rail network. Coinciding with the IGA, the Federally-owned Australian National (AN) 'above-rail' operations were sold, along with intrastate track leases in South Australia and Tasmania. The AN Track Access Unit, which had responsibility for some 4400 km of standard gauge interstate track and associated infrastructure, remained under Federal Government ownership.

An Australian Rail Track Corporation (ARTC) was then formed as a Federal government owned corporation and opened for business on 1 July 1998 when ARTC acquired the AN Track Access Unit. In keeping with the IGA, ARTC assumed the operations and management of the Victorian standard gauge interstate rail network.

By February 2002, after a series of asset sales by the federal and relevant State Governments and other changes, rail freight services by

a Government operator were only offered by Queensland Rail and its subsidiary Interail Australia (operating in NSW and Victoria). Queensland Rail also had a Network Access division to facilitate third party access to its tracks.

Along with smaller rail freight private operators, two major operators are of note: Pacific National (PN - Australian owned) and the Australian Railroad Group (ARG - at one stage, a joint venture between an Australian listed company and, a US company, Genesee and Wyoming) offered 'hire and reward' rail freight services, with both companies in 2003 holding leases over track in one or more of four states (Tas,Vic, SA and WA) with some third party access rights. Further information on rail privatization in Australia (and New Zealand) may be found in a paper for the World Bank by Williams et al (2005). However, not all people would agree with the authors assessment (page 57) that "Overall the rail privatization experience in Australia and New Zealand has been positive..."

No fewer than four federal rail inquiries were undertaken between 1997 and 2001 in Australia. These led to reports from a House of Representatives Standing Committee (1998, 2001), a Prime Ministers Rail Projects Task Force (1999) and the Productivity Commission (1999). The four Federal rail reports agreed that there is a need for a national integrated transport policy, to upgrade *'...substandard national track'*, lift Federal rail track investment, and harmonise rail operating standards. The response of the Federal Government included release of a Green Paper (DOTARS, 2002) outlining an integrated transport programme called AusLink.

Rail freight changes 2002 - 2009

Apart from noting that the iron ore railways operate at axle loads approaching 40 tonnes, we defer consideration of railways whose main purpose is to support commodity exports to later.

By way of contrast, the mainland intercity links have 23 tonne axle load (TAL) limit for wagons moving no faster than 80 km per hour, or a 21 TAL limit for wagons moving no faster than 115 km per hour.

These track standards are appreciably below US and Canadian Class I standards of 32.5 TAL moving at up to 100 km/h. In addition, the track linking Melbourne, Sydney and Brisbane (Australia's three largest cities) was subject to numerous speed weight restrictions.

The removal of some of these restrictions were partly addressed in an AusLink White Paper (DOTARS, 2004), which noted that in part that population and economic growth required a new approach that would focus on corridors. Subsequently, with the support of the relevant State governments, 23 draft corridor strategies were released, the first being for Brisbane Cairns (DOTARS, 2006).

Completion of a long promised Alice Springs Darwin standard gauge railway occurred in September 2003 (with actual construction occurring quickly after its official start in July 2001) on a 60 year Build, Own, Operate and Transfer agreement to the South Australian and Northern Territory Governments. The new 1420 km railway was facilitated by a long term lease over the Tarcoola - Alice Springs track. Freight services were started in January 2004 between Adelaide and Darwin. Although freight traffic had grown in all areas including from new mineral developments, by late 2008, the company had been placed in receivership. The line is also used for long distance passenger trains (The Ghan) between Adelaide and Darwin.

The intercity corridors

By 2002, after four decades of investment, the East-West corridor including rail links between Melbourne, Adelaide and Perth was mostly in a 'fit for purpose' condition. This was mainly as a result of four major Federal initiatives: Kalgoorlie-Perth gauge standardisation including a new route in WA during the 1960s; the work of Australian National including Adelaide-Crystal Brook gauge standardisation project and concrete resleepering; the Melbourne-Adelaide Rail Standardisation project completed in 1995; and, the work since 1998 by the ARTC. From 1998 to 2007, the freight task doubled on the East - West rail corridor, and rail now wins just over 80 per cent of the land freight between the Eastern States and Perth. Such a modal share for rail is high by world standards.

The situation for rail on the corridors linking Melbourne, Sydney and Brisbane (Australia's three largest cities) is much poorer. Coupled with large scale intercity highway upgrades, low road pricing for heavy trucks, and substandard track, rails share of freight on this corridor is small. The BTRE (2006a, page 59) gives past data and forward projections for road and rail freight on various intercapital city corridors. For Melbourne-Sydney (a shorter corridor, about 950 km for rail and 860 km for road), in 1995, rails share of intercity non-bulk freight was about 15 per cent. By 2008, it was down to about 7 per cent. For Sydney-Brisbane (about 980 km for rail and road), rails share since 1995 has fallen from about 25 per cent to less than 12 per cent.

In September 2004, the ARTC took up a 60-year lease of the NSW interstate mainlines and Hunter Valley coal lines with a commitment to invest over $870 million in infrastructure improvements. Along with more and/or upgraded crossing loops, replacement of the original 1880 rail bridge over the Murrumbidgee River at Wagga Wagga and the many antiquated safeworking installations on the NSW Main South line and between Casino (NSW) and near Brisbane, complete concrete re-sleepering of the entire ARTC North South corridor was undertaken. Current work includes a South Sydney Freight Line to improve separation of freight and passenger trains within Sydney. The overall aim of the North-South Improvement program, scheduled for completion in 2010, is to bring about a marked reduction in freight train transit times on the corridor to bring rail line with road transit and delivery times.

In May 2008, it was announced that joint Federal/ARTC/ Victorian $501 million North-East Rail Revitalisation Project would proceed along with a 45-year track lease to the ARTC. The project includes new passing loops along with the upgrading and conversion of 200 km of broad gauge track to standard gauge.

Despite this work on the North South Corridor, rail freight operations on the corridor continue to be impeded by track with severe speed weight restrictions. As seen by the ARTC in a 2008 submission to a new Federal agency called Infrastructure Australia outlining the need

for ongoing upgrading: "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."

Indeed, this is following a strategy developed by Queensland Rail in the early 1990s when they commenced an extensive MainLine Upgrade (MLU) project of their Brisbane - Cairns line. This included 120 km of rail deviations in some 45 locations were completed under MLU by 1996 (see, for example, Laird 2008). Along with faster and heavier trains, the completion of MLU resulted in an improvement in reliability of freight train movements. The corridor is of interest in that (DOTARS, 2006) "intermodal -containerised freight accounts for about 6 million tonnes of the total freight task and approximately 25-30% of this is carried by rail." Since then, assisted by rail- rail competition (provided by Pacific National since 2004), higher diesel prices and a shortage of truck drivers, rail has attracted more freight on this corridor. Further track upgrades are under way.

Other factors

After the initial sale of government rail assets, there was a period from 2003 of 'churning' of some of these assets resulting in new owners of above rail operations. There was also the need for governments to 'take back the track' in Tasmania (where all trains are limited to 60 km/h) and Victoria. Somewhat ironically, Queensland Rail as a Government owned corporation took over WA intrastate rail freight 'above rail' operations (from ARG) and commenced interstate rail freight operations.

It is also of note that in 2004 that the Government of New Zealand took back its rail track from the private sector where it had been since 1993 and in 2008 bought back the trains from the private sector with many agreeing with the view that rail privatization has been a 'failed experiment'. In the Australian context, the need to take back the track in two states, and a less than inspiring performance in recent years by Pacific National have given some support to this view.

By 2005, there was increasing concern about delays to exports and the state of the nations infrastructure plus State based regulatory constraints on planning and investment. This included the 2004 OECD report on Australia, the Business Council of Australia (2005), the Committee for Economic Development of Australia (2005), the Reserve Bank of Australia (2005) and Engineers Australia (2001, 2005). In response, a Prime Minister's Task Force was formed to report on bottlenecks, of a physical or regulatory kind, in the operation of Australia's infrastructure.

A CoAG meeting in June 2005 made recommendations in relation to infrastructure including agreement in principle to hasten the long-term planning being undertaken under Auslink; and, to reinvigorate the agenda for harmonising road and rail regulations. A good background paper on rail regulation is given by the BTRE (2006b). Progress on regulatory reform of rail has been slow despite a Productivity Commission (2006) freight report noting the need of *'...achieving a nationally consistent approach to access and regulation of the rail sector'* the CoAG agreement as above, Australia having a National Transport Commission (NTC) since 2004, and a 2002 Review of the precursor of the NTC noting the need for reform as urgent.

Interstate track upgrading options

There is Federal and NSW government support to upgrade sections of mainline track between North Strathfield (in Sydney) and Broadmeadow (Newcastle), which are currently subject to severe capacity and operational constraints. In addition, a $3 million study to examine rail freight movements to and through Adelaide is underway with a final report due in September 2009.

Both the Melbourne - Sydney and Sydney - Brisbane tracks have excessive length and poor horizontal alignment. In short, even after the current and extensive work of the ARTC on the North South corridor, trains moving between Melbourne and Sydney traverse some 72 circles of curvature on track whose length (about 960km) could be reduced by some 60 km by the construction of 200 km of

rail deviations in five locations (Laird, 2008). This work would also reduce freight train transit times by 1 hr 45 min and save fuel. The curvature and excess length (some 90 km) on the Sydney-Brisbane track is worse, in part due to much of the track being built in the early 20th Century as a string of branch lines built to basic standards and joined together in the 1920s. At present, the average speed of Sydney Brisbane freight trains is only 50 km per hour.

The construction of a 'fit for purpose' Melbourne - Sydney - Brisbane railway coupled with improved road pricing, has the potential to give rail a 50 per cent mode share of line haul intercapital city freight. A 50 per cent mode share by 2017 was announced at a rail industry conference (AusRail 2007 in Sydney) as a goal (see also ARA, 2007). This option, compared with projected (BTRE, 2006a) high road mode shares, would save 155 million of litres of diesel each year as well as reduce greenhouse gas emissions by about 400,000 tonnes per annum (Laird, 2008). It would also reduce transport costs and improve road safety with an estimated potential reduction in external costs of about $275m per year.

Further upgrading of the Queensland North Coast line would also reduce operating costs, fuel use, greenhouse gas emissions and external costs. A broad estimate (Laird, 2008) is that a saving of at least 30 million litres per year by 2014 (80,700 tonnes CO2-e) is expected if the NCL was further upgraded and rail was to win an average of 50 per cent of corridor freight and say 70 per cent of the Brisbane- Cairns intercity freight. The corresponding reduction in external costs would then be about $50m per year.

The potential for an inland route between Melbourne and Brisbane via Parkes has long been recognized for at least 20 years. Such a route could use the existing secondary lines in NSW west of the Great Divide with minor upgrading, and major new works in South West Queensland. This would include a new tunnel under the Toowoomba Range with standard gauge capability, and overhead clearances high enough to allow for passage of double stacked containers. In 2006, a major North South Rail Corridor Study was released, and in 2009, a further study is currently underway by the ARTC (2009). Some

positive gains were made by the Queensland Government including protection of land for a new Toowoomba Range rail crossing in 2004, and inclusion of this project as a long term commitment under a South East Queensland Infrastructure Plan.

Iron ore exports

The iron ore railways in the Pilbara region were built in the late 1960s to meet an emerging world demand for iron ore. In the five years from 1970 to 1975, there was a five-fold escalation of iron ore exports. The new iron railways were pushed to their limits, and track had to be strengthened to accommodate this burst of tonnage. During the 1990s, these iron ore railways were further extended and existing operations upgraded. By the year 2000, they were so efficient that by way of example, it took less than 0.75 litres of diesel fuel to move one tonne of iron ore over the 426 km of high quality railway track from Mt Newman to Port Hedland (Darby, 2001). This includes a sustained climb with loaded trains over the Chichester Ranges, and bringing back the empty wagons. Further efficiency gains have since been made.

From 2000 to 2008 there was a very strong growth in iron ore exports rising to 252 million tonnes (worth $A20.4 billion) in 2007-08 (ABARE, 2008). An emerging problem as new mines by new owners are being proposed is access to the existing rail network which are purpose built railways now owned by BHP Billiton Iron Ore (with Goldsworthy) and Pilbara Iron (Hamersley and Robe). As a result of National Competition Policy (NCP), a 'National access regime' required the State based rail systems to grant 'open access' to other operators trains. Such access issues continue to be contested in the Courts, and include applications by Fortescue Metals Group (FMG).

To meet escalating tonnages both BHP Billiton and Pilbara Iron have opened new mines and expanded rail capacity. By 1999, their combined length of track was about 1540 km (from 1025 km in 1970), it now exceeds 2000km. BHP Billiton has had, and continues to have, 'Rapid Growth Projects'. Pilbara Iron rail operations and their future expansion from 150 mtpa to 220 mtpa include a number

of 'Expansion Projects'. At one stage, feasibility studies were underway to expand to production to 320 mtpa by 2012. Further expansion of iron ore export capability has followed with a new FMG railway opened in 2008.

Coal exports

In 1960, as noted by Waters and Uyeno (1987, p 22), Australia coal exports were about 2 mt rising to near 20 mtpa in 1970 and near 90 mtpa by 1985. By 1999-2000 coal exports were 175mt, and by 2007 - 08 these had increased to 253mt with a value of $A24.3 billion (ABARE, 2008). Since 1985, the larger coal loading port facilities in Queensland and NSW have been upgraded and some smaller ones closed. Most of these facilities in 1985 where owned and operated by their respective State governments. They are now mostly owned or at least operated by the private sector. Within New South Wales, the main facility at Newcastle in NSW operated by Port Waratah Coal Services (PWCS) and has grown to become the largest coal exporting port in the world. In 2007, throughput reached 84.8 mtpa, and by 2008 there was capacity for 102 mtpa and plans for further expansion.

By way of contrast, the Port Kembla Coal Terminal in NSW has exports of 13 mtpa. This reflects limitations due to older and smaller coal fields and transport problems. Here there is excessive dependence on road haulage of coal at a level of about 5 mtpa with its high operating and external costs whilst many coal trains face steep ruling grades and severe rail congestion in Sydney. These problems could be largely resolved by completion of a 35 km section of a Maldon Port Kembla railway, which is currently under review with a federally funded ($0.3m) study.

The main rail issues at present are augmenting rail capacity to the larger ports. In the Hunter Valley, this is currently been addressed by the ARTC with a $270 million upgrade completed in 2008 and more work to follow. In Queensland, the extra capacity is being provided by new track, and upgrading existing track. In addition, QR is upgrading its electric locomotive fleet, acquiring new diesel electric locomotives and acquiring more wagons. It is of note that QR uses

electric traction in the Central Queensland coal export chains (estimated by this writer to be saving nearly 200 million litres of diesel each year) and operates modern diesel electric coal trains (with AC traction motors etc) in the Hunter Valley.

Grain exports

The situation regarding the rail network supporting grain exports is well summarised by the Australian Wheat Board in a submission to a an inquiry (HORSCT, 2007). "Rail infrastructure for the grain regional network across Australia is comprised of three gauge types and stretches some 18,000 kilometres....As a comparative guide North American rail networks carry up to 100 tonnes of wheat in a wagon. In contrast, the average Australian net wagon load is 55 tonnes and can be as low as 35 net tonnes.

"The regional branch line network has undergone minimal rationalisation over the years and this is primarily been limited to forced rail line closures due to the high cost of maintenance. There has been no significant public investment in the eastern states to upgrade and maintain the regional network to allow it to take advantage of larger, heavier or more efficient trains. ... "

Too often, an Australian approach of enforcing regulations affecting small rail operators has lead to an end result was to see more grain moved by heavy trucks on lightly constructed rural roads. A House of Representatives Inquiry (HORSCT, 2007) noted that Canada does not have a railway gauge problem; both the Federal and Provincial governments own grain wagons, and outlined how both levels of government in Canada act to facilitate short line operations for the movement of grain and other commodities. The Neville Committee in its 2007 report found that this type of structure "... is worth closer examination in Australia. The concept of local businesses and authorities arranging to take over the short regional lines, with some help from the State or Australian governments, could be a useful way of keeping the infrastructure available."

In 2007, the Government of Victoria commissioned a Victorian Rail

Freight Network Review (the Fischer Review). Reporting in 2008, the view recommended provision of a fit for purpose regional rail freight system at reasonable cost, and classified lines into four categories (Platinum (the base network), Gold (first priority for rehabilitation), Silver and Bronze. The report and its 29 recommendations received a generally positive response from the Victorian government.

In February 2009, a $3 million NSW Grain Freight Review was announced by the Federal Transport and Infrastructure Minister with matters of interest including changes in production patterns and domestic and export markets for grain along with enhancing the efficiency of grain transport, storage and handling.

Energy efficiency

With increasing world demand for oil having the potential for 'peak oil', and greenhouse gas emission concerns leading to emissions trading schemes, energy efficiency in land transport is increasingly important. In Australia, this has led to many reports including from the BTRE (for example, 1996, 2002) and inquiries such as by Senate Rural and Regional Affairs and Transport Legislation Committee into Australia's future oil supply and alternative transport fuels that reported in 2007.

In regards to rail transport energy efficiency for 'hire and reward' (formerly Government Rail) appears to have increased from 2.53 net tonne km per MegaJoule (ntkm/MJ - using Full Fuel Cycle (FFC) or primary energy) in 1994-95 (Laird, 1998) to 3.2 ntkm/MJ in 2006-07 (ARA, 2008).

However, this is somewhat behind both the 2006 averages for Canadian and United States Class I Railroads of 3.88 ntkm/MJ (from Association of American Railroads data) or a commendable Canadian Pacific Railway (2007 Annual Report) energy efficiency of 4.01 ntkm/MJ. On the other hand, assisted by the very high efficiency of the iron ore operations, Australian 'ancillary' rail operations show an impressive energy efficiency of 11 ntkm/MJ (ARA, 2008).

Conclusions

Due largely to large increases in iron ore and coal exports, the Australian rail freight task increased some 81 per cent from 1994-95 to 199 billion tonne kilometers in 2006-07. Between 1997 and 2002, most but not all Australian freight railways were privatized with mixed results. These railways demonstrate a mixture of operations at world best practice (by both the private and public sectors in moving iron ore and most coal exports plus non-bulk freight on the East - West corridor) and poor performance (coal exports through Port Kembla, freight on the North - South corridor and moving grain in part due to track limitations). Further track investment and land freight transport reform is needed by Australia in order to reduce its dependence on imported oil and greenhouse gas emissions.

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