

*Submission to the House of Representatives
Standing Committee on Transport and Regional Services Inquiry into the Integration of
regional rail and road freight transport and their interface with ports*

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1. INTRODUCTION

This submission shall briefly look at some aspects of land freight that is related to sea ports. It will draw on research conducted at the University of Wollongong and supported, in part, by the Rail CRC. However, it does not necessarily reflect the views of either organisation.

Since the 1850's, railways have facilitated the movement of goods to and from sea ports. During the early 20th century, many lightly trafficked lines were built in remote regions. After World War II, increasing reliance was placed on road transport. However, this has been costly in terms of oil use with significant environmental impacts appearing during the 1970s. These problems include the moving of large numbers of containers to and from ports in Sydney and Melbourne leading to plans to try and increase the percentage of these containers that are moved by rail. This problem is not new; during the 1970s the extended movement of containers by road from Mort Bay in Sydney prior to the opening of Port Botany led to a severe adverse impact on Balmain. This was then acknowledged by the NSW Maritime Services Board as “...*a situation that is clearly unacceptable*”.

More details of urban road freight impacts associated with NSW Ports are given in Appendix A. It is of note that whilst some of the problems caused by the movement of containers to and from Port Botany were alleviated by the opening of the M5 East, many problems remain. It is understood that the suburb of Bexley still has to contend with through movements of containers; and within a year of its opening it was congested at peak hours (suggesting it should have some demand management with congestion tolling).

Urban impacts due to port operations were also canvassed by the State Development Committee of the NSW Legislative Council in its June 2005 Final Report from its Inquiry into Port Infrastructure in New South Wales.

2. EXTERNAL COSTS

This NSW report notes, inter alia, some estimates of external costs of road and rail haulage of freight in urban areas. These costs are usually given in approximate unit costs in cents per net tonne kilometre (tonne-km or tkm, where one tkm results when one tonne of freight is moved a distance of one km). As the NSW report notes, these are only estimates.

However, it is clear that they are real costs borne by real people even if they do not appear in the accounts of those moving the freight, or causing it to move.

Updated estimates appear in Appendix B. This includes an estimate of the health costs of urban air pollution from articulated trucks at 0.65 cents per net tkm, derived from two Bureau of Transport and Regional Economics (BTRE) reports. The information supplied in these BTRE reports also gives some aggregate air pollution health cost data for non-urban areas, where the costs from articulated truck operations are subsequently estimated at 0.13 cents per net tkm.

These estimates of combined external costs adjusted to 2009 values (inflated by 3 per cent pa) are 3.57 cents per ntkm for road haulage in urban areas, 2.57 for road haulage in non - urban areas, 0.56 for rail haulage in urban areas, and 0.22 for rail haulage in non - urban areas. These costs suggest that for intercity freight moving between Sydney and Melbourne by road diverted to rail line haul, with road pick up and delivery, there is a net reduction of external costs of about \$20 per tonne. This includes use of assumptions of a road distance of 920 km, an upgraded rail distance of 940 km, urban hauls of 50 km for each line haul mode, plus an average 25 km urban road pick up and delivery for each rail line haul. The external cost for each tonne of road hauled intercity freight is of \$24.20 as against \$2.20 per tonne for rail line haul and \$1.80 per tonne for road pick up and delivery.

For intercity freight moving between Melbourne and Sydney diverted from road line haul to rail line haul, with road pick up and delivery, there is a net reduction of external costs of about \$18.40 per tonne. This assumes a road distance of 860 km, a rail distance of 940 km, and urban freight movements as above.

3. INTERCAPITAL CITY FREIGHT

Efficient low cost inter-capital city rail and road freight can assist shipping companies in reducing their number of ports of call in Australia, and, may also assist in providing competition between major Australian ports. Overseas examples of interest are the development of land bridging in the United States (with a trend to western ports serving Asia and eastern ports serving Europe facilitated by rail introducing more use of double stacked containers during the 1980s), and, in New Zealand the development of the Port of Tauranga at Mount Manganui as an alternative to the ports of Auckland, following the opening of the Kaimai 8 km tunnel in 1978.

Much has been written about the condition of the track linking Australia's three largest cities (and hence three largest non-bulk ports) of Melbourne, Sydney and Brisbane. Suffice it to say that the condition of this rail track was rated "*substandard*" in the 1999 Rail

Projects Taskforce, F- in the first national Infrastructure Report of 2000, and the ARTC 2001 Track Audit identified the need for selective upgrading.

On 5 September 2004, following an agreement between the Australian and NSW Governments, the Australian Rail Track Corporation (ARTC) took a 60-year lease on the NSW mainline interstate tracks excluding Newcastle - Sydney - Wollongong.

As part of the agreement, ARTC will make a \$872 million investment over five years (mostly loan funds). This will be supplemented by AusLink funds. This upgrading of North-South corridor rail track and signal systems is only now commencing, at a cost approaching \$2 billion. However, the National Transport Planning Task Force, in 1994, identified a \$3 billion scope of work to bring the interstate mainlines and the important Brisbane - Townsville track to a competitive goal 2 standard. So more work is needed.

In addition, the present scope of ARTC work on the North Coast corridor does not include any rail deviations. It is submitted that some rail deviations on the existing NSW Main South line and North Coast line should proceed whether or not an inland Melbourne-Parkes-Brisbane railway is built. Comment on rail deviations is given in Appendix C.

From 1992 to 1997, Queensland Rail undertook a MainLine Upgrade (MLU) between Brisbane and Cairns which included 120 km of high quality rail deviations with easy grades and curves. This supplemented about 40 km of deviations between Nambour and Gladstone undertaken as part of Queensland's Main Line Electrification project completed in 1989. The MLU allowed improved rail freight services particularly intermodal to and from North Queensland (including livestock trains which are now unique to Queensland). It also facilitated the direct service to bring fruit and vegetables from North Queensland to Sydney and Melbourne markets (albeit with a change of gauge at Brisbane). Concise reasons for proceeding with the Queensland MLU Project were given by Mr R. Hunter in a 1994 Rail Track Association conference paper: *"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. ...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."*

By way of contrast, the One Nation interstate track work of the early 1990s included only two minor deviations, and these were more to remove grades than to change horizontal alignment. As noted by the South Australian Minister for Transport, the Hon Diana Laidlaw MP in a keynote speech to a Rail 2000 conference in 1995 *"The Adelaide-Melbourne standard gauge program has been done on the cheap - the sharp curves and grades through the Adelaide Hills remain as an impediment to efficient operations. ... The Albury-Sydney*

line retains its steam alignment and the Sydney to Brisbane line remains the most difficult line in the country to operate, despite the high level of freight traffic between the two Pacific seaboard capitals.

The challenge for the nation is to find an acceptable process to evaluate track alignment improvements and how they compare with investments in large scale highway upgrades. It is quite clear that without continuous improvement rail will be condemned to a progressive contraction of its business if highways continue to improve at the rate they have, and mainline interstate track retains substandard alignment with its speed weight constraints.

4 INTRASTATE FREIGHT

4.1 QUEENSLAND

Caboolture - Landsborough duplication, with some realignment, is now long overdue for improvement to be able to cater for existing train operations. Freight trains are now subject to limited peak hour curfews, and a 'railway bus' has augmented train services between Caboolture and Nambour for some years. This section is now the most congested section of single track in Australia. Consistent with a then progressive approach to rail development, the 1997 Queensland State Budget included an allowance for detailed planning of part of this section. However, the actual commencement of work has been subject to extended delays due to acquisition of land, with a detailed study leading the Queensland Government to propose in late 2003 an option, which was subsequently put on hold early in 2004 prior to a State election. On 29 August 2005 it was announced that funding of \$262.4 million has been provided for a new 14 kilometre rail corridor between Caboolture and Beerburrum to be completed by mid 2009. The Queensland Government also that day released for public comment the preferred rail corridor for a further 17 kilometres from Beerburrum to Landsborough.

To quote Hon Paul Lucas, Minister for Transport speaking at the Queensland Estimates Committee on 13 July 2005 *"one of the things that I am very passionate about as transport minister is to make decisions about corridors that can protect them before they become an issue - in fact, if necessary acquire them before they become incredibly expensive-..."* The Minister noted that to that date, 40 land parcels had been purchased under hardship or strategic purchase arrangements for Robina to Tugun, Caboolture to Maroochydoore CAMCOA, and Gowrie to Grandchester corridor ... with more under investigation.

North of Landsborough further track straightening is required. As well, a new rail bridge at Bundaberg is needed, sooner better than later, to replace the present one with its 15

km/h 'flat' speed restrictions. Can Members of the Committee imagine a major bridge on the Bruce Highway with a permanent 15 km/h speed restriction.

West of Brisbane; the 1867 track between Grandchester and Toowoomba needs replacement. Three hour transit times for freight and passenger trains speak for themselves.

4.2 NEW SOUTH WALES

The findings of the NSW State Development Committee in its Inquiry into Port Infrastructure in New South Wales are commended. In addition, grain lines need rehabilitation rather than closure. The railway between Hornsby and Broadmeadow is now the most congested section of double track in Australia, albeit more from frequent passenger trains rather than from commercial freight activity. The worst aligned sections of track linking Sydney and Newcastle are also long overdue for realignment, or, a new line could be built for part of the way for passenger trains. Other work that could usefully be done would be to make a direct freight link from near Teralba to Hexham.

4.2.1 Port Kembla and the Maldon Port Kembla Railway

The Committee's attention is particularly invited to Port Kembla and the question of when is the best time to complete the Maldon-Port Kembla railway. It is submitted that completion of this railway is a question (to quote the Hon N Wran QC in his report in the mid 1990s on the Alice Springs - Darwin railway) of '*not if, but when*'.

The final report of the State Development Committee in relation to the Inquiry into Port Infrastructure in New South Wales released 17 June 2005 noted, inter alia, comment for and against completion of the Maldon-Port Kembla railway, and the option of tying it in with the "Wentworth" rail deviation from near Menangle to Yanderra or Aylmerton. The NSW Committee made two related recommendations:

Recommendation 12. That following the anticipated transfer of general cargo stevedoring to Port Kembla in 2006, the NSW Government re-examine the freight task out of Port Kembla to ensure that the anticipated increase in freight traffic is supported by the necessary improvements in road and rail infrastructure.

Recommendation 13. That the NSW Government consider the feasibility of expanding rail infrastructure into Port Kembla, including consideration of the Maldon to Dombarton line, in conjunction with the AusLink program.

The Maldon-Dombarton rail link is a 35 kilometre partly completed link. It was started, with enabling legislation, in 1983 by the Wran Government to improve rail access to Port Kembla. During the 1980s, the following work was done:

- a. Environmental impact assessment plus design and documentation.
- b. Construction and ballasting of over 25 kilometres of right of way from west portal to the boundary of Water Catchment near Wilton.
- c. Construction of approach viaducts in 1984-85 to Nepean River Rail Bridge.
- d. Installation of plant and site works, environmental control measures, start of tunneling at Avon tunnel on east portal and construction of west face of portal. The Avon tunnel contract was cancelled by the Greiner Government in mid 1988 (with \$4.5 million compensation to the contractors and contrary to pre-election promises to complete the line by 1991).

In addition, the 15 km Dombarton-Port Kembla section was upgraded and duplicated, with erection of masts from Port Kembla to Dombarton for high voltage electrification for the entire Maldon Port Kembla project. More details are given in Appendix D.

The sunk cost (dollars of the day) for the work done on the Maldon-Dombarton section was noted by Freight Rail (at the Port Kembla Coal Terminal Inquiry, 1993) as \$42 million, and the work done on upgrading and duplication of the Dombarton - Port Kembla section as \$57 million (the latter as part of upgrading Moss Vale - Unanderra line to support export grain, limestone and steel traffic).

The following work to complete the Maldon Dombarton rail link remains (with costings provided by Freight Rail to the PKCT Inquiry, 1993):

- a. Boring of the Avon tunnel (\$30 million), and bridges (\$18 million) - completion of the main span of the bridge over the Nepean River, a new bridge over the Cordeaux River and four road overbridges near Wilton.
- b. Grading of right of way from near Wilton to near Maldon (about 9 km- \$ 4 million)
- c. Laying of sleepers and track (\$20 million) with crossing loops at Avon, Cordeaux, Wilton and at the Maldon Triangle.
- d. Signalling and communications (\$15 million).
- e. AC (25,000 volts) Electrification (\$37 million).

The following changes have affected the case for completion of the link:

- A. Ongoing demand for electric trains from Sydney to Wollongong, with demand for more passenger trains leaving less paths for freight trains on the Illawarra Line.
- B. Increased rail congestion in Sydney, coupled with the extra costs of raiing coal via inner Sydney (with two 3 hour problem periods for coal train movements each working day), and the steep Como bank needing 4 locos for a small 31 wagon coal train or 5 locos for a 42 wagon train. Rail congestion is an ongoing issue in parts of Sydney.

C. Work, completed in late 1996 near Granville that gives a direct connection for coal trains moving between the Western coal field and Maldon.

D. Some upgrading of the line from Liverpool to Campbelltown for freight trains under the 'One Nation' program 1992-95, with more due 2005-08 by the ARTC.

The changes are in addition to the commissioning of a new Grain Terminal at Port Kembla and closure of the Rozelle Grain Terminal, and, closure of the Balmain coal loader.

Although coal tonnages have not met projections, and some mines have closed, there is potential for a Maldon Port Kembla railway to carry new freight and passenger traffic. As a new Waterfall-Thirroul route is not going to be constructed by 2010 or even 2015, then there is an increased case for early completion of the Maldon Port Kembla Railway.

4.2.2 The Wentworth Route

The Hon WC Wentworth suggested in 1991 (to a rail inquiry of the Industry Commission - see also SMH 26 Sept 1992) for a new railway to follow the route of the present section of the Hume Highway that was opened in 1980 between Campbelltown and Mittagong. It is of note that in about 1977, the former Public Transport Commission had examined a similar route. During the late 1990s, various options were examined for the former Rail Infrastructure Corporation of NSW and outlined in the 2001 Australian Rail Track Corporation (ARTC) Track Audit.

One proposal for a major 36 km rail deviation between Menangle to Aylmerton is located, for most of its length to the east of the Hume Highway. Starting at 68.0 km from Sydney, the new track would cross the Hume Highway and then follow it to the northern portal of the Aylmerton tunnel at 122.3 km. The net effect would be to replace 54.3 km of track with "steam-age" alignment by 36 km of new track built to modern standards, albeit with a ruling gradient of 1 in 50. The ruling curvature is 1500 m. This new track could 'tie in' with the existing track at 108.2 km near Yanderra, where heavy south-bound freight trains could be diverted onto the existing track, thus giving a ruling gradient of 1 in 60.

South of Aylmerton, a minor 2.8 km deviation and two locations of curve easing would reduce point to point distance by 0.5 m. The entire new track has curvature equivalent to 1.7 circles (of which 0.7 are on the Aylemerton - Mittagong section) as opposed to 13.8 circles on the old section.

4.2.3 The combined option

This is to construct together the Menangle, Wilton to Yanderra track and the Dombarton Wilton section.

The Menangle to Yanderra new track is about 25 km in length and would replace 40 km of 'steam age' alignment. This option could use part of the alignment of the Maldon - Port Kembla railway (east of the road interchange between the Hume Highway and Wilton/Picton road) and would extend from about 9.5 km to 12 km on the new line. On the Menangle to

Yanderra section of the existing Main South line, the 40 km of track has 22.0km of track on tight radius curves of less than 800 m, and requires trains turn a total of about 8.5 circles.

The Dombarton Wilton section is about 25 km long, and would need to include completion of the Avon tunnel, and a bridge over the Cordeaux River.

The combination would provide a much improved track alignment that is 15 km shorter than the present track through Picton with significant benefits to rail freight and passenger trains from Sydney to Melbourne, and, give most of the benefits of completion of the Maldon-Dombarton link.

4.3 VICTORIA

Gauge standardisation which looked promising in the year 2000 was set back by unintended consequences of rail privatisation, and, the decision of the Victorian Government not to specify gauge-convertible sleepers in its Regional Fast Rail Programme. As seen by Engineers Australia in their 2005 Victorian Infrastructure Report Card " *The current work will result in an effective lock out of standard gauge on the major regional corridors in the long term, in direct contradiction to explicit State Government commitments. Historically, it has been an unfortunate feature of State based rail administration that the long term national strategic imperatives are often given minimal consideration. Another shortcoming is the failure to address the metropolitan bottlenecks coming into Melbourne.*"

There is a good case for both the Victorian and Federal Government providing funds not only for regional rail rehabilitation but also making some further progress towards gauge standardisation. The AusLink White Paper (DOTARS, 2004 p 39 and 65) indicates that along with \$20 million for a rail pass of Wodonga, it is prepared to partner with the Victorian Government, the ARTC and Pacific National to fund standardisation of the broad gauge rail track from Melbourne to Albury - Wodonga and make an allocation of \$20 million towards the cost of standardisation of the broad gauge rail track between Geelong and Mildura. Both projects are considered to " *...greatly enhance operational efficiency and integration.*"

New Zealand has had to address the effect of rail privatisation in 1993 on under-investment in rail track. Their considered solution, in 2004, was to form a New Zealand Railways Corporation to own, maintain (at rail operators expense) and improve (with a \$200m conditional grant) the rail track. This would have been, and would still be, a good way for the Victorian Government to go. It may well need some Federal support and direction to get some sense here (as per NSW).

4.4 SOUTH AUSTRALIA

In addition to the welcome funds for rehabilitation of the Eyre Peninsular grain lines, South Australia is another State that could do with Federal assistance. Outstanding issues (apart from Adelaide's urban rail system) are residual gauge standardisation to Mt. Gambier, and realignment of the track on the Eastern side of the Adelaide Hills to ease grades and curves for heavy west bound superfreighters.

The future of the Mt. Gambier lines (to Wolseley SA and Heywood Vic) is uncertain. There are three proposals to export blue gum plantation timber when it is ready for harvesting later this decade. One is through a new port facility south of Kingston. This would require construction of new port facilities, which may or may not proceed. New facilities were seriously proposed in the late 1990's for a port for the export of coal at Granity on the West Coast of the South Island of New Zealand. After gaining initial consent, the proposal was subject to a lengthy appeal during 1998 and then did not proceed. It was replaced by the ongoing use of rail to Lyttleton Port at lower rail freight rates.

The two other proposals involve export of timber through the port of Portland in Victoria; one by line haul road haulage, and the other by trucking the timber to Penola, SA, and then by rail (over rehabilitated and gauge standardised track to Portland).

If we assume that after an initial road haul to Penola, then the timber is either hauled by rail about 170 km to Portland, or hauled by trucks using public roads, the difference in external costs (using the values cited above) between using road and rail haulage from Penola to Portland is about \$5 per tonne. This translates to \$5 million for each million tonnes of timber moved to Portland.

4.5 TASMANIA

This track could also do with some Government assistance; either State or Federal via AusLink. In addition, some AusLink rail funding is needed for the Burnie-Hobart corridor. At present, all AusLink funding for this corridor is proposed for road. This is despite a maximum speed limit of 60 km/h of any train with no shortage of permanent and temporary speed restrictions, some as low as 20 km/h) and a light 18 tonne axle load limit.

4.6 WESTERN AUSTRALIA

Post privatisation and arrangements expiring this year, attention will be needed to be paid to maintaining grain lines.

5. ENERGY EFFICIENCY

In moving reasonable tonnages of non-bulk freight, a simple rule is that rail is three times more energy efficient than road. Appendix E discusses the rail's generally superior

energy efficiency. Recent data shows that rail performed a larger freight task than road along with a small but significant passenger task using about 2.5 per cent (one fortieth) of the fuel used by all road vehicles.

A good approach to energy use in transport was given 26 years ago in an Australian Transport Advisory Council 1979 publication *Transport and Energy Overview*. This report was prepared following the second major world oil price shock during the late 1970s. Although the data used in this report is now dated, the approach as follows is commended. *"... rail is relatively energy efficient compared to road for long distance freight ... (and) ... does have fuel substitute options, such as coal-oil slurries or electrification As far as possible pricing and cost recovery policies should be consistent across the modes so as to encourage use of modes appropriate to particular tasks. Appropriateness may be defined broadly as minimising the total social cost of transport services, including externalities.*

By way of example, the decision in the 1980's of the Queensland Government to electrify its coal lines in Central Queensland is now saving an estimated 175 million litres of diesel per annum. This estimate is based on QR moving about 150 million tonnes of coal in 2004-05 in Central Queensland with an assumed average length of haul of 240 km (from the QR 2001-02 Annual Report (p 59) it appears to be 239km), and a FFC energy efficiency of 4.9 net tkm/MJ (see Appendix E, this being lower than the bulk average as the Pilbara Iron ore rail haul energy efficiency is very high) with 41.77 MJ per litre of diesel).

Another commendable approach is given in a 1995 report of the Intergovernmental Committee on Ecologically Sustainable Development (ESD), Part V Section 2 notes the 1992 National Strategy for ESD and the National Greenhouse Response Strategy recommendation of reducing *"...total energy consumption in transport through:*

- * *improved technical and economic efficiency of urban and non-urban transportation*
- * *switching to alternative transport technologies or modes where this reduces greenhouse emissions per passenger or unit of freight".*

The challenge is to implement modal shifts. Track upgrades not only increase rail's energy efficiency, but also allow rail to more effectively compete with road transport.

6. OIL IMPORTS

Australia is slow to gain an understanding that the decades of cheap oil, which fuelled the strong growth of road freight, are over. Oil prices have increased in recent years and remained above \$US40 per barrel since the start of 2005. As noted by the Aust Fin Review (Something has to give in Asia, 31 August) *"Consensus forecasts have crude oil averaging \$US50.50 a barrel next year"*, also some investors are now considering a \$US80 price.

As noted above, rail is energy efficient, with more potential to use electric traction. Australia needs to reduce rather than increase its dependence on imported oil.

However, allowing rail to slip backwards by denying funds for track rehabilitation and upgrades whilst spending record amounts on roads each year is a guaranteed way of increasing Australia's dependence on imported oil. In turn, this will erode Australia's international competitiveness. It is trusted that the Committee will consider this issue, and the potential problem of the "peak oil" theory being a reality.

7. CONCLUSION

At the start of the 21st Century, Australia's land freight has problems. Australia has rail operations that vary from the world's best practice (including the Pilbara Iron Ore and Queensland Rail's export coal haulage in Central Queensland under electric traction on narrow gauge) to extensive operations on substandard track.

Some slow progress has been made in improving the prospect for interstate rail freight following the Committee's 1998 report *Tracking Australia*. However, much work in addition to the ARTC's current programme under AusLink (to 2009) remains to be done. As well, much work needs to be done to rehabilitate regional and intrastate rail lines in each State.

The rapid completion of the engineering work of Alice Springs-Darwin railway (less than 30 months from financial closure on 20 April 2001 to 25 September 2003) ahead of time and within a tight budget shows that Australia can deliver outstanding rail engineering outcomes.

Other issues include those raised by the 2005 Fisher Review of Infrastructure and the Engineers Australia 2005 National Infrastructure Report Card released 7 September. The 'highway subsidisation' of the operation of heavy trucks with no application of the "polluter pays" principle also invites further attention. The Committee is challenged to produce a report that can move, without undue delay, the Australian Government into further action.

APPENDIX A URBAN PORT IMPACTS

This Appendix is taken from Chapter 2 of *Back on Track: Rethinking transport policy in Australia and New Zealand* by Laird, Newman, Bachelors and Kenworthy 2001 UNSW Press.

Large urban areas generate the movement of large tonnages of freight, although often only over short distances. The urban freight task, in tonne kms almost tripled within 19 years to 1995 (with an average growth rate of 5.6 per cent per annum).

Urban road freight includes all manner of goods deliveries to shops, offices and homes, which are often performed by the LCVs, or the smaller rigid trucks. There is also the movement of materials needed for factories, which may use rigid trucks, and in some cases, the larger articulated trucks. Large seaports now have a capacity to generate much road freight, including the movement of imported shipping containers between a wharf and a warehouse, or, movement of commodities to a wharf for export. All types of road freight have to compete with cars for the same road space. However, the heavier articulated trucks cause the greatest environmental and social impact on cities.

All cities with a major container port have a story to tell about the movement of containers, often using old articulated trucks, and sometimes on narrow streets that were never designed for large trucks. One case in particular has been the movement of containers within Sydney, firstly from Mort Bay near Balmain, and then from Port Botany.

A.1 Containers

Most imports into New South Wales come through Sydney. The movement of containers to and from Sydney's ports by heavy trucks has presented severe problems since 1969. The operation of Mort Bay as a container terminal serviced only by trucks in the suburb of Balmain from 1969 to 1980 was one of the worst urban blights in Australia and even recognised by the NSW Maritime Services Board as ". . . a situation that is clearly unacceptable" (Kirby, 1981). The Mort Bay facility with container trucks persisted until Port Botany was handling containers.

The NSW State Cabinet resolved to have containers compulsorily moved by rail between Port Botany and the Western Suburbs, as recommended by a Commission of Inquiry (Kirby, 1981) with the unanimous support of seven affected local government councils. However, this plan was quickly overturned following industrial action involving the Transport Workers' Union. Road has since then continued to carry the majority of containers to and from Port Botany (except for those being moved interstate). This road haulage was accompanied by truck queues near the Port for many years, and ongoing severe environmental impact, despite the ability of rail to clear containers to decentralised depots away from the port. Although it was not in rail's comparative advantage to service short-distance movements, the use of such a system (with concentrated volumes, regular cycles and appropriate pricing structures) would offset the remoteness of Port Botany from the main industrial areas of Sydney and the tortuous road links that existed for many years (Inter-State Commission, 1989).

More use of rail for container movements between Port Botany and Sydney's Western Suburbs evolved in the late 1990s. However, the failure to reserve such container movements to rail has punished Sydney suburbs such as Bexley with large-scale trucking operations to move shipping containers through residential and commercial areas with severe adverse social and environmental impacts. The solution favoured by the NSW Government for two decades has been to construct a new urban freeway that was rejected by the Kirby Government inquiry of 1981. The proposed freeway met with strong local opposition in the 1980s and the 1990s, and was finally approved as the M5 East in 1998. It is due for completion in 2002 at a cost of some \$400 million.

A.2 Road haulage of coal

A second urban freight horror story was the movement of millions of tonnes of coal, for export, through the streets of Wollongong during the late 20th century. The main export from New South Wales is black coal, the volume of which had grown from about 12 million tonnes in 1970 to over 60 million tonnes in 1999. Most of this export coal is delivered to port by rail. However, for most of the 1970s, 1980s and 1990s, over 4 million tonnes per annum (mtpa) were delivered by road to Port Kembla with a smaller amount delivered by road to coal export terminals at Newcastle. In addition, significant quantities of coal were hauled by heavy trucks on public roads to rail loading points in the Hunter Valley until the commissioning in 1997 of a new coal loading facility near Muswellbrook.

Undoubtedly, the most severe coal trucking impacts were felt by Wollongong during the 1970s and 1980s. In May 1979, no fewer than six lives were lost in two road accidents involving coal trucks. The public reaction was a massive petition signed by 40 000 people and presented to the NSW Parliament: *We, the residents of Illawarra and Southern Tablelands living on the road haulage routes used by heavy transport hereby request your consideration of our petition. I, the undersigned, am appalled by the continuing carnage on our roads and in particular Mt. Ousley, and join in demanding the local, State and Federal authorities take immediate action to ensure motorists' safety.*

I further demand the relevant authorities make provisions for the complete abandonment of coal haulage by road.

The immediate NSW Government response was a 40-km per hour speed restriction on heavy trucks descending Mt. Ousley, and a thorough mechanical check of the entire coal truck fleet. The results as reported in 1980 (McDonell) by a Commission of Inquiry showed that some 30 per cent of the coal trucks had major safety defects, mostly in the braking and steering systems. This led to the ongoing efforts of the NSW authorities in annual and random safety checks of the mechanical condition of heavy trucks operating in NSW.

However, in 1983, Illawarra coal trucks were reportedly involved in fatal crashes at rates, per 100 million vehicle kilometres, of up to three times higher than NSW averages for all articulated trucks. During the eight years from 1978 to 1985, trucks hauling coal to Port Kembla were reportedly involved in some 27 road fatalities. Further efforts by the NSW Government and the coal and trucking industry in the late 1980s, along with much road upgrading, led to an appreciable improvement in safety in coal trucking. However, the upgrading of main roads used by coal trucks and other vehicles came at a large cost, estimated to exceed \$250 million.

Other external costs of coal trucking to Port Kembla include road congestion in urban areas, air pollution, vibration, and noise. The noise from coal trucks was found to exceed NSW Government roadside noise guidelines and was appreciably more than the noise from coal trains (Healthy Cities Illawarra/EPA, 1993). Subsequently, noise walls were installed extending for several kilometres along Mt Ousley and other roads used by coal trucks near residential areas in Wollongong City.

Along with Newcastle and Wollongong, many other cities and towns have had to deal with problems posed by haulage of bulk commodities by heavy trucks using public roads. The impacts were well summarised by a NSW Coal Development Strategies Industry Task Force Report (1990, page 59): *Road haulage has significant community costs including noise and dust pollution, increased energy usage, increased road maintenance, safety hazards, negative effects on tourism and complaints from local residents'.*

APPENDIX B LAND FREIGHT EXTERNAL COSTS IN AUSTRALIA

These notes are from a 2005 ATRF paper that outlines some estimates of external costs of land freight transport published in Australia since 1990. The earlier reports include those of the former Inter-State Commission, the National Transport Planning Taskforce, the Victorian Environment Protection Authority and the Bureau of Transport and Regional Economics with its 1999 report *Competitive Neutrality between road and rail*.

With the increasing land freight task and projections for future growth, estimates of external land transport costs have been of increasing interest to government. Recent examples include Queensland Transport, the Victorian Department of Infrastructure, the NSW Department of Transport study of grain transport options, the Australian Transport Council's 2004 *National Guidelines for Transport System Management*, and, the New Zealand Ministry of Transport *Surface Transport Cost and Charges* study released in 2005. A 2003 Austroads report *Valuing Environmental and Other Externalities* is also of note.

The paper gives particular attention to six external costs of road and rail freight operations in both metro and non-urban areas identified for the Australian Rail Track Corporation's 2001 Track Audit. These external costs are accidents, air pollution, noise pollution, greenhouse gas emissions, congestion, and incremental road damage. The results of two studies conducted for Queensland Transport in 2001 and 2004 that provided updated estimates for each of the Track Audit externalities are discussed. The revised estimates of unit costs include:

1. Australia wide accident costs of 0.6 cents per net tonne kilometre (ntkm) for road freight moved by articulated trucks and 0.03 cents per ntkm for rail freight;
2. An average cost of air pollution in capital cities of 0.65 cents per ntkm for freight moved by articulated trucks and 0.22 cents per ntkm for rail freight moved by diesel electric locomotives. These estimates are based on PM10 emissions as discussed in two BTRE reports *Health Impacts of transport emissions in Australia: Economic costs* (2005) and *Urban pollutant emissions from motor vehicles: Australian trends to 2020* (2003).
3. Noise in capital cities - 0.22 cents per ntkm for road, 0.12 cents per ntkm for rail.
4. A greenhouse gas cost (based on \$25 per tonne of carbon dioxide) of 0.18 cents per ntkm for road freight moved by articulated trucks and 0.06 cents per ntkm for rail freight.
5. Road congestion (metro only) 0.10 cents per ntkm for road. -
6. Pending the third determination of road user charges for heavy vehicles of the National Transport Commission, under-recovery of road system costs from articulated trucks at 1.0 cents per ntkm.

Lower unit costs are given for air pollution and noise for road and rail haulage in non-urban areas.

Even if the users of land freight transport are not required to meet their full external costs, such costs should be fully accounted for when major infrastructure investment decisions are being made. Based on the information in this report, the following values in Table B 1 are recommended in year 2000 values.

Table B 1 Recommended year 2000 revised Australian land freight externality costs

| Externality Measure | Road (c/ntk) | Rail (c/ntk) |
|----------------------------|---------------------|---------------------|
| Accident Costs | 0.60 | 0.03 |
| Air pollution | | |
| - Metro | 0.65 | 0.22 |
| - Rural | 0.13 | 0.04 |
| Noise pollution | | |
| - Metro | 0.22 | 0.12 |
| - Rural | 0.07 | 0.04 |
| Greenhouse gases | 0.18 | 0.06 |
| Congestion (Metro only) | 0.10 | - |
| Increased road maintenance | 1.00 | |
| TOTALS | | |
| Metro | 2.75 | 0.43 |
| Rural | 1.98 | 0.17 |

Reference: As per text. Note that road maintenance costs for roads of light construction are higher, also that any rail track subsidies may need to be taken into account.

It may be noted that, excluding unrecovered road system costs, the metro articulated truck road external cost of about 1.75 cents per net tonne km is less than half the approximate value cited in the above Austroads report of some 4 cents per net tonne km.

It is also of note that road vehicle operators using petrol pay an appropriate de facto externalities charge through fuel excise without rebates, and the assigned average health costs from car use (1.3 cents per km) in the state capital cities equates to about 12 cents per litre of petrol used. However, following introduction of the New Tax System in 2000, the operators of heavy vehicles were granted conditional rebates for the use of diesel, which have since been further extended to effectively require no payment of external costs (cf about 20 cents per litre prior to 2000).

Further work is required in the area of land freight external costs. However, this should not stop government now incorporating into road user pricing and rail pricing conservative values for external land freight costs, so that the operators of diesel powered road vehicles and trains pay a basic externalities charge. This charge could be a adjusted following refinement of the initial estimates. It is also recommended that the additional revenue generated be applied to long overdue land transport infrastructure upgrades.

APPENDIX C NORTH - SOUTH RAIL DEVIATIONS

Several factors invite attention to the recent decision of the ARTC to defer deviations on the North - South corridor at a time work is proceeding on major highway rebuilding on both the Hume and Pacific Highways.

1. The substandard alignment of the Junee – Sydney – Brisbane track imposes severe speed-weight restrictions on the performance of superfreighters. In fact, the present alignment corresponds to that of the Hume Highway and the Pacific Highway in 1970 before the major road reconstruction took place. Moreover, some present NSW Main South alignment going back to the 1910s (eg Goulburn – Yass) is not only longer than the original 19th Century Whitton alignment, but the present alignment requires superfreighters to take 12 per cent longer and use 12 per cent more fuel than such trains would if traversing Whitton’s track alignment.
2. Many independent reports since 1977, including the ARTC 2001 Track Audit, found significant benefits from selected rail deviations along with other infrastructure upgrades.
3. The value of earlier rail deviations in more efficient and profitable freight train operations on long distance routes including:
 - a. Kalgoorlie – Perth and Chrystal Brook – Adelaide as part of gauge standardisation projects
 - b. Queensland Rail’s North Coast Mainline Upgrade
 - c. Two deviations north of Grafton in 1995.
4. The Federal Budget of May 2004 specifically citing straightening of the track between Sydney and Brisbane as part of a \$450 million grant.
5. The AusLink White Paper citing 14 rail deviations over 121 km between Sydney and Brisbane.

It is appreciated that other infrastructure upgrades, including attention to passing loops to reduce dwell time, have a high priority. It is also appreciated that some rail deviations well warrant a higher priority than others, and any decision to complete an inland route will impact on rankings. For example, Junee - Cootamundra rail deviations would take a higher priority in an Inland Route between Melbourne, Parkes and Brisbane whereas some, but not all, Maitland – Casino rail deviations would take a lower priority. It is also recognised that, as per the various upgrades of the Pacific Highways, major rail deviations will be built in stages.

Advanced planning involves route selection, environmental impact assessment, and land acquisition (or reservation). In some cases, as per the Tugan Bypass on the Pacific Highway on the NSW/Queensland Border, a combined road and rail corridor can be acquired. The Railway Technical Society Australasia (media release August 2005) has recently proposed this approach for the Moorland to Herons Creek section of the Pacific Highway north of Taree.

APPENDIX D MALDON PORT KEMBLA RAILWAY

The following gives older information on this railway. Much of the material in these notes appeared in the Illawarra Mercury on 3 Sept 1996. Since then, Burragorang Valley coal mines have ceased production and NSW rail freight has been privatised. More recently, in 2003 Port Kembla has been identified as a potential container port, and questions have been raised about both the long term future of the Stanwell Park Viaduct and the commitment of the NSW Government to complete a new Waterfall Thirroul railway by 2010 (abandoned later in 2003 with release of the summary of a consultants report escalating the cost from \$300 million to over \$1 billion). Some older studies are now reviewed.

A. Wollongong City Council, after reviewing projections for increases in coal exports, resolved in August 1991 *to seek a full cost benefit analysis by the Ministry of Transport into rail and road transport as it applies to coal haulage to and through the City. This analysis should have full regard to all hidden costs and subsidies and to externalities including social and environmental costs, be made public, and should form a basis in setting road user costs, rail freight rates, and the proposed Maldon Dombarton link.*

To response of the NSW Department of Transport was to firmly refuse to conduct such an analysis. In 1994, notes for a private briefing at the request of former Transport Minister Bruce Baird claimed, in summary that *"The Maldon - Dombarton rail link is not a viable rail link at this stage."*

B. The House of Representatives Standing Committee on Transport, Communications and Infrastructure in its April 1992 report "Warehouse to Wharf" from its Inquiry into the Efficiency of the Interface between Seaports and Land Transport noted the main issue relating to NSW coal transport was the high percentage of coal carried to the Port Kembla coal loader by road. The Committee noted the options of completion of the Maldon - Dombarton rail link and conveyors, recognised that such matters fall directly within State Government jurisdiction, and, recommended that a detailed evaluation be undertaken, that would *"...carefully consider and balance all social, economic and environmental factors."*

C. The results of a Bureau of Transport and Communications Economics study of export coal transport in NSW were published in October 1992 as part of a report Relative Efficiencies in the Transportation of Commodities. This report gave qualified support to considering the feasibility of completion of the Maldon Dombarton rail link after examination of coal exports in 1988-89 - a year when the export tonnages were low.

In regards to coal transport, the main conclusion of the study as noted in the 1990-91 Annual Report of the Department of Transport and Communications - pages 206-207) was *"... that rail is clearly a lower cost option than road in social cost terms for the line haul component of coal transport."*

D. In late 1992, Environmental Impact Statements (EIS) were released by BHP Collieries and the Port Kembla Coal Terminal (PKCT). In summary, coal exports were projected to increase from 15.5 mtpa in 1991-92 to 20 mtpa in the late 1990s. Total haulage of coal to Port Kembla for export and use by the steel works was projected to rise from about 20 mtpa to 26 mtpa. Although BHP indicated that a Maldon Dombarton link could take some 2 mtpa of coal from Tower Colliery to the BHP Steelworks at Port Kembla (then road hauled to O'Brien's Drift at the top of the Illawarra escarpment and now directly down Mt. Ousley Road to the steel works), the PKCT did not favour completion of the line. Instead, the PKCT EIS suggested ongoing high levels of road haulage of coal at about 6 mtpa.

Wollongong City Council favoured reduction of road haulage and proposed in 1993 that Clutha coal on road be reduced from about 2 mtpa to 1 mtpa. The PKCT lodged an amended application in 1993 with the NSW Minister for Planning that was the subject of a Public Inquiry held in September/October by a NSW Commissioner of Inquiry. He reported in favour of coal terminal expansion without limits on road haulage in January 1994.

Evidence was presented to the Inquiry showing that the Federal funding of Illawarra roads used by coal trucks was about \$100 million since 1976 in 1993 terms, and the NSW Roads and Traffic Authority advised the Inquiry that net State funding was about \$150 million.

E. In 1993, a study by the University of Wollongong for the Energy Research and Development Corporation (ERDC) applied the BTCE unit operating costs to updated data given in the BHP EIS and PKCT EIS. It was then found that if the Maldon - Dombarton rail

link was completed and electrified between Glenlee, Tahmoor and Port Kembla, and the new rail link was used for all Western, Clutha, Tahmoor and Tower coal, positive benefits would result. This option was found to have a benefit cost ratio of 1.15, and compared with the arrangements proposed by the coal industry, would reduce operating costs by some 17 per cent and social costs by about 23 per cent, plus save about 9 million litres of diesel a year.

In assessing the benefit cost ratio of 1.15, a discount rate of 7 per cent was used and social costs were excluded. Other factors excluded were:-

- i. The development of Port Kembla as a point of export of agricultural and horticultural produce, and the option of diverting wool exports from Sydney to Port Kembla.
- ii. The use of the line by passenger traffic, linking Wollongong to Campbelltown and Parramatta and possibly Sydney's second airport. (Note Wollongong-Dombarton-Maldon-Parramatta will be about 109 km as against 103 km for Wollongong-Sydney -Parramatta).
- iii. Employment benefits in construction, and regional development on its completion.

The ERDC project report (Land Freight Transport Energy Evaluation Main Report, Part One, P.G. Laird and G. Adorni-Braccesi, ERDC, Canberra) noted low energy efficiency, high transport operating costs and high social costs for transporting coal to Port Kembla,

F. Coal trucking safety and technology has improved during the 1990s with heavier legal mass limits for 6 axle semitrailers in the late 1980s. Following Wollongong City Council approval in late 1995, some use has been made of B- Boubles. Rigid tracks with trailers are also used. Although O'Brien's Drift was upgraded in the early 1990s its use ceased later in the 1990s.

Coal trucking is however, considerably more energy intensive than efficient rail operations. The ERDC project found that measured on a scale of 10 (net tonne km/MJ), BHP iron ore railways in the Pilbara were 10 out of 10, where as coal trucking to Port Kembla was about 0.7 and for coal trains using the existing rail track approaching 2.0.

G. In May 1993, the Illawarra Economic Development Council (IEDC) ranked completion of the Maldon-Dombarton rail link as "*... a medium to longer term need for the Illawarra*" as opposed to a new Waterfall-Thirroul rail tunnel that was noted as "*...essential to the economic development of the Illawarra*". This was despite recognition by an IEDC Transport Infrastructure Task Force that "*Increasing serving of the port of Port Kembla by road for bulk products, especially coal, is considered undesirable by the community and tourism agencies*".

The failure by the IEDC to give priority to completion of the Maldon-Dombarton rail link was widely criticised in the local media. This ranking was repeated in a State Rail Strategic Plan of January 1995 that raised a new Waterfall-Thirroul link as a future option and ignored Maldon-Dombarton.

H. Completion of the St Marys/Badgerys Creek - Campbelltown - Maldon-Dombarton rail link was raised in the 1995 report of the (Kelty)Task Force on Regional Development.

I. Funding for a \$100,000 feasibility study for completion of a St Marys/Badgerys Creek - Campbelltown - Maldon-Dombarton rail link was approved in December 1993 by the Federal Department of Local Government. The report was presented to Wollongong City Council in May 1995, and examined in some detail potential coal and general freight traffic.

The main finding of the Kinhill Engineers report, based on calculated negative Net Present Values was "*...that the St Mary's - Port Kembla rail link is not economically feasible*"... at this time.

In regards to the Maldon - Dombarton link alone, although the NPV's were in one case positive, it was held that completion of the 35 km link was "*not economically feasible*

and could not be justified on the basis of the coal and freight traffic expected in the foreseeable future. ...There is no evidence that the construction of the rail link would, of itself, contribute to shifting coal from road to rail transport or generate new freight trade..." and "...use of the existing rail network would remain economically preferable to investment in a new rail link." The Kinhill Engineers report recommended instead that

- i. payment of Community Service Obligation (CSO) payments to encourage all Clutha coal onto rail, [protracted examination- then Advance coal - mine since closed]
- ii. "...establishment of an effective road use charging system whereby road coal freight vehicles pay for the full external costs" such as pavement damage, congestion, noise and environmental costs, [NSW has moved away from this in 1996 when adopting Australia wide heavy vehicle charges determined by the National Road Transport Commission; and the issue is now receiving attention as the National Transport Commission is completing its third determination of such charges].
- iii. use of planning instruments to maintain the St Marys Glenlee and Maldon - Dombarton rail corridors. [a good recommendation - was it done for each corridor ? - note in 2005 land is held for the Maldon - Dombarton line].

The report also notes a proposal made in 1993 by Mr. W.C. Wentworth for a **complete rerouting of the Main South line from near Douglas Park to Mittagong** (see main submission)

J. Completion of the civil track and signalling works for Maldon - Dombarton (from above list) is about \$87 million in 1992 terms. The cost of 1500 volts DC electric overhead wiring (capable of later use at 25,000 volts AC) from Unanderra to Avon Loop would be in the order of \$10 million. Total cost for the cheaper option is then in the order of \$100 million. This option should be given further consideration, involving updated costings and further cost benefit analysis.

K. The 1995-96 State Budget included a conditional allocation for Maldon - Dombarton.

APPENDIX E RE LAND TRANSPORT ENERGY EFFICIENCY

Based on submissions by P Laird and the RTSA to the Productivity Commission in response to its draft report on Energy Efficiency.

General

We are now at a time, as argued cogently by Professor Allan Fels and Fred Brechly (*'No time to be over a barrel'* Aust Fin Review 5 May 2005), that the Government's White Paper on Energy, released in 2004, is now out of date. There is also a perception that the White Paper and the Commission's approach to Energy Efficiency as indicated in the Draft Report relies too much on 'Business As Usual'.

The draft finding 8.4 re funding support of energy efficiency research (page no 183 section 8.6) is not supported and is considered to be in strong need of review. This finding stated: "*The need for special energy efficiency research and development funds has not been substantiated, given that funds can be sourced from existing more general research and development programs.*"

However, the work done by the former Energy Research and Development Corporation (ERDC) was of value. It is submitted that any objective review of the work done

by this Corporation in its operation from about 1990 to 1997 would show that Federal money supporting ERDC was well spent, and, that there is much unfinished business in this area. It is also submitted that energy security is too important to be left to market forces alone.

Transport

As noted in the Draft Report, (p200) transport is a significant user of energy. It is also a major user of imported oil. The combustion of oil generates air pollution with associated health costs in urban areas. It also contributes to greenhouse gas emissions.

Accordingly, targets to constrain dependence on imported oil may be of value as may some regard to the concept of **'peak oil'** (which could well be a reality in a few year's time rather than decades). Or at least some recognition that since the Commission received its terms of reference dated 31 August 2004, oil prices have increased and remained above \$US40 per barrel since the start of 2005.

Also missing in the Draft Report is an estimate due to the Bureau of Transport and Regional Economics (BTRE) of the health costs of air pollution in capital cities from motor vehicle pollution. To quote (eg page 199) the concept of "cost effective" depends whether or not external costs are taken into account. This could usefully be clarified by the Commission in its final report.

Freight Transport

Freight Transport is an increasingly important topic, as shown by the warnings of the Reserve Bank of Australia early in 2005, and the OECD 2004 report on Australia. The Commission's recommendation for a national reform program **encompassing all freight transport modes** (NCP Inquiry report, p224, emphasis added) and not just the "rail sector" (Energy efficiency draft report, page 222, para 4) is supported.

Dealing with energy efficiency first, some discussion of the energy efficiency of all freight transport modes and not just road freight (drafts p224-5) would be in order. So also would relative energy efficiencies for various tasks and transport modes. Such discussion was provided for road and rail by the Industry Commission's 1991 report on Rail Transport.

In regard to Intermodal Transport, a series of Federal Government and Parliamentary Inquiries have highlighted rail track infrastructure deficiencies including "...*substandard national track*". The Commission, in its 2005 NCP Inquiry Report, Box 8.7 page 208 notes "*disparities in the standard of road and rail infrastructure*" whilst in its 1999 Report on Progress in Rail Reform, Box 10.2, p237 notes "*Participant's comments on deficiencies in rail infrastructure*" and concludes (p239) "*There has been inadequate investment in some parts of the rail network*" (including Sydney).

It is a good question as to how much diesel fuel could be saved if the Australian land freight task was redistributed to a system with "fit for purpose" rail infrastructure and competitively neutral access pricing for road and rail. To answer such a question will require improved transport data and would naturally depend on the assumptions made. The Commission was quite prepared to take on board such questions in its 1991 report 'Costs and benefits of reducing greenhouse gas emissions' Vol II: Appendices page F54 where this writer had noted, in regards to freight moving between Sydney and Melbourne; "*If the ruling gradients and limiting curvature were improved to Fast Freight Train standards and*

*if rail was to increase its modal share of land freight on the between Sydney Melbourne corridor to 70 %, there could be savings of **roughly** 70 million litres of diesel each year."*

The 1991 Industry Commission report also noted that such a fuel saving would correspond to a reduction of 202 kt of carbon dioxide. If such questions were relevant to the Commission in 1991 in considering Greenhouse Gas emissions, they would appear to warrant at least some attention by the Commission in 2005 in dealing with energy efficiency and the implied concept of energy conservation.

The need for improved rail transport data was recognised by the Commission in its 1999 report on Progress in Rail Reform, the ATC 2004 National Transport guidelines, and in a May 2005 report by the Senate Committee examining AusLink.

Comparative energy efficiencies

The use of Mega Joules of primary energy (Full Fuel Cycle – or FFC) gives a scientific basis for comparing energy use from different sources. Frequently quoted conversion factors include 41.77 MJ (FFC) per litre of diesel, and for older black coal fired power stations with an efficiency of 30 per cent, 1 kilowatt hour is equivalent to 12 MJ.

The data in Table E.1 shows that during 2002-03 a total of 581 Gigawatt hours was used for electric traction of freight trains along with 609 million litres of diesel. As a result all freight trains used a total FFC energy of 32.4 PJ. Using rail traffic task data from Table E.2 we obtain an average energy efficiency (FFC) for rail freight in Australia (2002-03) of about 4.9 net tkm/MJ. For non-bulk rail freight, the average energy efficiency is 3.4 net tonne km per MJ. Articulated trucks (including B-Doubles) in line haul work have an energy efficiency of about one third of rail for line haul non-bulk freight.

TABLE E.1 LAND FREIGHT TRANSPORT ENERGY USE: 2002-03

| Rail | Diesel Million litres (ML) | Electricity GigaWatt hours | Energy (FFC) PetaJoules PJ | |
|---------------------------|-------------------------------|-------------------------------|-------------------------------|-------|
| Bulk | 459.2 | 566.6 | 26.0 | |
| Non Bulk | 149.9 | 14.7 | 6.4 | |
| Total | 609 | 581 | 32.4 | |
| Road | Diesel (ML) | Petrol ML | Gas | PJ |
| Light Commercial Vehicles | 2277 | 1395 | 603 | 159.3 |
| Rigid Trucks | 43 | 2128 | 14 | 90.9 |
| Articulated Trucks | - | 3161 | - | 132.0 |

Reference ARA (2004) Australia Rail Industry Report 2003 (overlooking the use of 250 tonnes of coal) and ABS SMVU data Transport Facts. Conversion factors for primary energy (FFC) from ACG Australian Transport Facts 1998 are one litre of diesel = 41.77 MJ, one litre of petrol =37.0 MJ and one litre of LPG etc is 27.8 MJ. Assume 12 MJ per kWh (FFC) is the average across all power supplies for electric rail traction (with new coal power stations, hydro power and gas less than this average and Victoria's brown coal fired power stations more).

TABLE E.2 LAND FREIGHT TASKS AND ENERGY EFFICIENCY: 2002-03

| Task | Energy Efficiency |
|-------------------|--------------------------|
| billion tonne kms | Net tonne km per MJ |

| | | |
|---------------------------|--------|------|
| Rail | | |
| Bulk | 136.2 | 5.24 |
| Non bulk | 21.9 | 3.40 |
| Total | 158 | 4.88 |
| Road | | |
| Articulated trucks | 115.66 | 0.88 |
| Rigid Trucks | 30.41 | 0.33 |
| Subtotal | 146 | 0.66 |
| Light Commercial Vehicles | 6.71 | 0.04 |

Reference ARA (2004) Australia Rail Industry Report 2003 (overlooking the use of 250 tonnes of coal) ABS SMVU data, Bus Industry Confederation (2003) Transport Facts, and Table E 1.

The energy efficiencies given in Table E.2 for rail and road freight demonstrate the energy saving nature of rail. The ability of rail to use electric traction in some situations is also noted.