NEW PERSPECTIVES FOR RAILWAY GAUGE STANDARDISATION IN AUSTRALIA

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ABSTRACT: *The increasing requirement of governments for rigorous cost-benefit analysis of public investment proposals in recent years has placed greater emphasis on the measurement of benefits associated with railway gauge standardisation proposals.*

This factor, combined with the changing distribution of industry and associated patterns of trade, and the availability of relatively low cost gauge conversion techniques, has produced a climate which is certainly more favourable to large scale gauge standardisation than that which existed as recently as 15 years ago.

This paper addresses the new perspectives which apply to consideration of the extension of the national standard gauge railway network beyond the principal inter-capital links.

INTRODUCTION

The absence of a common railway gauge linking all adjoining capital cities on the Australian mainland has frequently been cited as the single greatest factor explaining the rail mode's failure to significantly increase its share of the Australian inter-capital freight task.

It is certainly true that traffic delays at break-of-gauge locations typically extend rail transit times by a substantial margin relative to those of road operators, thereby imposing on potential rail users the risks of high inventory costs and (possibly) lost sales.

Additionally, the rail systems themselves suffer a substantial financial disadvantage in the form of transhipment costs and the need to maintain larger fleets of locomotives and rollingstock than would otherwise be the case if there were gauge continuity across rail system boundaries.

For these reasons, the need for a common gauge rail network linking all capital cities has assumed greater importance, as the size of the inter-capital freight task has increased.

However, beginning with the construction of a standard gauge (1435mm) rail link between the New South Wales border and South Brisbane in 1930, the break-of-gauge problem between capital cities has gradually been overcome to the extent that today only one inter-capital link, between Melbourne and Adelaide remains to be connected to a common gauge rail network.

The standard gauge which, in this country, had its origins in New South Wales, forms the basis of the common gauge network. The extent of the mainland inter-capital standard gauge network to date (including a link to Alice Springs) is illustrated in Figure 1.

By contrast with the mainland inter-capital standard gauge network, a large broad gauge (1600mm) network exists in Victoria and in much of what was the South Australian Railways system - now part of the Australian National system, whilst narrow gauge (1067mm) systems exist in Queensland, Western Australia and in some parts of South Australia. The rail system in New South Wales, of course, consists entirely of standard gauge (1435mm).

Pressure for a common gauge rail network in Australia can be traced back to pre-Federation days. However, it was not until 1921 that the first government committee of enquiry, the Royal Commission on Uniform Railway Gauge, made recommendations for converting the whole of the Australian railways to standard gauge.[1] Following this enquiry, a draft agreement providing for overall standardisation on the basis of one fifth funding by the Commonwealth and four fifths funding by the States, was circulated to the States. Not surprisingly, this draft agreement was not accepted by the States, although recommendations to link South Brisbane with the New South Wales standard gauge and to extend the Transcontinental standard gauge line from Port Augusta to Port Pirie were implemented.

The Commonwealth Government subsequently sought to revive interest in a national gauge standardisation programme with the commissioning of a study by Sir Harold Clapp. The recommendations of this study, published in 1945, were that the entire national rail system, with the exception of some isolated lines (e.g. Tasmania and Eyre Peninsula) and some redundant lines, should be standardised and that, in addition, a new standard gauge line should be built between Alice Springs and Darwin, albeit along a different route from that which is currently under detailed investigation.

Once again, the States found proposals of this magnitude somewhat daunting with the result that another report commissioned in 1956 - that of the Government Members' Rail Standardisation Committee chaired by W.C. Wentworth - adopted a far more restrained approach. This report recommended that a programme for rail gauge standardisation be confined to three principal inter-capital links - Wodonga to Melbourne, Broken Hill to Adelaide via Port Pirie and Kalgoorlie to Perth and Fremantle - all of which were subsequently completed in accordance with the timescale outlined below.[2]

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[1] This was a three man commission established under the chairmanship of J.J. Garvan following a resolution of a 1920 Conference of Commonwealth and State Ministers.

[2] It is noteworthy that this committee concluded that standardisation of the Victorian and South Australian broad gauge networks which had been part of earlier plans should not proceed on the grounds that "some branch lines on those systems would become redundant and that consequently it would be wasteful to incur heavy expenditure on their conversion until the policy has been decided finally as to which lines are to be retained". (Harding 1958, p 92)

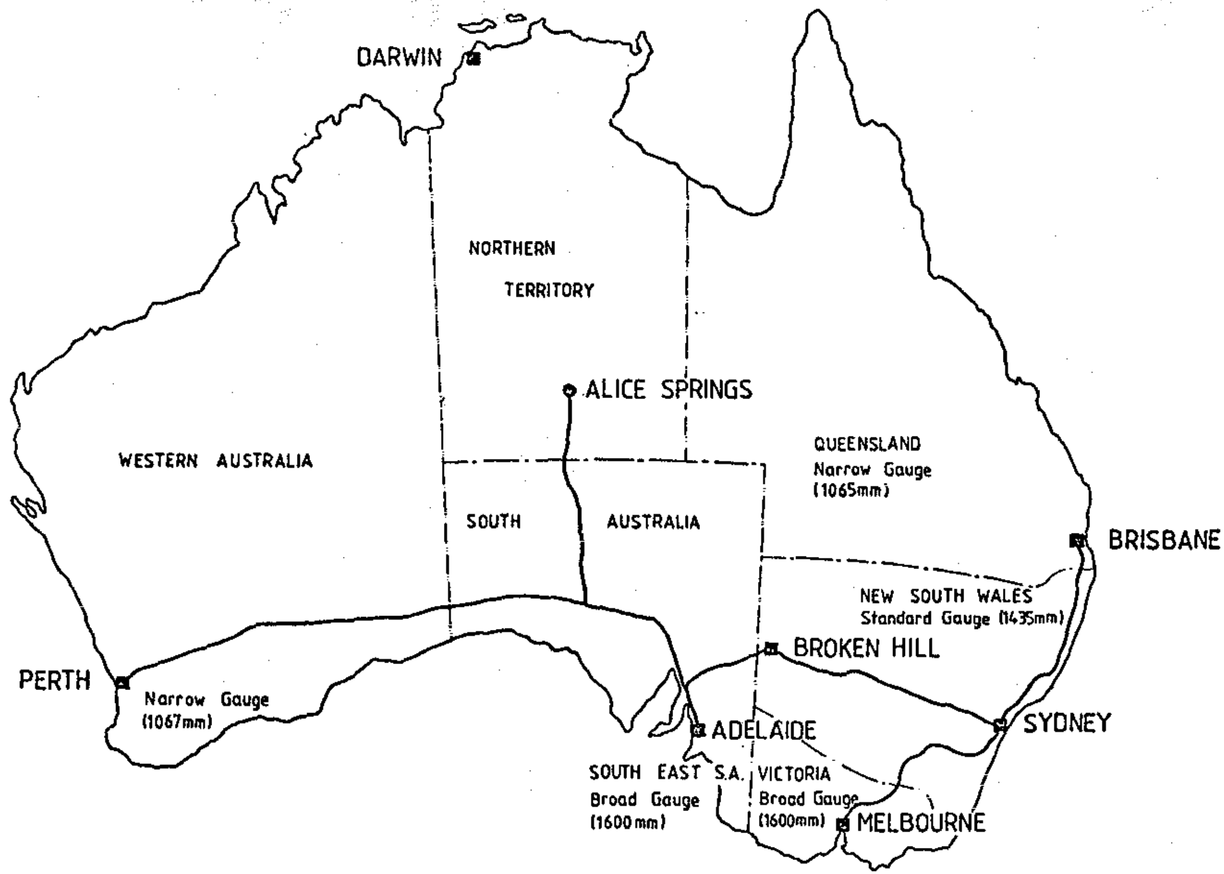

Fig. 1 - NATIONAL STANDARD GAUGE NETWORK

Following provision of the Sydney-South Brisbane standard gauge rail link, other milestones achieved in the progression to a common gauge inter-capital rail network are :

- 1962 - Completion of a standard gauge line between Melbourne and Wodonga (Vic.), thereby linking Melbourne with Sydney on one railway gauge.

- 1969 - Completion of the conversion to standard gauge of narrow gauge lines between Broken Hill and Port Pirie (SA) and between Kalgoorlie and Perth/Fremantle (WA), thereby creating a through standard gauge link between Sydney and Perth.

- 1982 - Conversion to standard gauge of the broad gauge line between Adelaide (Dry Creek/Islington) and Merriton (SA) coupled with construction of a new standard gauge line between Merriton and Crystal Brook on the Broken Hill-Port Pirie standard gauge line - thereby linking Adelaide to the standard gauge network.

Although not related to extension of the inter-capital common gauge network, construction of new standard gauge lines between Port Augusta and Whyalla in 1972 and between Tarcoola and Alice Springs in 1980 enabled efficient rail service to be provided to two major country centres with strong economic ties to the capital cities.

The standard gauge proposals, advanced by the Wentworth Committee, and earlier enquiries, were characterised by a "supply side" approach which concentrated on seeking <u>least cost solutions</u> to the problem, but which ignored any measurement of the benefits to be obtained from the proposals - whether commercial (i.e. internal to the rail systems and their customers) or social/external (i.e. accruing to external parties). Indeed, of the interstate standard gauge projects completed in the last 20 years, only the Adelaide-Crystal Brook project was subjected to rigorous examination of costs and benefits, before project commencement.

In view of the lack of emphasis on quantification of benefits in the assessment of most standard gauge proposals of the post-war era, it is perhaps not surprising that the projects which in fact proceeded, with few exceptions, involved little more than the gauge change of interstate mainlines and associated terminal facilities.

However, changing circumstances have produced a climate which is far more favourable to the justification of large-scale gauge standardisation projects than that which existed as recently as 10-15 years ago. These changing circumstances, which imply new perspectives for railway gauge standardisation in Australia, include the following :

(i) A greater concern by governments (both State and Federal) for rigorous analysis of benefits in relation to costs of major public investment proposals, coupled with refinement of cost-benefit analytical techniques and an emphasis on analysis of risk in relation to the evaluation of such proposals.

(ii) A gradual change in the distribution of industry and associated patterns of trade over the years (as a consequence of changing demographic and social patterns), resulting in significant freight flows being established between particular regions (e.g. South-East South Australia/South-West Victoria) and capital cities or, in some cases, major interstate shipping ports.

(iii) The competitive spur posed by growth of an aggressive road freight industry able to offer rapid transit and efficient handling of goods at attractive freight rates on all inter-capital and most major intrastate routes.

(iv) A gradual transformation of track construction and maintenance practices from high to low labour dependence (with the development of mechanical track construction techniques), with the result that the unit costs of track maintenance and construction have declined in real terms in recent years.

A preliminary evaluation of a standard gauge rail link between Melbourne and Adelaide recently prepared jointly by Australian National and Victorian rail authorities, has suggested that standardisation of a major part of the Victorian rail network (i.e. west of Ararat) and of the entire South-East of South Australia rail network, is likely to be justified in commercial terms as a result of the physical and commercial interdependence which exists between these sub-networks and the proposed principal Melbourne-Adelaide railway route.

Conversion of these sub-networks to standard gauge can be demonstrated to enhance the viability of a Melbourne-Adelaide standard gauge link (by contrast with the results which would be achieved through isolated development of an inter-capital standard gauge link).

This interdependence is reinforced by the factors listed in points (ii) and (iii) above.

This paper therefore focusses on the qualitative characteristics of the various standard gauge design alternatives (including "non-track" alternatives to gauge standardisation) and the basis on which the costs and benefits of a gauge standardisation programme are identified and measured. Finally, it addresses the "new" choices which confront government decision-makers in determining the future shape and extent of the common gauge rail network in Australia.

STANDARD GAUGE ALTERNATIVES

- INHERENT ADVANTAGES/DISADVANTAGES

There are three methods for solving the break-of-gauge problem.

The first method simply involves line abandonment, but this method is inappropriate where the rail network under investigation constitutes a major intercapital supply line or is an important inter-regional transport corridor. This method is therefore not further considered in this paper, except insofar as it might be used to achieve necessary rationalisation of potentially non-viable parts of a rail system (eg. some branch lines) prior to a programme of gauge modification.

The second method involves modifications to track, track structures and signalling and may be identified under the heading "track alternatives", whilst the third method avoids any change to track infrastructure by providing, in most instances, for transhipment of freight between gauges. This latter method is identified under the heading "non-track alternatives".

The "track alternatives" available for solution of the break-of-gauge problem are of three types:

- Provision of new track on entirely new formation.
- Re-gauging of track (simply, the movement of one rail to the desired gauge).
- Provision of a third rail (to accommodate mixed gauge operation on the same track formation).

In evaluating track alternatives to solve the break-of-gauge problem, the base case against which the relative costs and benefits of these alternatives will usually be measured is one involving transhipment of freight between gauges (or even a "do-nothing" base case, where transhipment alternatives are currently unavailable).

The principal techniques of freight transhipment (of relevance to Australia), here referred to as "non-track alternatives", are:

- Exchanging of bogies on freight rollingstock (involving mechanical exchange of bogies of different gauge for wagons in either loaded or empty condition).
- Mechanical or manual transfer of loading from wagons of one gauge to wagons of another gauge (involving the use of gantry or mobile cranes and forklifts, or simply, human effort).

Additionally, some studies have made reference to the development of variable gauge freight bogies as a solution to break-of-gauge problems but, to date, nowhere in the world have variable gauge bogies been proven in freight service (although in Spain they have been in use for many years on passenger rollingstock such as the "Talgo Train" carriages) and this alternative is excluded from further consideration in this paper.

The inherent advantages and disadvantages of all track and non track alternatives are identified in Table 1.

TABLE 1 STANDARD GAUGE ALTERNATIVES - INHERENT ADVANTAGES/DISADVANTAGES

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Track Alternatives New Track	. Minimal operational interference with existing gauge system. . Can provide additional track capacity. . Can be constructed with minimum disruption to existing services. . Capable of construction in heavier rail and concrete sleepers. . Avoids cost of bogie exchanging, or other forms of transhipment. . Facilitates faster transits and reduces rollingstock/locomotive requirements.	. High civil engineering cost. . High signalling system costs. (Requires separate signalling system). . Mutual interference between gauges at crossings and common use locations. . Could involve land acquisition costs.
Re-gauging	. Low civil engineering costs. . Utilises existing signalling system (requiring minimum alteration). . Avoids cost of bogie exchanging. . Facilitates faster transits and reduces rollingstock/locomotive requirements. . Encourages critical decisions to be made about system rationalisation. . Compatible with re-construction in heavier rail and concrete sleepers.	. Sometimes complex interfaces with existing gauge system. . Imposes operational difficulties during construction. . May require transhipment facilities at key break-of-gauge locations.

TABLE 1 (Cont'd)

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Third Rail	. Moderate civil engineering cost. . Minimal operational interference with existing gauge system. . Utilises existing signalling system (requiring minimum alteration). . Avoids cost of bogie exchanging. . Facilitates faster transits and reduces rollingstock/locomotive requirements (although to a lesser extent than new track or re-gauging options).	. Difficulties with usage of heavy rail in broad gauge/standard gauge combination (due lack of clearance between toes of 2nd and 3rd rails). . If concrete sleepers used, must be of special design (more expense). . Requires use of complex and expensive mixed gauge turnouts. . Specialised track circuiting required for train detection.
Non Track Alternatives		
Bogie Exchange	. Comparatively low capital cost.	. Imposes lengthy delays in wagon transits and is incompatible with "through scheduling" (thereby adding to locomotive and wagon requirements). . Large additional operating costs (as this method is still labour intensive).
Other Forms of Transhipment	. Comparatively low capital cost.	. Only efficient for consolidated or bulky loads (or liquids, using pumping methods). . Imposes significant delay in wagon transits and is incompatible with through scheduling (thereby adding to locomotive and wagon requirements). . Significant additional operating costs (very large in the case of manual transfer techniques).

INDICATIVE CAPITAL

COSTS OF STANDARD GAUGE ALTERNATIVES

The capital costs of a gauge standardisation programme (involving the application of track construction or modification methods), typically comprise the following elements :

(i) Track Capital Costs - Civil engineering costs associated with construction or modification of the formation and trackwork as a consequence of a changed gauge configuration.

(ii) Signalling Capital Costs - The minor costs of modifying or adapting the signalling system to a changed gauge configuration or, in the case of new track, the more substantial cost of installing a separate signalling system.

(iii) Bogie Conversion Costs - The costs of converting from one gauge to another, the bogie wheelsets and brake rigging of locomotives, wagons, brakevans and passenger carriages.

(iv) Costs of Acquiring New Locomotive and Rollingstock Assets - Basically, the capital costs of acquiring new assets needed to support additional traffic generated by gauge standardisation, after accounting for the reduction in locomotive and rollingstock requirements flowing from elimination of bogie exchanging and reduced cycle times.

Other capital costs may be incurred if the gauge standardisation programme being evaluated is a partial one (eg where there is a need to preserve an interface with an existing gauge system). Such costs can include those associated with the provision of transhipment facilities at branchline junctions.

In the case of the Melbourne-Adelaide standard gauge evaluation, preliminary estimates of capital costs for the least cost investment option, involving a maximum of track re-gauging as distinct from new track construction or third railing, were distributed as follows :

Track Capital	69%
Signalling Capital	28%
Bogie Conversion	2%
Other (eg Transhipment facilities)	1%
TOTAL ($ 144 million)	100%

In this instance, track capital costs are estimated to comprise greater than two-thirds of the total capital cost of the proposed gauge standardisation scheme.

However, selection of a scheme embodying a greater proportion of new track construction or third railing would significantly increase the track cost proportion of total capital cost.

Selection of a particular "track alternative" can therefore critically influence the outcome of a cost-benefit analysis of a gauge standardisation scheme.

The relative magnitudes of cost associated with all three track alternatives can be established from actual costs incurred in the Adelaide-Crystal Brook project and these are presented in Table 2.[3]

It is clear from this table that the pure conversion or re-gauging option is substantially cheaper than the other two "track" options, its cost being only slightly more than one quarter of the cost of third railing and less than 3% of the cost of new track on a new formation.

TABLE 2

INDICATIVE CAPITAL COSTS OF GAUGE STANDARDISATION ALTERNATIVES

Track Alternatives	
Re-gauging (Conversion of broad gauge mainline to standard gauge)	$ 7 500 per kilometre
Third railing (ie convert broad gauge mainline to dual gauge using secondhand rail)	$ 26 000 per kilometre
New standard gauge line on new formation	$300 000 per kilometre
Signalling Costs	
Typical conversion of automated signalling	Less than - $ 1 000 per kilometre
Installation of new C.T.C. signalling system on new standard gauge track	$ 45 000 - $ 75 000 per kilometre

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[3] These costs are escalated to December 1983 values and are based on data quoted in the paper by Adams (1983).

The cost advantage of this option, however, will be very much dependent on the speed with which the conversion can be achieved. In the case of Adelaide-Crystal Brook project, mainline conversion was completed at an average rate of 2.5 kms per day per basic 25 man gang (with 4 gangs being employed on this project). Achievement of such a rapid rate of conversion is dependent on sound logistical planning, but also on the availability of an alternative route (or routes) over which traffic may be diverted, without significant commercial and operating disadvantages, during the final conversion phase.

In the case of the proposed Melbourne-Adelaide project, a practical re-routing alternative exists via Tailem Bend-Pinnaroo-Ouyen-Ballarat-Melbourne, thereby tending to reinforce the comparative advantages of a re-gauging option for this project.

The signalling conversion costs associated with a gauge standardisati programme are in most instances of relatively minor magnitude (see Table 2) as they typically involve minor adjustments to signalling relays or mechanical signalling devices. However, in instances where a standard gauge programme involves choice of an alternative, but existing, rail route to that which presently conveys intersystem traffic, the prospect of a quantum increase in rail trafic on the proposed standard gauge route may require installation of an automated signalling system along the proposed route. (Such is the case with the proposed selection of a standard gauge intersystem route between Melbourne and Adelaide via North Geelong and Maroona, instead of via Bacchus Marsh and Ballarat). In such instances, signalling capital costs are likely to be substantial - probably in the order of $45 000 to $75 000 per track kilometre, as indicated in Table 2.

Bogie conversion and other costs (such as the provision of transhipment facilities at new key break-of-gauge points) are likely to be of relatively minor significance only. In the case of the Melbourne-Adelaide proposal, the magnitude of bogie conversion costs is likely to be moderated as a result of a far-sighted decision taken some years ago to equip South Australian locomotives and freight rollingstock with long wheel-seat axles, making them readily convertible from broad to standard gauge. Additionally, these costs can generally be spread over a longer period than the costs of track conversion.

The "non-track" alternatives to gauge standardisation are relatively inexpensive in terms of capital commitment by comparison with the track alternatives for which they are intended to substitute. (The cost of the Dry Creek bogie exchange being approximately $5.5 million in December 1983 values, and a new gantry crane for transhipment costs between $0.5 and $1.2 million depending upon designed lifting capacity).

However, as indicated earlier, these alternatives impose heavy operating cost penalties and reduced service standards, which can very quickly erode any advantage they may have over the track alternatives in terms of low capital cost.

MEASUREMENT OF THE BENEFITS OF STANDARD GAUGE CONVERSION

The benefits to be derived from a programme of gauge standardisation or, indeed from any public investment project, may be classified as "commercial" (i.e. internal) and "external".

Commercial benefits in this context are those which accrue in a direct sense to the railway systems and/or their customers, whilst external benefits are those which accrue typically to other parties or to society at large. Examples of the latter are the reduction in road maintenance, atmospheric pollution, road accident and fuel consumption costs which might result from a transfer of freight traffic from road to rail.

The focus of this paper is on the measurement of commercial, as distinct from external, benefits since inclusion of the latter in benefit/cost calculations merely serves to augment the viability of a gauge standardisation project (in the absence of any significant measurable external "disbenefits" which might reasonably be attributed to such a project[4]).

It is usual to measure the commercial benefits of a gauge standardisation programme against a base case which involves transhipment and/or bogie exchange between gauges, since these are invariably the alternatives which operate in the absence of a through common gauge.

When this is done, the commercial benefits of a gauge standardisation programme fall into two broad categories :

- Cost reduction benefits
- Traffic expansion benefits

The cost reduction benefits flowing from gauge standardisation include the reduction in the cost of bogie exchanging freight traffic, the reduction in train operating costs consequent upon an ability to operate "through" schedules for both freight and passenger traffic (thereby avoiding transit delays and excessive changing of crews and locomotives), a reduction in bogie pool requirements at bogie exchanges (and hence, in bogie replacement costs), and a reduction in locomotive, wagon, passenger carriage and brakevan requirements, (and hence, replacement costs) due to operation of "through" schedules.

Traffic expansion benefits are generated principally from the conversion of freight traffic from road and/or coastal shipping modes to rail, as a direct consequence of gauge standardisation (which can be expected to significantly reduce wagon transit and cycle times and with them the service advantages offered by competing transport modes).

Traffic expansion benefits can also be generated in the form of new freight demand arising from industry location/establishment decisions which have been directly influenced by provision of standard gauge rail links.

In all cases, traffic expansion benefits are valued in terms of the net revenue (i.e. gross revenue less incremental operating cost) gain to rail systems from generated traffic.

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4 Some loss of employment in both the road and rail industries can be anticipated to result in the longer term from a gauge standardisation programme. However, such an external disbenefit is likely to be very small in relation to the external benefits listed above.

Depending upon the relative levels of the capital costs and the present value of the cost reduction benefits which might be attributed to a gauge standardisation programme, traffic expansion benefits could have a significant bearing on the viability of such a programme.

In the case of the Melbourne-Adelaide proposal, three levels of traffic expansion were estimated - that at which the project might be expected to breakeven (i.e. would equate the present value of benefits with capital cost), a low growth situation involving the transfer to rail of 100 000 tonnes of new traffic in the Victoria-Western Australia corridor following gauge standardisation with growth at 1% p.a. thereafter for 10 years, and a high growth situation also involving the transfer of 100 000 tonnes, but allowing for growth at 3% p.a. for 10 years and ½% p.a. thereafter.

For this proposal, the distribution of estimated benefits in present value terms in the "low growth" case, assuming a 5% p.a. real rate of discount and a project life of 25 years, was as follows :

Cost Reduction Benefits	
Reduction in Freight Train Operating Costs	9.2%
Reduction in Bogie Exchange Operating Costs	11.3%
Reduction in Cost of Operating and Servicing Passenger Trains	0.7%
Saving in Wagon Capital Cost	0.5%
Saving in Locomotive Capital Cost	2.2%
Saving in Passenger Carriage Capital Cost	0.5%
Saving in Bogie Pool Capital Cost	1.6%
Other	3.2%
Sub Total	29.2%
Traffic Expansion Benefits	70.8%
Total ($257.6 million)	100.0%

The level of traffic expansion needed to achieve a "breakeven" outcome for this proposal was initially established at approximately 90 000 tonnes, representing an increase over current through rail freight traffic levels in the Melbourne-Perth corridor of approximately 30%. (This breakeven traffic increment was established over and above the additional traffic which could be expected to flow between Victoria and New South Wales as a consequence of the provision of a standard gauge link between Melbourne and North Geelong, thereby in effect providing a standard gauge link between the New South Wales standard gauge system and Geelong).

Subsequent refinements to capital cost estimates for the proposal suggest that the breakeven traffic increment might be as low as 20,000 tonnes. Nevertheless, it has to be concluded that traffic expansion benefits are still likely to have a significant bearing on the final relationship between the present values of cost and benefit established for this proposal.

Past experience has in fact suggested that standard gauge projects have had substantial traffic generating impacts, so that the fairly modest allowance for new traffic generation in the Melbourne-Adelaide proposal is likely to understate the benefits of the scheme.[5]

Inclusion of minimum traffic expansion benefits in the positive cash flow stream had the effect of improving the net present value estimated for the proposal (assuming a 5% p.a. discount factor) from - $62.431 million to $61.398 million with a corresponding change in the internal rate of return from 1.3% to 8.1%.

POSSIBLE PATTERNS FOR FUTURE STANDARD GAUGE EXTENSION

Figures 2a and 2b on pages 15 and 16 together indicate the extent of standard gauge development proposed for the Melbourne-Adelaide corridor.

Figure 2b in reality represents the preferred scheme insofar as it embodies a maximum of pure conversion or re-gauging of existing track by comparison with other evaluated schemes which embodied greater levels of new track construction and/or third railing.

From the standpoint of measuring benefits in relation to costs, this preferred scheme has three distinct elements :

(i) Change of gauge on the interstate mainline linking Melbourne with Adelaide via North Geelong, Maroona and Ararat.

(ii) Change of gauge on regional trunk lines connected to the interstate mainline (such as the Ararat-Portland, Heywood-Mount Gambier-Millicent, and Wolseley-Mount Gambier lines).

(iii) Change of gauge on branchlines connected either to the interstate mainline or affected regional trunk lines (e.g. Naracoorte-Kingston line in South Australia, Murtoa-Hopetoun line in Victoria).

In theory, it should be possible to evaluate each element in isolation, but in practice, there is a strong interdependence between the costs and benefits attributable to each element and thus there are compelling reasons for evaluating all elements as part of a "package".

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5 In the year following completion of the Melbourne-Wodonga standard gauge link, net tonnage increased by 32.5%, with an average increase of 8.6% p.a. for approximately 10 years thereafter (Joy 1977, p.22). Corresponding experience on the Tarcoola-Alice Springs line indicates a 59% increase in net tonnage in the year following commissioning of the new standard gauge line. Relevant data in respect of the Adelaide-Crystal Brook line is not yet available.

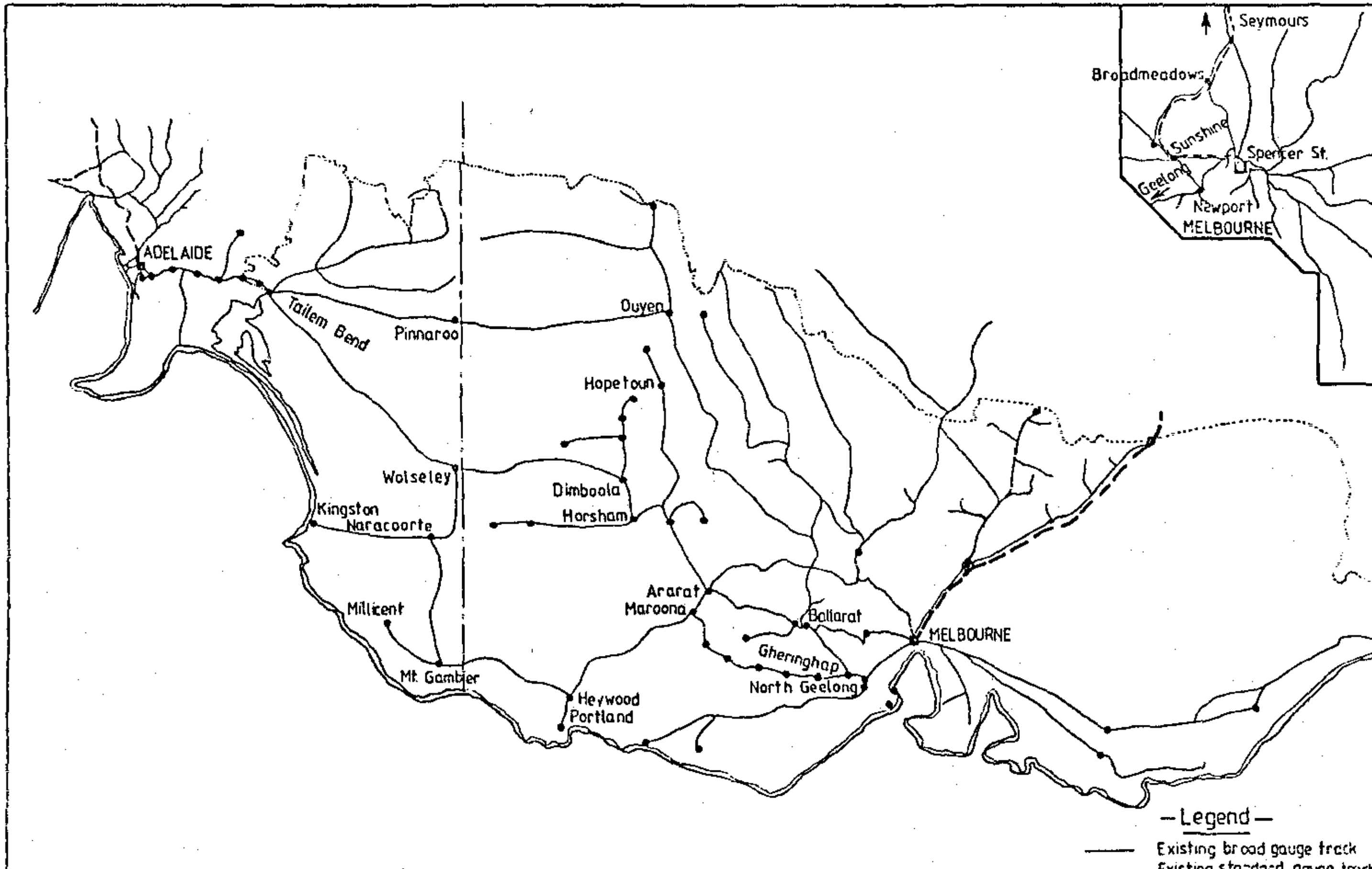

Fig.2A: Existing Broad Gauge Network
(Victoria and S.E. South Australia)

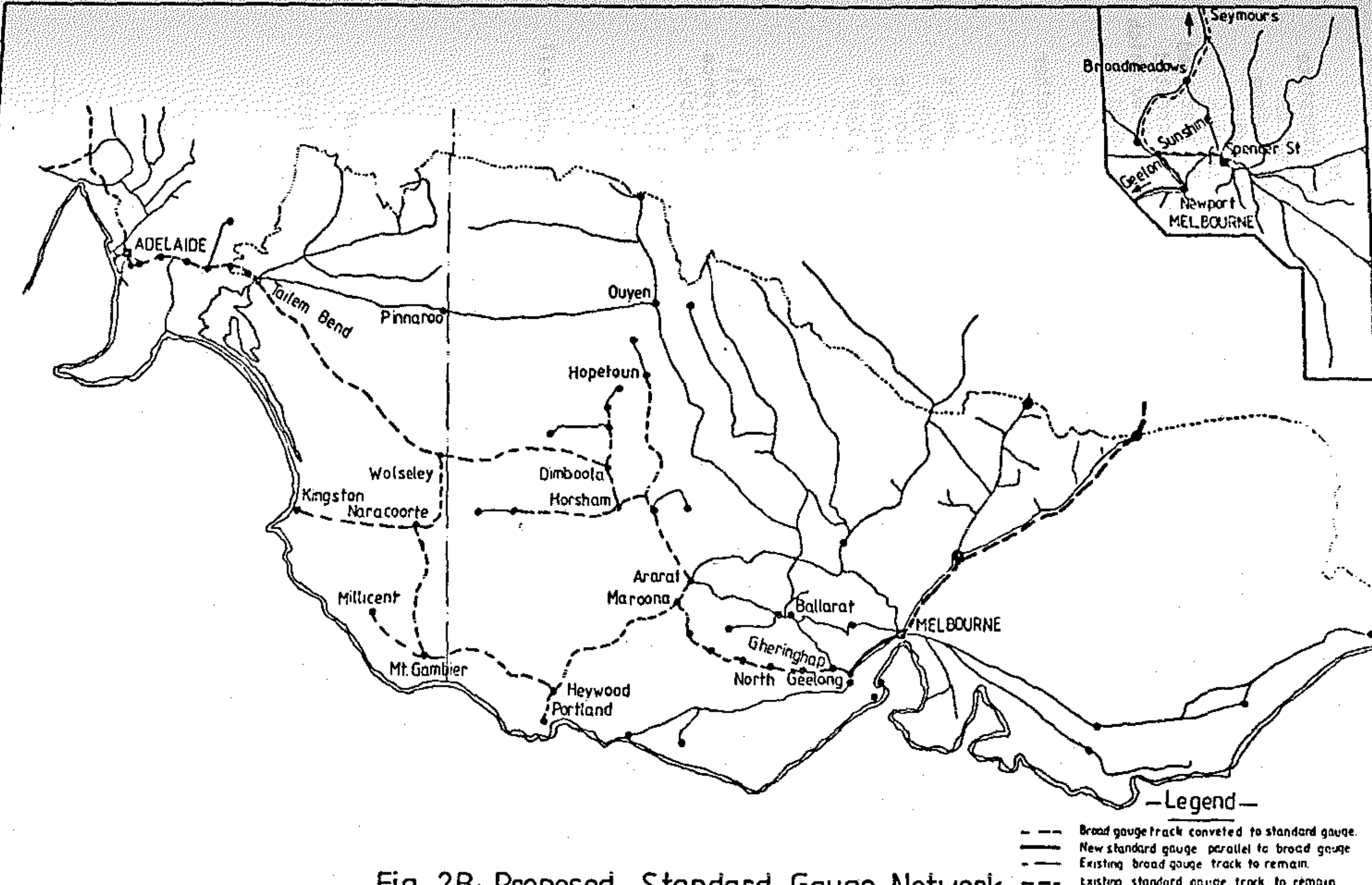

Fig 2B: Proposed Standard Gauge Network
(Victoria and S.E. South Australia)

Nevertheless, the linkages between these elements in the evaluation process suggest a certain evaluation sequence : the interstate mainline establishes the principal benefits for the overall standardisation scheme, these benefits are re-inforced by benefits derived from conversion of regional trunk lines (which currently generate a high proportion of traffic for bogie exchange in Melbourne and Adelaide) and finally, the conversion of potentially viable branchlines is justified to eliminate break-of-gauge difficulties which would otherwise be created by conversion of the interstate mainline or the regional trunklines to which they are connected.

This process would suggest that it is possible to conceive of the conversion of most of the Victorian country rail network, together with a major part of the existing South Australian country broad gauge network - possibly before next century.

The idea that this might be a reasonably predictable outcome is re-inforced by the real possibility that conversion to standard gauge of the Mangalore-Tocumwal line in Victoria could be justified either in isolation or as a consequence of its linkage to provision of a standard gauge line between Melbourne and North Geelong, which itself is a key component of the Melbourne-Adelaide proposal.[6]

On the basis of arguments advanced above, conversion of the Mangalore-Tocumwal line to standard gauge could result in a compounding justification for conversion of much of the north-eastern Victorian rail system and this in turn could lead to justified conversion of the balance of the Victorian broad gauge system which is at least inherently viable. Similar arguments could also be applied to some part of the South Australian broad gauge system (e.g. some mid-North lines).

CONCLUSION

New perspectives for extension of the national standard gauge rail network are offered as a result of :

(i) The development of relatively low cost gauge conversion techniques (flowing from the adoption by Australian railway systems of mechanised track construction and maintenance practices).

(ii) The likelihood that elimination of the break-of-gauge problem will stimulate a significant transfer of freight traffic from other transport modes (particularly road).

(iii) The strong physical and commercial interdependence which exists between interstate mainlines and other parts of the rail systems (an interdependence which has increased over the years in response to changing patterns of industrial development and trade).

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[6] The Mangalore-Tocumwal proposal is currently the subject of an evaluation by the Bureau of Transport Economics on behalf of the Australian Transport Advisory Council.

It is not inconceivable that these factors, coupled with an increasing concern by governments to establish the full benefits to be derived from such projects in relation to their costs, will cause government decision makers to view future proposals to extend the standard gauge network in a very different light from previous proposals.

Such a change of outlook could result in the conversion (or, where justified, abandonment) of a major part of the remaining broad gauge networks in Victoria and South Australia to standard gauge.

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