FINAL REPORT

Efficiency of NSW public transport services

Public version

Prepared for
The Independent Pricing and Regulatory Tribunal of NSW (IPART)

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THE CENTRE FOR INTERNATIONAL ECONOMICS
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Executive summary

The CIE has been commissioned by the Independent Pricing and Regulatory Tribunal (IPART) to assess the efficiency of public transport services for which it will determine maximum fares. We have been supported in this task by ARUP (ticketing and ferry services) and Palazzi Rail (rail services). Our review covers:

- rail services in the Sydney metropolitan region and surrounding areas (Blue Mountains, Southern Highlands, Hunter, Central Coast and Illawarra) provided by Sydney Trains and NSW Trains;
- bus services provided in the Sydney metropolitan region, Hunter and Illawarra by State Transit Authority of NSW (STA) and private bus operators;
- ferry services provided by Harbour City Ferries (Sydney) and the Stockton ferry service provided by STA;
- light rail services for the existing Inner West line and the currently being constructed South East and CBD line; and
- ticketing services provided by Transport for NSW (and contracted companies such as Cubic).

Our review has focused on the costs of operating these services. The review has been conducted over a relatively short time period and the depth to which specific reasons for inefficiency has been able to be tested reflects this timeline. This public version of the report excludes analysis that containes commercially sensitive information.

How we have considered efficiency

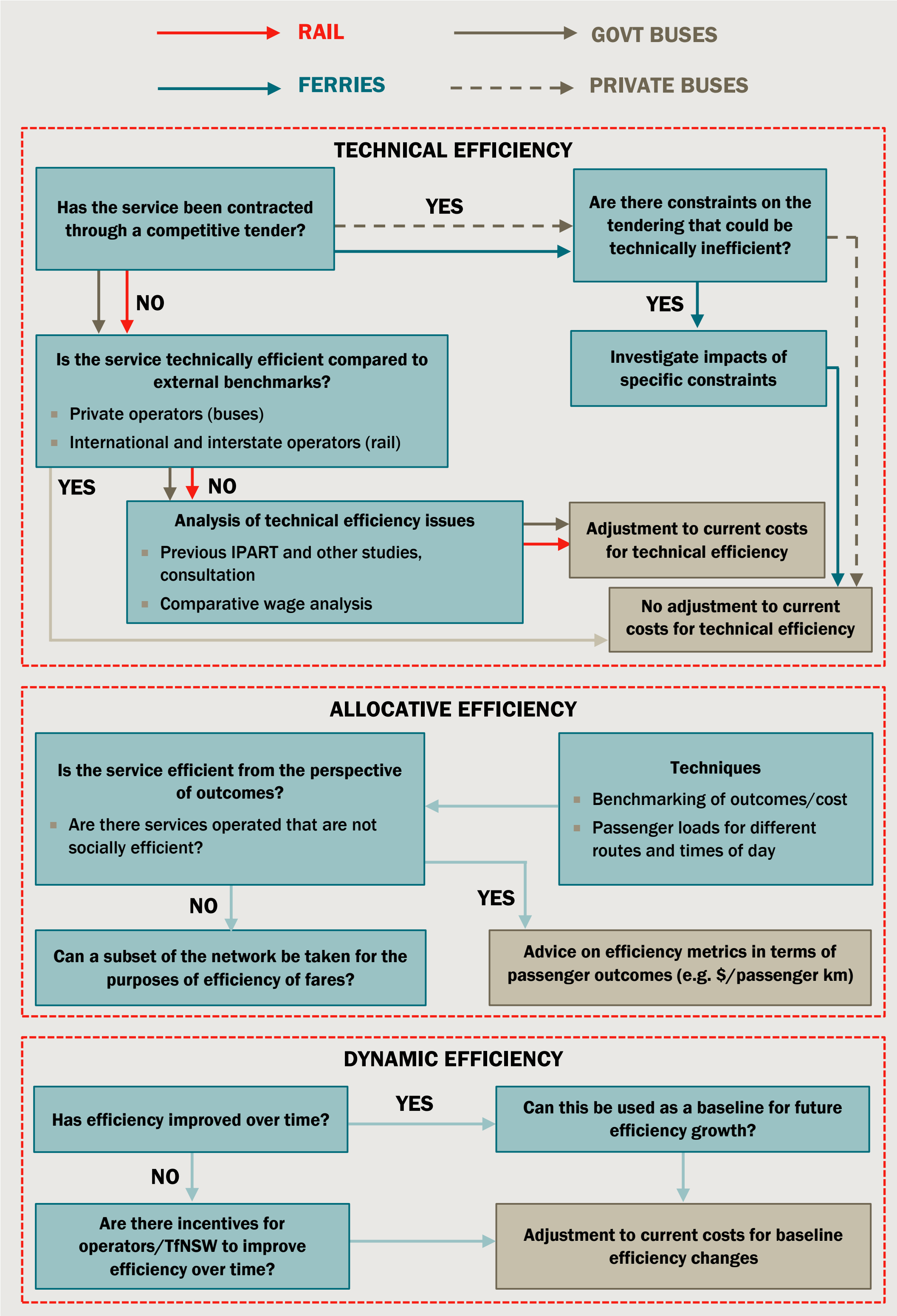
We have considered three aspects of efficiency that are relevant for determining fares.

- Technical efficiency — a technically efficient operator would use the least inputs to provide a given set of services. Key indicators for technical efficiency that we have used are operating costs per vehicle kilometre or service hour
- Allocative efficiency — an allocatively efficient service would ensure that services are provided to the point at which the marginal benefit of the service is equal to the marginal cost of the service. Key indicators are cost per passenger trip and cost per passenger kilometre. Our focus in considering allocative efficiency has been to exclude services that are provided for reasons of social equity and for which costs per passenger output are highly than would be provided on the basis of efficiency alone
- Dynamic efficiency — this reflects the extent to which an operator has the right incentives to improve their technical and allocative efficiency over time.

Note that the efficient operator is a hypothetical operator that is not constrained by particular government policies specific to service provision, such as station staffing requirements. The efficient operator is not an average operator but the best performing operator.

In order to undertake this assessment within the timeframe available, we have followed the same framework for each service as set out in chart 1.

1 Framework for assessing efficiency



Data source: The CIE.

What are our key findings

The evidence available for this study suggests that there is an efficiency gap between existing operators and an efficient operator.

The difference between efficient costs and actual costs for each of the services is shown in table 2. The total difference between current 2014/15 costs and efficient costs is $872 million across all services. By 2018/19 this difference is $603 million, as rail, bus and ferry services are all projected to become more efficient from 2014/15 to 2018/19.

2 Efficiency gap for the provision of public transport services

	2014/15	2015/16	2016/17	2017/18	2018/19
	$m 2015	$m 2015	$m 2015	$m 2015	$m 2015
Rail	702	520	451	465	468
Light rail	0	0	0	0	0
Buses (STA, metro)	138	133	128	123	118
Buses (non-STA, metro)	0	0	0	0	0
Buses (outer metro)	18	18	17	17	17
Sydney ferries	14	8	2	0	0
Stockton ferries	1	1	1	1	1
Ticketing [a]	na	na	na	na	na
Total	**872**	**680**	**599**	**606**	**603**

[a] No inefficiency is included for ticketing. Costs of providing ticketing services are currently higher than benchmarks of efficient costs, partly because of transition costs to a new system, but potentially also reflecting inefficiency. It is not possible to assess this robustly, however, and costs by the end of the period are consistent with the lowest cost in Australian jurisdictions that we have considered.
Source: The CIE.

A comparison of current costs and efficient 2018/19 costs reflecting the service provided is set out in table 3.

- Sydney Trains and NSW Trains have improved their efficiency from 2011/12. They remain in the order of 30 per cent less efficient than an efficient operator. Efficiency is projected to continue to improve over time as the reform process continues, particularly including improved train driver utilisation.
- State Transit Authority of NSW (STA) has costs that are 20 per cent higher than privately contracted bus services, after adjusting for factors outside of the control of STA, such as higher congestion on inner city routes. This inefficiency os observed for STA's metropolitan and outer metropolitan services.
- The private contracting of Sydney Ferries operations has resulted in an immediate reduction in costs in the order of 10 per cent and put costs on a downward trajectory, compared to previously increasing costs. This leads to costs being efficient by 2018/19.

3 Assessment of efficient costs on a per service kilometre basis

Mode	Unit	Current costs (2014/15)	Efficient costs (2018/19)	Difference between efficient and actual
				Per cent
Rail	$m, normalised	2 399	1 696	-29.3
Light rail	$/service km	na	18.8	Na
Buses (STA, metro)	$/service km	9.12	7.22	-20.8
Buses (non-STA, metro)	$/service km	5.69	5.82	n.a.
Buses (outer metro)	$/service km	5.87	5.36	-8.7
Ferries (Sydney)	$/revenue hour	Confidential	Confidential	-12
Ferries (Stockton)	$m	Confidential	Confidential	-50
Ticketing	$/trip	0.26	Confidential	na
Total	**$m**	**na**	**na**	**na**

Note: All figures are in 2014/15 dollars. Rail costs for 2014/15 are normalised to expected service and patronage levels in 2019 so that they are directly comparable. Current ticketing costs are higher than steady-state efficient costs. It is not clear if this reflects inefficiency or transition to a new arrangement.
Source: The CIE.

The efficiency of the provision of transport services has improved markedly. Since 2012, rail cost growth has been restrained with nominal costs remaining constant to 2015 and real costs declining. This compares to rapid cost growth from 2007 to 2012. Efficiency has also been improved markedly in buses and ferries, where private operation and competitive tendering has been introduced.

The efficiency of services in terms of costs per passenger output is set out in table 4. Rail has the lowest operating cost per passenger kilometre, with efficient costs about half the per passenger cost of bus and ferry services. We note that rail costs are substantially higher on a per passenger basis than for international operators. This largely reflects past choices about the rail network and the density of Sydney and it is not reasonable to categoruise this as inefficiency. For buses, we recommend that outer metro regions should not be included in the assessment of the efficient costs per passenger because many of these services are provided for reasons of social equity rather than efficiency.

4 Current cost compared to 2018/19 efficient cost on a per passenger basis

Mode	Current costs (2014/15)	Efficient costs (2018/19)	Difference
	$/passenger km	$/passenger km	Per cent
Rail	0.43	0.29	-32
Light rail	na	na	na
Buses (STA, metro)	1.07	0.85	-21
Buses (non-STA, metro)	0.71	0.73	na
Buses (outer metro)	1.80	1.64	-9
Ferries (Sydney) [a]	1.36	1.20	-12
Ferries (Stockton)	6.70	3.35	-50
Ticketing ($/trip)	0.26	Confidential	-30 to -50 [b]

[a] Sydney ferries costs per passenger kilometre have been revised upwards from the draft report to account for more accurate passenger kilometre estimates made available from OPAL data.

[b] Costs of providing ticketing services are currently higher than benchmarks of efficient costs, partly because of transition costs to a new system, but potentially also reflecting inefficiency. It is not possible to assess this robustly, however, and costs by the end of the period are consistent with the lowest cost in Australian jurisdictions that we have considered.

Note: All figures are in 2014/15 dollars. This compares current (2014/15) costs to efficient 2018/19 costs. The difference in efficiency is larger than comparing 2018/19 as rail and STA buses are expected to become more efficient over time.
Source: The CIE.

The key findings for each of the services that we have considered are set out in greater detail below.

Rail

Our conclusion is that Sydney's rail services are not technically efficient. Reforms to the operations of trains appear to have reigned in the rapid cost growth from 2007 to 2012 and have led to real cost declines from 2012 to 2015. In 2015, we estimate remaining technical inefficiency of ~30 per cent, or $700 million. Forecasts of costs from Sydney Trains and NSW Trains anticipate efficiency improvements relative to 2015 financial year costs. By 2019, efficient costs are 22 per cent below cost forecasts provided by Sydney Trains and NSW Trains, as set out in table 5. Achieving efficient costs would reduce costs by $468 million in 2019.

5 Estimates of current, forecast and efficient cost

Category	Unit	Normalised projected cost 2015	Forecast cost 2019	Efficient cost 2019
Infrastructure	$/track km	295 292	298 506	298 506
Rolling stock	$/car km	1.37	1.39	1.00
Customer interface costs	$/passenger trip	1.05	0.95	0.78
Train operations	$/train km	16.24	15.95	10.00
Overheads	% of other costs	23%	16%	17%
Total (normalised)	$m	2 399	2 164	1 696
Total	**$/car km**	**9.1**	**8.2**	**6.4**
Difference to efficient cost	*Per cent*	*-29.3*	*-21.6*	*0.0*

Note: The normalised projected cost for 2015 is based on service levels and passenger levels in 2019.
Source: Sydney Trains, NSW Trains and The CIE.

Our view on the inefficiency of Sydney Trains and NSW Trains has been formed from:

- analysis of benchmarks for unit costs of providing rail services for each component of costs;
- consideration of the implications of the assessment of individual components against total cost benchmarks from Melbourne Metro and international operators, including information for ISBeRG operators provided by Sydney Trains (which is confidential and not reported in this public report). After accounting for differences in networks and passenger loads (to the extent possible), the most efficient operator has costs of less than 50 per cent of Sydney Trains. Melbourne Metro has costs that are 37 per cent lower than Sydney Trains, after accounting for network and service level differences;
- benchmarking exercises using data from international benchmarking groups, which have highlighted some specific areas of inefficiency, such as train driver utilisation;

- changes in costs through time for CityRail and subsequent rail operators (Sydney Trains and NSW Trains); and
- previous analysis conducted specifically for the Sydney rail system, identifying areas for efficiency improvement.

Buses

We estimate that in 2018/19, across the whole metropolitan and outer-metropolitan network:

- the technically efficient cost per service kilometre is $6.28 (in real 2014/15 dollars)
- the efficient cost per passenger is $4.75
- the efficient cost per passenger kilometre is $0.85.

We estimate that by 2018/19, an 11.0 per cent reduction in costs across the metropolitan and outer-metropolitan bus network would be necessary to achieve technically efficient costs (table 6). If realised, this would represent a saving of $134.6 million (in 2014/15 dollars) to the NSW Government.

Our estimate of the efficient cost is based on the average of the privately operated metropolitan regions that went to competitive tender, adjusted for different average speeds across contract regions (which are largely outside the control of the operator).

- Although STA has made significant cost savings over recent years, we estimate it would need to reduce the average cost per service kilometre by a further 22.8 per cent to achieve the efficient cost benchmark, based on 2014/15.
- Operators in outer-metropolitan areas would need to reduce costs by 10.6 per cent to achieve the benchmark, of which the majority reflects cost inefficiency in STA's outer-metropolitan operations.

6 Actual and efficient cost estimates for bus services

	2014/15			2018/19		
	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark	Estimated cost	Estimated efficient costs	Efficiency gains to achieve benchmark
	$	$	Per cent	$	$	Per cent
Non-STA metro						
Average cost per service km	5.69	5.69	0.0	5.82	5.82	0.0
Average cost per passenger	5.52	5.52	0.0	5.65	5.65	0.0
Average cost per passenger km	0.71	0.71	0.0	0.73	0.73	0.0
STA						
Average cost per service km	9.12	7.04	- 22.8	8.99	7.22	- 19.8
Average cost per passenger	4.81	3.71	- 22.8	4.74	3.80	- 19.8
Average cost per passenger km	1.07	0.83	- 22.8	1.06	0.85	- 19.8

	2014/15			2018/19		
	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark	Estimated cost	Estimated efficient costs	Efficiency gains to achieve benchmark
Outer-metro						
Average cost per service km	5.87	5.25	- 10.6	5.95	5.36	- 9.8
Average cost per passenger	7.57	6.77	- 10.6	7.67	6.91	- 9.8
Average cost per passenger km	1.80	1.61	- 10.6	1.82	1.64	- 9.8
Total						
Average cost per service km	**7.04**	**6.14**	**- 12.8**	**7.06**	**6.28**	**- 11.0**
Average cost per passenger	**5.33**	**4.64**	**- 12.8**	**5.34**	**4.75**	**- 11.0**
Average cost per passenger km	**0.95**	**0.83**	**- 12.8**	**0.96**	**0.85**	**- 11.0**

Note: All figures are in 2014/15 dollars.
Source: Transport for NSW, The CIE.

Ferries

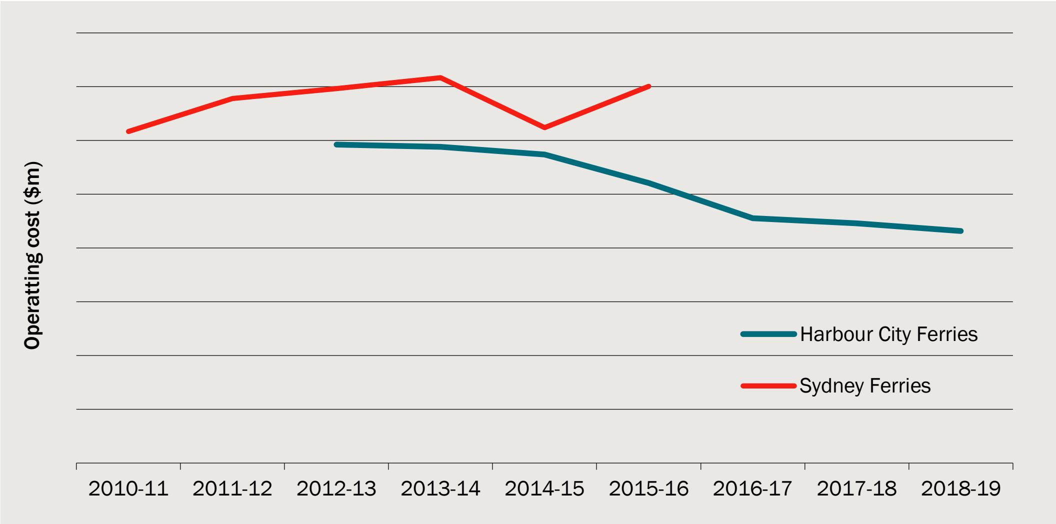
Ferry services in Sydney are operated by Harbour City Ferries (HCF). HCF's estimated operating costs are technically efficient, by the end of the contract period, based on the continued use of the existing vessel fleet. Our review found that HCF's operating costs:

- were in the order of 10 per cent less than Sydney Ferries expected operating costs at the start of the contract period[1];
- decline by 10-15 per cent over the contract period; and
- on average are similar to the efficient costs estimated by LEK over the period between 2012-13 and 2015-16.

Chart 7 shows the level and trajectory of costs for Sydney Ferries (the previous NSW Government operator) and Harbour City Ferries (the current private operator).

1 This may understate the difference as it is not clear that some costs for HCF, such as vessel lease payments, are excluded from Sydney Ferries costs.

7 Expected operating cost pre and post contract for Sydney ferry services



Note:. Costs are in 2015 dollars.

Data source: HCF Contract and Financial bid and cost data used in analysis supporting L.E.K. Consulting, 2012, Sydney Ferries Cost Review. January 2012.

Ferry services across the three network areas (Manly, Parramatta River and Inner Harbour) are allocatively efficient as HCF's operating cost per passenger trip are lower than the estimated marginal benefit per passenger trip.

The peak fare charged on the unsubsidised/private Manly ferry service (provided by Manly Fast Ferries) is similar to the fare for the public Manly ferry service operated by HCF. Based on the data, less than 50 per cent of the fare charged on the public Manly service reflects HCF's operating and capital costs to provide the service, indicating that it is cross-subsidising other services.

Stockton ferry service

Previous reviews of Stockton's cost by the CIE and Indec found the service is not technically efficient and efficient costs would be in the order of 50 per cent of actual costs.

Light rail

Light rail services include the existing Inner West service and the currently being constructed CBD and South East light rail service. Estimated operating costs for these services are in the order of $18.8 per service kilometre.

These services are provided through a private contract. On this basis that this was competitively tendered, we consider that these costs are efficient.

Ticketing

The ticketing costs for implementing and operating electronic ticketing in Sydney are, by the time transition of paperless ticketing is completed, within the range of other benchmarks. It is not possible to form a view as to whether this represents technical inefficiency, with available data though we note that the service has been largely tendered out.

Operating expenditure for ticketing will fall over time, reflecting the removal of paper tickets and falling costs for Opal once transition is completed. By the end of the forecast period, costs per passenger trip are expected to be similar to those of Melbourne at $0.14 per passenger trip (noting that Opal has additional functionality compared to MyKi).

We consider that the most appropriate estimate of the efficient steady-state operating costs for ticketing is based on TfNSW projections for 2020/21, which are similar to current costs per passenger trip for Melbourne.

Applying efficiency findings to IPART's determination of fares

IPART is determining maximum fares through considering the optimal fares, taking into account costs of different modes of service, demand and external costs and benefits, such as congestion. This study provides evidence of the actual costs and efficient costs of different public transport modes.

Fare optimisation could seek to use either actual costs or efficient costs to determine optimal fares.

- Using actual costs has the advantage that this is representative of the expected resource cost implications if fare changes lead to changes in demand, that then require changes in levels of service.
- Using efficient costs has the advantage that users of public transport services would not pay for inefficiencies in service provision that largely arise from Government operation of services.

IPART's fare setting model also uses costs for peak and off-peak services and costs that are per passenger (like a passenger flagfall) and that vary by the distance a passenger travels. We have presented information relevant to this where possible.

1 Approach to measuring efficiency

Defining efficiency

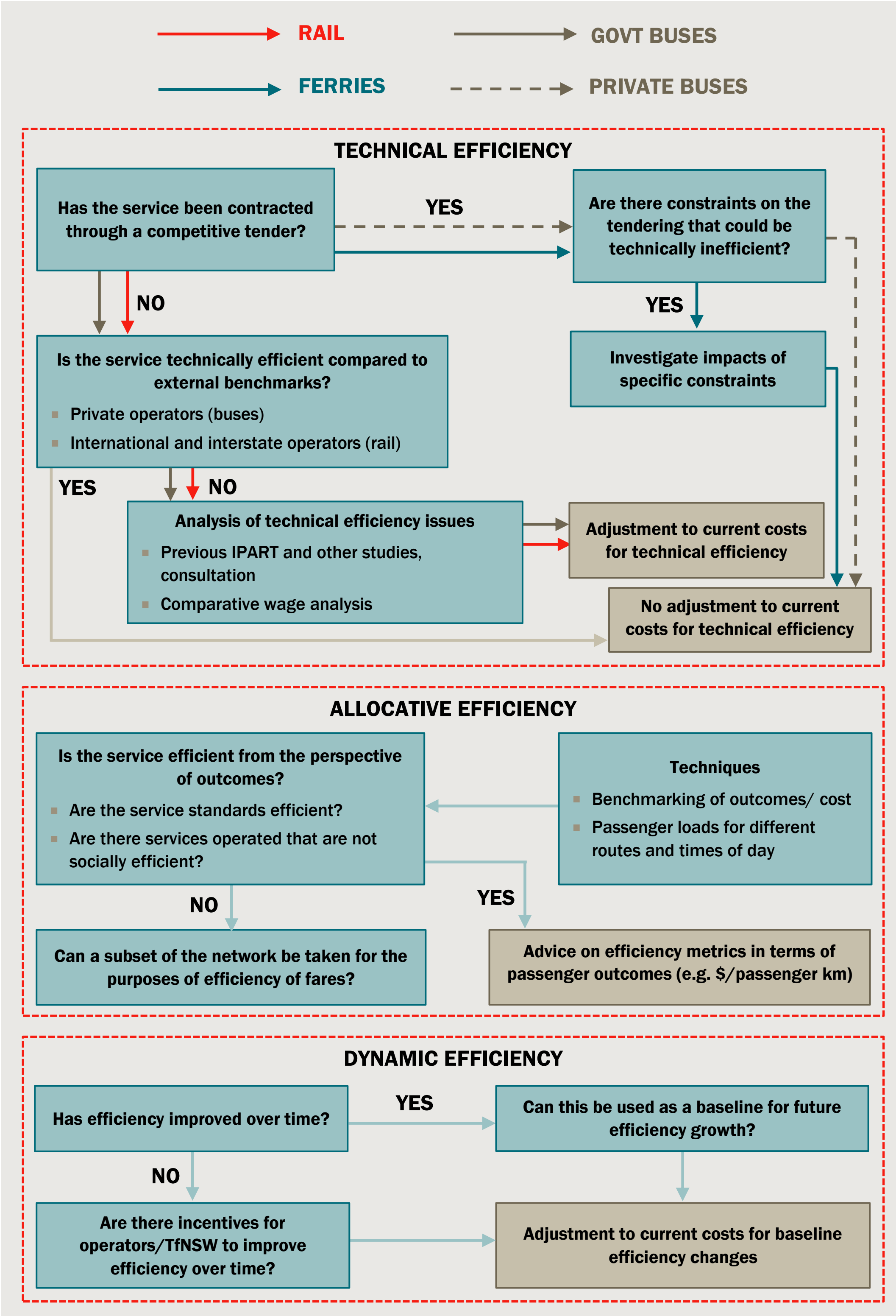
Economic efficiency captures a number of different concepts that need to be considered separately. Three central aspects underpin the efficiency concept – technical (or productive) efficiency, allocative efficiency and dynamic efficiency.

- **Technical efficiency** is when a service provider delivers a given set of services for the lowest possible cost. In the context of transport services, examples of technical efficiency metrics include operating cost per train kilometre or labour hours per train kilometre. Note that a pure measure of technical efficiency relates the outputs to input quantities, such as labour hours or units of capital. We focus on outputs per unit of cost, because we cannot differentiate between the quality of labour units and we do not have information on all other relevant input quantities. Further, the information required for setting fares requires a measure of cost.
- **Allocative efficiency,** in the context of transport services, is where services and the standard of service are socially efficient. That is, the marginal benefits exceeds the marginal costs. There are likely to be some transport services that are not allocatively efficient, such as off-peak services or some routes, which are provided for reasons of social equity rather than efficiency.[2] Metrics of allocative efficiency for transport services would include operating cost per passenger kilometre or passenger trip. Consideration of allocative efficiency is restricted to removing services that are provided for social equity reasons, primarily for buses.
- **Dynamic Efficiency**, is where the transport operators face appropriate incentives for investing in and innovating their service delivery approach and for improving efficiency over time. Over the longer term, it is dynamic efficiency that is the most important economically.

The assessment framework we have developed is based around the above concepts. The framework is set out in chart 1.1. We also show how the different services flow through this framework.

2 In some cases, these services may have benefits from a network externality perspective that are not easy to measure.

1.1 Framework for assessing efficiency



Data source: The CIE.

How we have assessed technical efficiency

Technical efficiency is when a service provider delivers a given set of services for the lowest possible amount of inputs. In the context of transport services, examples of technical efficiency metrics include labour hours per train kilometre. Our measure is slightly different than a pure technical efficiency measure, because we are focused on cost per unit of output. A business may be technically efficient but have relatively high costs per unit of output if:

- it has not chosen the efficient combination of inputs; or
- it overpays for inputs.

We use costs as our measure of inputs because this is what is important for IPART in determining fares and this encompasses additional aspects of efficiency as set out above. Further, costs implicitly account for a number of other important factors relevant for undertaking comparisons across jurisdictions and over time, that are not well accounted for using measures such as labour hours.

- Inputs have different quality (such as the skill level of employees), which is reflected in wage rates paid
- Contracting arrangements can distort measures of inputs. For example, sub-contracting can reduce measured labour inputs, but is still accounted for in costs
- There are a wide range of labour, capital and intermediate inputs relevant for producing outputs, for which measures of quantity are not available.

The disadvantage of using cost data is that where comparisons are made internationally, the prices for the same quality inputs (eg skilled labour) might be different.

Note that our hypothetical efficient operator is not constrained by policy positions of the NSW Government specific to the operations of services, such as station staffing requirements and train crewing requirements. The efficient operator is also not the average operator but the best operator.

Our first step in assessing technical efficiency is whether the service has been provided through a competitive tendering process. Where this has been the case, and consistent with other regulators[3], we assess the costs as being efficient, as long as there are no constraints imposed by the tendering process. Where constraints have been imposed on the tendering process, such as requirements to use existing NSW Government facilities or meet particular industrial relations requirements, then we examine these issues to determine their impact. For some services, such as rail, aspects of the provision of services are tendered out. We have not considered each of these arrangements and instead have focused on the overall operation of the service.

Where services are not provided through a competitive tendering process, which is the case for rail services and some bus services, then we undertake a two-stage process to consider technical efficiency.

3 The AER has considered in detail issues around outsourced contracts. If there was an arms-length competitive process then it would include the contract price in the estimate of expenditure. Australian Energy Regulator 2011, *Review of prices for Victorian electricity distribution network service providers 2011-2015,* Final Decision, chapter on Outsourcing.

1 We develop benchmarks for the operator in terms of efficiency. Benchmarks are taken from similar Australian operators and international operators. While we recognise that benchmarking has a number of limitations, it has been an important tool used by economic regulators and can be particularly useful where costs or performance deviates substantially from other operators.[4] Limitations important for our analysis include:

   a) the service standards under which companies are required to operate may be different, leading to different costs

   b) there may be differences in industrial relations environments across countries that mean that overseas benchmarks are difficult to replicate in Australia

   c) the networks may not be comparable in terms of size, density and other characteristics that drive costs.

2 We consider specific areas of operational performance suggesting inefficiency, based on previous assessments of operators, industry knowledge held by our team and consultation with operators

How we have assessed allocative efficiency

Allocative efficiency is where a good or service is produced to the point at which the marginal benefit of the service is equal to the marginal cost of the service. In the case of public transport services, allocative efficiency encompasses:

- the amount of services provided — which includes the frequency of services across peak and off-peak periods, the routes chosen and the density of public transport services. A service would be allocatively inefficient if its marginal benefits did not recover its marginal costs;
- the other service standards applicable — such as contracted requirements for vehicles (e.g. air conditioning), reliability and levels of crowding. A service standard would be allocatively inefficient if the marginal benefits from a change in service standards was greater than the marginal costs;[5] and
- the extent to which assets are utilised for other revenue opportunities — for example, the ferry fleet might be able to be used for catered harbour cruises as well as timetabled services, or stations may be able to be used to capture retail activity. The private fast ferry operator for Manly is a good example of the extent to which there are opportunities for greater efficiency by providing additional services that people value.

Within the timing available for our study, we have limited the assessment to the first point. To undertake this assessment we have considered whether there is a rationale to exclude some services from measures of efficiency per passenger trip or passenger kilometre. This has been done by developing approximate benchmarks of cost per service kilometre for peak and off-peak services and the level of patronage at which the benefits

4 Economic Insights 2014, Economic benchmarking assessment of operating expenditure for NSW and ACT DNSPs, prepared for the Australian Energy Regulator.

5 Note this could be for an increase or a decrease in service standards.

of the service are equal to the cost of the service. An example of how this is done is set out in Box 1.2.

We apply this framework to aggregated services, such as bus contract regions, because of data constraints. Applying it at this level is also more appropriate where there are network externalities between services in a given region and across the day. For example, a bus user who generally uses peak services to get home might occasionally use an off-peak service. The lack of availability of an off-peak service might have a larger impact on their decision about mode in general than represented by the occasional off-peak trip that they take.

1.2 Example of assessing allocative efficiency

Suppose that the marginal costs of operating a bus service in the off-peak period are $5 per bus kilometre.

The benefits of a service, on a per person basis, are the fare that the person pays, plus some level of consumer surplus. Suppose the fare is $0.40 per bus kilometre and using the average elasticity of demand for a particular bus service we find an average consumer surplus of $0.30 per bus kilometre.

Further, suppose that there are external benefits of $0.30 per bus passenger kilometre. This gives total benefits per bus passenger kilometre of $1.0.

In this case, a service that has five people on it (on average) achieves a marginal benefit in excess of the marginal cost. A service that has fewer than five people on it achieves a marginal benefit lower than the marginal cost, and would be considered to be allocatively inefficient.

How we have assessed dynamic efficiency

Dynamic efficiency is where the transport operators (including TfNSW) face appropriate incentives for investing in and innovating their service delivery approach and for improving efficiency over time. Over the longer term, it is dynamic efficiency that is the most important economically.

There are three distinct aspects of dynamic efficiency.

- Technological opportunities may arise that allow for improvements in efficiency, such as automatic train operations or bus engine technology, some of which may be achievable within the regulatory period. These opportunities represent an outward movement in the 'productivity frontier' — that is, the amount of outputs that can be produced from a given set of inputs.
- An operator may not currently be technically efficient. For the operator to become more efficient requires that the incentive structures are there for them to do so. If this is not the case, then over time we would expect that IPART would identify technical efficiency opportunities that were not taken up by the public transport operator.

- A service may not currently be allocatively efficient. For the operator to improve allocative efficiency requires that the incentive structures are there for them to do so. If this is not the case then services would continue to be operated where there were net costs from providing services and revenue opportunities from use of assets would not be maximised.

Our approach examines qualitatively the incentives for the operation of the transport system. This is considered partly to inform the extent to which operators are likely to achieve the efficiency gains identified, but also to inform mechanisms for improving incentives for operators. Note that even where operators are not likely to achieve efficiency gains because of the incentive arrangements, this does not imply that these costs should therefore be borne by public transport users.

Services covered by this review

For this review we have covered the services set out in table 1.3.

1.3 Services covered by this review

Service	Description
Rail services	Sydney Trains and NSW Trains services (excluding CountryLink). This covers passenger rail services in the greater Sydney Metropolitan region, extending to Newcastle, the Blue Mountains, Southern Highlands and South Coast.
Bus services	Services provided in the greater Sydney metropolitan region, including Newcastle and the Illawarra
Ferry services	Ferry services provided in Sydney Harbour and the Stockton ferry service in Newcastle
Light rail services	The existing Inner West light rail line and the planned CBD and South East light rail line
Ticketing services	The provision of ticketing services by Transport for NSW, and its major contractor Cubic

Source: The CIE.

Costs covered by this review

This review has focused on the costs of operating transport services. Operating costs cover the labour and other inputs to run services, maintain fleet (and track for rail) and cover overheads. We have given limited consideration to the efficiency of capital costs, although we have included these costs for buses and ferries.

The overall costs from society's perspective related to the provision of a service encompasses the costs that we have assessed, plus costs that are incurred by others. For example, overall bus service costs include costs for the operator of bus services, costs for TfNSW in planning and providing ticketing for bus services and costs such as bus stops and bus lanes provided by Roads and Maritime Services and local councils. Our assessment of efficiency covers the costs for the operator of the bus service and the costs of ticketing.

Applying efficiency findings to IPART's determination of fares

IPART is determining maximum fares through considering the optimal fares, taking into account costs of different modes of service, demand and external costs and benefits, such as congestion. This study provides evidence of the actual costs and efficient costs of different public transport modes.

Fare optimisation could seek to use either actual costs or efficient costs to determine optimal fares.

- Using actual costs has the advantage that this is representative of the expected resource cost implications if fare changes lead to changes in demand, that then require changes in levels of service.
- Using efficient costs has the advantage that users of public transport services would not pay for inefficiencies in service provision that largely arise from Government operation of services.

IPART's fare setting model also uses costs for peak and off-peak services and costs that are per passenger (like a passenger flagfall) and that vary by the distance a passenger travels. We have presented information relevant to this where possible.

2 Rail services

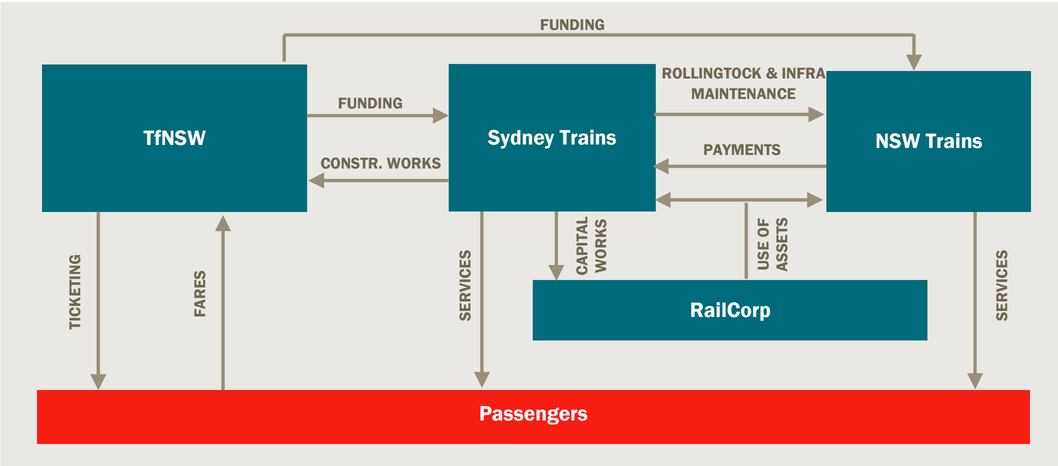
Services and organisations covered

Rail services for which IPART determines fares are provided by Sydney Trains and NSW Trains.

- Sydney Trains provides services for the greater Sydney suburban area, which includes to Emu Plains in the West, Berowra in the North, Macarthur in the South West and Waterfall in the South; and
- NSW Trains provides services between Sydney and the Hunter, Central Coast, Blue Mountains, Southern Highlands and Illawarra and South Coast regions. It also provides regional services not covered by IPART's review.

Chart 2.1 sets out how services are provided. Note that this is a simplification of arrangements, as there are also inter-entity payments for shared services (from the operators to TfNSW) and NSW Trains covers both intercity services and regional services.

2.1 Structure of provision of rail services



Data source: The CIE.

Historical and future cost projections

The cost of providing rail services can be categorised as set out in table 2.2. Operating costs are incurred by Sydney Trains and NSW Trains (mainly). Capital costs are incurred by RailCorp and TfNSW. There are also costs incurred for operating the rail system related to ticketing and planning that are borne by TfNSW.

The focus of our review is on operating costs. A breakdown of operating costs by category is shown in chart 2.3.

2.2 Cost categories

Operating costs	Capital costs
Train operations, such as crewing and guard costs, network operation and electricity/fuel costs.	Infrastructure capital for new tracks. A portion of major periodic maintenance costs is treated as capital costs
Customer interface, particularly station operations	Rolling stock capital for new and replacement fleet
Infrastructure, such as track, signalling and power maintenance and maintenance of stations	Other capital, such as land and buildings
Rolling stock maintenance	
Overheads, such as IT, corporate and human resources costs	

Source: The CIE.

In using cost data reported by Sydney Trains and NSW Trains, the following notes are relevant.

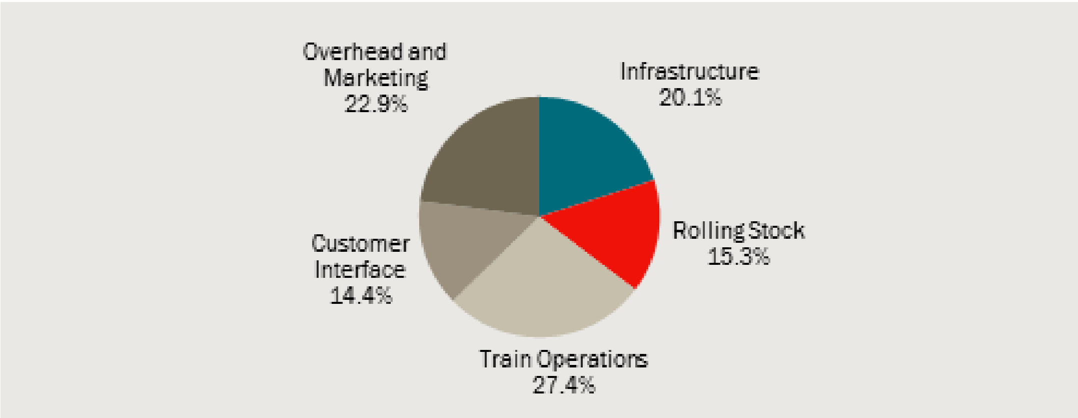
- The CIE has moved electricity and fuel costs from rolling stock costs to train operations costs for NSW Trains, to be consistent with the treatment by Sydney Trains.
- In undertaking comparison to other operators, and through time, for specific cost components, the CIE has made a number of changes. This has included considering the impact of the removal of ticketing costs from rail operators to TfNSW, and considering infrastructure costs in total before allowing for cost allocation to freight, regional and intercity versus Sydney Trains services.
- The revenue paid by companies accessing the Sydney Trains network for freight rail has been deducted from infrastructure costs for the purposes of reporting infrastructure costs relevant for passengers. Note that this may not be consistent with previous infrastructure cost data provided to IPART.
- Financing costs for Waratah rolling stock are excluded from 2014 onwards. For prior years, it is likely that Waratah financing costs are included. This would impact on more recent years, as this arrangement is relatively new.
- Sydney Trains undertakes most of the functions of NSW Trains and charges for these. This includes track maintenance, rolling stock maintenance and fuel/electricity. NSW Trains has then allocated the cost between its intercity and Country services.
  - The extent to which arrangements between Sydney Trains and NSW Trains reflects costs is not known
- The cost allocation process for NSW Trains between regional and intercity services is based on many operational statistics but it is difficult to allocate infrastructure costs. The allocation of infrastructure costs to intercity services used in cost estimates in this report is approximately 5 per cent of the infrastructure costs charged from Sydney

Trains to NSW Trains, or about 2 per cent of total infrastructure costs for the network maintained by Sydney Trains.[6]

- Costs for transport officers (who undertake fare compliance) for all transport services are part of Sydney Trains costs. These costs are ~$25 million per year, of which about 40 per cent are not incurred on Sydney Trains. No adjustment has been made for this, meaning that Sydney Trains costs are potentially overstated by about $10 million and other services understated by the same amount.
- RailCorp also has operating costs. In some cases these are charged to Sydney Trains, where they reflect services provided by Sydney Trains. A large part of RailCorp's operating costs are related to capital costs (such as borrowing) and property activities. On this basis none of these costs are included in the assessment of costs for operating rail services.

We have also followed the approach of Sydney Trains in not including capitalised major periodic maintenance for infrastructure in operating costs. This is consistent with IPART's preferred approach from previous reviews.

2.3 Breakdown of operating costs by category (2014/15)



Data source: The CIE calculations based on Sydney Trains and NSW Trains data.

IPART has been reviewing the costs of providing rail services in the Sydney metropolitan area since 1996. There have been significant changes in how rail services are provided over this period, which makes it difficult to develop clear information on cost trends. This includes changes in how track infrastructure maintenance is delivered and changes in where functions such as ticketing and security are allocated. The allocation of costs between NSW Trains' intercity and regional services may also have changed.

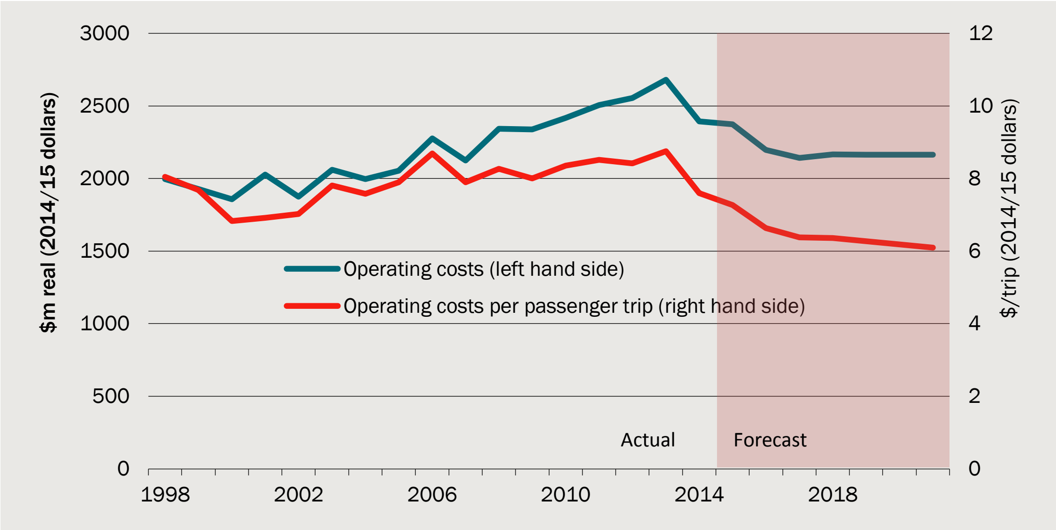
Based on the data available, the costs of providing rail services have steadily increased over time in real terms and have stayed relatively constant in real costs per passenger trip (chart 2.4). Costs were at close to historic high levels in 2013 and have since fallen. This appears to reflect changes in cost allocation processes between IPART's last review and a real reduction in costs. For example, data from 2014 onwards excludes freight revenues

6 Note that the cost allocation used in the numbers reported in this report is based on CIE cost allocation. This is very similar to a revised cost allocation subsequently provided by NSW Trains.

as a deduction in costs, excludes ticketing costs and excludes PPP financing costs. Nevertheless, these changes are not sufficient to explain the full extent of the reduction in costs from previous data to 2014 data.

Costs are forecast by Sydney Trains and NSW Trains to decline in real terms from 2014 to 2021and to decline more sharply on a per passenger trip basis. These costs are on a consistent basis. This cost decline reflects the efficiency improvements anticipated by Sydney Trains and NSW Trains over the forecast period.

2.4 Historic and forecast costs for providing rail services



Note: There have been a number of restructures of the provision of rail services that make it difficult to accurately compare over time. For 2014 onwards we have removed the financing component of the Waratah PPP, as this is a capital cost. Past figures for recent years, include Waratah financing costs of gradually increasing amounts.

Data source: IPART 2006; IPART 2013; TfNSW;. Bureau of Transport Statistics 2014, Train Statistics, Table 3.

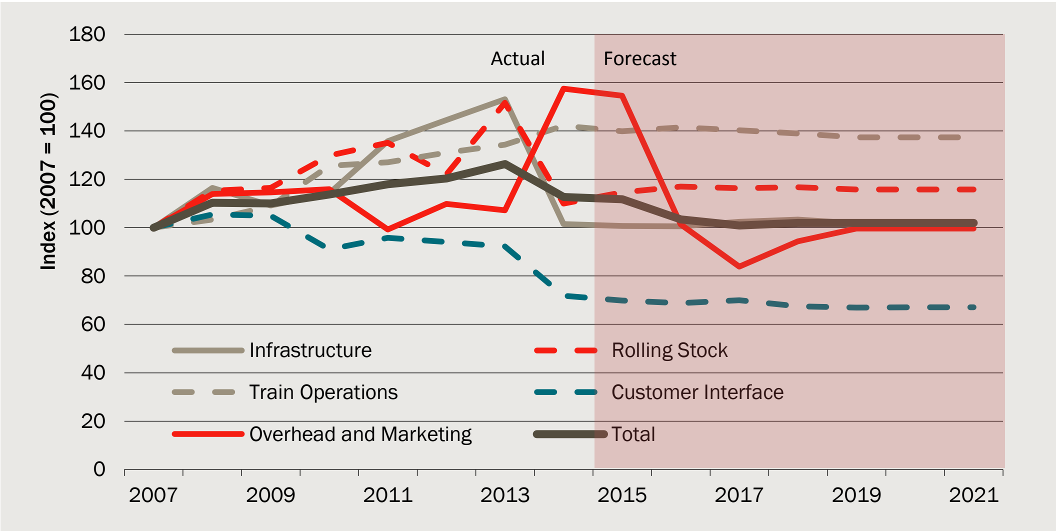
From 2006/07 to 2020/21 we can break costs down into categories (chart 2.5). This provides a view on the consistency of data over time, as well as changes in costs for different categories.

The first year of data for the changed structure with a separate NSW Trains and Sydney Trains is 2014, and a clear break in the data can be seen at this point.

- Infrastructure costs fall markedly in 2014. This likely reflects changes in what is included in these costs, such as freight. Infrastructure has also been an area where Sydney Trains has been focusing on efficiency. However, it is not possible to trace through efficiency gains using this aggregate data.
- There is also a smaller break in the data for customer interface, which fall in 2014. This at least in part reflects the shift of ticketing costs to TfNSW.
- Overheads increase markedly for 2014 and 2015. This is likely to be a real change as subsequently overheads fall to a similar level as prior to the revised organisation arrangements.
- Rolling stock costs fall in 2014, which likely reflects the inclusion of Waratah fleet financing costs in rolling stock costs for previous years but not from 2014 onwards.

The change in structure also marks a change in the trends in costs. From 2007 to 2013, total costs gradually increased, and increased particularly rapidly for infrastructure. From 2014 onwards costs gradually fall. Across both periods, customer interface have steadily declined in real terms, and more rapidly if considered against the metric of passenger trips. Train operations costs have risen substantially from 2007 to 2013 and are now expected to stabilise and fall slightly at levels close to 2015 costs (in real terms).

2.5 Cost changes for each cost category



Note: For 2013, data are forecasts from IPART's 2012 review as actuals are not available.
Data source: TfNSW 2013 and 2015.

The decline in total costs is consistent with information provided by Sydney Trains about efficiency gains made from 2012/13 onwards. These efficiency gains are estimated by Sydney Trains at $336 million gross (not accounting for costs associated with reforms) and $293 million net (accounting for costs of reforms) in 2014/15. This is consistent with the no nominal cost growth observed in rail costs from 2011/12 to 2014/15, and real cost declines. However, it is difficult to be sure how much of the observed cost declines are from efficiency versus changes in functions. On a category by category basis, it is difficult to align efficiency impacts with cost changes, likely because cost categories are not consistent across time.

The costs can also be disaggregated by costs for providing Sydney Trains services, versus NSW Trains intercity services (not including regional services), as set out in table 2.6. NSW Trains costs are typically lower per output than for Sydney Trains. NSW Trains costs are also lower on a per passenger kilometre basis than Sydney Trains, which is somewhat surprising given that Sydney Trains would typically carry more passengers per service.

Table 2.6 shows *total* operating costs compared to a number of metrics, such as car kilometres, passenger kms or trips. We consider that none of these overall metrics are satisfactory as different cost categories are driven by different underlying metrics.

In table 2.6, we also present costs relative to key outputs for each category.

- Rolling stock costs are shown as costs per car kilometre. The other alternative is costs per car, as rolling stock maintenance costs reflect both the kilometres travelled and annual servicing.
- Trains operations costs per service kilometre. Crewing costs (driver and guard) are the primary component of train operations and are most obviously related to the kilometres of train services. Fuel costs are also included in train operations costs are reflect the amount of kilometres.
- Infrastructure cost is reported per track kilometre. These costs reflect track, electrical and signalling maintenance, and facilities maintenance. We only use the track kilometres for the network maintained by Sydney Trains, rather than also including the ARTC network on which some intercity services also operate.
- Customer interface costs are reported per station and per passenger trip. Of these metrics, we prefer the per passenger trip metric as stations that cater for more passengers have larger staffing costs. Stations with few passengers may not have staff and hence have low costs.
- Overheads and marketing is reported as a per cent of other costs and per passenger trip. Our preferred metric is as a share of other costs, as overheads relate to the management of other cost categories, such as human resources, corporate and finance.

2.6 Cost metrics for Sydney Trains and NSW Trains (2014/15)

	Unit	Sydney Trains	NSW Trains	Combined
Total operating cost metrics				
Operating costs per carriage km	$/km	9.18	8.42	8.98
Operating costs per passenger km	$/km	0.44	0.35	0.43
Operating costs per passenger trip	$/trip	6.13	16.97	7.27
Specific component metrics				
Rolling stock costs per carriage km	$/km	1.38	1.36	1.37
Train operations costs per service km	$/km	21.18	8.06	16.24
Infrastructure costs per track km	$000/km	261	346	295
Customer interface cost per station	$000/station	1,784	237	1,116
Customer interface costs per passenger trip	$/trip	1.06	0.91	1.05
Overheads and marketing as a share of costs	Per cent	0.24	0.19	0.23
Overheads and marketing per passenger trip	$/trip	1.47	3.27	1.66

Source: The CIE, based on information provided by TfNSW.

The data underlying these metrics for 2015 are set out in table 2.7.

2.7 Metrics for operating costs for Sydney Trains and NSW Trains 2014/15

	Sydney Trains						NSW Trains					
	Numerator		Denominator		Metric		Numerator		Denominator		Metric	
Metric	Value	Unit	Value	Unit	Value	Unit	Value	Unit	Value	Unit	Value	Unit
Operating costs per carriage km	1788.3	$m	194.8	Mill. car kms	9.18	$/car km	585.5	$m	69.5	Mill. car kms	8.42	$/car km
Operating costs per passenger km	1788.3	$m	4098.4	Mill. pkms	0.44	$/pkm	585.5	$m	1654.6	Mill. pkms	0.35	$/pkm
Operating costs per passenger trip	1788.3	$m	291.9	Mill. ptrips	6.13	$/trip	585.5	$m	34.5	Mill. ptrips	16.97	$/trip
Rolling stock costs per carriage km	268.1	$m	194.8	Mill. car kms	1.38	$/car km	94.7	$m	69.5	Mill. car kms	1.36	$/car km
Train operations costs per service km	528.8	$m	25.0	Mill. service kms	21.18	$/train service km	121.5	$m	15.1	Mill. service kms	8.06	$/train service km
Infrastructure costs per track km	250.7	$m	961.0	Track km	260.89	$000/track km	225.3	$m	651.0	Track km	346.07	$000/track km
Customer interface costs per passenger trip	310.3	$m	291.9	Mill. ptrips	1.06	$/trip	31.3	$m	34.5	Mill. ptrips	0.91	$/trip
Overheads and marketing as a share of costs	430.4	$m	1788.3	$m	24.07	Per cent	112.8	$m	585.5	$m	19.27	Per cent

NoteL Passenger kilometres estimates are from 2013/14 inflated to 2014/15 by the change in trip growth.
Source: Bureau of Transport Statsitics 2015, NSW Train Statistics 2014; Sydney Trains and NSW Trains, The CIE..

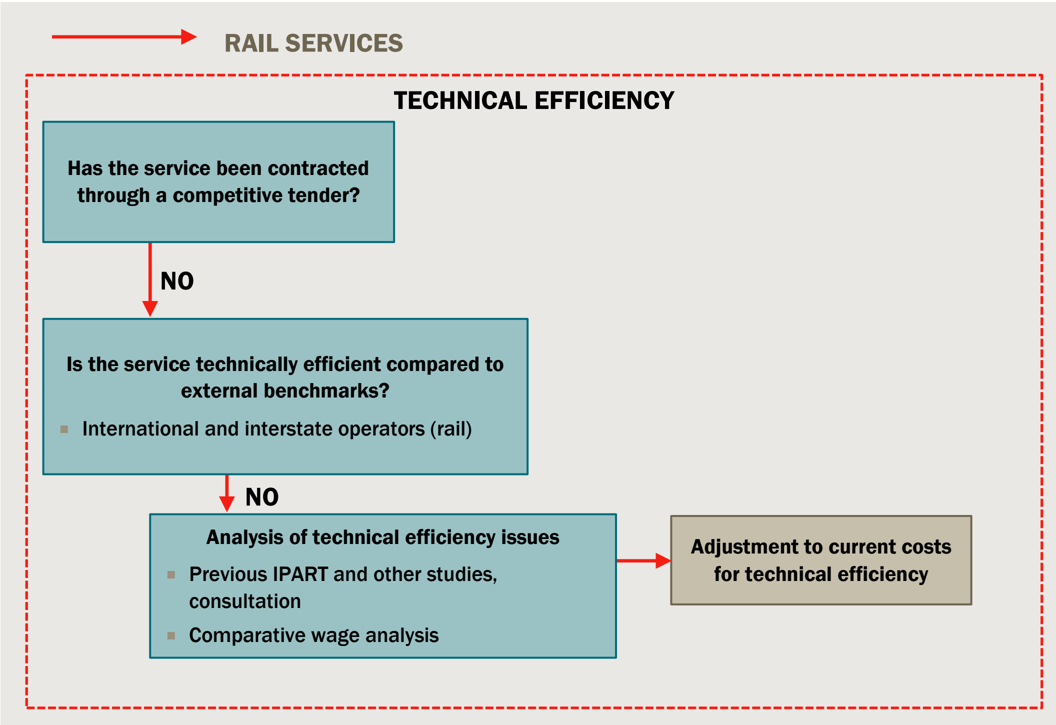
Application of framework for technical efficiency

The assessment of rail services against our framework for considering technical efficiency is set out in chart 2.8.

- Rail services are provided by a NSW Government agency and have not been privately contracted. Many parts of service provision are contracted individually.
- The provision of rail services in Sydney is higher cost than international and Australian benchmarks.
- There are number of past studies providing views on areas where services are not efficiently provided.

For these reasons we consider that the efficient cost for providing rail services in Sydney is lower than the actual costs. This is discussed in greater detail in the sections below.

2.8 Application of framework for rail



Data source: The CIE.

Benchmarking of service costs

To provide benchmarks of the costs of Sydney Trains and NSW Trains we:

- compare operating cost benchmarks for international rail networks. The main metric we use is total operating costs per car kilometre, although we also consider operating costs per passenger trip and passenger kilometre;

- develop costs for international rail networks if these networks were to have the same unit costs as Sydney Trains and NSW Trains. This is then compared to their actual operating costs; and
- consider benchmarks for specific cost categories where there is data available.

The details of the dataset and benchmarking are set out in Attachment A. Because the benchmarking is based on publicly available information, there are likely to be differences in how costs and service metrics are measured, which we cannot account for. Our final recommendations are based on consideration of individual cost components, noting that the resulting overall implications are consistent with international benchmarking and comparisons with Melbourne Metro.

International operators used

The operators that we have used to compared to Sydney Trains are set out in table 2.9. The selection of these operators largely reflects data availability. We have measured performance relative to Sydney Trains, because its operations are more closely aligned than are those of NSW Trains. We have not developed benchmarks for NSW Trains. Performance of Sydney Trains is compared for 2015.

The operators compared are generally smaller than Sydney Trains in terms of operating costs and have a smaller network of track. They have passenger numbers that range from smaller to larger than Sydney Trains and car kilometres that range from smaller to about the same as Sydney Trains. Most are also subway type operators with underground track and lighter rolling stock, and that would potentially also be slower than Sydney Trains, all of which have implications for costs.

All operators except Hong Kong MTR are government owned. This means that there is no strong rationale for considering that other operators are efficient, unlike in benchmarking we have conducted between public and privately operated bus companies. As such, it would be expected that the better performing operators are the measure of efficiency, rather than the average operator.

2.9 Operators used in benchmarking

City	Operator	Annual passengers	Track kilometres	Car kilometres	Train kilometres	Operating costs (PPP adjusted)	Govt/Private	Other transport modes in costs
		(millions)	(km)	(million km)	(million km)	(A$m)		
Sydney	Sydney Trains 2015	292	961	195	25	1788	Govt	No
Singapore	SMRT	711	129	124	25	938	Govt	No
Hong Kong	MTR	1661	175	N/A	N/A	N/A	Private	Yes
London	Transport for London	136	247	32	8	534	Govt	Yes

City	Operator	Annual passengers	Track kilometres	Car kilometres	Train kilometres	Operating costs (PPP adjusted)	Govt/Private	Other transport modes in costs
Toronto	Toronto Transit Corporation	217	124	81	79	640	Govt	Yes
Madrid	Metro de Madrid	604	292	172	29	2070	Govt	No
Montreal	STM	239	142	78	13	1028	Govt	No

Note: Operating costs are reported only for heavy rail in the case that operators cover multiple modes. Although the operating costs relevant to rail for Hong Kong were not provided, MTR produced the operating costs per car-km and operating costs per passenger which were used in the CIE's analysis.

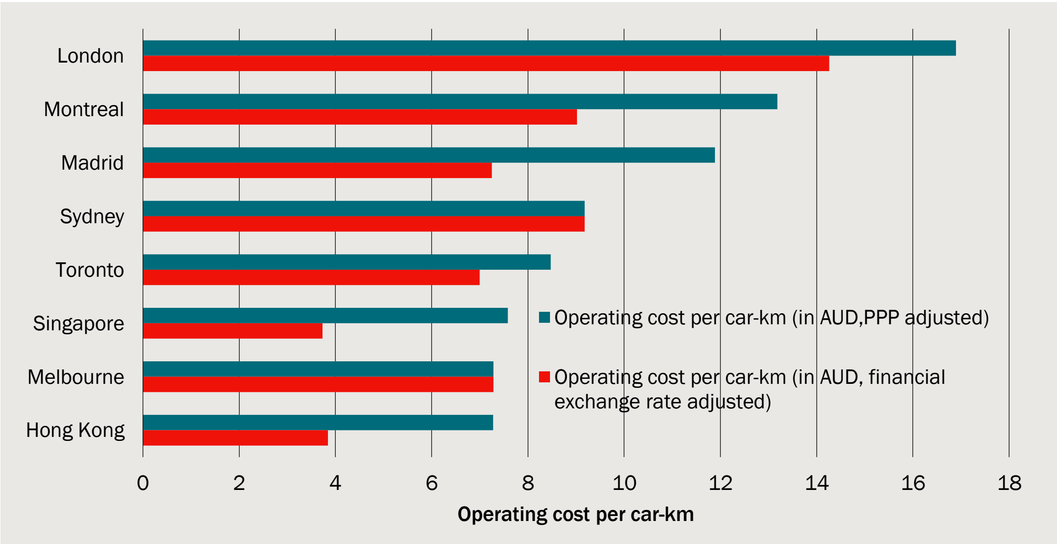
Source: Transport operator's publicly available reports and CIE's calculations.

Sydney Trains has also provided benchmarking data for the International Suburban Rail Benchmarking Group (ISBeRG). The set of comparators in this data is likely to be somewhat more comparable than the operators from publicly available data, and the data is more granular. This is not reported in this public version, because it is confidential.

Comparison of operating costs per car kilometre

Sydney Trains has higher operating costs per car kilometre than four of the comparator operators and lower costs than three operators for which data has been obtained (chart 2.10). Note that we consider operating costs per car km using the PPP measure to be preferable to the financial exchange rate measure. Sydney Trains is in the order of 20 per cent from the lowest cost operator on a cost per car km basis.

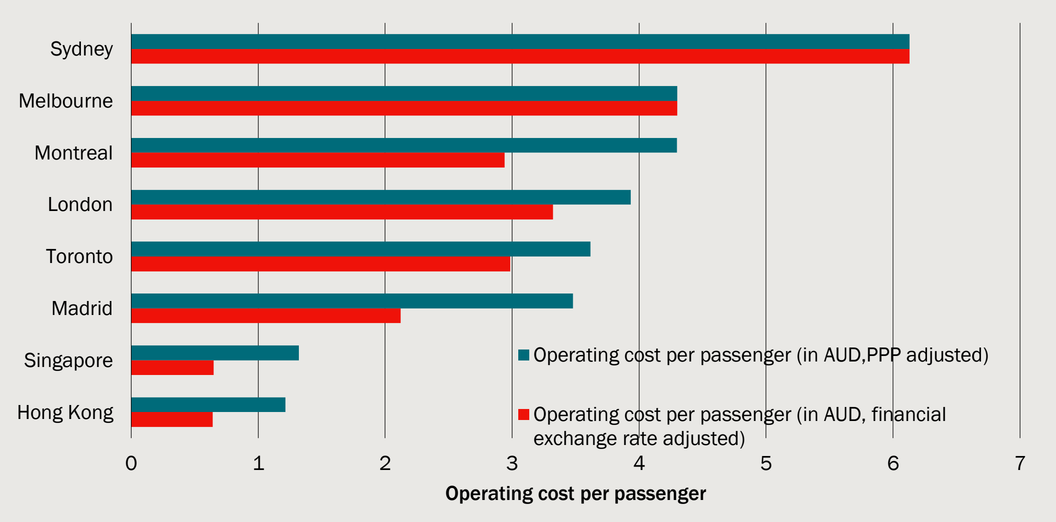
2.10 Operating costs per car kilometre



Data source: See Attachment A.

On a per passenger trip basis, or a per passenger kilometre basis, Sydney Trains costs are substantially higher than all other operators. Chart 2.11 shows results for costs per passenger trip. Additional results are reported in Attachment A.

2.11 Costs per passenger trip



Data source: See Attachment A.

Benchmarking allowing for differences in networks

Comparisons of total operating costs per car kilometre do not account for differences in the rail networks. Potentially important differences can include the size of the network (track or route kilometres), the number of services (car and train kilometres) and the number of stations or amount of patronage through stations. To account for these differences, we apply Sydney Trains unit costs to each international network, as set out in Box 2.12.

2.12 Developing cost metrics accounting for network characteristics

To account for the differences in network characteristics, we apply Sydney Trains cost benchmarks to other networks. A worked example is set out below. (Note that these are not the actual unit costs.)

Category	Sydney Trains unit cost	Network A measure	Implied cost
Infrastructure costs	$400 000/track km	100 track kms	$40m/year
Customer interface costs	$1/passenger trip	30 million passenger trips	$30m/year
Rolling stock costs	$2/car km	15 million car kms	$30 million/year
Overheads	20 per cent of other costs		$20 million/year
Total			**$120 million/year**

The total implied cost of $120 million, if the network were to achieve Sydney Trains unit cost rates, is then compared to the actual operating cost. For example, if Network A had actual operating costs of $100 million/year, then this would indicate than it is $20 million per year more efficient than Sydney Trains.

The unit cost benchmarks used for Sydney Trains and NSW Trains are set out in table 2.13. These are for 2014/15 but converted to 2013/14 dollars, to be as comparable as possible with operating cost measures for other operators. Note that we have made a number of adjustments to cost benchmarks to align as closely with cost drivers as possible.

- Facilities (stations) maintenance costs are removed from infrastructure and included as a per passenger trip cost, as they are not likely to be related to track kilometres, but rather to station size/capacity
- Infrastructure costs for track, signalling and electrical used reflect the total cost benchmark for the entire network maintained by Sydney Trains. No costs have been allocated to regional services. Revenue for freight is subtracted from costs, on the basis that there are additional costs associated with providing access to freight, although we don't know if the revenue charged is reflective of these costs.

2.13 Unit costs used for Sydney Trains 2014/15

	Unit	Sydney Trains, 2013/14 dollars
Rolling stock costs per carriage km	$/km	1.35
Train operations costs per service km	$/km	20.78
Infrastructure costs per track km (excluding facilities, entire network managed by Sydney Trains)	$000/km	250
Customer interface costs per passenger trip (including facilities maintenance)	$/trip	1.24
Overheads and marketing as a share of costs	Per cent	0.24

Note: Measures are in 2013/14 dollars. Note that infrastructure costs used for benchmarking are
Source: The CIE, based on Sydney Trains and NSW Trains data.

The comparison of international operators if they achieved Sydney Trains cost benchmarks is detailed in table 2.14. Operating costs for other international urban rail services are lower than for Sydney Trains, except for Montreal, after accounting for the different cost drivers of each network. Costs are more than 50 per cent lower for Singapore and almost 30 per cent lower for Toronto, as compared to Sydney Trains.

2.14 Comparison of costs for international urban rail operators

City	Network	Year	Actual operating costs	Operating cost if achieve Sydney Trains unit costs	Difference from actual to Sydney Trains
			$m/year (AUD PPP)	$/year (AUD PPP)	Per cent
Singapore	SMRT	2014	938	2 096	- 55
London	Overground	2013/14	534	575	- 7
Toronto	Toronto Rapid Transit	2014	640	897	- 29
Madrid	Metro de Madrid	2013	2 070	2 167	- 5
Montreal	STM	2013	1 028	930	11

Source: The CIE, based on data set out in Attachment A.

We have also undertaken a comparison with Melbourne Metro. Melbourne Metro is a useful comparison because it is operated by a private consortium and it is subject to the same general business frameworks as NSW operators, such as industrial relations. It is also more comparable in terms of its network than international operators for which we have data, which are often subway type operators using lighter fleet and underground services. The Sydney Trains and Melbourne Metro networks are relatively similar in size and patronage levels as set out in table 2.15, with Melbourne about a third smaller on measures of carriage kilometres, and smaller differences across other categories.

2.15 Melbourne and Sydney rail networks

Indicator	Unit	Sydney Trains 2015	Melbourne 2015
Track	Kms	961	830
Train services	Million kms	25.0	21.9
Carriage kms	Million kms	194.8	131.4
Stations	No.	174	218
Passenger trips	Million	292	223

Source: Sydney Trains; Bureau of Transport Statistics 2014, Train Statistics; Public Transport Victoria 2015, *Track record June 2015;* Public Transport Victoria Website, accessed September 2015. .

The total costs of Melbourne's rail network comprise payments made by the state to the operator and fare revenue collected by the operator. Together, we estimate these at $957 million in 2014/15, based on Metro Trains Melbourne keeping 40 per cent of metropolitan public transport fare revenue.[7] The payments made by the state, and the costs incurred by the operator, may include some capital costs. For example, train payments included payments for projects and payments to cover rolling stock leases.[8] These appear to cover capital costs, which are not included in the Sydney Trains operating cost figures.

If we apply Sydney Trains unit costs to Melbourne's system, we arrive at an estimated cost of $1.5 billion, which indicates Melbourne operates 37 per cent below Sydney's costs (table 2.16). This suggests Melbourne's system is operated substantially more efficiently than Sydney's. Note that there may be differences in the service quality of the train operations between Sydney and Melbourne. We have looked at measures of customer satisfaction and on-time running. In Sydney customer satisfaction with trains is reported at 88 per cent, compared to 72 per cent in Melbourne, but these measures are not directly comparable.[9] Service punctuality is reported at 98.8 per cent for Melbourne in 2014/15, compared to Sydney Trains reported peak punctuality of 93.2 per cent in 2014/15, but again the indicators are not directly comparable.[10] In the absence of directly comparable data we have not made an assessment of differences in service quality.

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7 Victoria DTPLI 2014, Annual Report 2013/14, p. 145.

8 Allens Arthur Robinson 2012, *Franchise Agreement — Train,* prepared for Public Transport Victoria.

9 Sydney Trains 2015, Corporate Plan 2015/16, p. 4; Public Transport Victoria 2015, Annual Report 2014/15, p. 26.

10 Public Transport Victoria 2015, Annual Report 2014/15, p. 26; Sydney Trains website, http://www.sydneytrains.info/about/our_performance/otr_year.jsp for 2014/15.

2.16 Costs of Melbourne's rail system

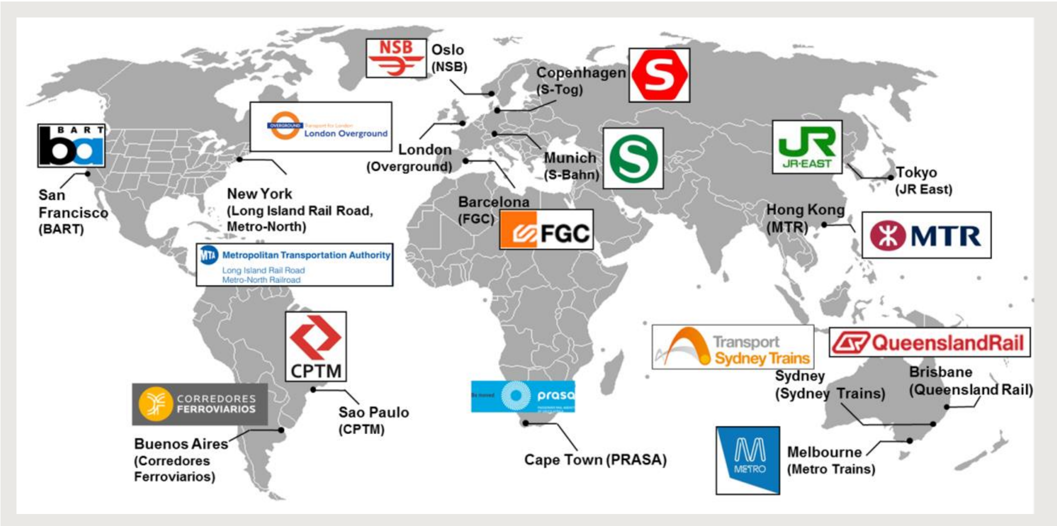
Cost category	2014/15
	$m
Payments from state	728
Fare revenue	229
Total	**957**
Estimate using Sydney Trains unit costs	1 513
Difference (per cent)	-37

Source: Public Transport Victoria 2015, *Track record June 2015,* Table 8; Fare revenue based on information in Public Transport Victoria 2015, Victorian official fare compliance series May, indicating a fare evasion rate of 5.8 per cent resulting in a loss of $33.8 million. This implies total revenue of $573 million, of which 40 per cent is directed to Melbourne Metro; The CIE.

ISBeRG comparisons from Sydney Trains

Sydney Trains is part of the International Suburban Rail Benchmarking Group (ISBeRG). This group includes the operators set out in chart 2.17.

2.17 ISBeRG coverage



Data source: ISBeRG website, http://www.isberg-web.org/.

Sydney Trains has provided a comparison of its performance relative to ISBeRG operators. This suggests Sydney Trains is close to the median in costs per standardised capacity km and would have to reduce costs by one third to get to top quartile performance. On other benchmarks Sydney Trains would have to reduce costs by one third to one half to get to top quartile performance.

Data is not reported in this public report because it is confidential.

Comparison of specific cost categories

Rolling stock maintenance costs

Imperial College London has undertaken a study of rolling stock maintenance costs from 2005 to2012 (Brage-Ardeo et al 2014) for 24 urban rail transit operators from the Comet and Nova benchmarking groups.[11] They find average rolling stock maintenance costs of $0.65 (USD PPP) per car kilometre and $73 500 (USD PPP) per car. Sydney Trains and NSW Trains are substantially above this benchmark on a per car km basis and significantly above this benchmark on a per car basis (table 2.18). It is not clear how inflation has been adjusted for in this study, although the study finds that costs are *lower* for later years than for earlier years. The extent to which the definition for rolling stock maintenance costs used in this study is consistent with reporting of Sydney Trains and NSW Trains is difficult to ascertain. Neither Sydney Trains/NSW Trains nor Brage-Ardeo et al 2014 include mid-life upgrade costs.

2.18 International rolling stock maintenance costs

	Costs per car kilometre	Costs per car	Costs per car kilometre	Costs per car
	US$ PPP/car km	US$ PPP per year	A$ PPP/car km	A$ PPP per year
Minimum	0.28	34 500	0.43	52 976
Average	0.65	73 500	1.00	112 861
Maximum	1.47	137 000	2.26	210 367
Sydney Trains (2015)	0.90	107 495	1.38	165 062
NSW Trains (2015)	0.89	130 109	1.36	199 786
Combined	0.89	112 604	1.37	172 907

Note: Figures rounded to two decimal places for costs per car kilometre and to the nearest hundred dollars for costs per car. Fuel and electricity costs have been removed from rolling stock costs for NSW Trains and Sydney Trains.

Source: Brage-Ardao, R., D. Graham and R. Anderson 2014, "Determinants of rolling stock maintenance cost in metros", Imperial College London.

Brage-Ardeo et al 2014 also investigate the drivers of rolling stock maintenance costs, finding:

- air conditioning is associated with an 18 per cent increase in maintenance costs;
- hours contracted out is associated with a substantial reduction in maintenance costs. A 10 per cent increase in hours contracted out would lead to a 5-6 per cent reduction in maintenance costs;
- cars operated for a larger number of car kilometres per year had lower costs per car kilometre, indicating some component of maintenance costs is fixed per car and some dependent on use; and
- greater fleet availability leads to lower maintenance costs.

The study also finds strong economies of scale in maintenance. In the case of Sydney these may not be gained because of different types of fleet. Jan and Phillips 2011

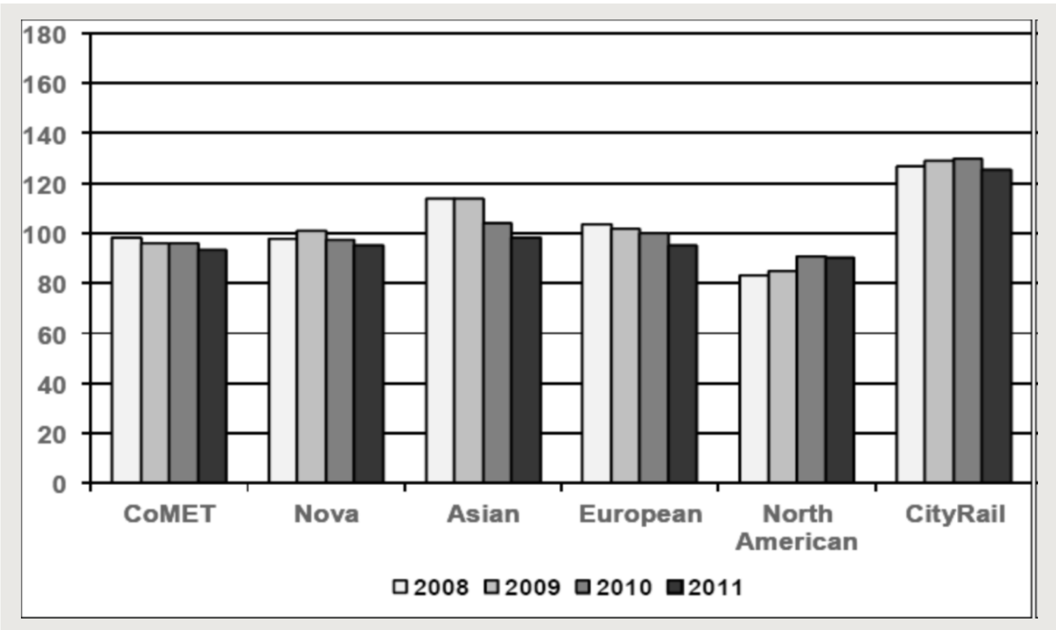
11 Brage-Ardao, R., D. Graham and R. Anderson 2014, "Determinants of rolling stock maintenance cost in metros", Imperial College London.

suggested that additional types of fleet could add 15 to 20 per cent to rolling stock maintenance costs.[12]

CityRail has also previously reported how it compares to international operators on a maintenance cost per car kilometre basis. Maintenance costs cover track, rolling stock and station maintenance. Its costs have been >20 per cent higher than the average of other urban rail operators (chart 2.19). From 2011 to 2019, rolling stock costs per car kilometre for the combined Sydney Trains and NSW Trains are expected to fall by 20 per cent.

Comparison of costs of maintenance for rolling stock under different arrangements, such as the PPP contract for the Waratah fleet, outsourced maintenance contract for the Millennium fleet and internal maintenance costs for other rolling stock has not been undertaken, due to data availability.

2.19 International benchmarking of maintenance cost per car km (index)



Data source: RailCorp 2012, *CityRail Performance Update: Comparison to International Benchmarking Groups,* 2011 data.

Based on these assessments, our view is that rolling stock maintenance costs are likely to be inefficient. For our assessment of efficient costs we use average rolling stock costs of $1 per car km, based on Brage-Ardeo et al 2014. While this is the average, and hence not representative of the most efficient operator, because Sydney Trains' and NSW Trains' fleet has characteristics that are likely to lead to higher costs, such as heavier rolling stock and air conditioned rolling stock, we use the average as representative of the efficient level for Sydney Trains. This implies by 2019 that the efficient level of rolling stock costs is 28 per cent below that projected by Sydney Trains and NSW Trains.

12 Jan, A. and D. Phillips 2011, *Rail value for money study: Rolling stock whole life costs,* ARUP: London.

Track maintenance costs

We estimate track maintenance costs for Sydney Trains' network at $255 000 per kilometre of track (table 2.20). This covers track, signalling and electrical infrastructure. This excludes facilities maintenance, but includes costs allocated to regional services. We have excluded freight revenue on the basis that allowing for freight services imposes costs, although we do not know the extent to which arrangements reflect the incremental cost of freight to Sydney Trains.

2.20 Track infrastructure costs

Item	2015
	$m
Sydney Trains track costs	194
NSW Trains track costs	218
Total allocated as track	412
Track kms in Sydney Trains' network (No.)	1 612
Cost per track km (($/km)	255 302
Note: Freight revenue excluded	59

Note: Data are in 2014/15 dollars.
Source: The CIE based on Sydney Trains and NSW Trains.

Comparisons that are available suggest this is substantially higher or similar to benchmarks (table 2.21).

- In 2011, a figure of $146 000 per track kilometre was considered appropriate for Melbourne Metro to provide access to its network. This did not include electrical maintenance.
- The Queensland Competition Authority has recently reviewed the cost of heavy haul railway networks in Central Queensland [13]. Their consultant SKM found that the cost of maintenance per km was between $35,000 and $90,000 depending on the location in the network, the Goonyella System being the highest. This cost included track, bridges, signalling, electrical and overhead administration. Both the Goonyella and Blackwater networks are electrified. While these are simple rural located networks, which do not involve the complexities of egress associated with Sydney's network, the comparison shows that railway infrastructure carrying up to 100 million tonnes can be maintained for significantly less than the Sydney network. Access to the track to avoid train operation is similarly restricted for major works to planned possessions and ad hoc access for minor works is also restricted.
- Transport Watch in UK in 2004 reported the maintenance and renewals costs for the UK rail system at £62,000-£94,000 per track km (depending on the lower and upper bounds of expenditure forecast).[14] At the current exchange rate and allowing for inflation, the equivalent costs in Australia are $201,000 to $305,000, similar to Sydney Trains. The Office of Rail Regulator has noted the Network Rail is inefficient

13 http://www.qca.org.au/Rail/Aurizon/Intro-to-Aurizon/2013-Draft-Access-Undertaking/In-Progress/2013-Aurizon-Network-Draft-Access-Undertaking

14 http://www.transport-watch.co.uk/facts-sheet-8-rail-versus-road-track-maintenance-costs

compared to other track operators, in the order of 20 per cent in 2010 and substantially higher in 2004.[15]

2.21 Track infrastructure cost maintenance

	Benchmark
	$/track km
Melbourne Metro	146 000 (2011)
Goonyella Heavy Haul System	90 000 (2014)
UK Network Rail	201 000 - 305 000 ($2015)

Source: GHD 2011, Review of MTM's operations and maintenance costs, prepared for Essential Services Commission, p. 5; http://www.qca.org.au/Rail/Aurizon/Intro-to-Aurizon/2013-Draft-Access-Undertaking/In-Progress/2013-Aurizon-Network-Draft-Access-Undertaking; http://www.transport-watch.co.uk/facts-sheet-8-rail-versus-road-track-maintenance-costs AND http://www.rateinflation.com/consumer-price-index/uk-historical-cpi?start-year=2001&end-year=2015

Because the above analysis is not conclusive, we do not allow for any efficiency gain in infrastructure. Consideration of the efficiency of infrastructure costs would require a deeper analysis than possible in this review.

Station operations costs

Customer interface costs have declined in real terms for the provision of rail services since 2007 and are forecast to continue to decline. These costs have not declined to the extent considered efficient by previous reviews, , which have noted that Sydney has many more staffed stations than comparable networks such as Melbourne.

On previous work, which estimated customer interface cost savings of 43 per cent in 2011, and accounting for the forecast decline in costs per passenger trip from Sydney Trains and NSW Trains, the efficient level of customer interface costs would be 17 per cent lower than forecast costs in 2019 (table 2.22). Note that this allows for the shift in ticketing costs from Sydney Trains to TfNSW, using an assumption that these costs were $40 million per year.

2.22 Efficient customer interface costs

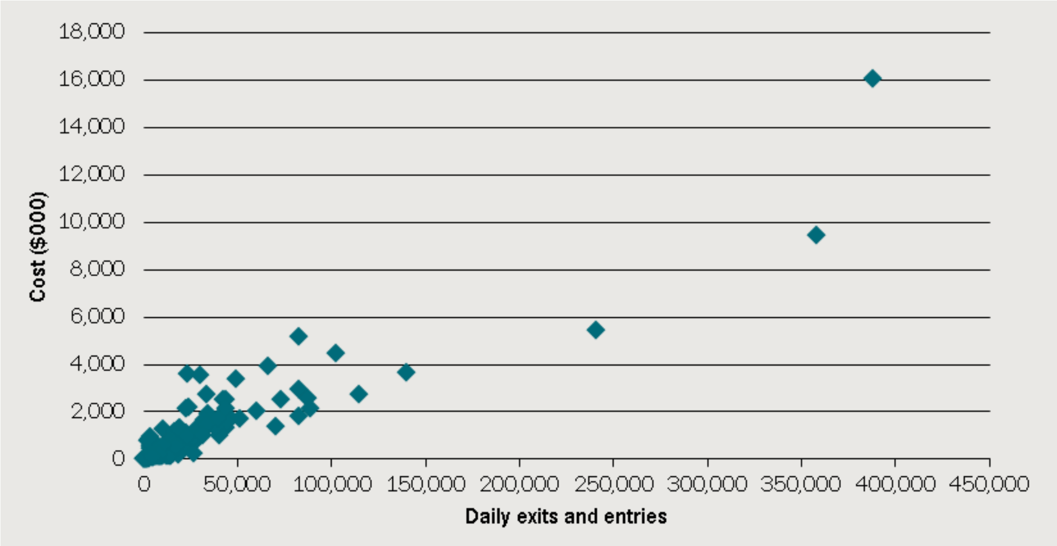
	Costs per passenger journey	Efficiency gain to achieve benchmark
	$/trip, 2014/15	Per cent
CityRail 2011	1.59	-43
Sydney Trains and NSW Trains 2019	0.97	-17
Benchmark with ticketing	0.91	
Benchmark with ticketing removed	0.78	

Note: Assumed reduction in ticketing costs for Sydney Trains and NSW Trains is $40 million per year.
*Source:*2011 figures based on data provided for IPART 2013 review of CityRail fares; 2019 figures based on data and forecasts provided by Sydney Trains and NSW Trains and CIE assumption of 1.5 per cent per year patronage growth.

15 UK Office of Rail Regulation 2013, *PR13 efficiency benchmarking of Network Rail using LICB*, August.

Stations costs are driven by passenger entries and exits (chart 2.23). This chart shows only station staffing costs, which comprise about half of customer interface costs.

2.23 Station costs and daily entries and exits

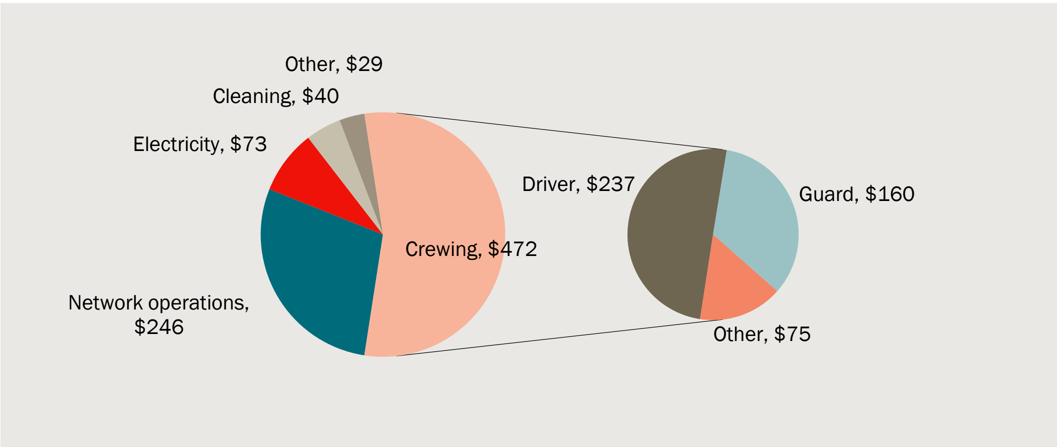


Data source: CIE analysis based off Bureau of Transport Statistics station barrier counts and cost data from Sydney Trains.

Train operations costs

A breakdown of Sydney Trains train operations costs is set out in chart 2.24, with figures reported as dollars per train service hour.

2.24 Train operations costs per train service hour, Sydney Trains 2015



Data source: Sydney Trains.

Train operations costs are the area of Sydney Trains/NSW Trains costs that are least efficient. This reflects low utilisation of driver time driving (less than 30 per cent in 2011 and no evidence that this has changed) and two person crewing (driver and guard). For 2015, the driver cost per train service hour was $200 for NSW Trains and over $230 for Sydney Trains. Guard costs were an additional $150 per train service hour (chart 2.25). The high costs reflect the low amount of time that drivers and guards spend on trains.

For example, at an hourly wage of $50 per hour, if a driver spent one quarter of their paid time driving then the driver cost per train service hour would be $200.

2.25 Driver and guard costs per train service hour

Data source: The CIE, based on data provided by Sydney Trains and NSW Trains.

The entire train operations costs, including rostering/administration, network operations and train cleaning amounts to over $800 per train service hour (chart 2.26).

2.26 Train operations costs per train service hour

Data source: The CIE, based on data provided by Sydney Trains and NSW Trains.

On a per kilometre basis, train operations costs for Sydney Trains and NSW Trains are $21 and $6 per service kilometre respectively. NSW Trains can achieve lower costs per service kilometre because its trains operate at faster average speeds and it does not have costs associated with network operation. Combined, train operations cost are $15 per service kilometre.

Our assessment is that efficient costs are substantially lower and we use an estimate of $10 per train service kilometre. This allows for an approximate one third reduction in train operations costs from their 2015 level.

- This is consistent with ISBeRG data provided by Sydney Trains, which suggests an average operator has service operations labour hours per scheduled revenue train hour that are substantially lower than Sydney Trains.
- This is potentially conservative in the context that guard costs are about one fifth of train operations costs and driver utilisation (time driving trains) is about two thirds of the top quartile of international operators.
  - Sydney Trains indicates that train revenue hours divided by train driver hours is 28 per cent in 2014. Sydney Trains has indicated that it is projecting driver productivity to improve by 2018.

  Combined, these changes alone would reduce train operations costs by 30 per cent.

Overhead costs

Sydney Trains and NSW Trains combined report overheads at 24 per cent of costs in 2015, falling to 16 per cent of costs in 2021. Overhead costs as a share of costs have risen substantially from 16.5 per cent in 2007 to 23.8 per cent in 2015.

We have not undertaken a detailed analysis of overhead costs for other operators. Instead, we base our level of efficient costs on achieving a similar level of overheads as a share of costs as was achieved in 2007. Note that by 2019, Sydney Trains and NSW Trains are projecting rapid reductions in overheads to a level as a share of cost that is close to or lower than the 16.5 per cent benchmark. Because other costs would be lower if these were efficient, the amount of overheads in dollar terms for an efficient operator is lower than allowed for in projections.

Total efficiency implications

The cost implications of the assessments above are set out in detail later in this chapter. In total they imply efficient costs are 22 per cent below forecast 2019 costs and 29 per cent below (normalised) 2015 costs.[16] (Forecasts from Sydney Trains and NSW Trains allow for significant efficiency improvements over time.) This is equivalent to a cost saving of $703 million in 2015 and $468 million in 2019. This is somewhat below the evidence from the comparison of total operating costs with Melbourne and the best international operators.

Other studies on the efficiency of Sydney's rail services

As a check on the above assessments we have reviewed other studies undertaken into the efficiency of rail services in Sydney. As well as information provided by Sydney Trains already noted above.

16 This means 2015 costs normalized for the service levels and patronage in 2019.

Benchmarking groups

CityRail, and more recently Sydney Trains, is a member of a two of the three international rail benchmarking groups (Nova and ISBerg). All three benchmarking groups are operated by Imperial College London.

- Nova — covers 16 small to medium international metro rail providers, where size is defined on the basis of passenger trips and includes Sydney Trains
- ISBerg (International Suburban Rail Benchmarking Group) — covers 15 suburban railways including Sydney Trains
- CoMet (Community of Metros) — covers 16 large international metro rail providers, with more than 500 million passengers annually

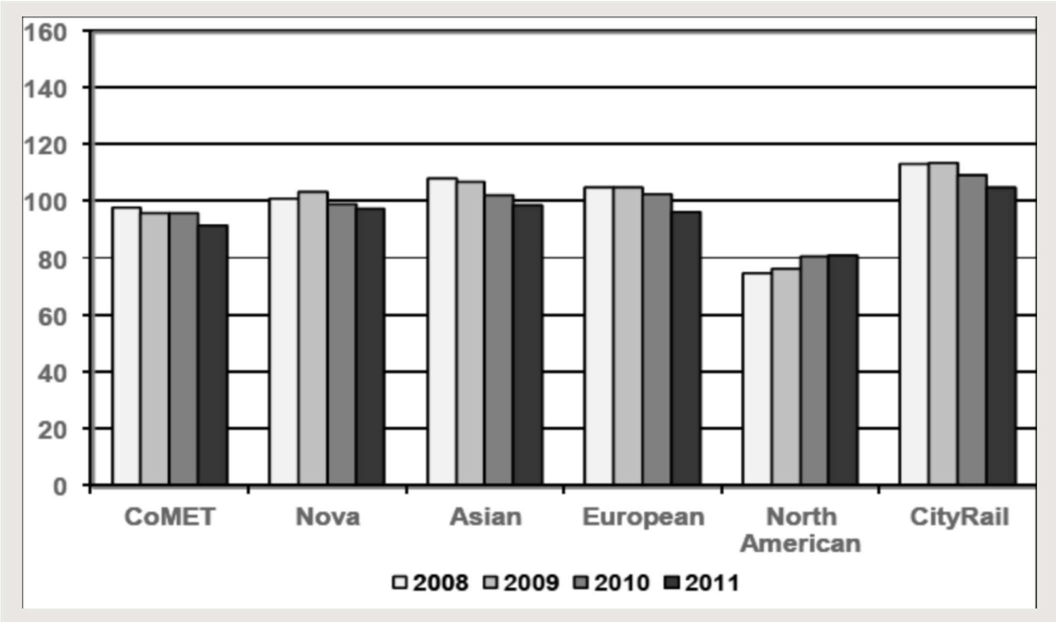
Data provided by members is confidential, and public release of data has occurred only where this does not impact on confidentiality. CityRail released aspects of its performance publicly, based on these benchmarking groups.

Aspects of the efficiency of CityRail, which was a combination of Sydney Trains and NSW Trains intercity services, evident from international comparisons were that:

- CityRail had somewhat higher costs per car kilometre than its international peers on average (in the order of 10 per cent, chart 2.27) and substantially more compared to the lowest cost operators
- CityRail had higher maintenance costs per car kilometre than its international peers
- CityRail had the highest train service costs of all international peers, because of two person crewing, rather than driver-only, and low levels of utilisation of driver time driving in service trains
- CityRail had substantially higher costs per passenger trip than its international peers
- CityRail had a better utilisation of cars at peak times than its international peers.

The changes in costs evident from 2011 indicate that most of these issues are still relevant in 2015. On a per car kilometre basis, we would anticipate that an efficient Sydney Trains/NSW Trains may well have lower costs than other operators, because it can operate at faster speeds (reducing train operations costs) and has fewer passengers per car kilometre (which should reduce station costs). Somewhat offsetting this is that it has a larger network of track to maintain.

2.27 International benchmarking — total operating cost per car kilometre (index)



Data source: RailCorp 2012, *CityRail Performance Update: Comparison to International Benchmarking Groups,* 2011 data.

Data envelopment analysis of international urban rail operators

In 2014, Sydney's rail system was part of a study on international urban rail operating costs undertaken by Tsai, Mulley and Merkert.[17] This study undertook Data Envelopment Analysis (DEA) using employment and number of cars as the inputs and total car kilometres as the output, using data from 2009 to 2011. The study found that Sydney's rail system was technically efficient, in that it could not reduce all inputs and continue to produce the same output. The study also found that Sydney could reduce costs by 20 per cent by shifting to a more efficient mix of labour and cars (less labour and more cars). The study also reported slack in variables, indicating the extent to which a particular input could be reduced and the same output could be achieved. It found that Sydney had a labour slack of 7,700 employees (about half the workforce) and a shortage of 211 cars, although as noted below we treat this finding with substantial caution.

A previous version of this study also considered effectiveness, based on passenger trips per input. Sydney's rail system performed poorly on this measure, with a score of 0.23, compared to 1.0 for a firm that is maximally effective.[18]

There are a number of limitations for this study, in terms of its use for our task, that are worth noting.

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17 Tsai, Mulley and Merkert 2014, "Measuring the cost efficiency of urban rail systems: An international comparison using DEA and tobit models", Journal of Transport Economics and Policy, Volume 49, Part 1, January 2015, pp. 17–34.

18 Tsai and Mulley 2013, "How does the efficiency performance of Sydney CityRail compare with international urban rail operators?", Australian Transport Research Forum 2013 proceedings.

- The study uses employment numbers and car numbers as an input. If rail businesses adopt different levels of outsourcing then this will reduce employment numbers artificially. Further, if companies are inefficient in their use of other inputs (parts, fuel etc) then this will not be identified in the analysis.
- If a rail business is overpaying for inputs then this would not be identified in the analysis.
- The level of slack estimated for Sydney appears unrealistic, with about half of the Sydney rail labour force considered to be slack. The extent to which cars and labour hours are substitutes also does not appear to be realistic, as car numbers are normally based on the need for services and cannot readily be substituted for labour to achieve the same outcome.
- The effectiveness analysis uses number of passenger trips. However, distances of trips undertaken in different rail networks are likely to be very different, and passenger kilometres is a preferable measure, where this is available.

Nevertheless, the study does provide a useful reference point for considering efficiency and comparing data collected for our study. Using the data reported, the international average operating cost per car kilometre, weighted average and 25th percentile ranged from 11 per cent lower to 26.7 per cent lower than Sydney's cost (table 2.28). This is similar in magnitude to the efficiency differences we have estimated.

2.28 Operating cost per car km from Tsai, Mulley and Merkert

	Operating cost per car km	Difference to Sydney Rail
	USD PPP	Per cent
Sydney heavy rail	7.50	
Average (other operators)	6.62	-11.6
Weighted average (other operators)	6.10	-18.7
25th percentile	5.49	-26.7

Note: The weighted average uses car kilometres as the weight.
Source: The CIE based on Tsai, Mulley and Merkert 2014, "Measuring the cost efficiency of urban rail systems: An international comparison using DEA and tobit models", Journal of Transport Economics and Policy, Volume 49, Part 1, January 2015, pp. 17–34.

Previous IPART studies

IPART has undertaken previous studies of the efficiency of rail services provided for Sydney and surrounding areas.

In 2008, IPART commissioned a detailed review of the performance of CityRail by LEK Consulting. This study identified cost efficiency savings of 15 to 20 per cent under a continuation of existing policies (such as staffing of stations) for CityRail or more if these policies were relaxed. It also identified specific recommendations to improve efficiency.

A comparison of CIE estimates for 2015 and 2019 and LEK estimates in 2008 and 2011 is shown in table 2.29.

2.29 Comparison of efficiency estimates across cost components

Category	CIE 2015	CIE 2019	LEK 2008	LEK 2011
	Per cent	Per cent	Per cent	Per cent
Infrastructure	0	0	-7	Confidential
Rolling stock	-27	-28	-35	Confidential
Customer interface	-25	-17	-26	Confidential
Train operations	-38	-37	-37	Cofnidential
Overheads	-49	-20	-45	Confidential
Total	**-30**	**-22**	**-29**	**Confidential**

Note: LEK estimates are for the Australian benchmark.

Source: L.E.K. Consulting (2008), "Total Cost Review of CityRail's Regular Passenger Services", *Independent Pricing and Regulatory Tribunal;* LEK 2011, *CityRail efficiency review,* prepared for NSW Department of Transport.; The CIE.

Reasons for technical inefficiency

The reasons for technical inefficiency include policy decisions imposed on train operators (such as requirements for guards and station staffing) and inefficiencies within the existing policy constraints. It is beyond the scope of this study to detail specific areas of inefficiency. This has been undertaken in two previous studies to which we have access.[19]

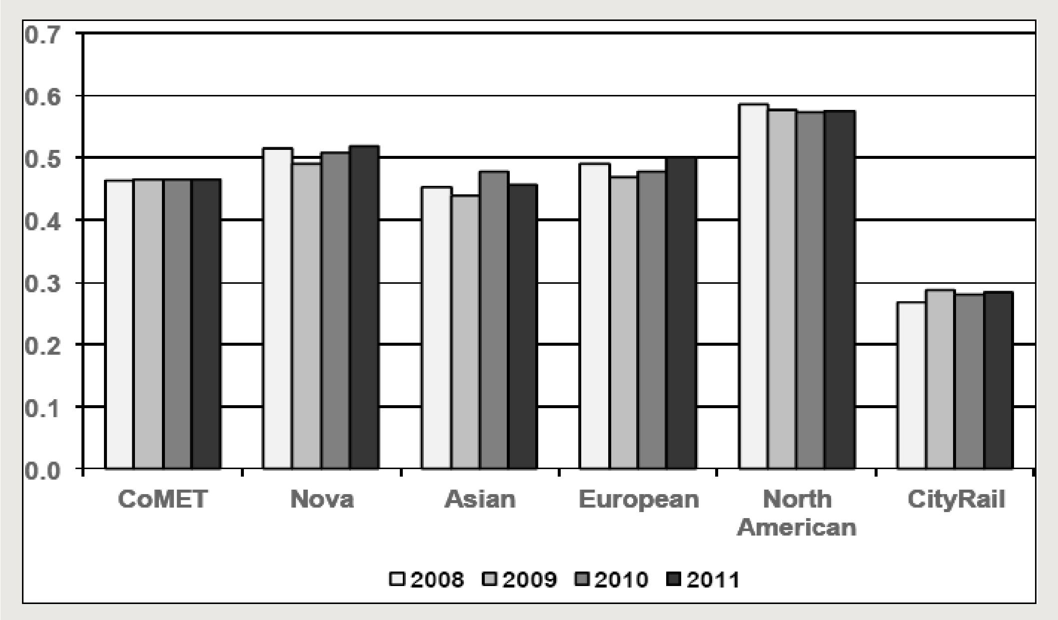
The international benchmarking data also provides evidence of areas of specific inefficiency.

- CityRail achieved a driver share of time driving of less than 30 per cent in 2011, compared to the best operators at 40 to 60 per cent (chart 2.30). This low level of driver utilisation is in addition to higher train operations costs from two person crewing (driver and guard).[20]
- CityRail had higher maintenance costs and total operating costs per service kilometre than the average in each other international region, as set out earlier.

19 L.E.K. Consulting (2008), "Total Cost Review of CityRail's Regular Passenger Services", *Independent Pricing and Regulatory Tribunal;* LEK 2011, *CityRail efficiency review,* prepared for NSW Department of Transport.

20 RailCorp 2011, *CityRail performance: Comparison to Comet/Nova benchmarking community peers.*

2.30 Train hours divided by driver hours



Data source: RailCorp 2012, *CityRail Performance Update: Comparison to International Benchmarking Groups,* 2011 data.

We have also considered wage comparisons across passenger rail in greater Sydney, greater Melbourne and greater Brisbane, as one possible reasons for higher costs. The average wages are very similar across these regions (table 2.31). While we cannot adjust for skill levels, this does not appear to be a significant driver of either justifiable cost differences or inefficiency.

2.31 Wage comparison for people employed in Australian passenger rail transport sector 2011

	Average wage	Average hours	Wage per hour	Difference to NSW
	$/week	N.o.	$/hour	Per cent
Sydney	1 555	37.6	41.3	
Melbourne	1 517	37.2	40.8	-1.41
Brisbane	1 539	37.8	40.8	-1.43

Note: For the purposes of calculating averages we have used mid-points of Census intervals. For income greater than $2000 per week we have used $2500. For hours greater than 49 we have used 50.
Source: The CIE, based on ABS Census TableBuilder.

Conclusions on technical efficiency

Our conclusion is that Sydney's rail services are not technically efficient. The degree of inefficiency found in previous work remains valid at between 20 to 20 per cent. Forecasts of costs from Sydney Trains and NSW Trains do anticipate efficiency improvements relative to 2015 financial year costs. 2015 costs, forecast 2018/19 costs and efficient 2018/19 costs are set out in table 2.32.

2.32 Estimates of current, forecast and efficient cost

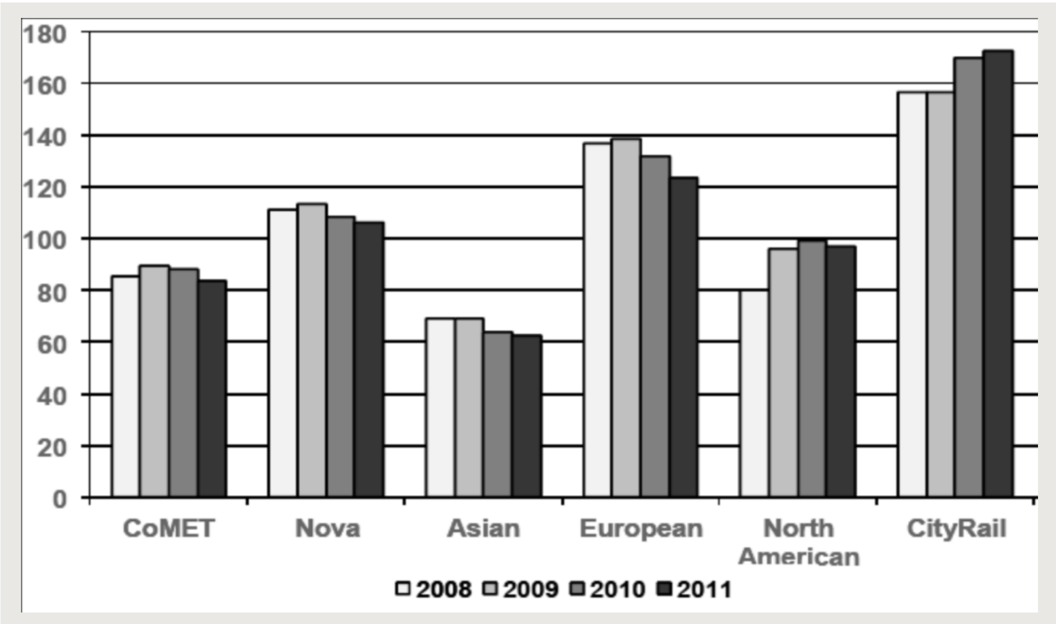
Category	Unit	Normalised projected cost 2015	Forecast cost 2019	Efficient cost 2019
Infrastructure	$/track km	295 292	298 506	298 506
Rolling stock	$/car km	1.37	1.39	1.00
Customer interface costs	$/passenger trip	1.05	0.95	0.78
Train operations	$/train km	16.24	15.95	10
Overheads	% of other costs	23%	16%	17%
Total (normalised)	$m	2 399	2 164	1 696
Total	**$/car km**	**9.1**	**8.2**	**6.4**
Difference to efficient cost	Per cent	-29.3	-21.6	0.0

Note: The normalised projected cost for 2015 is based on service levels and passenger levels in 2019.
Source: Sydney Trains, NSW Trains and The CIE.

Allocative efficiency of services

CityRail has substantially higher operating costs per passenger kilometre than other operators (chart 2.33). This reflects high costs per service kilometre, combined with the low urban density of Sydney and surrounding areas serviced, and past decisions about where to locate the network and stations. Efficiency comparisons on the basis of costs per passenger kilometre are therefore not overly useful for IPART in considering fares, as many factors cannot be easily changed or improved upon by rail operators.

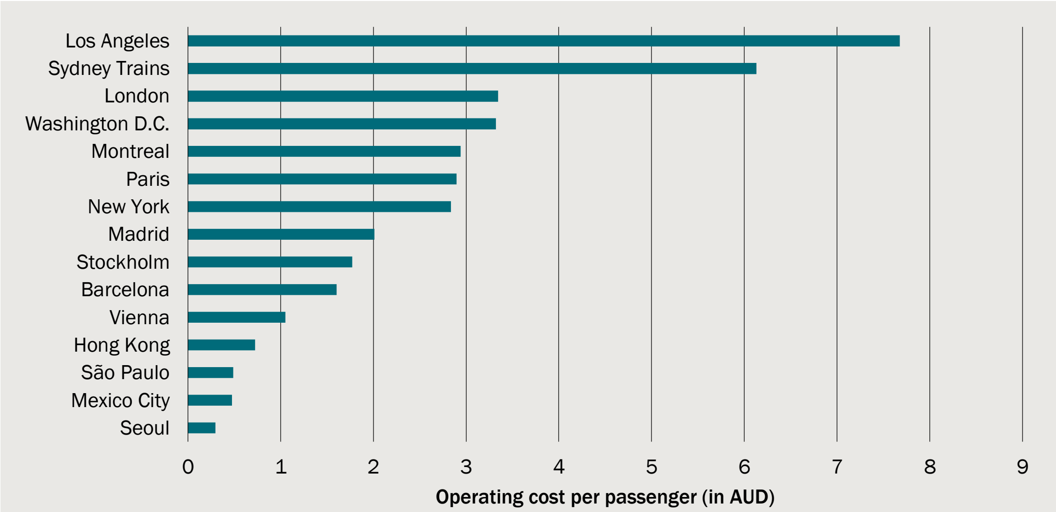
2.33 CityRail operating costs per passenger km (index)



Data source: RailCorp 2012, *CityRail Performance Update: Comparison to International Benchmarking Groups,* 2011 data.

This is similar to findings from our analysis of international rail operators (see chart 2.11) and findings from the Transit Leadership Summit (see chart 2.34).

2.34 Operating cost per passenger trip — Transit Leadership Summit



Data source: See Attachment A.

2.35 Operating costs per passenger km — selected networks

	Costs per trip	Costs per passenger km
	$/trip	$/pkm
Singapore	1.32	0.12
Hong Kong	1.21	0.11
Melbourne	4.30	na
Sydney Trains	6.13	0.44

Source: The CIE.

As discussed earlier, fare setting on the basis of efficiency could choose to leave out routes or services that were provided for social equity reasons and hence for which passengers would not be expected to be willing to pay an efficient fare. In the context of rail this can be considered through whether to include NSW Trains in the estimates of costs per passenger trip or passenger kilometre, or only use data from Sydney Trains, which covers the relatively more dense metropolitan network. We do not have access to cost information at a more disaggregated level, such as by line or for peak and off-peak services.

The differences in costs on a passenger kilometre or trip basis using Sydney Trains or also including NSW Trains are set out in table 2.36. On a per passenger kilometre basis, NSW Trains has lower operating costs. On a per passenger trip basis, NSW Trains has higher operating costs. This makes a slight difference to combined costs, given that Sydney Trains has many more passengers than NSW Trains.

Our recommendation is that costs for the combined Sydney Trains and NSW Trains should be used. This is because it is not clear that costs per passenger metrics indicate substantially different levels of allocative efficiency. Further, a large part of the costs of NSW Trains (about 60 per cent) are contracted to Sydney Trains. The extent to which these inter-entity arrangements are reflective of costs is not known.

2.36 Cost metrics using Sydney Trains or both NSW Trains and Sydney Trains 2019

	Sydney Trains	Combined
Actual cost metrics		
$/passenger trip	5.35	6.27
$/passenger km	0.38	0.37
Efficient cost metrics		
$/passenger trip	4.03	4.91
$/passenger km	0.29	0.29

Note: Metrics are for total operating costs. The same efficiency adjustment has been applied to Sydney Trains and NSW Trains costs.
Source: The CIE; Sydney Trains and NSW Trains.

These costs reflect standards required for services provided, such as reliability and crowding. We have not considered the extent to which these standards appropriately reflect customer preferences.

Dynamic efficiency of services

Costs for Sydney rail services have increased in real terms over time until 2011/12. Since then costs have stabilised in nominal terms and decreased in real terms. Sydney Trains and NSW Trains forecasts that these costs will decline over the forecast period.

IPART has noted over many years the need to increase the efficiency in the provision of rail services. There have been improvements in the costs of some parts of the service, particularly in station staffing. There has also been a program to improve efficiency of services beginning in 2012/13, which Sydney Trains estimates has achieved efficiency reductions of approximately $300 million (net of the costs of the reforms). (These have not been verified in our study but are consistent with the slowing growth in costs compared to growth from 2007 to 2012.)

Forecasts provided by Sydney Trains and NSW Trains indicate an expectation of continued improvement in efficiency over time, and, as noted in table 2.32 above, move services towards efficient costs. Further reforms that are planned over the next five years include improving train driver utilisation, which is low compared to other rail operators. Our findings suggest that there will continue to be inefficiencies, partly related to constraints on operators such as station staffing requirements and crewing, by 2018/19.

In general, the incentives for a Government run business to make decisions to reduce costs are weaker than for a private company. Fare setting itself will have no impact on the technical efficiency of service provision. Competitive contracting for other modes (bus and ferry) does appear to have reduced costs and provided services more efficiently than under a Government operated model, as is used for rail services.

Allocation of costs as fixed costs, capacity costs and usage costs

In order to determine fares, IPART will allocate costs to peak and off-peak periods and as fixed costs, per trip costs or per kilometre costs. Our assessment of the allocation of costs is set out in the table below.

2.37 Allocation of cost types

Operating cost category	Allocation	Trip or km based
Infrastructure maintenance	Fixed	Na
Rolling stock maintenance	Usage/Capacity	Kilometre
Customer interface	Usage/Capacity	Trip
Train operations	Usage	Kilometre
Overheads	Usage	Trip/km in proportion to other costs

Source: The CIE.

3 Bus services

Summary of findings

We estimate that in 2018/19, across the whole metropolitan and outer-metropolitan network:

- the technically efficient cost per service kilometre is $6.28 (in real 2014/15 dollars);
- the efficient cost per passenger is $4.75; and
- the efficient cost per passenger (straight line) kilometre is $0.85 (table 3.1).

We estimate that for 2018/19, a 11 per cent reduction in costs across the metropolitan and outer-metropolitan bus network would be necessary to achieve technically efficient costs (table 3.1). If realised, this would represent a saving of around $134.6 million (in 2014/15 dollars) to the NSW Government.

Our estimate of the efficient cost for each region is based on the average of the privately operated metropolitan regions that went to competitive tender, adjusted for different average speeds across contract regions (which are largely outside the control of the operator).

- Although STA has made significant cost savings over recent years, we estimate it would need to reduce the average cost per service kilometre by a further 19.8 per cent to achieve the efficient cost benchmark.
- Operators in outer-metropolitan areas would need to reduce costs by around 9.8 per cent to achieve the benchmark.

3.1 Actual and efficient cost estimates (real 2014/15 dollars)

	2014/15			2018/19		
	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark	Estimated cost	Estimated efficient costs	Efficiency gains to achieve benchmark
	$	$	Per cent	$	$	Per cent
Non-STA metro						
Average cost per service km	5.69	5.69	0.0	5.82	5.82	0.0
Average cost per passenger	5.52	5.52	0.0	5.65	5.65	0.0
Average cost per passenger km	0.71	0.71	0.0	0.73	0.73	0.0
STA						
Average cost per service km	9.12	7.04	- 22.8	8.99	7.22	- 19.8
Average cost per passenger	4.81	3.71	- 22.8	4.74	3.80	- 19.8

	2014/15			2018/19		
	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark	Estimated cost	Estimated efficient costs	Efficiency gains to achieve benchmark
Average cost per passenger km	1.07	0.83	- 22.8	1.06	0.85	- 19.8
Outer-metro						
Average cost per service km	5.87	5.25	- 10.6	5.95	5.36	- 9.8
Average cost per passenger	7.57	6.77	- 10.6	7.67	6.91	- 9.8
Average cost per passenger km	1.80	1.61	- 10.6	1.82	1.64	- 9.8
Total						
Average cost per service km	7.04	6.14	- 12.8	7.06	6.28	- 11.0
Average cost per passenger	5.33	4.64	- 12.8	5.34	4.75	- 11.0
Average cost per passenger km	0.95	0.83	- 12.8	0.96	0.85	- 11.0

Source: Transport for NSW, The CIE.

Services and organisations covered

All scheduled regular metropolitan and outer-metropolitan bus services are provided under contracts between TfNSW and a mix of public and private operators. The current contract arrangements were first introduced in 2005, in response to a 2004 *Review of Bus Services in NSW*, chaired by former NSW Premier Barrie Unsworth (the Unsworth Review).

Key reforms following the Unsworth Review included:

- consolidating the number of regions from 87 to 15 (this has since been reduced to 14 with region 11 having been merged into a larger region)
- one contract per region for bus services in the Sydney metropolitan regions, as well as Newcastle, Wollongong, the Central Coast and the Blue Mountains (outer metropolitan regions).

All routes and timetables are specified in the contracts. Payments to the operator are based on the services provided as specified in the contract. The services provided can be varied during the contract period, with rates for variations also specified in the contract. Any fare revenue is deducted from the monthly contract payment, which effectively means that all fare revenue is returned to Transport for NSW.

The initial contracts were negotiated with operators and were for a term of seven years. Following completion of the initial contracts:

- revised contracts for eight privately operated metropolitan bus regions were put to competitive tender
- revised contracts for two other privately operated regions (including a region amalgamated from two previous smaller regions) were negotiated, as the incumbent

operators met preconditions in relation to transferring control of their fleet and depots to Transport for NSW[21]

- new contracts were negotiated for the four metropolitan regions operated by the publicly owned STA
- the 11 private and 1 STA outer metro contracts were negotiated.

Table 3.2 summarises the current operator for each region and the procurement arrangement for the current contract.

3.2 Metropolitan and outer-metropolitan bus contract regions

Region	Operator	Private or public	Procurement arrangement
Metropolitan			
SMBSC 1	Busways Blacktown Pty Ltd	Private	Tender
SMBSC 2	Ingleburn Bus Services Pty Ltd	Private	Tender
SMBSC 3	Transit (NSW) Liverpool Pty Ltd	Private	Tender
SMBSC 4	Hillsbus Co Pty Ltd	Private	Tender
SMBSC 5	Punchbowl Bus Company Pty Ltd	Private	Tender
SMBSC 6	State Transit Authority of NSW	Public	Negotiated
SMBSC 7	State Transit Authority of NSW	Public	Negotiated
SMBSC 8	State Transit Authority of NSW	Public	Negotiated
SMBSC 9	State Transit Authority of NSW	Public	Negotiated
SMBSC 10	Transdev NSW Pty Ltd	Private	Negotiated
SMBSC 12	Transdev NSW Pty Ltd	Private	Tender
SMBSC 13	Transdev NSW Pty Ltd	Private	Negotiated
SMBSC 14	Forest Coach Lines Pty Ltd	Private	Tender
SMBSC 15	Neville’s Bus Service Pty Ltd	Private	Tender
Outer-metro			
OMBSC 1	Rover Coaches	Private	Negotiated
OMBSC 2	Hunter Valley Buses	Private	Negotiated
OMBSC 3	Port Stephens Coaches	Private	Negotiated
OMBSC 4	Hunter Valley Buses (Toronto)	Private	Negotiated
OMBSC 5	State Transit Authority of NSW	Public	Negotiated
OMBSC 6	Busways Central Coast Pty Ltd	Private	Negotiated

21 New South Wales Auditor-General’s Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 6.

Region	Operator	Private or public	Procurement arrangement
OMBSC 7	The Entrance Redbus Service Pty Ltd	Private	Negotiated
OMBSC 8	Blue Mountains — Blue Mountains Bus Co.	Private	Negotiated
OMBSC 9	Wollongong North — Greens Northern Coaches	Private	Negotiated
OMBSC 10	Wollongong South — Premier Illawarra Pty Ltd	Private	Negotiated
OMBSC 11	Nortale Pty Ltd	Private	Negotiated
OMBSC 12	Seapost (Dions), Green R and Vagone	Private	Negotiated

Source: Transport for NSW.

For the remainder of this chapter, we use the following groupings:

- Non-STA metropolitan regions — this includes SMBSC regions 1-5, 10 and 12-15
- STA metropolitan regions — this includes SMBSC regions 6-9
- Outer-metropolitan regions — this includes all outer-metropolitan regions, including the STA-operated region (OMBSC region 5), as well as the privately operated outer-metropolitan regions OMBSC regions 1-4 and 6-12).

Historical costs

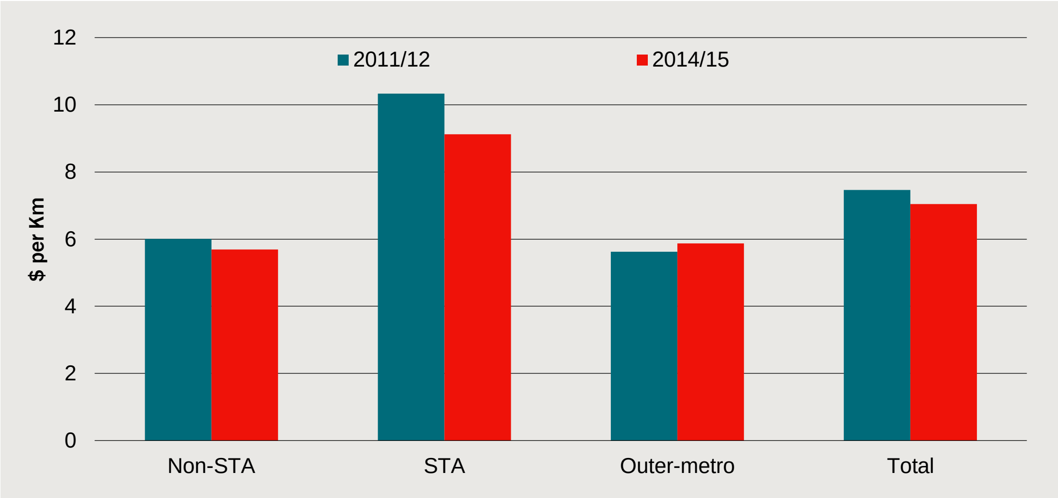
The costs of bus services that are part of contractual arrangements with operators include:

- salaries and wages
- contract bus maintenance and repairs
- fuel and oil
- various items to cover the principal and interest on existing and new buses
- a contract depot ownership charge
- passenger incentive payments
- KPI credits
- other.

In nominal terms, cost per service kilometre are estimated to have declined between 2011/12 and 2014/15 (chart 3.3). During this period, the previous contracts expired and the new contracts were either negotiated or put to tender (see above).

- The largest cost savings have been achieved in the STA-operated metropolitan regions, although costs remain highest in those regions.
- Cost savings were also achieved in the privately-operated metropolitan regions.
- In contrast to the metropolitan regions, costs increased in the outer-metropolitan regions.

3.3 Cost per service kilometre



Data source: Transport for NSW, The CIE.

Application of framework for technical efficiency

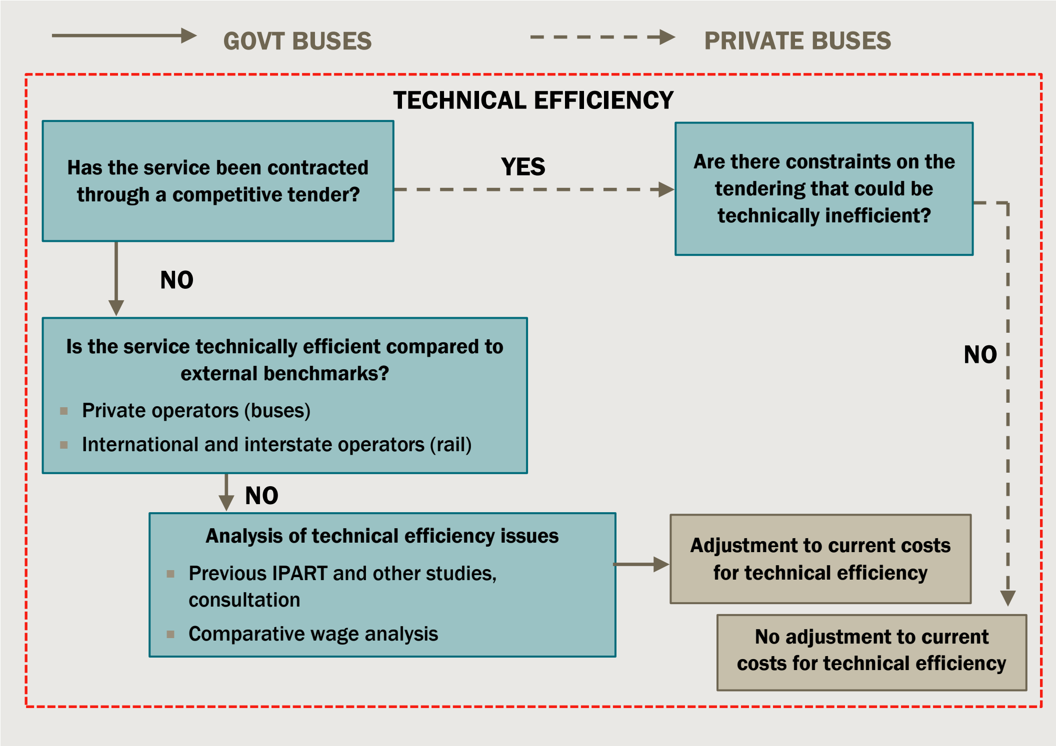
Chart 3.4 shows the framework for assessing technical efficiency applied to buses. As discussed above, eight of the metropolitan bus contract regions were subjected to a competitive tender process.

- A potential constraint on the competitiveness of the tendering process is that ownership of the existing bus fleet and depot(s) could give the incumbent operator an advantage over competitors.
  - However, TfNSW noted that all buses purchased under the contract arrangements must be sold to TfNSW if the operator becomes insolvent or loses the contract. As the number of buses purchased under these arrangements has increased over time, obtaining access to sufficient buses to provide the required services has become less of a barrier to competitors.
  - TfNSW noted that obtaining access to a depot is not currently a barrier to market entry, it could potentially become so in the future.
- The fact that four incumbent operators lost the contract following the tendering process indicates a high level of competition.
- Furthermore, a recent performance audit of Sydney metropolitan bus contracts by the NSW Auditor-General found that TfNSW adopted a robust process in implementing the purchaser-provider model and its decisions were justified.[22]

Based on this framework, it is reasonable to assume that the costs paid by TfNSW to operators in the eight contract regions that were subjected to a competitive tender process are technically efficient.

22 New South Wales Auditor-General's Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 12.

3.4 Application of framework for buses



Data source: The CIE.

On the other hand, the contracts with STA did not go to tender; this reflected a government decision that STA should remain in public ownership and retain its contract regions.[23] According to the Auditor-General's performance audit, STA and TfNSW have agreed on efficiency savings to be achieved, which have been reflected in the negotiated price. Nevertheless, the Auditor-General notes that the contract price for the four STA regions may not reflect true market rates (or technically efficient costs) because it was not market tested through competitive tendering.[24]

The technical efficiency of private operators with negotiated contracts is less clear. This includes two metropolitan contracts regions (regions 10 and 13) and all outer metropolitan contracts. The Auditor-General's performance audit noted that the contracts were negotiated with private operators in two metropolitan regions; however, does not explicitly exclude these regions when making the general comment that the process was robust and the decisions were justified. The Auditor-General's performance audit covered only metropolitan contracts; outer-metropolitan contracts were not included.

23 New South Wales Auditor-General's Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 12.

24 New South Wales Auditor-General's Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 13.

Benchmarking of service costs

Although it is reasonable to assume that the service costs in the regions that were competitively tendered are efficient, the technical efficiency of the service costs in those regions that were not competitively tendered needs to be tested. The mix between regions that were competitively tendered and negotiated provides an opportunity to benchmark the regions where the contracts were negotiated against the competitively tendered regions.

Cost per kilometre

One indicator of technical efficiency is the cost per service kilometre. There are various approaches to measuring cost per service kilometre, including the following.

- Average cost — this measure is calculated using gross contract payments to operators in 2014/15 as the measure of cost, divided by total service kilometres. This measure therefore includes all costs, including bus and depot-related costs. These costs are generally considered to be capital, rather than operating costs. However, they are considered 'capacity costs' under IPART's methodology.
- Average cost (ex fleet payments) — this measure uses gross contract payments to operators in 2014/15 less various fleet-related payments specified in the contract as the measure of cost. As above, this is divided by total service kilometres. This is closer to a traditional measure of operating costs (although includes depot-related payments).
- Marginal cost based on prices for contract variations — the contracts specify the rates at which operators are paid for service variations, with different rates applying at different times. These variation rates include both a cost per service kilometre and cost per service hour. They do not include the cost of any necessary fleet expansion. These costs can therefore be interpreted as the (short run) marginal operating cost per service kilometre and service hour. We convert these variation rates to a single measure of cost per kilometre for each time period using the average speed in each region[25] (although the average speed will vary at different time periods) (table 3.5).

3.5 Marginal operating costs per service kilometre 2014-15

	Cost per service km[a]	Cost per service hour[a]	Average speed	Hour costs	Total cost
	$ per km	$ per hour	km/hour	$ per km	$ per km
Non-STA metropolitan	1.19	45.51	25.8	1.76	2.95
STA metropolitan	1.43	57.93	18.7	3.10	4.53
Outer metropolitan	1.29	46.64	29.2	1.60	2.89
Total	**1.27**	**47.94**	**22.9**	**2.09**	**3.37**

[a] Based on a simple average across regions using rates for 5am to midnight on weekdays.

Source: Transport for NSW, The CIE.

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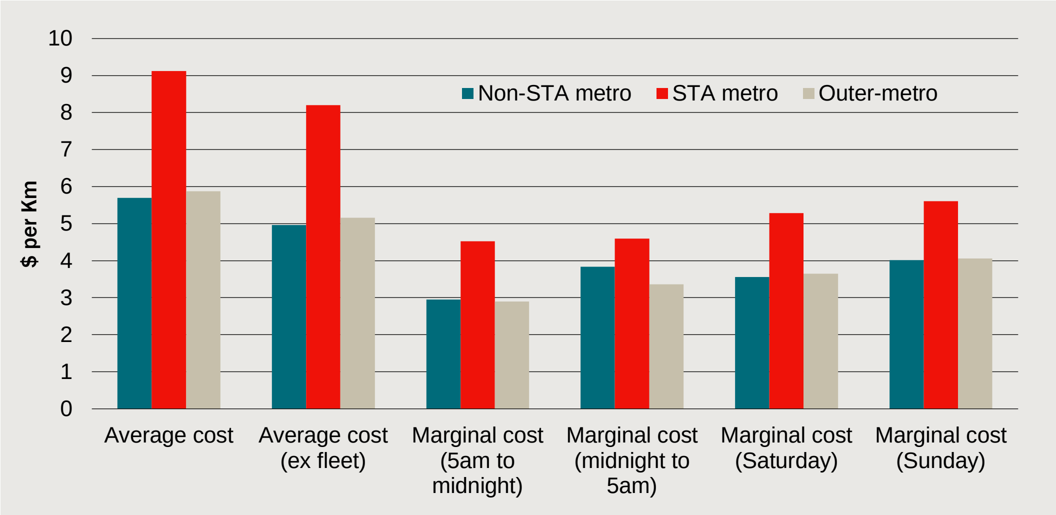
25 The average speed is calculated from the total service kilometres in each region divided by total service hours.

Chart 3.6 compares each of the above measures across the STA metro regions, the non-STA metro regions and the outer-metro regions.

3.6 Cost per kilometre



Data source: Transport for NSW, The CIE.

In general, costs in STA regions are significantly higher than in the non-STA metro regions.

- Based on the average cost measures, STA costs per service kilometre are around 60 per cent higher than the non-STA metro regions when fleet-related payments are included and around 65 per cent higher when fleet-related payments are excluded.
- The difference in costs are less pronounced based on the marginal cost measures, mainly due to these measures taking into account differences in speed across regions. Nevertheless, marginal operating costs are between 20 per cent (during the midnight to 5am period on weekdays) and 53 per cent (during 5am to midnight periods on weekdays) higher in the STA regions than in non-STA regions.

Costs in outer-metropolitan regions were closer to the privately operated metropolitan regions.

- Average costs were 3-4 per cent higher in outer-metropolitan regions, compared to the privately operated regions.
- The comparison of the marginal cost measures were more variable. Compared to the privately operated metropolitan regions, the marginal cost per service kilometre in the outer-metropolitan regions ranged between 3 per cent higher (on Saturdays) and 12 per cent lower (between midnight and 5am on weekdays).

A limitation of average cost per service kilometre as a benchmark of technical efficiency is that there may be legitimate variation in the technically efficient costs across contract regions. One reason why technically efficient costs may vary is that there are likely to be different levels of road congestion, number of stops and passengers across regions. A region with greater traffic congestion, more passengers and more stops will decrease the number of service kilometres that can be delivered per hour and therefore increase the cost per kilometre. Slower average service speeds is one factor explaining higher costs in the STA-operated metropolitan regions.

Comments provided by STA also suggest that increased congestion:

- increases costs associated with layovers
- results in more accidents, increasing the costs associated with repairs, as well as higher compulsory third party (CTP) insurance premiums.

Other factors identified by STA that mean their technically efficient costs are higher include:

- a higher share of late night and weekend services when higher labour costs apply
- differing bus fleet composition — STA argue that the composition of its bus fleet as a result of decisions made by government has resulted in higher costs (for example, there are additional costs associated with compressed natural gas (CNG) buses).

The share of services provided during peak times could also affect technically efficient costs, because peak demand will be a key factor determining the size of each operator's bus fleet. Operators that provide a higher share of their services during peak times will likely have lower bus utilisation rates during non-peak times and therefore higher average costs (although this would not affect the ex fleet cost measure). Driver shift arrangements may also be harder to manage in regions with relatively higher peaks, resulting in higher driver payments. We note that the data provided by TfNSW indicates that a slightly higher share of services are provided in peak periods in the privately operated metropolitan regions, compared to the STA-operated regions. Not accounting for this may somewhat understate the cost inefficiency of STA in this case.

Estimating technically efficient costs per kilometre

As discussed above, there are a range of factors that mean that the technically efficient costs could vary significantly across regions. Based on the data we have available, we can adjust the benchmarks for:

- different average speeds across regions
- the share of services on weekends.

We have insufficient information available to adjust the benchmarks for the other factors mentioned above. Nevertheless, we note that:

- the average cost (ex fleet payments) measure will partly account for differences in the fleet composition, although it will not account for any differences in operating costs (for example, there may be differences in operating costs for CNG and/or articulated buses)
- the evidence on the impact of congestion on road accidents appears to be mixed.

Technically efficient marginal costs

Adjusting the marginal cost benchmark for speed is relatively straightforward. We simply apply the average hourly and kilometre rates across the regions that went to tender to the average speed for each region (table 3.7). This analysis suggests that once differences in average speeds are taken into account:

- STA would need to reduce marginal operating costs by around 20 per cent to achieve the benchmark; and
- operators in outer-metropolitan regions would need to reduce costs by around 5 per cent to achieve the benchmark.

This is broadly consistent with the findings using average costs.

3.7 Marginal operating costs compared to benchmark

	Cost per kilometre at contract rate	Cost per Kilometre at benchmark rate	Efficiency improvement to achieve benchmark
	$ per Km	$ per Km	Per cent
Private metropolitan	2.95	2.95	0.00
STA metropolitan	4.53	3.62	-19.95
Outer metropolitan	2.89	2.75	-4.93
Total	**3.37**	**3.18**	**-5.67**

Source: Transport for NSW, The CIE.

While these measures provide some indication of technically efficient costs, TfNSW note that variation rates are not a significant factor when awarding contracts, suggesting we should be cautious about inferring these rates are technically efficient. This implies that the average cost measures are likely to be a better measure of technically efficient costs.

Technically efficient average costs

Adjusting the average cost estimates for differences in speed across regions is less straightforward because the split between kilometre-based costs and hour-based costs is not known with certainty.

- The benchmark used to estimate efficient cost is the average across the privately operated regions that went to tender (see table 3.2 above). As discussed above, the key assumption underpinning the benchmarking exercise is that contract regions that went to tender are operating at efficient costs. This implies that even those regions that went to tender that are above the average of those regions (by definition some must be above average) are still assumed to be operating at efficient costs.
- While the share of costs affected by time is not known with certainty, our adjustments for each region are based on the share of hour-based costs in the total variation cost in each region.

In addition, regions that have a higher share of total service hours on weekends, when higher labour costs apply could have higher overall costs. We estimate that:

- costs in STA regions could be around 0.9 per cent higher (see table 3.8) due to a higher share of services on weekends based on the following.
  - The share of total service hours during weekends in STA regions (18.3 per cent) is 4.5 percentage point higher than in non-STA regions (13.8 per cent).

  - total operating costs being around 20 per cent higher, based on the average weekend variation rates (averaged across Saturdays and Sundays) being around 20 per cent higher than weekday rates (during the period between 5am and midnight), assuming average speeds for each regions
- costs in outer-metropolitan regions could be around 0.3 per cent higher due to a higher share of services on weekends based on:
  - the share of total service hours during weekends in outer-metropolitan regions (14.7 per cent) is 0.8 percentage point higher than in non-STA regions
  - total operating costs being around 33 per cent higher, based on the average weekend variation rates being around 33 per cent higher than weekday rates, assuming average speeds for each regions.

3.8 Increased costs due to weekend services

	Share of services during weekends	Comparison with non-STA metro	Additional cost during weekends	Total additional cost
	Per cent	Percentage points	Per cent	Per cent
Non-STA metro	13.8	0.0	28.3	n.a.
STA metro	18.3	4.5	20.1	0.9
Outer-metro	14.7	0.8	33.3	0.3

Source: CIE based on data provided by TfNSW.

Having made the adjustments identified above suggests the following.

- The non-STA metropolitan regions are broadly operating at efficient costs — this includes the regions that went to tender (which are assumed to be operating at efficient costs) and those that were negotiated, which are operating close to the efficient cost benchmark.
- The STA regions would need to reduce the average cost per service kilometre to achieve the efficient cost benchmark by 22.8 per cent for 2014/15.
- The outer-metropolitan regions would need to reduce the average cost per kilometre by around 10.6 per cent to achieve the efficient cost benchmark for 2015.

Excluding fleet-related contract payments:

- STA would need to reduce costs in metropolitan regions by around 25.5 per cent to achieve efficient costs
- operators in outer-metropolitan regions would need to reduce costs by around 12 per cent to achieve efficient costs.

3.9 Actual and efficient cost estimates — 2014/15

	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark
	$	$	Per cent
Average cost			
Non-STA metro	5.69	5.69	0.0
STA metro	9.12	7.04	- 22.8
Outer-metro	5.87	5.25	- 10.6
Total	**7.04**	**6.14**	**- 12.8**
Average cost (ex fleet payments)			
Non-STA	4.96	4.96	0.0
STA	8.20	6.11	- 25.5
Outer-metro	5.16	4.54	- 12.0
Total	**6.24**	**5.33**	**- 14.6**

Source: Transport for NSW, The CIE.

More than half of the inefficiency in outer-metropolitan regions can be attributed to OMBSC Region 5 operated by STA, although the average costs in several privately operated outer-metropolitan regions also exceed the efficient cost benchmark. STA outer metropolitan operations would have to reduce costs by more than 20 per cent to meet the efficiency benchmark. The measured level of inefficiency is substantially higher for STA's operations in OMBSC Region 5 than for other outer metropolitan bus regions.

Specific constraints to technical efficiency

The main constraint to achieving technical efficiency is the NSW Government decision not to subject all regions to a competitive tender process.

- The available data suggests that STA provides services less efficiently than private operators that were subject to a competitive tender.
- The evidence also suggests that the outer-metropolitan (that were not subject to competitive tender) were less efficient than the market-tested metropolitan regions.

As discussed above, another possible constraint on technical efficiency is the competitiveness of the tendering process. In particular, ownership of the existing bus fleet and depot(s) could have given the incumbent operator an advantage over competitors. This is not a criticism of the tender process, which the Auditor-General described as robust.[26] Nevertheless, any advantage enjoyed by incumbent operators means that there is a possibility that the tender process did not achieve efficient costs. TfNSW noted there was a competitive field in all contract regions and in several regions, the incumbent

26 New South Wales Auditor-General's Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 12.

operator lost the contract. We do not therefore consider that this is a significant constraint to contracted costs representing efficient costs.

Allocative efficiency of services

A service is considered to be allocatively inefficient if the marginal benefits of providing the service are lower than the marginal costs of providing the service. For buses, the marginal cost of providing an additional service will depend on whether the additional service is at a peak time or a non-peak time.

- Additional services during peak periods will generally require an expansion to the fleet. The marginal cost of the additional peak service will therefore include the cost of the additional bus, plus the additional operating costs, including driver labour, fuel, maintenance and cleaning.
- By contrast, additional services during non-peak periods will generally involve increasing the utilisation of the existing fleet. The marginal cost of the additional non-peak service would therefore include only the associated operating costs, including driver labour, fuel, maintenance and cleaning.

The marginal benefit of each additional service includes:

- the private benefit to passengers — this includes fare revenue plus consumer surplus
- any external impacts, such as reductions in car congestion.

As the service routes and timetables are largely set by TfNSW (although TfNSW noted that operators have an opportunity to offer two tender improvement options), allocative efficiency is mostly outside of the operator's control. The service planning framework is set out in:

- the *Integrated Public Transport Service Planning Guidelines* for the Sydney metropolitan regions
- the *Outer-metropolitan Service Planning Guidelines* for outer-metropolitan regions.

Some of the minimum service guidelines that could potentially result in allocatively inefficient services being run are summarised in table 3.10.

3.10 Service planning guidelines

	Metropolitan regions	Outer-metropolitan regions
Coverage	Service coverage guidelines for all modes are: ▪ On weekdays, 90 per cent of households to be within 400m of a bus stop, ferry wharf, light rail station or train station between 6am and 10pm. ▪ On Saturdays, 90 per cent of households to be within 400m of a bus stop, ferry wharf, light rail station or train station between 9am and 6pm ▪ On Sundays and public holidays, 90 per cent of households to be within 800m of a bus stop, ferry wharf, light rail or train station between 9am and 6pm.	Typical walking distance criteria for bus routes in built-up areas are between: ▪ 400m during the daytime ▪ 800m during the night.

	Metropolitan regions	Outer-metropolitan regions
Service frequency	For buses minimum service frequency guidelines depend on time of day and whether the service is a Mass Transit Network, Intermediate Transit Network or Local Transit Network. Minimum service frequencies for Mass Transit and Intermediate Transit networks are as follows: ▪ Weekday pre-peak (5am to 6am) — 15-30 minutes for Mass Transit Network and 30 minutes for Intermediate Transit Network ▪ Weekday peak (6am to 9am and 3pm to 6pm) — 5-10 minutes for Mass Transit Network and 10 minutes for Intermediate Transit Network ▪ Weekday inter-peak (9am to 3pm) — 10 minutes for Mass Transit Network and 15 minutes for Intermediate Transit Network ▪ Weekday early evening (6pm to 10pm) — 10-15 minutes for Mass Transit Network and 15-30 minutes for Intermediate Transit Network ▪ Weekday late night (10pm to midnight) or weekend/public holiday night (7pm to 10pm) — 15-30 minutes for Mass Transit Network and 30-60 minutes for Intermediate Transit Network ▪ Weekday early morning (midnight to 5am) and weekend early morning (10pm to 7am) — as required ▪ Weekend and public holidays (7am to 7pm) — 15 minutes.	Services are designated as either regional, district or local. ▪ For regional routes (routes that link residential areas to the nearest designated centre, are direct and frequent and meet several other criteria), frequency should be equal or better than: – 60 minutes at pre-peak times, night time and daytime during weekends – 30 minutes during peaks and inter-peak ▪ For district routes (routes that link residential areas to the nearest strategic transport corridor, or another mode or node, that operates to the nearest designated centre), frequency should be: – 60 minutes during peaks, inter peak and Saturday daytime periods – 120 minutes during Sunday daytime. ▪ For local and other routes, frequency should be 120 minutes in inter peak periods (or as required by TfNSW).

Source: Transport for NSW, *Integrated Public Transport Service Planning Guidelines: Sydney Metropolitan Area*, December 2013 and NSW Transport and Infrastructure, *Outer Metropolitan Service Planning Guidelines*, November 2009.

Identifying specific routes or services that are allocatively inefficient would be a highly resource and data-intensive process that is beyond the scope of this exercise. Nevertheless, comparing the average cost per passenger across regions provides some insights into regions that are likely to have a high proportion of allocatively inefficient services (chart 3.11). One major data caveat is that STA have been unable to provide actual patronage data since the Opal card was introduced. Recent patronage data from STA are therefore estimates.

Nevertheless, the available data suggests the cost per passenger varies significantly across regions. These passenger estimates include school children travelling under the School Student Transport Scheme. The estimated cost per passenger is:

- lowest in the STA regions due to higher patronage estimates
- highest in outer-metropolitan regions.

3.11 Cost per passenger trip (actual)

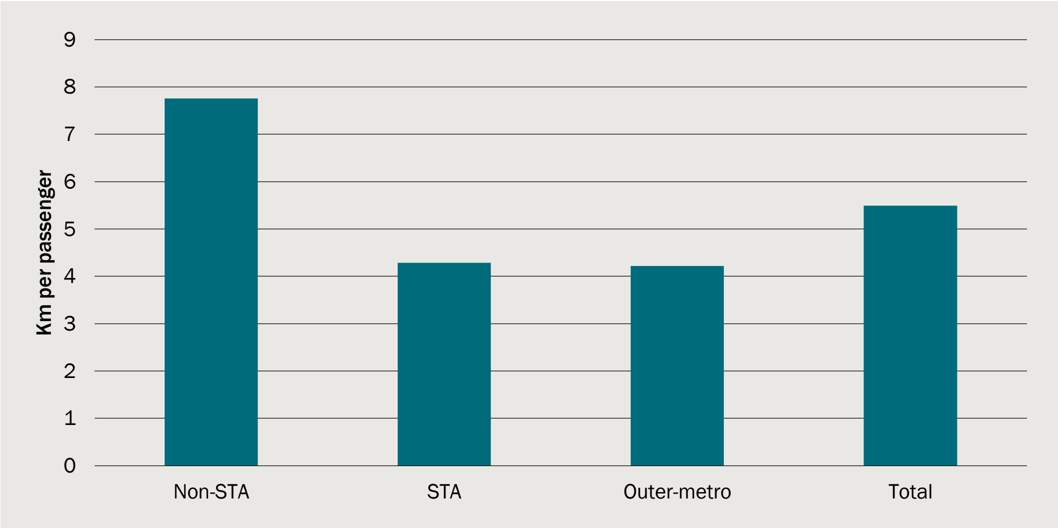
Data source: Transport for NSW, The CIE.

We also estimate the average cost *per straight line passenger kilometre*, using Opal card data over the period from 4-25 May 2015, to estimate the average straight line distance travelled per passenger. There are several caveats to the Opal card data, including the following.

- The Opal card data measures **the straight line distance** between the where the passenger taps on and the point where the passenger taps off, rather than the distance actually travelled. It is therefore not directly comparable with the service kilometre data. This may be the relevant measure for IPART if fares are based on straight line distances.
- The Opal card data does not cover all trips as some passengers continue to use paper tickets.
- Where passengers fail to tag on or tag off, the trip is recorded as zero distance.

Ignoring the trips recorded as zero distance, the Opal card data suggests that the average passenger trip in privately operated regions is around 8 km, compared with around 4 km in STA-operated metropolitan regions and outer-metropolitan regions (chart 3.12). This discrepancy between privately operated regions and STA and outer-metropolitan regions is largely due to contract region 4, operated by Hillsbus; Opal card data suggests the average trip in this contract region is arounod 16 Km, which would reflect the Hillsbus services to North Sydney and the CBD (see Appendix B for more details).

3.12 Average straight line distance per passenger

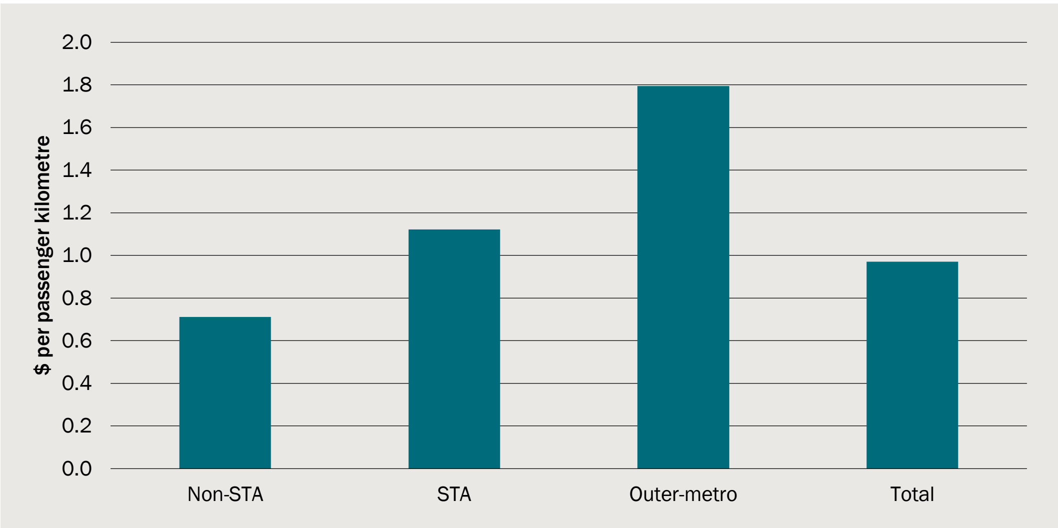


Data source: Opal card data provided by Transport for NSW, The CIE.

Putting this information together suggests that the average cost per passenger kilometre is $0.97 across the whole metropolitan and outer-metropolitan network (chart 3.13). The cost per passenger kilometre varies significantly across operators.

- The cost per passenger kilometre is highest in outer-metropolitan areas due largely to low patronage relative to other regions.
- Costs are lowest in non-STA metropolitan regions, mainly as a result of the longer average passenger trip.

3.13 Cost per straight line passenger kilometre (actual)



Data source: Transport for NSW, The CIE.

These data suggest that there are likely to be allocatively inefficient services in some regions, particularly in outer-metropolitan regions. Without identifying specific allocatively inefficient services, it is difficult to take this into account in our estimates of efficient costs. Our recommendation is that outer-metro services should not be included in the costs used for setting fares. The differences in Non-STA and STA services on a passenger basis are small and do not provide a compelling argument for excluding one or the other in determining fares.

Dynamic efficiency of services

As costs have decreased over the past three years in nominal terms, this implies that technical efficiency has improved. To a large extent, these cost savings are likely to have been linked to the change to new contracts during the period.

The current contracts for the metropolitan regions will remain in place over IPART's fare period. If a private operator reduces their costs then they will receive higher profits and hence are incentivised to become more efficient. These incentives are likely to be weaker than in a competitive market, because an operator does not face incentives of losing market share or becoming unprofitable, which can drive decisions to improve efficiency. Prices are specified in the contracts, with some inflated using various price measures. Specifically:

- the salaries and wages component is inflated annually (in arrears) based on movements in the total hourly rates of pay excluding bonuses (private and public) in the Transport, postal and warehousing
- the contract bus maintenance and repairs are inflated using the CPI (all groups) for Sydney
- the fuel and oil component is inflated monthly using the monthly average mobile terminal gate price
- the contract depot ownership charges are inflated using the CPI (all groups) for Sydney.

In adjusting for changes in the price of labour there are no explicit offsetting productivity adjustments to encourage operators to improve technical efficiency over the life of the contract. The reason wages typically increase at a faster pace than general inflation (as reflected by the CPI) is because labour becomes more productive over time.

The *State Transit Authority Bus Operations Enterprise (State) Award 2015* prescribes wage increases of 2.38 per cent from 1 January 2015; 2.5 per cent from 1 January 2016; and 2.5 per cent from 1 January 2017. As these wage increases are broadly in line with the Reserve Bank of Australia's inflation target, they are likely to imply constant wages in real terms, rather than rising real wages. The *State Transit Authority Senior and Salaried Officers' Enterprise (State) Award 2015* has the same increases. It is unknown what proportion of employees fall under these awards, therefore the magnitude of the increase in the salaries component is also uncertain. All private operators must provide increases in wages for their employees at least in line with Award wages.

All of the competitively tendered contracts specify a modest increase in the price for salaries and wages in addition to the indexation. This implies that the contracts allow for rising real labour costs both through wages increasing at a faster pace than in the broader economy and declining labour productivity.

If services levels are held constant for the duration of the contract (variations are dealt with separately), a decline in real salaries and wages would suggest efficiency gains, while an increase would suggest a reduction in efficiency.

By contrast, the STA metropolitan contracts have savings built into the price. This includes:

- agreed savings amounting to around $46.3 million per year by 2015/16 across the four contract regions STA operates..A further $8.4 million per year in costs are transferred elsewhere, meaning that the total cost reduction already built into the contract price amount to $54.6 million per year
- an annual $27 million efficiency dividend specified in the contract.

We understand that these savings have mostly already been achieved and would also be reflected in estimates of future contract payments.

In addition, the contracts with STA identify six review initiatives to be pursued by the Strategic Governance Committee (this is made up of specified TfNSW and operator members). These initiative are as follows:

1 Service Efficiency Management review
2 Fleet Management Maintenance review
3 Depot Maintenance program review
4 Operating Model review
5 Fleet Strategy review
6 CTP Insurance Options review.

Under the contracts with STA any additional savings arising from these reviews can be determined after each one has been completed. The contracts effectively allow the contract price to be varied to reflect any determined savings targets. As noted by the Auditor-General, these governance arrangements do not provide a clear separation of purchaser and provider, with the CEO of STA (the provider) subject to the control and direction of the Secretary of TfNSW, who also controls TfNSW (the purchaser).[27]

Information provided by STA suggests that additional savings of $17.5 million per year to be achieved by 2016/17 have been identified.

Overall, the contracts provide some incentives for operators to improve technical efficiency over time, although these may not be passed through to TfNSW and customers in the medium term. Operators retain some incentive to provide the level of service required in the contract at a lower cost. However, even if the operator does make savings (whilst maintaining the necessary level of service), there is no mechanism for these savings made to be passed onto TfNSW under the current contract arrangements.

In relation to allocative efficiency, variations to the services specified in the contract are identified through a collaborative arrangement between TfNSW and the operator. The contracts all include a review mechanism.

[27] New South Wales Auditor-General's Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 13.

This may involve adding new services and/or removing under-utilised existing services, subject to meeting the minimum service standards set out in the *Integrated Public Transport Service Planning Guidelines* or the *Outer Metropolitan Service Planning Guidelines* (see above).

In relation to removing or re-allocating under-utilised services, the Integrated Public Transport Service Planning Guidelines specify minimum load guidelines of:

- greater than 80 per cent of seated capacity at peak times
- greater than 40 per cent of seated capacity at base times
- greater than 40 per cent of seated capacity during overnight periods.[28]

Where a service operating at a frequency above the minimum frequency fails to meet these minimum load guidelines, the service is reviewed with a view to services being reduced. Various other service performance indicators are also considered when services are reviewed.

The other way operators could improve the allocative efficiency of services is to increase patronage. Increased patronage on an under-utilised services improves the allocative efficiency of that service and may mean that an allocatively inefficient service becomes allocatively efficient.

The contracts provide limited incentive for operators to increase patronage.

- Private operators receive a Passenger Incentive Payment for each additional paid passenger. However, the Passenger Incentive Payment is set at only 5 cents per additional passenger, which provides a limited incentive for operators to generate increased patronage on existing services.
- As noted by the Auditor-General, the STA does not receive the Patronage Incentive Payment.[29] This means there is no incentive for the STA to encourage greater patronage on existing services.

Mechanisms to increase incentives for operators to attract revenue within an integrated fare system could be usefully improved, such as increasing the revenue an operator gains from attracting new passengers through a shadow price on patronage set much higher than the Passenger Incentive Payment.

The contracts also provide limited incentive for operators to monitor the collection of fare revenue and reduce fare evasion. As it applies only to *paid* passengers, the Patronage Incentive Payment provides some incentive for operators to reduce fare evasion. However, the low level of these payments means this incentive is limited. In Victoria, providing revenue-based incentives for rail and tram operators is one factor that has led to reductions in levels of fare evasion.[30]

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28 Transport for NSW, *Integrated Public Transport Service Planning Guidelines: Sydney Metropolitan Area*, December 2013, p. 24.

29 New South Wales Auditor-General's Report: *Performance Audit — Sydney metropolitan bus contracts*, Transport for NSW, 9 September 2015, p. 13.

30 Public Transport Victoria 2015, Victorian official fare compliance series May.

Estimating efficient costs in 2018/19

The benchmarking exercise above suggests that currently (2014/15):

- STA would need to reduce the average cost per service kilometre by around 22.8 per cent to achieve the efficient cost benchmark
- Operators in outer-metropolitan regions would need to reduce the average cost per service kilometre by around 10.6 per cent to achieve the efficient cost benchmark.

However, as discussed above, cost savings are built into the STA contracts, with the possibility open for more to be identified. By contrast, some cost increases are built into most of the contracts for the privately operated regions, particularly those that went to tender. This implies that there will be some convergence in costs by 2018/19, albeit a modest one.

To estimate efficient costs in 2018/19 (in 2014/15 dollar terms):

- we inflate salaries and wages in all contracts by the historical gap between CPI and the WPI measure used to inflate salaries and wages in the contract — over the period since 2010, the annual change in the WPI measure has been around 0.54 per cent higher than the change in the CPI, implying real wage increases of that amount. Over the four years to 2018/19, wages are therefore inflated by 2.15 per cent
- in addition, we inflate the wages and salaries component of the contract price by the prices specified in each contract over that period (except for outer-metropolitan regions where the contracts will have expired).

We also reduce estimated STA costs by an additional $17.5 million to reflect the additional savings identified.

Maintaining the assumption that the competitively tendered contract regions are operating at efficient costs, this implies a modest increase in efficient costs over the period (table 3.14).

For the STA metropolitan regions, the savings identified are estimated to outweigh the indexation arrangements (in real terms) resulting in a modest decrease in real costs. Overall these adjustments make a modest difference to efficiency gains necessary for STA to reach efficient costs, despite significant savings having been built into the STA contracts. This is largely because the (real) savings to labour costs are front-loaded into the first two years of the contract and have therefore already been achieved.

3.14 Actual and efficient cost estimates

	2014/15			2018/19		
	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark	Estimated cost	Estimated efficient costs	Efficiency gains to achieve benchmark
	$	$	Per cent	$	$	Per cent
Non-STA						
Average cost per service km	5.69	5.69	0.0	5.82	5.83	0.0
Average cost per passenger	5.52	5.52	0.0	5.65	5.65	0.0
Average cost per passenger km	0.71	0.71	0.0	0.73	0.73	0.0

	2014/15			2018/19		
	Actual costs	Estimated efficient costs	Efficiency gains to achieve benchmark	Estimated cost	Estimated efficient costs	Efficiency gains to achieve benchmark
STA						
Average cost per service km	9.12	7.04	- 22.8	8.99	7.22	- 19.8
Average cost per passenger	4.81	3.71	- 22.8	4.74	3.80	- 19.8
Average cost per passenger km	1.07	0.83	- 22.8	1.06	0.85	- 19.8
Outer-metro						
Average cost per service km	5.87	5.25	- 10.6	5.95	5.36	- 9.8
Average cost per passenger	7.57	6.77	- 10.6	7.67	6.91	- 9.8
Average cost per passenger km	1.80	1.61	- 10.6	1.82	1.64	- 9.8
Total						
Average cost per service km	7.04	6.14	- 12.8	7.06	6.28	- 11.0
Average cost per passenger	5.33	4.64	- 12.8	5.34	4.75	- 11.0
Average cost per passenger km	0.95	0.83	- 12.8	0.96	0.85	- 11.0

Source: Transport for NSW, The CIE.

These estimates suggest the following:

- STA would need to improve efficiency by 19.8 per cent by 2018/19 to achieve efficient costs;
- outer-metropolitan operators would need to improve efficiency by 9.8 per cent to achieve efficient costs. This mainly reflects STA operations improving efficiency by more than 20 per cent and also some smaller efficiency gains for other outer metropolitan bus operators; and
- this would be a 11 per cent improvement in costs across the metropolitan and outer-metropolitan bus network.

4 Ferry services

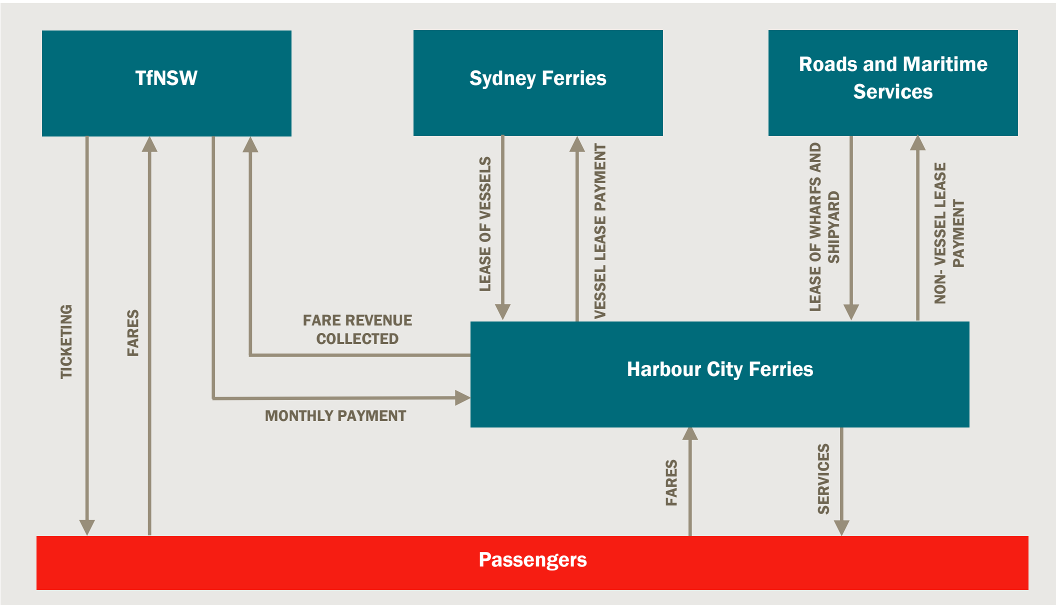
Services and organisation covered

Ferry services for which IPART determines fares are:

- Sydney Ferry network services provided by Harbour City Ferries under a contract arrangement with Transport for NSW, Sydney Ferries and Roads and Maritime Services
- the Stockton ferry service between Stockton and Newcastle operated by Newcastle Buses and Ferries.

The structure of the provision of ferry services in Sydney is set out in chart 4.1.

4.1 Structure of provision of ferry services – Harbour City Ferries



Data source: The CIE.

Application of framework for technical efficiency

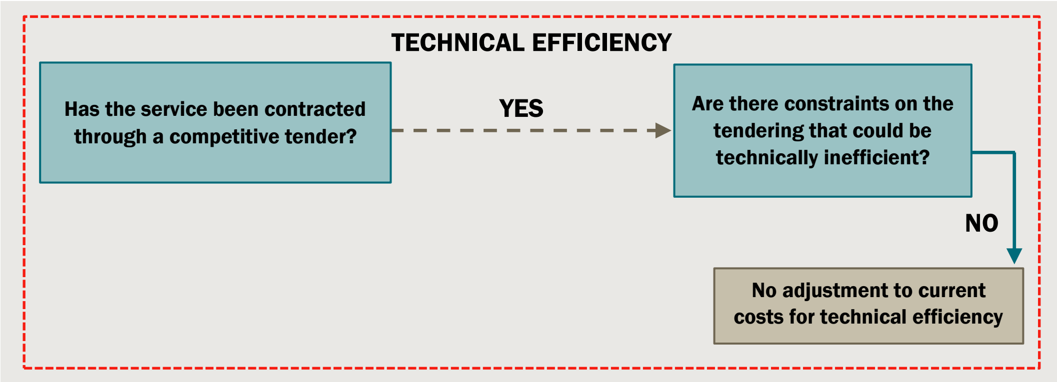
The approach taken for the assessment of ferry services is set out in chart 4.2.

- Ferry services provided on the Sydney Ferries network have been privately contracted to Harbour City Ferries through a competitive tender. The costs to provide the specific services of the contract can therefore be considered to be technically efficient (except where constraints in the contract limit technical efficiency or if costs specified in the contract by the NSW Government are not cost-reflective) by virtue of the competitive contracting process.[31]

- During the first two years of the contract period (2012-13 and 2013-14), Harbour City Ferries was constrained by the contract to maintain staff levels and staff remuneration packages that existed under the previous contract with Sydney Ferries.
- Harbour City Ferries service provision cost is approximately in line with efficient costs of ferry services as estimated by LEK in 2012 for IPART.

For these reasons we consider that the efficient cost for providing ferry services in Sydney is in line with the current contract costs incurred by Harbour City Ferries. This is discussed in greater detail in the sections below.

4.2 Application of framework for ferries



Data source: The CIE.

Contract for provision of Sydney ferry services

Harbour City Ferries (HCF) was awarded the contract to provide Sydney ferry services following a competitive tender. The contract is a seven year franchise agreement between HCF and TfNSW for the provision of Sydney ferry services between July 2012 to July 2019. Key conditions of the contract are:

- the NSW Government continues to own the vessel fleet and Balmain shipyard, with the assets leased to HCF with the requirement that assets are returned to Sydney Ferries at the end of the contract in the same condition as they were when leased;
- the NSW Government maintains control over fares, service levels and timetabling; and
- existing enterprise bargaining agreements held by employees who transferred from Sydney Ferries to Harbour City Ferries were required to remain in place for the first two years of the contract.

31 HCF was the selected bidder following a competitive selection process which included 29 registrations of interest and a subsequent 5 expressions of interest (EOIs) submitted.

HCF is provided with priority access to commuter wharves for the purposes of providing timetabled services. HCF is also provided with exclusive access to Circular Quay wharves 3, 4 and 5 and the western sides of Circular Quay Wharf 2 and Manly Wharf.

HCF leases all 28 vessels of Sydney Ferries' fleet under the contract arrangement (table 4.3).

4.3 Vessel fleet, routes serviced and passenger capacity

Vessel class	Main routes	Number of vessels	Passenger capacity per vessel
Freshwater Class	Manly	4 vessels	1 100
Lady Class	Taronga Zoo; Mosman	2 vessels	552 or 811
First Fleet Class	Inner Harbour	9 vessels	396
RiverCat	Parramatta River	7 vessels	230
SuperCat	Eastern Suburbs	4 vessels	326
HarbourCat	Back up vessel for River & Inner Harbour	2 vessels	150
Total fleet		**28 vessels**	

Source: Transport for New South Wales, Sydney Ferries, http://www.transport.nsw.gov.au/customers/ferries/sydney-ferries Accessed 14 September 2015.

Contracted service payment

Harbour City Ferries receives a monthly payment from the NSW Government to provide the required services under the contract. The monthly payment consists of a:

- service payment – paid to the Operator based on HCF's bid service payments (table 4.4)
- vessel lease payment (deduction) – payable by HCF to the Director-General
- net fuel cost payment – fuel cost payment net of applicable fuel tax credits paid to HCF
- margin payment – paid to HCF
- fare revenue deduction – payable by HCF to the Director-General equal to fares collected by HCF.

The annual service payments HCF bid in its tender are outlined in table 4.4. Harbour City Ferries' service payments decline over the contract period by 10-15 per cent with significant annual declines of 5 per cent and 6 per cent in 2015-16 and 2016-17 respectively, despite regular ferry service revenue hours remaining constant over the contract period.

- The decline in service payments in 2015-16 is primarily due to a 5 per cent decline in expected wage and salary costs which reduce vessel hour costs.
- The decline in service payments in 2016-17 is primarily due to a 27 per cent decline in total vessel maintenance costs, particularly due to reduction in maintenance costs relating to maintenance labour costs, dry docking, parts and fleet breakdown maintenance.

As mentioned above, HCF was bound by the contract to honour existing enterprise bargaining arrangements of existing Sydney Ferries staff for two years from the commencement of the project. The bid service payments remain relatively constant for the first two years reflecting this restriction.

4.4 Harbour City Ferries' annual bid service payments – 2013 dollars

Financial Year ending	Annual Bid Service Payments	Annual change
	$m	Per cent
2012-13	Commercial-in-confidence	
2013-14		0
2014-15		-1
2015-16		-5
2016-17		-6
2017-18		-1
2018-19		-2
2019-20		0

Note: Costs presented in $2013 dollars to maintain consistency with HCF's financial bid and contract.
Source: MinterEllison Lawyers, Ferry System Contract Schedules: Executed Version.

LEK's previous analysis of efficient costs

In 2012, LEK Consulting reviewed Sydney Ferries operating costs and conducted a benchmark analysis against selected domestic and international services to estimate efficient costs of providing ferry passenger services across the Sydney Ferries Network.[32] LEK considered the operating and capital cash costs required to operate the ferry services currently provided by Sydney Ferries, depreciation and amortisation costs were not considered.

Overall, LEK found forecast efficient costs for the 2015-16 financial year were estimated to be $107 million per annum, compared to projected costs of $141 million, a difference of $34 million.

Key findings from LEK's benchmark analysis included:

- ***vessel operating costs*** Sydney Ferries' vessel operating costs are higher than those of the benchmark operators due to:
  - staffing levels above benchmark levels (especially on the Inner Harbour routes)
  - remuneration of vessel crew is high compared to benchmarks across the entire network.
- ***wharf operation costs*** Sydney Ferries wharf operation costs were also higher than domestic and international benchmarks –almost completely driven by high compensation levels, as staffing levels are only slightly above average.
- ***repairs and maintenance*** Cost efficiency in the area of repair and maintenance was lower than the benchmark:

32 L.E.K. Consulting, 2012, Sydney Ferries Cost Review. January 2012.

- labour productivity of the Balmain shipyard is materially below the external benchmark
- two classes of vessels (Lady and Freshwater) are particularly expensive to maintain.

In terms of cost efficiency metrics, LEK found contrasting outcomes depending on metric used:

- ***operating costs per capacity hour*** were close to 30 per cent above the average of benchmark operators
- ***operating costs per passenger*** were 16 per cent below the benchmark.[33]

LEK found that around half of the $34 million difference between projected costs and efficient costs could be saved without IR reform.

LEK's recommendation for partial fleet renewal

No material changes to the Sydney Ferries fleet have occurred since the release of LEK's review with the exception of engine replacements, which have been implemented progressively from 2007 onwards. As of January 2015, all vessel classes had engine replacements except the Freshwater and Lady Classes (currently operating on engines that are over 20 and 30 years old respectively).

LEK assessed different fleet scenarios and determined that the procurement strategy of partial fleet renewal was the most efficient option. The recommendations and cost savings associated with fleet and vessel costs due to the partial fleet renewal option are summarised in table 4.5.

Based on the partial fleet renewal option, LEK estimated a total efficiency saving of $5.3 million in repairs and maintenance costs for the 2015-16 financial year following the replacement of the Freshwater and Lady Class Vessels in 2014-15. In addition, a further saving of $2.3 million was identified in fuel cost savings associated with these new vessels and their MTU S60 engines.

LEK estimated the capital costs associated with the partial fleet renewal option as $37 million, incurred in 2015-16 or depreciated annual cost of $2.5 million assuming capex depreciation over a 15 year life of the vessel.

4.5 Fleet and vessel recommendations

Cost category	Recommendation
Maintenance	▪ Efficient costs based on outsourcing
Engines	▪ All new vessels with MTU S60 engines
Fleet	▪ Lady Class, 2 vessels replaced by proposed 24m vessels ($3m per vessel) ▪ Freshwater Class, 4 vessels replaced by prosed 35m vessels ($5.5m per vessel) ▪ All other vessels to be retained

33 L.E.K. Consulting, 2012, Sydney Ferries Cost Review. January 2012.

Cost category	Recommendation
Savings identified from recommendations ($2015)	▪ $5.3m in FY16 in R&M costs ▪ $2.3m in FY16 in fuel cost

Source: L.E.K. Consulting, 2012, Sydney Ferries Cost Review. January 2012.

The NSW Government confirmed a number of key changes occurring to Sydney's future Ferries fleet in 2016 including six new vessels to commence operations in 2016.[34]

HCF's estimate of efficient operating costs over the contract period is based on operating the existing 28 vessels in the fleet. Table 4.6 shows the potential reduction in fuel and repairs and maintenance costs that LEK estimated would result from a partial renewal of the fleet. Based on LEK's estimated costs, HCF's total cost of fuel and repairs and maintenance in 2018-19 could be 28 per cent lower with a partial renewal of the vessel fleet.

4.6 Vessel cost savings with partial fleet renewal strategy

Cost category	2014-15	2015-16	2016-17	2017-18	2018-19
$2015 (millions)	$m	$m	$m	$m	$m
Repairs and maintenance	14.2	15.5	10.5	10.5	9.5
Fuel	8.4	8.4	8.4	8.4	8.4
Total vessel cost (without partial fleet renewal)	**22.6**	**23.9**	**18.9**	**18.9**	**17.9**
Repairs and maintenance (savings)	0.0	-5.2	-5.2	-5.2	-5.2
Fuel (savings)	0.0	-2.3	-2.3	-2.3	-2.3
Vessel capex[a]	0.0	2.5	2.5	2.5	2.5
Total vessel-related cost (with partial fleet renewal)	**22.6**	**18.9**	**13.9**	**13.9**	**12.9**

Note: Assumes capital depreciation over 15 years. Costs presented in 2015 dollars.

Source: ARUP's analysis of confidential source and L.E.K. Consulting, 2012, Sydney Ferries Cost Review. January 2012.

LEK estimated efficient annual cash costs[35] until 2015-16 providing four years of overlap with HCF's contract period for comparison. On average over the four year period between 2012-13 and 2015-16, HCF's total operating costs are similar to LEK's estimated efficient operating costs.

Comparison of HCF's cost with Sydney Ferries' operating cost

Prior to the contract with HCF in 2012-13, Sydney Ferries (a government owned authority) provided public ferry services on the Sydney Ferries Network.

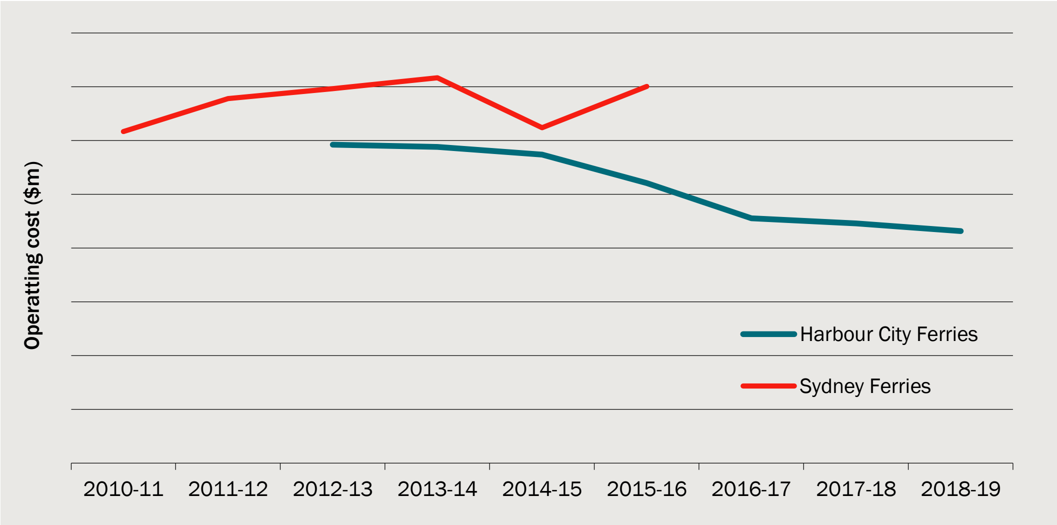
In the first two years of HCF's current contract (2012-13 and 2013-14), HCF's operating costs were in the order of 10 per cent lower than the forecast operating costs for the

34 Transport for NSW, 2013, *Sydney's Ferry Future: Modernising Sydney's Ferries.*

35 Based on efficient cash costs less capital expenditure and major periodic maintenance (which is capitalised for the purpose of financial modelling).

previous contract held by Sydney Ferries for the same period (chart 4.7). As noted above, HCF's annual operating cost continues to decline over the contract period to 2018-19.

4.7 Expected operating cost pre and post contract



Note: Costs are in 2015 dollars.

Data source: HCF Contract and Financial bid and cost data used in analysis supporting L.E.K. Consulting, 2012, Sydney Ferries Cost Review. January 2012.

Allocative efficiency

In the context of this review, allocative efficiency is where ferry services and the standard of service are socially efficient. That is, the marginal benefits exceed or equal the marginal costs. The operating cost per passenger trip compared to the marginal benefit of a ferry passenger trip is used to assess whether the service is allocatively efficient.

Allocative efficiency is considered across the three main ferry service areas of the network, Manly, Parramatta River and the Inner Harbour. Vessel classes are grouped according to their respective network service area (table 4.8).

4.8 Ferry routes and vessel class by main network service area

Main network service area	Main routes	Vessel class
Manly	Manly	Freshwater
Inner Harbour	Taronga Zoo, Mosman, Inner Harbour, Eastern Suburbs	Lady, First Fleet, SuperCat and Harbour Cat[a]
Parramatta River	Parramatta River	RiverCat and HarbourCat[a]

[a] The operating costs of the HarbourCat vessel class are apportioned to the Inner Harbour and Parramatta River service areas according to revenue hours.

Source: The CIE.

Efficiency metrics across network service areas

Chart 4.9 shows the annual operating cost per passenger, between 2014-15 and 2018-19.[36] The operating cost includes labour, fuel, repairs and maintenance and vessel lease payments. Overhead costs and non-vessel lease payments (e.g. lease of Circular Quay facilities) are not included in these estimates of operating cost. Annual patronage is held constant over the contract period equivalent to annual patronage in 2014-15.[37]

The operating cost per revenue hour for the Manly service area is substantially larger than for Parramatta River and Inner Harbour service areas. This is to be expected as the passenger capacity of the Freshwater vessel class (1 100 passengers per vessel) is greater than the passenger capacity for vessel classes used for the other two service areas (on average 340 passengers per vessel).

The operating cost per passenger is highest for the Parramatta River services, following by the Inner Harbour services. The operating cost per passenger is lowest for the Manly services (chart 4.9).

Between 2014-14 and 2018-19, the expected operating cost per passenger declines across all three network service areas, by 6 per cent for Manly services and 13 per cent for both Inner Harbour and Parramatta River services.[38] The operating cost per passenger could decline further over the contract period if passenger numbers increase within current capacity limits.

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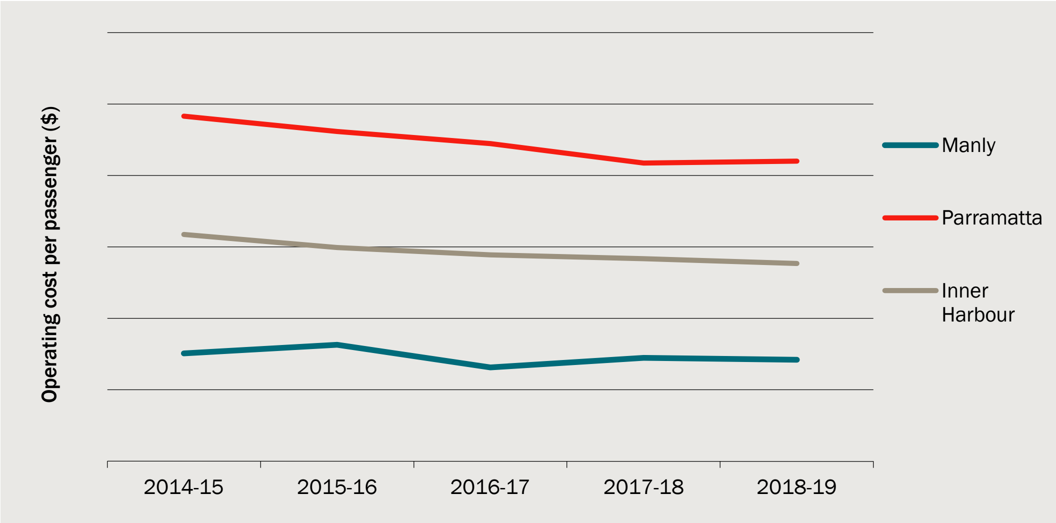
[36] The first two years of HCF's 7 year contract period (2012-13 and 2013-14) are excluded from charts because patronage data is based on 2014-15 financial year for which revenue hours differed to 2012-13 and 2013-14. Charter hire vessels were also used in 2012-13 and 2013-14 for provision of regular ferry services and the costs associated with these vessels have not been included as costs could not be allocated across the three network service areas.

[37] Monthly patronage data sourced from Harbour City Ferries' Operational Report May 2015. Data was not available for June 2015, so total annual patronage is based on actual monthly patronage in from July 2014 to May 2015, with patronage in June 2015 based on the average of the previous 11 months of the financial year.

[38] Assumes patronage remains at 2014-15 levels. Revenue hours and vessel numbers remain constant between 2014-15 and 2018-19.

4.9 Operating cost per passenger trip during HCF's contract period



Note: Overheads and non-vessel lease payments are not included. Operating costs presented in 2015 dollars.
Data source: The CIE based on information provided in confidential source.

The estimates of average operating cost per passenger based on HCF's cost estimates roughly align with LEK's estimates of total vessel operating costs per passenger for Sydney Ferries prior to 2012.

LEK found that the low patronage of Parramatta River services drives the high per passenger service cost relative to the remainder of the Sydney Ferries network.[39] Parramatta River service has the highest operating cost per passenger trip across the Sydney Ferries network and the lowest annual patronage. Across the Sydney Ferries network, the Parramatta River service represents 16 per cent of total patronage but 27 per cent of total operating costs (table 4.10).

4.10 Relationship between patronage and operating cost across entire network

	Proportion of total patronage across Sydney Ferries network	Proportion of total operating costs across Sydney Ferries network
Manly	39%	23%
Parramatta	16%	27%
Inner Harbour	45%	51%

Source: The CIE based on information provided in Franchising Sydney Ferries, 2012, *Financial Bid – Veolia Transport Australia Pty Ltd & Transfield Services (Australia) Pty Ltd together as a consortium named 'Harbour City Ferries'.* January 2012.

Operating cost per passenger kilometre is cheapest for the Manly service. The Inner Harbour service is the most expensive per passenger kilometre.

39 LEK. Consulting, 2012, *Sydney Ferries Cost Review.* January 2012, page 27.

Allocative efficiency of current services

The marginal benefit of the ferry service is estimated as the current fare paid by passengers plus a service's externality value. Ferry services are estimated to provide a positive externality of approximately $0.19 per passenger kilometre based on factors including avoided environmental externalities, congestion and accidents.[40]

The current fares paid by passengers is set by IPART and follows a two-tier fare structure as follows:

- Distances up to 9km – required for the following wharves Woolwich/Balmain, Darling Harbour, Mosman, Neutral Bay, Taronga Zoo, Watsons Bay and stops on the Parramatta River between Circular Quay and Cabarita wharf.
- Distances greater than 9km – required for Manly and stops on the Parramatta River between Kissing Point and Parramatta (table 4.12).

4.11 Current fare structure for Sydney Ferries network

Ticket	Distances up to 9km	Distances greater than 9km
	$	$
Adult Single	5.74	7.18
Concession Single	2.87	3.59

Source: www.opal.com.au/en/opal-fares/fare_information_ferry/ Accessed November 2015.

4.12 Marginal benefit per passenger trip across network service areas

	Current fare paid	Externality value	Est. marginal benefit per passenger trip
	$/passenger trip	$/passenger trip	$/passenger trip
Manly	7.18	2.13	9.31
Parramatta River (short)	5.74	1.71	7.45
Parramatta River (long)	7.18	4.09	11.27
Inner Harbour	5.74	1.30	7.04
Total across all network areas	6.46[a]	1.90[b]	8.36

[a] Average of $7.18 and $5.74

[b] Estimated externality per passenger trip from IPART's Transport Externality Model. Assumes standard trip distance of 10 kilometres.

Note: Trip distance is assumed to be 11.2km for Manly, 6.8km for Inner Harbour, 9km for Parramatta River (short) and 21.5km for Parramatta River (long) based on distance estimates used in LEK. Consulting, 2012, *Sydney Ferries Cost Review.* January 2012.

Source: www.opal.com.au/en/opal-fares/fare_information_ferry/ Accessed November 2015.and IPART, 2014, *Transport Externality Model,* Spreadsheet model, February 2014.

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40 Estimate of $0.19 per passenger kilometre is sourced from IPART's Transport Externality Model based on the following scenario parameters: medium term time period, ferry transport mode only, low excess burden of taxation (8 per cent), the average of the -10 per cent and +10 per cent fare change modelled using the bus mode as the base for ferries. Source: IPART review of External Benefits for Public Transport, August 2014. Transport externality model 2014, Guide to Externality Model.

The average operating cost per passenger trip is less than the estimated marginal benefit per passenger trip for the three network service areas.[41] The average operating cost across all ferry services provided by HCF is also less than the estimated marginal benefit per average passenger trip on the Sydney Ferries Network (including and excluding overheads and non-vessel lease payments).

Overall, ferry services provided across the three network service areas are allocatively efficient. However, because the estimated cost per passenger trip do not distinguish between peak and off-peak services some services, particularly off-peak services, may not be allocatively efficient.

Competition on the Manly ferry service

Manly Fast Ferries is a private company operating unsubsidised fast ferry services on the Manly route, including the service between Manly and Circular Quay that is provided by Harbour City Ferries under contract with TfNSW.

A single trip between Manly and Circular Quay is similar to the private unsubsidised service compared to the subsidised service provided by HCF. A peak service fare on the private service using a smartcard is $6.80[42] (table 4.13). The regular (non-smart card) fare is $7.60 to $8.50. This compares to a flat rate of $7.60 per trip on the public service, not using Opal, or $7.18 using Opal.

4.13 Fare structure for Manly Fast Ferries

Departure	Monday to Friday	Smartcard Fares	
		Adult ($)	Child ($)
Manly	Before 7:30am	6.40	4.00
	7:30 am to 8:30am	6.80	5.00
	8:30am to 9:30am	6.40	4.00
	9:30am to midnight	6.00	4.00
Circular Quay	Before 9:30am	5.00	4.00
	9:30am to 4:00pm	6.00	4.00
	4:00pm to 5:15pm	6.40	4.00
	5:15pm to 6:30pm	6.80	5.00
	6:30pm to midnight	6.40	4.00
Manly & Circular Quay	Saturday & Sunday	6.40	4.00

Source: Manly Fast Ferry, Fares Information. http://manlyfastferry.com.au/fares-info. Accessed 14 September 2015.

Based on analysis of fare revenue as a proportion of operating costs across the three network service areas, the Manly ferry service is cross-subsidising other ferry services on the network.

41 Except for the Parramatta River (short) service. However overall the estimated marginal benefit per passenger trip for the entire Parramatta River service is greater than the average operating cost.

42 Based on SmartCard fares offered by Manly Fast Ferries.

Manly Fast Ferries provides more peak[43] and off-peak services on weekdays than the public service operated by Harbour City Ferries but provides approximately 70 per cent less services on Saturdays, Sundays and Pubic Holidays (table 4.14).

4.14 Manly services provided by Harbour City Ferries and Manly Fast Ferries

	Monday to Thursday	Friday	Saturday	Sunday	Public Holiday
Harbour City Ferries					
Peak	10	10	0	0	0
Off Peak	61	63	71	64	71
Total	**71**	**73**	**71**	**64**	**71**
Manly Fast Ferries					
Peak	22	22	0	0	0
Off Peak	68	68	22	22	22
Total	**90**	**90**	**22**	**22**	**22**

Note: Peak periods include the AM Peak between 6:30am to 8:30am for services running from Manly to Circular Quay and the PM Peak between 5:00pm to 7:30pm for services running from Circular Quay to Manly.

Source: Harbour City Ferries, *Contract Service Plan: January to December 2014* and Manly Fast Ferries, *Current Timetables.* *http://www.manlyfastferry.com.au/time-table* Accessed September 2015.

IPART noted that maximum fare regulation for the Manly service could be removed and be replaced with price monitoring given the considerable competition provided by the private sector for the Manly to Circular Quay ferry route.[44] This is a decision for Government and IPART noted that on 10 September 2012, the Minister for Transport announced “It is not our intention to deregulate fares on the Manly route”[45].

In terms of setting allocatively efficient fares, the extent to which fares above costs for the public Manly ferry service distort choices for consumers should be considered.

Stockton ferry service

The Stockton ferry service runs between Newcastle and Stockton and is operated by Newcastle Buses and Ferries (owned by the State Transit Authority of NSW).

43 Manly Fast Ferries peak periods are matched to peak periods as determined in Harbour City Ferries Contract Service Plan. The AM Peak is between 6:30am to 8:30am for services running from Manly to Circular Quay. The PM Peak is between 5:00pm to 7:30pm for services running from Circular Quay to Manly.

44 IPART, 2012, *Review of maximum fares for Sydney Ferries services from January 2013.* Final Report November 2012.

45 http://www.smh.com.au/nsw/ferry-fares-tipped-to-rise-40-per-cent-2012091025nh2.html (accessed 29 October 2012).

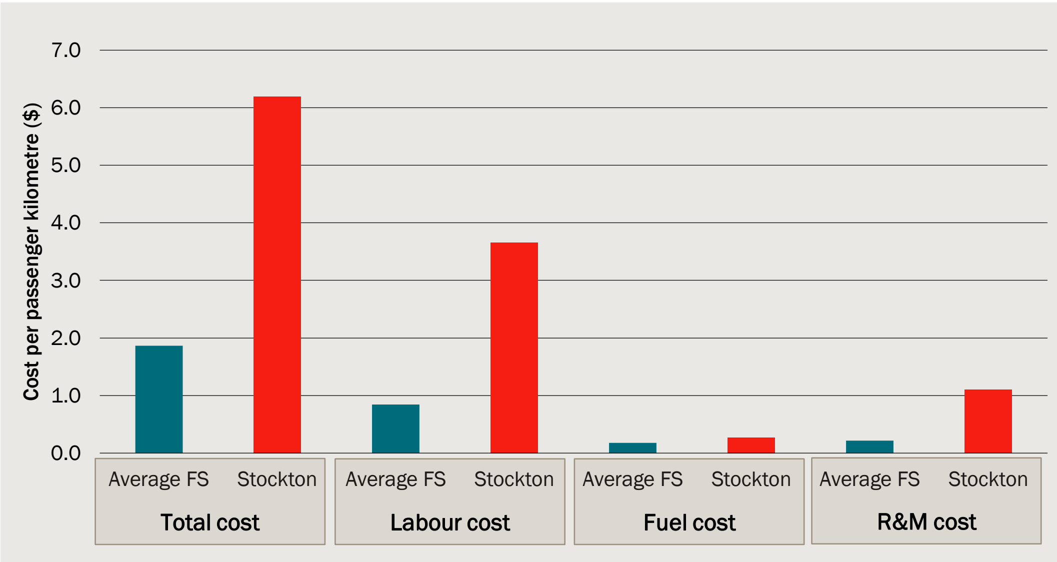
STA operates two ferries but only one ferry is used for regulated services at any one time. Each ferry has a carrying capacity of 200 passengers.[46]

Technical efficiency

The CIE reviewed the efficient costs of providing the Stockton ferry service in 2013 based on survey data collected from the operator for the financial years between 2008-09 and 2012-13. Key findings of benchmark analysis of the Stockton ferry service relative to private ferry services included:

- ***maximum fares per kilometre*** — the average maximum fare per kilometre across private ferry operators was $1.75[47] compared to the fare per kilometre for the Stockton ferry service of $3.85 per kilometre.
- ***historical cost weights*** — Stockton's labour cost weight was 19 per cent higher relative to private ferry services whilst its fuel cost weight was 9 per cent lower.
- ***cost per passenger kilometre*** — Stockton's cost per passenger kilometre based on total cost, labour cost, fuel cost and repairs and maintenance cost were all greater than for other private ferry services (chart 4.15.)
- ***the proportion of cost recovered through fare revenue*** — between 2008-09 and 2012-13, the Stockton ferry service cost had the lowest cost recovery rate across private ferry operators in the greater Sydney region at 70 per cent of its costs.

4.15 Comparison of Stockton's cost per passenger kilometre for key cost items



Note: Average FS represents the average of the private ferry services regulated by IPART that Stockton ferry service was benchmarked against.

Data source: The CIE, 2013, *Private ferries cost consultancy: Assessment of cost structure and form of regulation.* Prepared for the Independent Pricing and Regulatory Tribunal of NSW, October 2013.

46 Indec, 2014, *Efficient costs of providing private and Newcastle-Stockton ferry services*. Prepared for Independent Pricing and Regulatory Tribunal NSW, October 2014. Public Version Draft Report.

47 Excluded private ferries for which information on the average distance of a passenger trip was not provided.

Indec reviewed the efficient costs of providing private ferry services and the Newcastle-Stockton ferry service for IPART in 2014. Indec's review used the survey data collected by the CIE in 2013 augmented with further information provided by the private ferry operators. The key finding from Indec's review was

- Stockton's current operating costs exceed reasonably efficient costs.[48]
- The Stockton service has relatively poor passenger load factors compared to the 200 passenger carrying capacity of each one of its ferries.
- Given the very significant layover hours which continue to incur maintenance and crew costs, Indec suggested a re-think of the service provision such as smaller ferries operating the Stockton service on a continuous loop basis similar to some Brisbane river ferry services.

Allocative efficiency

The operating cost per passenger trip on the Stockton ferry service is approximately $4.30 per passenger trip. The operating cost per passenger kilometre is approximately $6.70, as the trip is short (less than one kilometre).

The marginal benefit of the Stockton ferry service is approximately $2.70 per passenger trip based on the current maximum fare of $2.60 per passenger trip and an externality value of $0.12 per passenger trip (table 4.16).

The current fares paid by passengers on the Stockton ferry service is set by IPART and is currently set at $2.60 per passenger trip.

4.16 Marginal benefit per passenger trip for Stockton ferry service

	Current maximum fare	Externality value	Estimated marginal benefit per passenger trip
	$/passenger trip	$/passenger trip	$/passenger trip
Stockton ferry	2.60	0.12[a]	2.72

[a] Externality value of $0.12 based on $0.19 per passenger kilometre apportioned to distance of Stockton ferry service of 0.65km.

Source: IPART, 2014, *Stockton Ferry Service: Determination*. December 2014 and IPART, 2014, *Transport Externality Model,* Spreadsheet model, February 2014.

The average operating cost per passenger trip of $4.00 is almost 50 per cent greater than the estimated marginal benefit per passenger trip (table 4.16) for the Stockton ferry service. Note that we do not consider that this provides strong evidence that the service as a whole is inefficient, as the value to many users will be above the value of the marginal user. The extent to which average costs are close to marginal costs has also not been investigated in detail.

48 Indec, 2014, *Efficient costs of providing private and Newcastle-Stockton ferry services*. Prepared for Independent Pricing and Regulatory Tribunal NSW, November 2014. Public Version Final Report.

5 Light rail services

Services and organisations covered

Sydney's light rail services include the existing Inner West Light Rail (IWLR) and the City and South East Light Rail (CSELR), which is currently under construction. Light rail services are provided by the private sector under contracts with Transport for NSW.

The IWLR has been in operation since 1997 and has been extended twice in that time. The CSELR is in the procurement stage and is estimated to be completed in March 2019.

New contractual arrangements put in place from 2014 to 2015 under a competitive tender process consolidate the existing IWLR system into the new build and operation of the CSELR. The IWLR and CSELR systems are collectively termed Sydney Light Rail (SLR) under these new contractual arrangements.

Inner West Light Rail service

The first section of Sydney's light rail system opened in 1997 and operated from Central Station to Pyrmont. In 2000 the light rail was extended 7.2 kilometres to Lilyfield, with 14 stations added. The original light rail fleet was seven low floor trams, with one decommissioned in 2013.

The system was extended further, from Lilyfield to Dulwich Hill, in March 2014. The section is known as the Inner West Extension, is 5.6 kilometres in length, and includes 9 new stations. The Inner West Light Rail fleet now comprises twelve Urbos 3 trams, six of which replaced the original fleet.

Transdev has operated the IWLR under contract with TfNSW since 1998, and continues to operate it under the new contract arrangements. When Transdev's operation and maintenance contract for the IWLR expired in June 2015, it was taken over by the ALTRAC light rail consortium. As a member of the ALTRAC consortium, Transdev retained the right to continue operating the IWLR.[49]

[49] Andrew Constance, *Minister for Transport and Infrastructure Media Release, Delivering an Integrated Light Rail System: ALTRAC takes over operation of Inner West Light Rail*, Transport for NSW 2015, 2 July 2015.

City and South East Light Rail service

The CSELR project will be procured through two packages:[50]

- A Public Private Partnership (PPP) for the financing, design, construction, operation and maintenance, including required services relocations
- A limited Early Works package, delivered by a Managing Contractor undertaking selected utilities adjustments and other works.

In December 2014 ALTRAC was awarded the PPP package under a competitive tender process. ALTRAC was chosen from three consortia short-listed to submit a proposal following registering an Expression of Interest evaluation process, one of which withdrew and did not submit a proposal.

The ALTRAC consortium includes four companies: Transdev, Alstom, Acciona and Capella Capital. As noted above, the PPP also involved ALTRAC taking over the operation and maintenance of the Inner West Light Rail at the end of the existing contract's term (from July 2015), which in effect enables Transdev to continue as the IWLR operator.

In June 2014 Laing O'Rourke Australia Construction Pty Ltd was chosen from three short-listed bidders for the Early Works package. Under the contract, Laing O'Rourke Construction Australia is appointed to carry out up to $45 million worth of essential early works, including relocating buried utilities such as water, telecommunications, gas and electricity cables and pipes, and initial work around Moore Park.

The Sydney Light Rail Project Deed is the primary contract for the PPP package. The estimated construction completion date for the CSELR is March 2019 and the contract end of concession is March 2034.

ALTRAC's contractual obligations under the Sydney Light Rail Project Deed include:

- Procure financing of the required financing amount under the PPP
- Design and construct the project works in compliance with contractual requirements, including trackwork, rail structures, rail systems, interchange facilities, terminus facilities and stops
- Modify, reinstate and improve local areas, including all public spaces which are in any way affected by the project works
- Comply with all applicable laws, obtain the planning approvals required for the PPP, and comply with all conditions
- Operate and maintain the Light Rail services in accordance with contract service level requirements and key performance indicators
- Hand the light rail back to Transport for NSW at the end of the contract term.
- Maintain the condition and performance of the PPP assets to ensure that the Sydney Light Rail remains fit for purpose throughout the design life of the asset

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[50] Sydney Light Rail procurement webpage, Transport for NSW, http://www.sydneylightrail.transport.nsw.gov.au/information/procurement

- Increase service levels as directed by Transport for NSW, within specified bounds at a per-service kilometre price and/ or per vehicle operating hour price
- ALTRAC is to use its best endeavours to complete the project by the estimated date of completion of March 2019.

Under the contract, the Government:

- Retains ownership of all works and assets affixed to the Sydney Light Rail site, including stops, railway track and maintenance and stabling facilities
- Controls fare setting through IPART
- Must make monthly payments and applicable bonus and option payments, if exercised, to the contract provider, noting the estimated net present value of the service payments for the PPP over the 19.1 years is $2,200.4 million.[51]

Historical and future cost and service projections from TfNSW

Light rail services include the following operating and maintenance cost components:

- salaries and wages
- depot stabling costs, including building maintenance, facility costs and utilities
- operations and general costs, including insurances, training, IT support and software, and waste removal
- fleet vehicle maintenance
- infrastructure maintenance, including corridor, track, signalling, stations, passenger lifts, overhead lines and substations
- electricity supply.

These costs are covered in the assessment. We do not have detailed information on capital costs.

Patronage of the existing Inner West light rail increased from 3.9 million in 2013-14 to 6.1 million trips in 2014-15 after the opening of the Dulwich Hill extension. The CSELR would have the capacity to move up to 9,000 people per hour in each direction, with up to 300 passengers per vehicle. By 2021, users are expected to make 14,000 trips in both directions in the morning peak.[52] This is expected to increase to 23,000 by 2036. Total demand on the CSELR extension is projected to reach almost 40,000,000 trips by 2036.[53]

[51] Transport for NSW 2015, *Sydney Light Rail PPP Contract Summary: Final*, 25 August.

[52] CBD and South East Light Rail Project Environmental Impact Statement – Volume 1a Main Volume, Parts A to C, prepared by Parsons Brinckerhoff Australia Pty Limited for Transport for NSW, November 2013, p. 5-76.

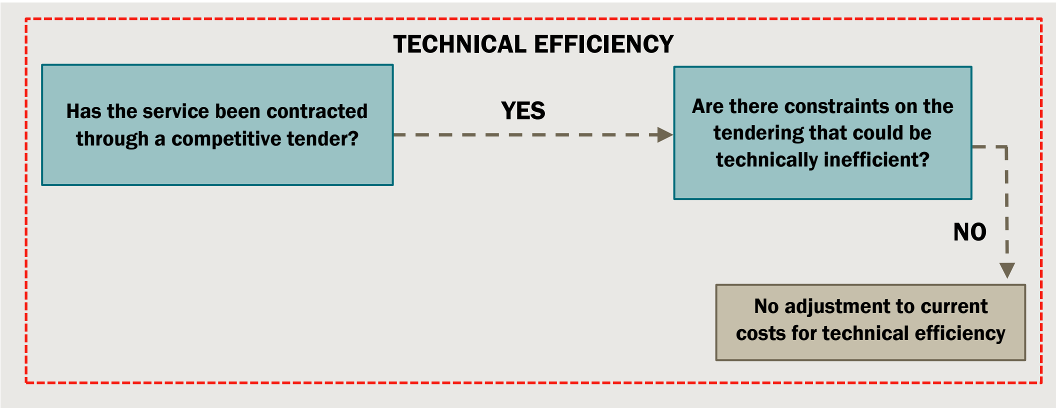
[53] CBD and South East Light Rail Project Environmental Impact Statement – Volume 2 Technical Papers 1 and 2, Transport Operations Report, prepared by Booz and Company and AECOM for Transport for NSW, November 2013, p. 116.

Application of framework for technical efficiency

Chart 5.1 shows the framework for assessing the technical efficiency of light rail services.

As discussed above, the SLR PPP was competitively tendered, with three consortia shortlisted to submit a proposal. One of the consortia withdrew, and therefore there were only two parties competing for the contract. Notably, the incumbent operator of the Inner West system was awarded the right to continue to operate it as a member of the winning consortia. This suggests that competitive pressures to deliver technical efficiency may have been limited.

5.1 Application of framework for light rail



Data source: The CIE.

Benchmarking of service costs

A public sector comparator (PSC) was estimated for the SLR PPP based on a reference project developed by the State to provide a benchmark to assess the net present cost of the private sector bids.[54] The PSC was prepared separately for the IWLR system and for the entire Sydney Light Rail system, i.e. the new CSELR and the existing IWLR combined.

Our analysis is confidential and is not reported in this public version of the report.

The publicly available information on the new SLR PPP is limited. The SLR PPP contract summary provides a net present cost figure only and does not specify the discount rate used. Therefore, it is not possible to derive a per service km cost to compare against the PSC.

The SLR PPP contract summary states that the PPP net present operating and maintenance cost is 13.5 per cent higher than the PSC.[55] Once transferred risk is accounted for, the total net present cost of the SLR PPP is 4 per cent lower than the PSC. If information were available on how much of the transferred risk falls on the operating

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[54] Transport for NSW 2015, *Sydney Light Rail PPP Contract Summary: Final*, 25 August.

[55] Transport for NSW 2015, *Sydney Light Rail PPP Contract Summary: Final*, 25 August.

side versus on design and construction, this could allow for adjustment of the private sector comparator costs to a technically efficient benchmark.

Efforts were made to collect such data to obtain additional benchmarks to better assess the technical efficiency of Sydney's light rail services against other light rail services in Australia and internationally. However, there is a lack of publicly available information on the operating costs of similar light rail services and this has not been possible.

Our recommendation is that a cost of $18.8 per service kilometre should be used for light rail services, based on the public sector comparator for the CBD, South East and Inner West light rail operations.

6 Ticketing services

Thie chapter sets out our review of ticketing operating expenditure. We note that a large part of this chapter has been redacted from the publicly available version for because of commercially sensitive data.

Services and organisations covered

Ticketing services covers the provision of ticketing across all modes of transport. This includes the existing paper tickets and the electronic ticketing system — Opal.

The development of the electronic ticketing system has been privately contracted. Initially ERG Group was contracted to provide TCard. This contract was terminated in 2008 and a subsequent electronic ticketing system contract was awarded to the Pearl Consortium in May 2010. The Pearl Consortium, includes Cubic Transportation Sydney (Australia) as the lead contractor, Downer EDI Engineering Power and the Commonwealth Bank of Australia. The consortium is to build and then operate and maintain the ETS for a period of fifteen years. We refer to this consortium hereafter as Cubic.

Costs of providing ticketing services

The NSW Auditor General has tracked the forecast spend on the project as set out in table 6.1. The 2014 costs show a significant increase from previous estimates, largely because of escalation of costs over time and additional approved ETS scope changes (this includes Cash on System and the introduction of Opal on Light Rail) has been included in the estimates. The original project budget accounting for escalation is reported by the NSW Auditor General at $1600 million.

6.1 NSW Auditor General's reviews of costs

	2011	2012	2013	2014
	$m			
Fixed charges for contractor	388	413	397	
Variable charges for contractor	244	264	254	
Total contractor	632	677	651	
Government agencies	568	528	556	
Total costs	**1 200**	**1 205**	**1 207**	**1 800**

Source: NSW Auditor General's Report 2011, Volume Eight: Public transport ticketing corporation; NSW Auditor General's Report 2012, Volume Eight: Public transport ticketing corporation; NSW Auditor General's Report 2013, Volume Eight: Transport Overview; NSW Auditor General's Report 2014, Volume Seven: Full Report.

TfNSW reported ticketing expenditure

TfNSW has undertaken a reconciliation of actual operating and capital expenditure for 2011-12, 2012-13 and 2013-14. In addition, it has provided budgeted expenditure for 2014-15 and forecast expenditure for the following years. This data is commercially sensitive and is not included in the public report.

Capital expenditure relates solely to the roll-out of the ETS by Cubic. The roll-out is expected to be largely complete by 2016-17 with relatively minor ongoing expenditure of $3 million forecast. The forecast $3 million annual expenditure appears to be related to a provision for replacement of minor ETS equipment.

Operating expenditure includes contract payments to Cubic as well as further costs incurred by TfNSW in program delivery. Operating expenditure ramps up over the period 2012-13 to 2014-15 and then is forecast to decline as costs transition to steady-state costs for the new system, and paper tickets are no longer available.

Steady state operating expenditure

Steady state operating expenditure for ticketing projected by TfNSW is substantially lower than current expenditure. The actual projections are commercial-in-confidence and we do not report these here.

Based on the split of patronage between the various public transport modes, the following apportionment of costs can be calculated (table 6.2).

6.2 Operating costs allocates across mode

Cubic contract cost	Sydney Trains	NSW TrainLink Intercity	Bus	Ferry	Light Rail	Total
Patronage split	49%	11%	37%	2%	1%	100%
2015/16	79	18	59	3	2	161

Source: ARUP calculations based on TfNSW data.

Benchmarking of ticketing costs

The provision of electronic ticketing for the public transport system has been tendered. On this basis, it could be considered to be at the level of efficient cost. We have also considered publicly available benchmarks.

Table 6.3 provides a comparison of ticketing costs across various locations and systems. The table is based on publicly available information. All endeavours have been made to ensure comparisons are undertaken on a 'like-with-like' basis, however the analysis should be considered indicative only and further investigation is required. In addition, it is difficult to directly compare ticketing costs due to differences in size, scale, functionality, modes of transport and other factors.

Sydney's ticketing costs will, in steady-state, decline substantially from current levels and are likely to be similar to Melbourne and well below Brisbane. Costs will be above London, on a per passenger trip basis, which likely reflects substantial economies of scale.

6.3 Ticketing systems across jurisdictions

Indicator	Sydney (Opal)	Melbourne (Myki) [b]	SEQ (go card)	London (Oyster)
Patronage (trips) across public transport system	1.51m in 2012/13 daily average [a]	1.47m daily average 2014	0.48m daily average in 2014/15	10.9m daily average 2014/15 [d]
Modes	Bus, train, light rail, ferry	Bus, train, tram	Bus, train, tram, ferry	Light and heavy rail, underground, bus, riverboat
Geographic areas	Metropolitan	Metropolitan and regional Victoria	Metropolitan	Metropolitan
Smart ticketing features	Time and zone based, auto top up, online	Time and zone based, auto top up, online top up, pass and money	Zone based, auto top up, online top up	Zone based, auto top up, online top up, pass and money
Paper based tickets continued	Yes	No	Yes	No
Operating expenses for ticketing system	$161m for ticketing expenditure in 2015 budget, provided by TfNSW	Ticketing system costs $93.4m in 2013/14, which includes write back of Metcard system of $16.9m. Net cost of ongoing ticketing services estimated at $76.5m.	$46m for the operational management of go Card integrated ticketing system (a Cubic system) through to 2016 [c]	Transport for London awarded a 7+3 year contract valued at £660m to a consortium led by Cubic Transportation Systems in 2014. Est. annual cost £66m [e]
Per trip ticketing operating cost (annual opex /annual trips)	$0.26 (2015/16)	$ 0.14	$ 0.26	£ 0.02
Per resident population operating cost [f]	$ 33 (2015/16)	$ 17	$20	£ 7.73

[a] Audit Office NSW (2013) http://www.audit.nsw.gov.au/ArticleDocuments/291/05_Volume_Eight_2013_Transport_Overview2.pdf.aspx?Embed=Y; [b] Public Transport Victoria (2014) http://ptv.vic.gov.au/about-ptv/ptv-data-and-reports/annual-report/; [c] Translink Transport Authority Annual report: https://publications.qld.gov.au/dataset/65792fcb-b904-4bdc-960e-230594b661c1/resource/f571ba84-620a-4724-84e1-88a0e7443a7b/download/201112annualreport.pdf; [d] Transport for London (2015) https://tfl.gov.uk/cdn/static/cms/documents/annual-report-2014-15.pdf; [e] Transport for London (2014) https://tfl.gov.uk/info-for/media/press-releases/2014/july/tfl-and-cubic-continue-partnership; [f] Australian city estimates provided by ABS for March 2014, http://www.abs.gov.au/ausstats/abs@.nsf/mf/3218.0/ London population provided by Greater London Authority https://www.london.gov.uk/mayor-assembly/mayor/publications/gla-intelligence/demography/population.

Source: TfNSW; and ARUP based on sources noted above.

TfNSW has noted some of the differences in these systems, (table 6.4), with additional features for Sydney's system having led to higher costs, as set out in the table below.

6.4 Features of Opal in comparison to other systems

Feature	Sydney (Opal)	Melbourne (Myki)	SE Qld (Go Card)	London (Oyster)
Cash top up at stations/wharves	Yes	Yes	Yes	Yes
Single ride tickets	Yes	No	Yes	Yes
Single ride available at stations/on buses	Yes (bus not on peak services)	No	Yes (bus not on peak services)	Stations/not buses
Online application and eligibility checking for concessions	Yes	No	Yes	Yes
Support contactless and mobile technologies	Yes	Retender in 2016	Tender in FY16	Tender in FY16

Source: TfNSW.

Conclusion

The cost of the introduction of the Opal Card ETS in Sydney has increased above the original estimates. In addition, there have been fluctuation from year-to-year on the final forecast costs and also the apportionment of costs between the provider and government.

In comparison with other ETS, Sydney's ticketing costs are currently high, but are expected to fall to be below Brisbane and similar to Melbourne once in steady state on a per trip basis . The forecasts show declining costs over time.

Our recommendation is that TfNSW forecast future costs by 2020/21 be considered as efficient steady-state costs of providing ticketing services. Costs in prior years are higher, partly because of transition costs to a new system, but potentially also reflecting inefficiency, given that current costs are high relative to other jurisdictions. It is not possible to assess this robustly, however, and costs by the end of the period are consistent with the lowest cost in Australian juriosdictions that we have considered.

A Rail operator benchmarking

The CIE has compiled data around urban rail networks around the world to compare the performance of Sydney rail services to other international operators. The benchmarking focuses on Sydney Trains, rather than NSW Trains, because international urban rail operators are closer in their characteristics to the Sydney Trains operations.

In comparing different operators, it is important to recognise factors that influence the number of passengers, network length and operating costs of rail in different countries. For example, Sydney Train's network is spread out over a larger area, whereas Asian countries such as Singapore and Hong Kong face a denser network. Moreover, the different terrain may influence operating costs.

The performance of Sydney Trains was compared to other cities using two different metrics:

- operating cost per car-km, and
- operating cost per passenger

As discussed in the body of this report, we have also estimated operating costs for international networks if they achieved the cost metrics of Sydney Trains. The data on costs and other key data were the publicly available reports from operators, such as financial statements and annual operating reports.

In measuring operating cost, any costs associated with amortisation and depreciation were excluded. We have also in some cases had disaggregate costs specific to rail services for operators that also provide other transport services, such as bus.

Further, there were operators who reported the operating costs per car-km, the operating costs per passengers, but not overall cost numbers. Where available, these numbers were used in the CIE's analysis even if they were associated with operating costs across several different modes of transport. If this was the case, care was taken to ensure that the car kilometres and the number of passengers also related to the relevant transport modes. We note that this may overstate the costs we use for some operators, such as London Overground, as costs per cark kilometre for rail are likely to be lower than for buses or light rail, because crewing costs are spread over more cars.

Coverage of operators

The CIE focused on operators that were considered to be most comparable in the report by LEK (2008). [56] However, due to discrepancies in the reporting style of operators and paucity in data, only certain operators were selected. To ensure robust analysis, operators were excluded if it was not possible to ascertain or estimate the costs relating to the rail network and other relevant data.

For example, initial research around the Paris Réseau Express Régional (RER) showed that it is operated in parts by two organisations – the Régie Autonome des Transports Parisiens (RATP) and Société Nationale des Chemins de fer Français. The RATP Group operates across several modes of transport and also has subsidiaries that operate internationally. As a result, the reported operating costs do not relate specifically to the Paris RER, making it difficult to use in our analysis.

The metro system in Kaohsiung, Taiwan was also initially a point of interest. Although detailed operating data was available in the Kaohsiung Rapid Transit Corporation's Annual Report, this was restricted to only information around passenger numbers, route lengths and track kilometres. The financial data for the operating costs could not be obtained as the section was produced in Mandarin. Furthermore, the latest data available was 2011, which was considered out-dated relative to the information available for other rail operators.

To ensure an evidence-based comparison for Sydney Trains, operators that provided detailed operating and financial data for recent years were used. The data and the results are summarised in table A.1.

[56] L.E.K. Consulting 2008, "Total Cost Review of CityRail's Regular Passenger Services", *Independent Pricing and Regulatory Tribunal*

A.1 Summary of operators

City	Operator	Annual passengers	Route km	Track kilometres	Car kilometres	Train kilometres	Operating costs (local)	Operating costs (PPP adjusted)	Govt/Private	Other transport included in cost
		(millions)	(km)	(km)	(million km)	(million km)	(m)	(A$m)		
Sydney	Sydney Trains 2015	292	380	937	192	24	1788	1788	Govt	No
Singapore	SMRT	711	64	129	124	25	526	938	Govt	No
Hong Kong	MTR	1661	87	175	N/A	N/A	N/A	N/A	Private	Yes
London	Transport for London	136	124	247	32	8	246	534	Govt	Yes
Toronto	Toronto Transit Corporation	217	62	124	81	13	526	640	Govt	Yes
Madrid	Metro de Madrid	604	146	292	172	29	925	2070	Govt	No
Montreal	STM	239	71	142	78	13	676	1028	Govt	No

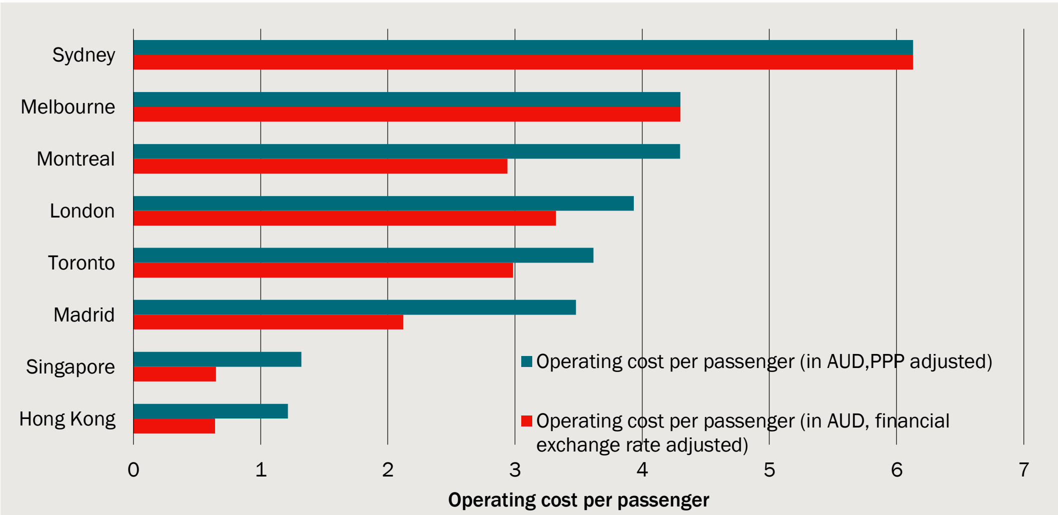
Note: Although the operating costs relevant to rail for Hong Kong were not provided, MTR produced the operating costs per car-km and operating costs per passenger, which were used in the CIE's analysis.

Source: Transport operator's publicly available reports and CIE's calculations

Key results

Sydney Trains' operating costs per passenger are considerably higher than other cities as shown in chart A.2. The operating costs per passenger trips for the Melbourne trains and London Overground were close to each other, at second place to Sydney Trains, however the differences between the costs of Sydney Trains and all other operators were substantial.

A.2 Operating cost per passenger trip

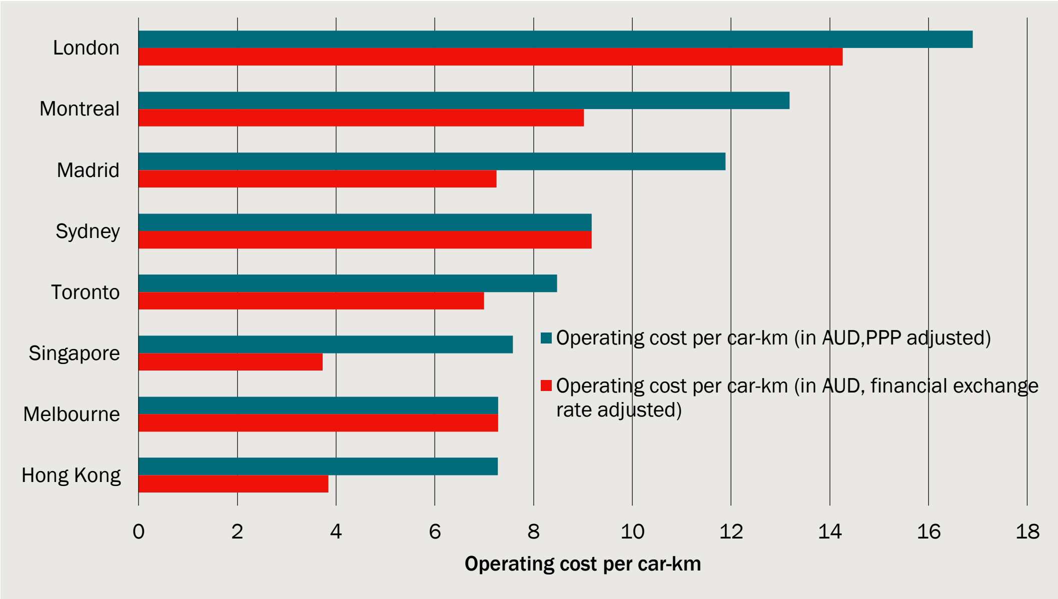


Note: Where the operators reported "passenger trips" or "passenger journeys", this was considered to be equivalent to passengers
Data source: CIE calculations

Tsai and Mulley (2013) have suggested that operating costs per car-km is a good efficiency measure.[57] Using this to compare Sydney Train's performance to other operators, when using financial exchange rates, Sydney's operating costs per car-km is lower than that of London Overground's and higher than all other operators. However, when using PPP adjusted exchange rates (which accounts for the differences in living costs and also likely labour costs), operating costs per car-km for Sydney were lower than London Overground, the Montreal Metro and the Madrid Metro and higher than the four other operators(chart A.3).

[57] Tsai C.H. and Mulley C. 2013, "How does the efficiency performance of Sydney CityRail compare with international urban rail systems", *Australasian Transport Research Forum 2013*

A.3 Operating cost per car-km



Note: London data refers to the London Overground only.

Data source: CIE calculations

In generating chart A.2 and A.3, only the most latest data available for each of the above operators were used. Table A.4 shows the underpinning data and also reflects the performance of individual operators over time.

A.4 Calculations of operating cost per car-km and operating cost per passenger

City	Operator	Year	Operating cost per car km (in local currency)	Operating cost per car-km (in AUD - PPP adjusted)	Operating cost per car-km (in AUD - financial exchange rate adjusted)	Operating cost per passenger (in local currency)	Operating costs per passenger (in AUD - PPP adjusted)	Operating costs per passenger (in AUD - market exchange rate)
Singapore	SMRT	2014	4.3	7.6	3.7	0.7	1.3	0.6
Singapore	SMRT	2013	3.4	5.9	2.8	0.6	1.0	0.5
Singapore	SMRT	2012	4.1	7.0	3.2	0.7	1.2	0.6
Singapore	SMRT	2011	3.5	5.9	2.7	0.6	1.0	0.4
Hong Kong	MTR	2014	26.8	7.3	3.8	4.5	1.2	0.6
Hong Kong	MTR	2013	24.9	6.8	3.3	4.3	1.2	0.6
Hong Kong	MTR	2012	24.2	6.6	3.0	4.2	1.1	0.5
Hong Kong	MTR	2011	23.1	6.4	2.9	4.0	1.1	0.5
Hong Kong	MTR	2010	21.5	6.0	3.0	3.9	1.1	0.5
London	Transport for London	2013/14	7.8	16.9	14.3	0.5	1.0	0.8
London	Transport for London	2012/13	7.3	15.9	11.9	0.4	1.0	0.7
London	Transport for London	2011/12	7.4	16.2	11.4	0.5	1.1	0.8
London	Transport for London	2010/11	8.6	18.6	13.3	0.8	1.7	1.2
Toronto	Toronto Transit Commission	2014	7.0	8.5	7.0	3.0	3.6	3.0
Toronto	Toronto Transit Commission	2013	6.6	8.1	6.7	2.8	3.5	2.9
Toronto	Toronto Transit Commission	2012	6.7	8.2	6.5	2.9	3.5	2.8
Toronto	Toronto Transit Commission	2011	6.8	8.2	6.6	2.9	3.6	2.8

City	Operator	Year	Operating cost per car km (in local currency)	Operating cost per car-km (in AUD - PPP adjusted)	Operating cost per car-km (in AUD - financial exchange rate adjusted)	Operating cost per passenger (in local currency)	Operating costs per passenger (in AUD - PPP adjusted)	Operating costs per passenger (in AUD - market exchange rate)
Madrid	Metro de Madrid	2014	4.9	11.1	7.2	n/a	n/a	n/a
Madrid	Metro de Madrid	2013	5.2	11.9	7.2	1.5	3.5	2.1
Madrid	Metro de Madrid	2012	4.6	10.5	5.8	n/a	n/a	n/a
Montreal	STM	2013	8.7	13.2	9.0	2.8	4.3	2.9

Note: For Hong Kong, Toronto and Madrid, the operating costs per car-km were provided from the operators. For Hong Kong, Toronto and London, the operating costs per car-km and per passenger are not specific to rail only. The operating costs per passenger for Madrid could only be calculated for 2013 because the number of passengers were sourced from the TLS report discussed further below.

Source :The CIE's calculations based on transport operator's publicly available reports

CIE's rail database

In the rail database, the various terms are defined as follows:

- **Route kilometres** is the distance from origin to destination of the coverage of the network.
- **Track kilometres** is the network of track laid out. Where track kilometres were not explicitly stated by the operators, they were deduced from the route kilometres assuming that there were two tracks (both going in opposite directions) per route. For example, where route kilometres were stated as 60km, track kilometres were calculated to be 120km.
- **Train kilometres** is the total distance travelled by all the trains throughout the network in a year.
- **Car kilometres** are the total distance covered by a train carriage (also referred to as 'car'). For example, if there are 100 train kilometres and six cars per train, then there would be 600 car kilometres.

Table A.5 sets out the data. Subsequent sections detail data for each operator.

A.5 Rail database

City	Operator	Year	Operating costs	Route kilometres	Track kilometres	Train kilometres	Car kilometres	Total no. of passengers (annual)	Passenger-km	No. of stations
			('000)	km	km	million km	million km	('000) no.	million km	no.
Singapore	SMRT	2014	526 365	64.3	128.6	24.7	123.7	710 800	8 016	88
Singapore	SMRT	2013	411 510	64.3	128.6	24.4	122.2	690 900	7 887	88
Singapore	SMRT	2012	467 212	64.3	128.6	22.9	114.4	654 400	7 575	88
Singapore	SMRT	2011	350 202	55.0	109.9	20.0	100.2	603 900	7 076	88
Hong Kong	MTR	2014	n/a	n/a	n/a	n/a	n/a	1 660 806	18 269	85
Hong Kong	MTR	2013	n/a	87.4	174.7	n/a	n/a	1 586 021	17 446	85
Hong Kong	MTR	2012	n/a	87.4	174.7	n/a	n/a	1 540 747	16 794	85
Hong Kong	MTR	2011	n/a	87.4	174.7	n/a	n/a	1 470 468	16 028	85
Hong Kong	MTR	2010	n/a	87.4	174.7	n/a	n/a	1 398 668	15 245	85
London	Transport for London	2013/14	246 235	123.6	247.2	7.9	31.6	135 700	n/a	83
London	Transport for London	2012/13	219 576	123.6	247.2	7.5	30.0	124 600	n/a	83
London	Transport for London	2011/12	204 584	123.6	247.2	6.9	27.6	102 600	n/a	83
London	Transport for London	2010/11	178 791	123.6	247.2	5.2	20.8	57 200	n/a	83
Toronto	Toronto Transit Commission	2014	562 688	61.9	123.8	13.5	80.8	n/a	n/a	74
Toronto	Toronto Transit Commission	2013	525 931	61.9	123.8	13.2	79.3	217 250	n/a	74

City	Operator	Year	Operating costs	Route kilometres	Track kilometres	Train kilometres	Car kilometres	Total no. of passengers (annual)	Passenger-km	No. of stations
			('000)	km	km	million km	million km	('000) no.	million km	no.
Toronto	Toronto Transit Commission	2012	527 594	61.9	123.8	13.1	78.6	n/a	n/a	74
Toronto	Toronto Transit Commission	2011	514 443	61.9	123.8	12.7	76.1	n/a	n/a	74
Toronto	Toronto Transit Commission	2010	486 783	61.9	123.8	12.6	75.7	n/a	n/a	74
Madrid	Metro de Madrid	2014	n/a	146.2	292.4	28.4	170.18	n/a	n/a	300
Madrid	Metro de Madrid	2013	924 640	146.2	292.4	28.6	171.68	604 100	n/a	300
Madrid	Metro de Madrid	2012	900 690	146.2	292.4	32.3	193.78	n/a	n/a	300
Montreal	STM	2013	675 648	35.5	71	13.0	78.0	239 264	n/a	68

Note: Where data was limited for either route kilometres or track kilometres, it was assumed that the track kilometres were double that of the route length.

Source: Operators' financial statements and annual reports, Transit Leadership Summit

Singapore

Singapore has two main operators for transport – SMRT Corporation and SBS Transit. Both operators work across the different modes of public transport available in Singapore, and are both in charge of buses and trains.

There are five railway routes in Singapore, two operated by SBS Transit (the North East line and the Downtown line) and three run by SMRT Corporation (the Circle line, North South line and East West line). It was difficult to ascertain the costs relating specifically to the train lines operated by SBS Transit because of the nature of reporting in the financial statements. The operating data and the operating costs for SMRT's rail services were detailed in SMRT's financial statements. Therefore, in the CIE's analysis, only the data around SMRT's network is used. These are shown in table A.6 below.

A.6 Key operating data for SMRT's railway tracks

	FY2011	FY2012	FY2013	FY2014	FY2015
Total route length (NSEWL & CCL)[a] (km)	109.9	128.6	128.6	128.6	129.8
Total car-kilometres operated (to nearest million)	100.2	114.4	122.2	123.7	126.8
Growth in car-kilometres operated (%)	9.1	14.1	6.8	1.2	2.5
Total ridership (to nearest million)	603.9	654.4	690.9	710.8	730.6
Growth in ridership (%)	12.6	8.3	5.6	2.9	2.8
Average weekday ridership (to nearest '000)	1 776	1 927	2 041	2 091	2 148
Growth in average weekday ridership (%)	12.5	8.5	5.9	2.5	2.7
Total passenger-kilometres (to nearest million)	7 076	7 575	7 887	8 016	8 129
Growth in passenger-kilometres (%)	9.8	7	4.1	1.6	1.4
Average car occupancy (passenger per car)	70.6	66.2	64.5	64.8	64.1
Growth in average car occupancy (%)	0.7	-6.2	-2.6	0.4	-1

[a] NSEWL & CCL stand for North South Line, East West Line and Circle Line. These are the three railway tracks operated by SMRT Corporation.

Note: The total route length as reported is interpreted to be equivalent to CIE's definition of 'total track kilometres'.

Source: SMRT Annual Report 2015

The operating cost figures used in the CIE's calculations were obtained from two SMRT Annual Reports – 2015 and 2013. These are outlined in table A.7.

A.7 Operating expenses for SMRT

	FY2015	FY2014	FY2013	FY2012	FY2011
	$('000)	$('000)	$('000)	$('000)	$('000)
Operating expenses (net of other income) - MRT only	526 936	526 365	467 212	411 510	350 202

Note: The figures for operating expenses exclude any costs associated with depreciation or amortization

Source: SMRT Annual Report 2015 (Page 168) and SMRT Annual Report 2013 (Page 180)

In Singapore, the fiscal year for the Government and many government linked corporations runs from 1 April to 31 March. Therefore, FY2015 refers to 1 April 2014 to 31 March 2015.

There are 88 train stations in the SMRT network, and an average of five cars per train is assumed to calculate the train kilometres from the car kilometres reported in table A.6.

Hong Kong

In Hong Kong, the MTR Corporation is the main railway operator. MTR is also in charge of running other transport operations such as the Airport Express, a dedicated high-speed link providing the fastest connections to Hong Kong International Airport and the city's major exhibition and conference centre, AsiaWorld-Expo. Other transport operations run by MTR include the Light Rail, buses and intercity railway services.[58]

The MTR Corporation's Annual Report 2014 included ten-year statistics as shown in table A.8.

A.8 Hong Kong Transport Operations

	2014	2013	2012	2011	2010
Revenue car-km operated	('000)	('000)	('000)	('000)	('000)
Domestic and Cross-boundary	273 771	269 141	260 890	254 407	253 067
Other	33 960	33 770	33 587	29 769	29 419
Total number of passengers	('000)	('000)	('000)	('000)	('000)
Domestic Service and Cross-boundary	1 660 806	1 586 021	1 540 747	1 470 468	1 398 668
Other	243 832	237 379	229 895	220 831	209 794
Average passenger km travelled	km	km	km	km	km
Domestic and Cross-boundary	11	11	11	11	11
Other	47	47	47	48	48
Average car occupancy (no. of passengers)	no.	no.	no.	no.	no.
Domestic and Cross-boundary	67	65	65	63	60
Other	63	62	61	63	62
HK$ per car-km operated (Hong Kong Transport Operations)	**HK$**	**HK$**	**HK$**	**HK$**	**HK$**
Operating costs	26.80	24.90	24.20	23.10	21.50
HK$ per passenger carried (Hong Kong Transport Operations)	**HK$**	**HK$**	**HK$**	**HK$**	**HK$**
Operating costs	4.47	4.27	4.18	4.02	3.91

Note: The reported HK$ per passenger carried and the HK$ per car-km operated are across passengers and kilometres for all modes of transport operated by MTR

Source: MTR Annual Report 2014 (Ten Year Statistics)

For the CIE's international benchmarking, the reported figures for HK$ per car-km operated and the HK$ per passenger carried were used. These figures encompass all modes of transport.

London

Of all London rail services, the London Overground was considered to be most comparable to Sydney Trains. Based on the Transport for London's (TfL) Annual Report 2013/14, key data around the London Overground is shown in table A.9.

58 MTR Corporation, 'Corporate Profile' available at http://www.mtr.com.hk/en/corporate/overview/profile_index.html

A.9 London Overground

	2013/14	2012/13	2011/12	2010/11	2009/10
Passenger journeys (millions)	135.7	124.6	102.6	57.2	34.3
Train kilometres operated (millions)	7.9	7.5	6.9	5.2	3.4
On-time performance (per cent)	96.1	96.6	96.6	94.8	93.2
Customer satisfaction (score)	82	82	82	80	73

Note: Passenger journeys is interpreted to be equivalent to the number of passengers.
Source: Transport for London Annual Report 2013/14

Under the segmental analysis reported in TfL's Annual Report 2013/14, the income and expenditure associated with the different modes of transport are outlined in table A.10.

A.10 TfL Annual Report 2013/14 Segmental Analysis

	London Underground	London Rail	Surface Transport	Corporate Items	Total
	£m	£m	£m	£m	£m
Expenditure	2 475	383	2 791	161	5 810

Source: Transport for London Annual Report 2013/14

The "London Rail" component comprises of London Overground, Docklands Light Railway (DLR) and London Tramlink. Therefore, the operating expenditure reported in table A.10 relates to all three modes.

The detailed calculation of costs associated specifically with the London Overground were calculated using the figures above and data around the kilometres operated for all modes of transport considered as part of "London Rail". The operating expenditure was then calculated on a per kilometre basis and then per car-kilometre. These calculations are detailed in table A.11.

A.11 Detailed calculations of operating costs for London Overground

	2013/14	2012/13	2011/12	2010/11
Kilometres operated (millions)	17	16	15	13
Carriage kilometres operated (millions)	49	47	43	35
Operating expenditure (£m)	383	345	315	303
Operating costs per km (£/km)	23	21	22	24
Operating costs per carriage km	8	7	7	9
Operating costs for London overground	246	220	205	179

Source: Transport for London Annual Report and CIE calculations

According to the TfL Annual Report 2009/10, the London Overground consists of three-carriage trains. However, recently, there have been plans to add extra carriages for the London

Overground services, with the first 5-carriage train being introduced in late 2014.[59] Therefore, on average, each train is assumed to have four carriages.

Each rail service for the DLR has between 2 to 3 carriages (and therefore, calculated as an average of 2.5) and each tram is a single carriage. The operating expenditure per kilometre and per carriage kilometre is assumed to be equal across all three services. This may overstate costs for London Overground as costs such as crewing would be lower per car-km for London Overground compared to other services.

Toronto

The Toronto Transit Commission (TTC) is the main corporation in charge of Toronto's rail transport, referred to as the subway. Operating statistics relating to the subway are shown below in table A.12.

A.12 TTC Operating Statistics

	2014	2013	2012	2011	2010
Subway lines	3	3	3	3	3
Subway length (km)	61.9	61.9	61.9	61.9	61.9
No. of subway cars	724	704	708	712	676
Kilometres operated ('000) - subway	80 846	79 326	78 628	76 101	75 705

Note: Subway length is assumed to be equivalent to route kilometres and the kilometres operated refers to car kilometres.

Source: Toronto Transit Commission Website, Operating Statistics, available at https://www.ttc.ca/About_the_TTC/Operating_Statistics/2014/Section_One.jsp

The number of passengers using the Toronto subway were obtained from the TTC's website, which reported the approximately 217 million passengers on the subway trains.[60]

The TTC is also in charge of other modes transport such as streetcars and buses. Commuters pay the same fare across all transport modes. In their Annual Report 2014, the TTC reported the following operating expenses as shown in table A.13.

A.13 TTC Operating expenses

	2014	2013	2012	2011	2010
Average number of employees	13209	12920	12739	12674	12553
Operating expenses ($ millions)	1589.5	1491.7	1472.4	1460	1385.9
Operating expense per passenger trip ($)	2.97	2.84	2.86	2.92	2.9
Operating expense per kilometre ($)	6.96	6.63	6.71	6.76	6.43

Note: All dollar figures are in Canadian dollars. Further, the CIE assumes that the reported operating expense per kilometre refers to the expense per car-kilometre.

Source: Toronto Transit Commission Annual Report 2014

[59] Transport for London Press Release (2014), "Extra Carriages for London Overground Services", accessed at https://tfl.gov.uk/info-for/media/press-releases/2014/november/extra-carriages-for-london-overground-services

[60] Toronto Transit Commission Operating Statistics, available at http://www.ttc.ca/About_the_TTC/Operating_Statistics/2013.jsp

The operating expenses per passenger trip and the operating expenses per kilometre were used in the CIE analysis. However, these figures relate to all modes of public transport under TTC's operation and the specific expense for Toronto's subway is not segregated. Due to the lack of specific data, these figures are considered the closest estimates.

Madrid

There are two major public transport services in Madrid –rail, also known as the Metro, and bus. Metro de Madrid is a public company, in charge of operating the Metro network lines in service and maintenance of the underground network facilities.[61]

The Director's Report for Metro de Madrid reports the supply and demand numbers for the rail network as shown in table A.14.

A.14 Relevant data for Madrid Metro

	2014	2013	2012
Kilometres of network	292	292	292
Number of stations	300	300	300
Fleet in operation (no. of cars)	2 347	2 394	2 303
Cars x Km (million / year)	170	172	194
Total trips (million / year)	561	558	602

Note: Cross checking with other online resources showed that the 'kilometres of network' refers to track kilometres.

Source: Metro de Madrid Directors' Report and Corporate Social Responsibility (2014)

The operating costs per car-kilometre were also obtained from the same Directors' Report (2014) and are reflected in table A.15. The figure for operating costs per car-km was used in the CIE's international benchmarking exercise.

A.15 Operating costs per car-km

	2014	2013	2012	2011
	2014 euros	2014 euros	2014 euros	2014 euros
Operating costs per car-km	4.87	5.23	4.64	5.85

Source: Metro de Madrid Directors' Report 2014, Page 160

To calculate the operating costs per passengers, the total number of passengers was sourced from the TLS report to be 604 million annually. The operating cost was obtained from the Metro de Madrid Annual Report 2013 and the breakdown in shown in table A.16.

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61 Metro de Madrid (2009), 'Who we are', accessed at <http://www.metromadrid.es/en/conocenos/quienes_somos/index.html>

A.16 Metro de Madrid operating expenses

	2013	2012
	(m Euros)	(m Euros)
Personnel	438.82	359.3
Supplies	86.23	91.81
Overseas services	371.2	414.91
Tax	2.76	3.67
General	2.08	3.38
Other charges	4.86	6.97
Financial	18.69	20.65
Total (excl Amortisation)	**924.64**	**900.69**

Source: Metro de Madrid Annual Report 2013

Montreal

There are three main modes of public transport in Montreal: commuter rail, buses and the Montreal metro.

The main operator for Montreal metro is Société de transport de Montréal, also known as STM. All data used in the CIE's analysis for STM was sourced from the Transit Leadership Summit report 2012-14, under the "heavy-rail" section. The data used is summarised in table A.17 below.

A.17 Montreal data

Indicator	Units	Data
Current annual ridership, heavy-rail metro	million trips	239
Current number of stations/stops, heavy-rail metro	no.	68
Current route length (km), heavy-rail metro	km	71
Current number of rail cars, heavy-rail metro	no.	759
Annual system operating costs (excl. long-term liabilities)	C$m	676

Note: The annual system operating costs relates to rail only and excludes depreciation and amortization

Source: Transit Leadership Summit 2012-2014, available <at http://transitleadership.org/docs/Transit-Leadership-Summit-2012-2014.pdf>

Exchange rate adjustment

To convert the operating costs in local currency to Australian dollars, two different methods were used in calculation:

- **purchasing power parity (PPP) exchange rate:** this is the rate at which the currency of one country would have to be converted into that of another country to buy the same amount of goods and services in the country.
- **market exchange rates:** this refers to the financial rates prevailing in the foreign exchange market, as published by the Reserve Bank of Australia.

It is important to note the differences in the calculated costs when using the two different ways of exchange rate conversion. Market rates are volatile whereas PPP exchange rates are relatively stable over time. PPP exchange rates help to standardise the operating costs across cities by adjusting to the variation in the cost of living expenses.

Financial exchange rates are more relevant to internationally traded goods and services, as non-traded goods are cheaper in low-income countries as compared to high-income countries.[62] In this case, metropolitan transport services are non-traded goods, although some capital inputs are tradeable.

The rates used for PPP adjustment are shown in table A.18. These were used to convert to US Dollars and then the AUD/USD rates were used to convert to Australian dollars.

A.18 PPP Conversion Factor, local currency unit per international dollar

	2012	2013	2014
Australia	1.5222	1.5221	1.5355
Singapore	0.8859	0.8724	0.8617
Hong Kong SAR, China	5.5555	5.5756	5.6546
United Kingdom	0.6951	0.6985	0.7081
Canada	1.2462	1.2517	1.2612
Spain	0.6884	0.6801	0.6756

Source: The World Bank, available at <http://data.worldbank.org/indicator/PA.NUS.PPP>

The financial exchange rates for all the cities used in the CIE's international comparison are shown in table A.19. These were obtained from the Reserve Bank of Australia.

A.19 Financial exchange rates

	A$1=USD	A$1=EUR	A$1=GBP	A$1=SGD	A$1=HKD	A$1=CAD
2010	0.920	0.698	0.596	1.250	7.148	0.952
2011	1.041	0.745	0.648	1.305	8.102	1.028
2012	1.039	0.804	0.653	1.293	8.060	1.038
2013	0.960	0.722	0.614	1.203	7.447	0.993
2014	0.899	0.681	0.546	1.141	6.973	0.995

Source: Reserve Bank of Australia, available at <http://www.rba.gov.au/statistics/historical-data.html#exchange-rates>

Transport Leadership Summit

In addition to compiling data individually from some transport operators to build up a rail database, another source for comparison and analysis is data from the Transport Leadership Summit 2012-2014.

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62 Callen T. (2007), "PPP Versus the Market: Which Weight Matters?", *Finance and Development,* International Monetary Fund, vol. 44, no. 1

The Transport Leadership Summit (TLS) first commenced in 2012, with the objective of bringing together senior transportation executives from different metropolitan cities around the world to discuss major transportation topics. Between 2012 and 2014, there have been three summits organised annually, in three different cities[63] with representatives from 17 participating countries.

The Regional Plan Association (RPA), based in the United States, is one of the lead sponsoring partners of the TLS. The RPA is an independent urban research and advocacy organization. Research analysts from the RPA produced a comprehensive document based on materials prepared for the Summit series and discussions.

This document, titled 'Transit Leadership Summit 2012-2014' contained detailed metrics on some selected cities and their transport network. City profiles and comparative statistics were developed across the 17 participating countries.

In developing the metrics, the analysts looked at four main modes of transport across the different cities. Box A.20 shows the definitions for the different transport systems used by TLS.

A.20 Definitions of different transport modes as per the TLS

The data from the participating cities were collated around four different types of transport systems. The differences between the various systems are explained below. [64]

Heavy rail metro

A system that typically carries passengers within the city on an exclusive grade-separated right-of-way, elevated viaduct of embankment, subterranean tunnels or an open cut. Trains run frequently throughout the system, stations are spaced more closely together and speeds are slower than commuter rail. Journey times range from 15 to 30 minutes on average.

Light rail metro

A system that typically runs along surface streets in some cases in mixed traffic, or on exclusive lanes. Light rail systems generally operate at lower speeds, can brake faster to avoid conflicts with pedestrians, have a lower capacity and are less expensive to build and maintain.

Commuter rail

A system that typically transports residents from further suburbs to the major job centres in metropolitan areas. Commuter trains run faster than heavy and light rail systems, rely on schedules and make less frequent stops.

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[63] The Summit was held in New York in 2012, in Singapore in 2013 and in London in 2014.

[64] Transit Leadership Summit 2012-2014 (2013), available at http://transitleadership.org/docs/Transit-Leadership-Summit-2012-2014.pdf, viewed 21 September 2015

Bus rapid transit

A system that aims to provide high-quality surface transportation service similar to that of a rail network. Essential to its success are an exclusive right-of-way, off-board fare collection, platform-level boarding, and improved service plans. A BRT system may adapt some or all of these features depending on its urban context, leading to a range of BRT services worldwide.

For the purpose of our analysis in comparing international rail networks to Sydney's rail network, the CIE has used only the data relating to the heavy rail metro from the TLS dataset. The CIE recognises that the commuter rail in some other cities may also be comparable to Sydney's rail network, however it was not clear which ones should be included and therefore the whole category was excluded in this analysis.

Challenges associated with international comparisons

In collating the data to undertake international comparisons across the selected cities, RPA highlighted some of the challenges they faced.

The different definitions used across various agencies made it difficult to ensure like for like assessment. For example, the definition for ridership varied as in some cases, ridership included all trips separately (unlinked trips) whereas other agencies defined a trip as the complete journey even if it included multiple modes (linked trips). This was difficult to reconcile due to the diverse reporting styles.

Another contrasting factor was the variation in the scope of the transit systems between countries. For example, the farebox ratio could reflect costs and revenues for the metro only or the entire transit system, which might include more expensive on per passenger basis modes such as buses or commuter railroads. This would be based on the different styles of reporting adopted by various operators. The TLS report resolved this by aiming for the inclusions of the metro systems only, but noting in the few cases when the numbers did not completely conform.

A point of difference between the London data in the CIE's database as compared to the TLS dataset is that in the TLS dataset, heavy rail refers to the London Underground. Data around London Overground is not specified. This is different from our analysis where the data from London Overground is used as it is assumed to be most comparable to Sydney Trains.

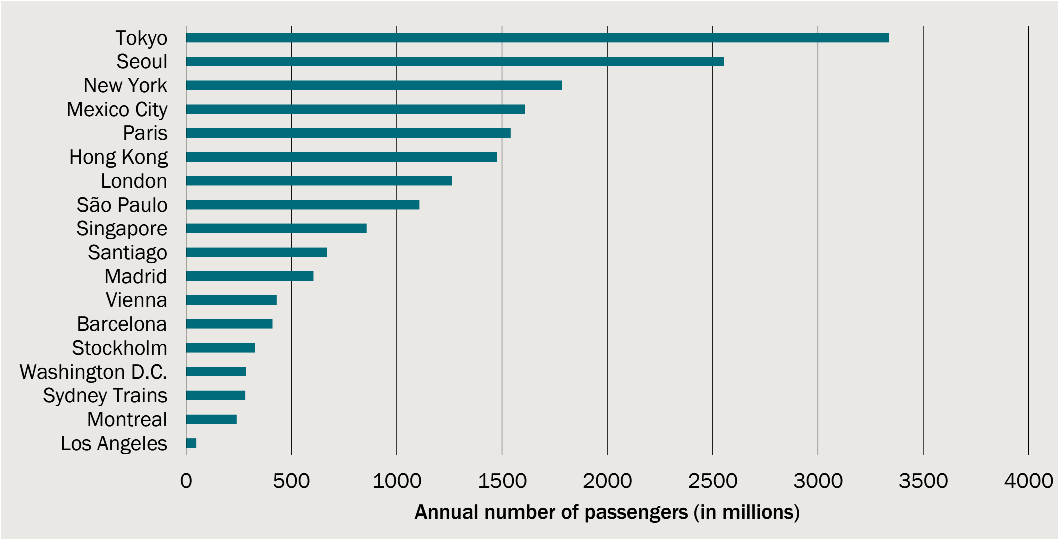
A final caveat is that all cost figures reported in the TLS report are in US Dollars, adjusted using the financial exchange rate which does not account for the variation in the cost of living across cities.

International benchmarking

The following charts show the different characteristics of rail networks across various cities based on data collated from representatives at the TLS. Only data around the heavy-rail systems have been included for comparison with the performance of Sydney trains.

Chart A.21 shows the annual number of passengers commuting in the rail network in each city. Tokyo and Seoul have a much higher number of passengers using the rail annually compared to the other cities. Sydney Trains have a small number of passengers commuting using the rail annually, relative to the other cities in the dataset.

A.21 Annual number of passengers

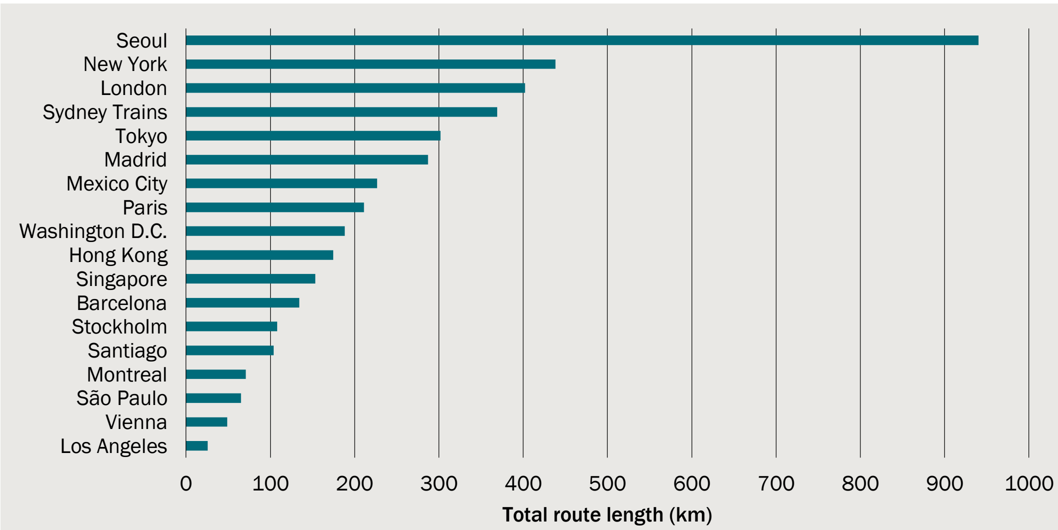


Note: Data for London relates to the London Underground

Data source: Transit Leadership Summit 2012-2014

Chart A.22 shows that in terms of the rail network, Seoul has the longest track length amongst all the cities, with the second operator (the New York subway) being only around half the length of Seoul's. Sydney Trains has one of the largest networks in terms of route kilometres, being lower than only the London Overground, New York Subway and Seoul Subway.

A.22 Comparison of route kilometres

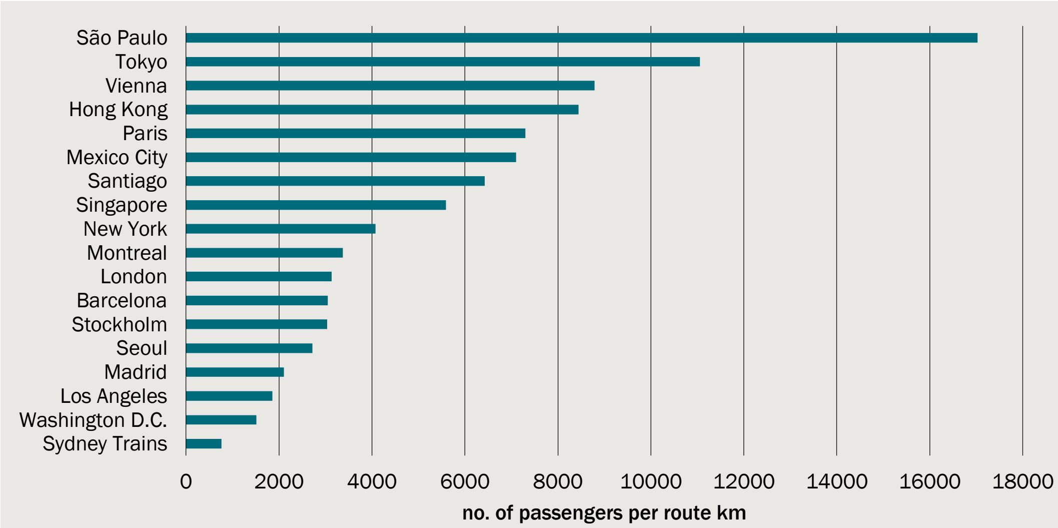


Note: Data for London relates to the London Underground

Data source: Transit Leadership Summit 2012-2014

As seen in chart A.23, Sydney Trains has the lowest number of passengers per route kilometre, on an annual basis compared to all the other cities.

A.23 Number of passengers per route kilometre

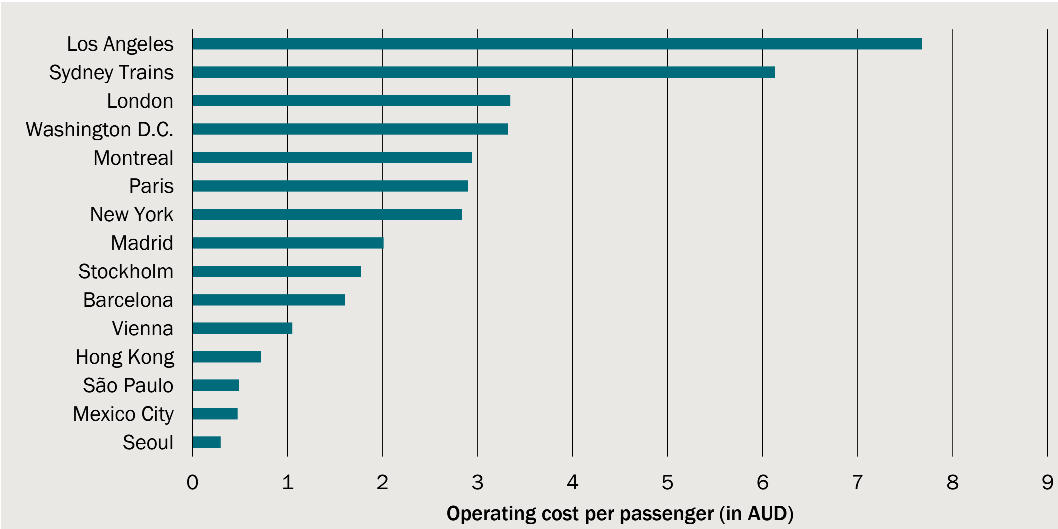


Note: Data for London relates to the London Underground

Data source: Transit Leadership Summit 2012-2014

As the operating costs in the TLS dataset were reported in US dollars, this was adjusted to AUD using financial exchange rates produced by the RBA. The operating costs per passenger in AUD is shown in chart A.24.

A.24 Operating cost per passenger in AUD



Note: Where it was difficult to ascertain costs relating to rail only, cities were excluded from this analysis.

Data source: Transit Leadership Summit 2012-2014, and CIE calculations

Overall, in terms of operating costs per passenger (in AUD), Sydney Trains is considerably more expensive than the networks in other cities, coming in second only to Los Angeles. Cities like Hong Kong, Sao Paulo and Mexico city have much higher passenger numbers (annually and on a route kilometre basis), however incur much lower operating costs per passenger.

B Bus operator benchmarking

Approach to benchmarking

Chooosing a benchmark

A key assumption underpinning our approach to benchmarking is that the operators in the seven metropolitan regions that were subjected to a competitive tendering process are technically efficient. However, there is some variation in costs across these regions. For example, the average variable cost per service kilometre in those regions that were competitively tendered ranged between $4.35 per kilometre and $6.00 per kilometre. This variation may reflect a range of factors, including different average speeds across regions, as well as differences in the barriers to entry across regions. Nevertheless, the variation across regions raises the question as to what is the appropriate benchmark within this range.

Alternative approaches to setting the benchmark include the following.

- The average across the competitively tendered regions — one is approach is to simply average the cost per service kilometre across regions. This could be:
  - a simple average across regions; or
  - a weighted average, where the weighting reflects either cost or the number of service kilometres.
- The minimum cost in the competitively tendered regions — the logic in using the minimum is that operator with the lowest cost is the most efficient and therefore an appropriate benchmark for efficient costs.
- The maximum cost in the competitively tendered regions — a less aggressive approach to estimating efficient costs is using the maximum of the competitively tendered regions. One argument for using the maximum of the competitively tendered region is that using any lower benchmark (such as an average or the minimum) would be inconsistent with the assumption that costs in the regions that went to competitive tender are efficient.
- The 25th percentile of the competitively tendered regions — the actual percentile chosen is arbitrary, but this is essentially a more aggressive approach benchmarking than using the average (or maximum) of the competitively tendered regions (although less aggressive than the minimum).
- The average across those regions where the incumbent operator lost the contract — as there are some barriers to market entry, incumbent operators possibly have a advantage over competitors. It is therefore possible that these barriers to market entry mean that the competitive tendering process did not achieve efficient costs in all regions. The incumbent operator losing the contract indicates that the barriers to entry were lower in those regions. It is therefore possible that costs in those regions are more indicative of efficient costs.

It is possible to mount a plausible argument for any of these benchmarks. However, we generally use the average of the regions that went to competitive tender.

Adjustments for varying speeds

For each region, the average total cost per Km is compared to an 'efficient cost' benchmark. The benchmark for each region is estimated as follows:

$$EC_i = KC * \ \cdot d + HC^* \cdot \frac{d}{S_i}$$

Where:

- EC_i is the efficient cost for area i
- KC* is the efficient average cost per Km (based on the average of the tendered metropolitan regions)
- d is the distance in Km (in this case 1)
- HC* is the efficient average cost per Km (based on the average of the tendered metropolitan regions)
- the d/S_i term is the time taken to travel the 1 Km in region i, where Si is the average speed in region i.

To estimate the efficient average cost per Km and hour, we estimate the average cost per hour and per region for each region. So that the costs are not double counted, this involves splitting total costs between Km based costs and hour based costs.

As this is unknown, our estimates are based on the shares implied by the variation price in each region. As follows:

$$\frac{KC_i}{TC_i} = \frac{PK_i \cdot d}{PK_i \cdot d + PH_i \cdot \frac{d}{S_i}}$$

$$\frac{HC_i}{TC_i} = \frac{PH_i \cdot \frac{d}{S_i}}{PK_i \cdot d + PH_i \cdot \frac{d}{S_i}}$$

Where:

- TC_i is the total cost per Km in region i
- KC_i is the kilometres costs (per Km) in region i
- HC_i is the hourly costs per Km in region i
- PK_i is the variation price per Km in region i
- PH_i is variation price per hour in region i.

Note that the speed is taken into account in the allocation between kilometre-based costs and hour-based costs (meaning that those regions with a slower average speed will have a greater share of costs allocated to hour-based costs) as well as in the calculation to estimate efficient costs from the kilometre and hour-based costs. This means that the adjustment is non-linear.

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