PSTN OTA Benchmarking study

Jeff Lassen

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Synergies Economic Consulting Pty Ltd
www.synergies.com.au

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Executive Summary

The ACCC has commenced a consultation process on its recently released draft indicative PSTN Originating and Terminating Access (PSTN OA and TA) prices.

This report assembles and examines international PSTN OA and TA prices for comparison to the indicative prices and a constructed Australian access price. The key cost drivers of OA and TA services that have implications for international price comparisons are examined in some detail. Where feasible, international prices are adjusted to account for cross-country differences in factors impacting on the costs of providing the services.

The key finding is that Australia's current OTA indicative price (a weighted price combining both OA and TA prices) of 1.04 cents, after making adjustments for cross-country differences in density and the cost of capital, is lower than almost all other countries. The ACCC's indicative price of 0.80 cents for 2011/12 is below the adjusted price of every country.

International benchmarking does not provide evidence that current Australian charges are inefficiently high. Rather, a rollover of current OTA prices is more in line with international prices and cost trends.

Price level comparisons

After adjusting international prices for cross-country differences in density and the cost of capital, only the UK, Denmark and Ireland having a lower price than the Australian current OTA indicative price of 1.04 cents (table below). The prices of Denmark and Ireland at 1.00 cents and 0.99 cents, respectively, are only marginally below Australia's price.

The ACCC's indicative price of 0.80 cents is based on estimates from a network cost model developed by Analysys Mason. The price of 0.80 cents is lower than all benchmark prices. With the exception of the United Kingdom, benchmark prices are significantly higher, ranging between 23 and 546 per cent greater than the ACCC price.

For the density and WACC adjustments, Australia has a cost disadvantage relative to all countries included in the benchmarking. Australian densities are lower and costs of capital higher.

In addition to cross-country differences in density and the cost of capital, there is a large list of other potential impacts on PSTN OA and TA price comparisons. As they have not been individually quantified, it is not possible to know if the impacts of these influences "average out". Their net effect may reduce the magnitude of the upward adjustment to prices for some countries, while increasing it for others. Overall, I would expect that their net effect would be modest relative to the size of the quantified adjustments for density and cost of capital. In particular, I would not expect quantification of their effects to reverse the key finding that Australia's current price is low versus international benchmarks, and that the ACCC price of 0.80 cents is lower than any of the benchmark prices.

Adjusted benchmark prices

Benchmark	Starting point blended price (cents)	Traffic density (cents) [a]	Line length (cents)[a]	WACC adjustment (cents)[a]	Adjusted prices (cents)	Distance above ACCC price (%)
Australia - ACCC cost model price	0.80	-	-	-	0.80	-
United Kingdom	0.50	0.06	0.27	0.00	0.84	5
Ireland	0.74	0.08	0.13	0.04	0.99	23
Denmark	0.66	0.11	0.19	0.04	1.00	25
Current Australian OTA indicative price	1.04	-	-	-	1.04	30
Sweden	0.90	0.05	0.09	0.08	1.12	41
Switzerland	0.68	0.16	0.29	0.03	1.17	47
United States	1.10	0.10	0.09	na	1.30	62
Italy	0.85	0.17	0.30	0.08	1.40	75
Norway	1.28	0.03	0.05	0.07	1.43	79
France	1.14	0.05	0.27	0.07	1.54	92
Germany	0.85	0.24	0.43	0.04	1.57	96
Portugal	1.18	0.14	0.25	0.06	1.62	103
Spain	1.29	0.16	0.27	0.06	1.78	123
Austria	1.29	0.16	0.28	0.11	1.83	129
Poland	1.63	0.21	0.37	0.08	2.29	187
Mexico	2.11	0.09	0.14	na	2.34	192
Netherlands	1.23	0.32	0.95	0.06	2.55	219
Belgium	1.12	0.50	0.89	0.04	2.56	220
Chile	2.84	0.04	0.04	na	2.92	264
Brazil	4.30	0.07	0.09	na	4.47	459
Peru	5.00	0.05	0.04	na	5.09	536
Finland	4.74	0.11	0.16	0.15	5.17	546

[a] **The adjustments are described in the notes to Table 14 and through the body of the report.**

Price trend comparisons

Relative increasing costs of service provision

Differences in network design result in differences in cost shares by asset type - switching, ducting and trenching, and other transmission assets. Switching and equipment prices have been decreasing over a considerable period, whereas trenching costs - driven largely by labour costs - have been increasing. Different cost shares combined with different price trends will result in underlying cost structures changing at different rates. Therefore, there is the potential for error in using overseas price trends (regulated glide paths) to infer the rate of change in industry costs, and hence prices, in Australia.

The differences in price trends between equipment costs (costs declining) and ducting/trenching costs (costs increasing), would contribute to Australian costs declining at a rate slower than for most if not all benchmark countries, or increasing at a faster rate. Given cost-reflective pricing, a similar impact on PSTN OA and TA price comparisons would be observed.

Upward pressure on OA and TA costs

Almost all of the benchmark countries are experiencing declining PSTN traffic volumes which is beginning to impact on regulatory price setting as evidenced by price increases (e.g. for Germany). In the medium term, while there may be some downward movement in OA and TA prices for some countries, there is also likely to be increases in some countries, and price stability in others. Given these cost pressures, the ACCC's draft indicative price of 0.80 cents is likely to be very low relative to benchmark prices in 2011-12 (as it is compared to 2008-09 benchmark prices).

Summary

International benchmarking does not provide evidence that Australia's current OTA indicative price at 1.04 cents is inefficiently high. After accounting for cross-country differences in the cost of capital and, in particular, density differences, the only country with a measurably lower price is the United Kingdom.

Given cross-country differences in network designs and cost shares, equipment prices declining, but ducting and trenching costs rising, the costs of providing OA and TA services in Australia can be expected to increase relative to benchmark countries.

Similar to Australia, overseas countries are experiencing reductions in PSTN traffic volumes which is putting upward pressure on costs and is beginning to reverse the trend of regulated OA and TA prices declining.

As current OA and TA indicative prices in Australia are not high, and the relative costs of providing the services are likely to increase, a rollover of current OA and TA indicative prices would be more in line with the evidence provided by international benchmarking than would the establishment of a glide path to 0.80 cents by 2011-12.

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1 Introduction

1. My name is Jeff Lassen. I am a Director of economic consulting firm Synergies Economic Consulting. I have been asked by Telstra to perform a benchmarking analysis of PSTN Originating Access (OA) and Terminating Access (TA) services globally and, informed by that analysis, to prepare a detailed PSTN OA and TA benchmarking report.

2. The ACCC employs PSTN OA and TA benchmarking, amongst other services as a cross check for cost estimates derived from the Analysys fixed network services cost model (the "Analysys Model"). The term "OTA" signifies that the prices being compared are a blended OA and TA price.

3. My instructions are contained in Annexure D. My curriculum vitae, including relevant qualifications and experience, is included in Annexure A. Annexure F includes a list of reviewed documents.

4. I have read the Federal Court's practice direction 'Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia' and prepared this report accordingly.

5. The ACCC has commenced a consultation process on its recently released indicative PSTN OA and TA prices. In forming the indicative prices the ACCC has drawn on the Analysys Model and an international benchmarking report prepared by Analysys Mason.

6. I have been asked to prepare an independent report which:

   (a) assembles and examines international PSTN OA and TA prices for comparison to Australia's current OTA indicative price and the ACCC's draft indicative prices; and

   (b) analyses the cost drivers underlying OA and TA services that have implications for price comparisons. Where feasible, this may involve identifying order of magnitude adjustments which would improve the validity of price comparisons.

7. The task is a difficult one given the paucity and opaqueness of available data on PSTN OA and TA prices. Data limitations are discussed later in this Report. Despite the data limitations, a number of adjustments to benchmark prices have been calculated. In each case, assumptions underpin the calculations. The assumptions are explained to ensure that the process of adjusting the benchmark prices is transparent.

8. The report is set out as follows:

(a) international PSTN OTA price comparisons are presented (section 2);

(b) network cost drivers are analysed (section 3);

(c) regulatory cost drivers are analysed (section 4); and

(d) implications for benchmarking are considered, including quantitative adjustments to benchmark prices (section 5).

2 International price comparisons

2.1 Service definition

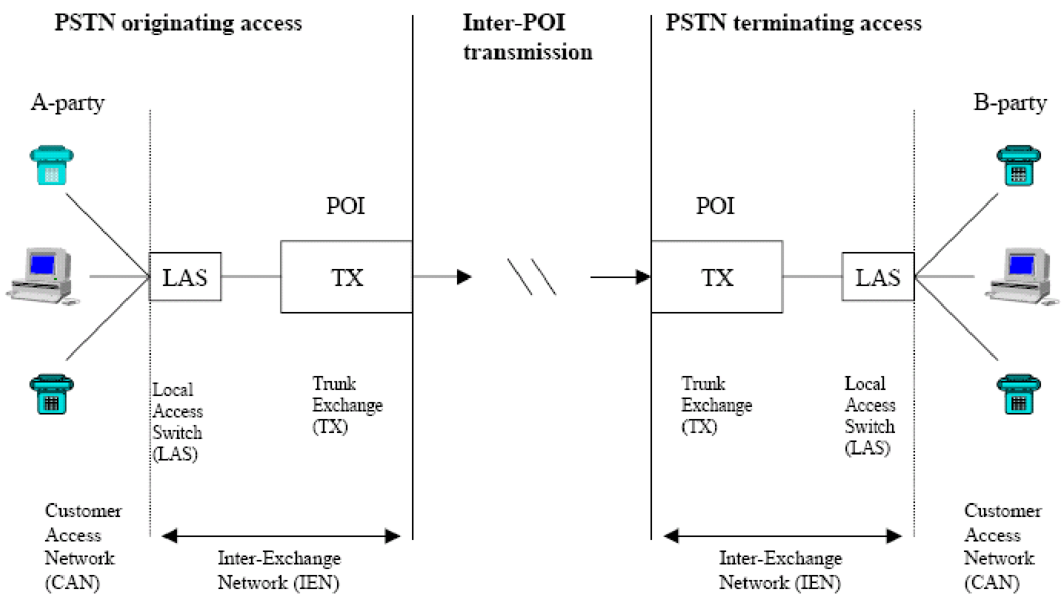
9. Domestic PSTN originating access (OA) is the carriage of telephone calls from the calling party to a Point of Interconnection (POI) with an access seeker's network (Figure 1). Usually, POIs are located at a trunk exchange.

10. Domestic PSTN terminating access (TA) is the carriage of telephone calls from POI within an access seeker's network to the party receiving the call.

11. The declared domestic PSTN OA and TA services are, in general, used as inputs by service providers primarily to supply long distance calls, mobile-to-fixed calls to end-users in Australia, and international calls. They can also be used by other network operators to interconnect with Telstra's fixed network.

12. The PSTN OA and TA services allow access seekers to buy the carriage of telephone calls from a calling end-user to a POI (OA) with the access seekers network, and the carriage of telephone calls from a POI to a receiving end-user (TA).

Figure 1 Representation of PSTN OA and TA services



Source: ACCC 2006, Assessment of Telstra's PSTN and LCS Undertaking, Final Decision, November.

2.1 Factors impacting on price benchmarking

13. International price comparisons typically compare a single price for each country. This tends to give the impression that there is a greater level of accuracy in the comparisons than there is in reality.

14. Many factors can impact on international price comparisons and how they are interpreted (Box 1). The factors relate to either measurement error in prices or relate to explanations of why accurately measured costs and prices differ. The factors can be grouped under four headings:

(a) *price comparison methodology*: the data and procedures used to make price comparisons will impact on the end results of the comparisons;

(b) *underlying differences in the cost of service provision*: country specific factors and conditions can cause immutable differences in the cost of service provision, for example, differences in densities, and geographic/climatic conditions. These cost differences result even where the networks in respective countries are optimally designed and operated efficiently. Where prices are the outcome of regulatory processes, differences in the cost structure of regulated carriers can be the result of different regulatory approaches, or implementation differences;

(c) *differences in the relationship between prices and costs*: the conditions under which prices are set can impact on the relationship between prices and costs so that prices can differ independent of differences in underlying costs. Where prices are the outcome of regulatory processes, price differences can reflect in the extent to which regulators influence prices towards costs; and

(d) *timing considerations:* there are a range of factors that can impact on point-in-time price comparisons.

Box 1 Factors impacting on international PSTN OA and TA price comparisons

- Price comparison methodology
  - estimation of average rates and units
  - calculation of rates for defined periods (peak/off-peak)
  - conversion of geographically differentiated rates
  - conversion of local currencies to Australian dollars (PPP versus spot exchange rate or equilibrium exchange rates)
  - conversion of component based charging (e.g. in some US states there are three components to the interconnection charge - end office switching, tandem switching, and common transport)
- Differences in the underlying cost of service provision
  - technology mix and relative prices (e.g. cost of labour, cost of material and taxes)
  - network topology and architecture, including geographic terrain and network coverage
  - density economies in service provision resulting jointly from the scale and distribution of the population over a

given land mass (including housing stock mix)
  - mix of voice and data traffic
  - tax treatments
  - technical or productive inefficiency
- Regulatory imposed differences in the cost of service provision
  - removal of subsidies (if any) associated with service obligations
  - applicable pricing principle used to set prices in each country (e.g: forward looking cost based)
  - differences in the implementation of pricing principles (e.g. degree of scorching in determining efficient costs)
  - differences in the overall pro-competitive settings of the regulatory environment
  - costing methodologies (e.g. valuation methodology, approach to smoothing depreciation charges, cost allocation (particularly with large common costs and significant changes in demand patterns between alternative services and substitution to other services, such as, mobile), cost of capital)
- Timing considerations
  - comparing prices from regulatory determinations made at different points in time
  - use of depreciation methods that shift costs impacting on price comparisons at a point in time

2.2 International price comparisons

2.2.1 ACCC's draft indicative prices

15. The draft indicative prices released by the ACCC range from 0.90 cents in 2009-10 declining to 0.80 cents by 2011-12 (Table 1). The price of 0.80 cents is derived from the Analysys Model. The ACCC has stated that both cost modelling and international price benchmarking provided inputs to the development of the prices, along with the establishment of a glide path to address concerns about adjustment costs[1].

16. The international benchmarking resulted in a geographically averaged benchmark price of between 0.75-0.78 cents for local OTA and 1.11-1.16 cents for single transit OTA[2]. The Analysys Model generated a range of estimates between 0.74 cents for 2009-10 increasing to 0.79 cents in 2011-12.

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1 ACCC 2009, Draft pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS, LSS, August, p.36.

2 Analysys Mason 2009, Report for the Australian Competition and Consumer Commission, International benchmarking analysis, Analysis of WLR, LCS, LSS and PSTN OTA, August.

Table 1 ACCC draft indicative prices

	2009-10	2010-11	2011-12
All zones (cents)	0.90	0.85	0.80

Note: ACCC is proposing a single national uniform price per minute compared to the structure of previous and current prices that include flagfall and usage components that are regionally varied. The changes are based on the ACCC's view that the costs associated with transmit are likely to be the same throughout the CAN and/or inter-exchange network[3] (core network) notwithstanding the geographical location of the end-user. The average price included local and single transit access services only.

Source: ACCC (2009)

2.2.2 A current Australian OTA indicative price

17. In this report we benchmark Australian prices against a set of international prices. We show comparisons against a constructed Australian "current OTA indicative price" and the ACCC's indicative price of 0.80 cents derived from the Analysys Model. Construction of the current OTA indicative price is based on the following assumptions:

(a) *average call hold time*: an average call hold time of four minutes was used as per ACCC standard assumptions and consistent with the assumptions adopted in constructing the international prices).

(b) *traffic patterns*: Originating-Terminating traffic shares of **[TC1 c-i-c commences]** [0.78] **[TC1 c-i-c ends]** C-I-C **[TC1 c-i-c commences]** C-I-C **[TC1 c-i-c ends]** for Rural/Regional traffic based on Telstra traffic data;

(i) the CBD/Metro share is applied to local connection prices and the rural/regional share is applied to single tandem prices (this assumption is discussed further below);

(c) *symmetric rates*: Originating and Terminating shares are set at 50/50;

(ii) Australian and most other countries' OA and TA prices are symmetric, so price comparison results are not sensitive to this assumption; and

(d) *currency conversion*: international prices are converted to Australian dollars using US *PPPs*.

18. It is necessary to construct a blended price because there are a number of different prices for OA and TA connection services varying by geographic classification and fixed/usage charges (Table 2). Based on the assumptions above, the current OTA indicative price is calculated at 1.04 cents using the ACCC call hold duration assumption.

3 The Inter-Exchange Network comprises the local switching and transmission elements of the PSTN.

Table 2 Current OTA indicative price

	Current ACCC indicative OTA prices					
	CBD	Metro	Provincial	Remote		
Flagfall (cents)	0.85	0.84	0.94	2.06		
Conveyance (cents)	0.35	0.49	0.68	3.66		
Average Call Hold Time (ACHT) (minutes)	4.00					
Average cost (cpm) - 4min ACHT	0.56	0.70	0.92	4.18	(FF + Con' x 4mins)/4mins	
	Local (CBD + Metro)		**Single (Prov + Remote)**		**Total**	
Geographic profile (minutes) by switching equivalent	[TC1 c-i-c commences] C-I-C	C-I-C	[redacted]	[redacted]	C-I-C [TC1 c-i-c ends]	
						Total
Headline rate (4min ACHT)	0.03	0.51	0.12	0.38	= (Geo' profile x Average cost 4min)	1.04

Source: Telstra traffic data and Synergies)

19. In many jurisdictions (particularly in Europe) fixed interconnection prices are typically provided in terms of network elements reflecting the nature and extent of the use of switching and other network elements (e.g. local; single tandem and double tandem). In countries that are geographically smaller and more dense than Australia, for example, these elements based charges are generally consistent with the steeper distance gradient and associated network costs when the call is delivered across longer distances (e.g. a single tandem charge also reflects the additional transport between the local and tandem switch).

20. However, in less dense more geographically dispersed jurisdictions such as Australia, typically interconnection has been based on geographically based prices. This reflects that things such as network topology (and therefore costs) will vary more significantly between metropolitan and rural areas so that an elements based methodology will understate geographic differences.

21. Nevertheless, assumptions need to be made regarding the relationship between prices disaggregated by geographic profile and the type of connection in order to validly compare European elements charges to either a comparable single national charge or geographic based charge.

Accordingly, we have adopted the approach of the NZCC in determining an equivalent averaged cost for jurisdictions that are element based. This approach is set out below.

22. For CBD and Metro traffic, it is assumed that local interconnection charges apply reflecting the lower distances (and costs) associated with delivery of the call. For provincial and remote traffic, it is assumed that single tandem charges apply. This means that the share of local connections in total connections is set equal to the CBD/Metro traffic share at **[TC1 c-i-c commences]** C-I-C **[TC1 c-i-c ends]** per cent, and the single tandem share is set equal to the rural/regional share at **[TC1 c-i-c commences]** C-I-C **[TC1 c-i-c ends]** per cent.

This rule is conservative and will tend to understate the true cost differences between Australia and the European jurisdictions. For example, contrary to the split between local interconnection and single tandem assumed above I am instructed that Telstra currently interconnects **[TC1 c-i-c commences]** C-I-C **[TC1 c-i-c ends]** of its OA and TA calls at the single tandem layer and **[TC1 c-i-c commences]** C-I-C **[TC1 c-i-c ends]** at the local interconnection layer. This also does not take into account differences in network topology between metro and rural areas.

23. Based on these differences, if a blended Australian price was constructed based on Australian shares by type of connection then that price would be higher than 1.04 cents. However, the higher price would be associated with higher costs. For the purpose of international price benchmarking, a cost adjustment would therefore have to be made to reflect differences in network designs with the adjustment pulling the blended price back down to something like the 1.04 cents calculated above.

2.3 Focus of this paper

24. This paper focuses on what are key factors impacting on PSTN OA and TA price comparisons. The paper examines:

(a) cross-country differences in densities and implications for costs;

(b) transmission and switching costs, and related price trends; and

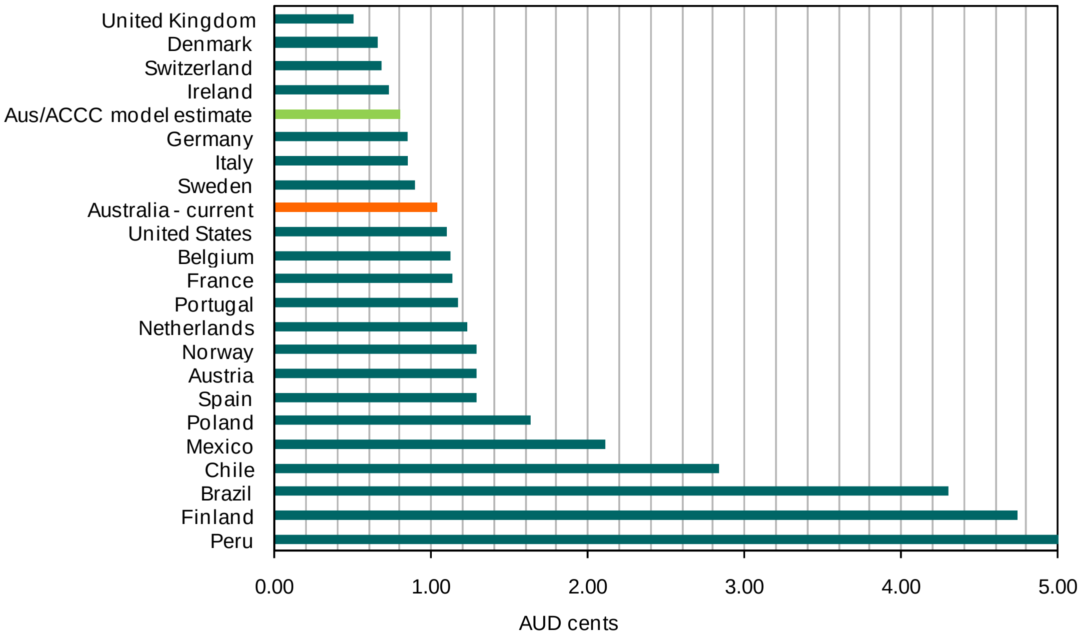
(c) regulatory influences on cost structures, in particular, differences in the Weighted Average Cost of Capital (WACC) and approaches to depreciation.

25. The paper examines the adjustments to international prices implied by the analysis. Where feasible, it makes quantitative adjustments to derive new PSTN OTA price comparisons.

26. The unadjusted prices are shown below. Australia's current OTA indicative price of 1.04 cents is below average compared to a range of international countries to which

Australia is typically benchmarked (Figure 2)[4]. The ACCC's draft indicative price of 0.80 cents for 2011/12 is low by international standards, even before taking account of cross-country differences in factors impacting on the costs of providing OTA services.

Figure 2 Blended PSTN OTA price comparisons



Notes: Assumptions as per described in Table 14. The country prices are based on the prices of national fixed network operators as describe in Annexure E.

Data source: OVUM, and Synergies based on data provided by Telstra

4 International price data from OVUM, Europe and Americas additional benchmarks and tables, Q2, 2008.

3 Cost drivers

3.1 Network costs

27. Core network costs can be classified as those costs relating to transmission between exchange or concentrator points and those costs relating to switching.

3.1.1 Transmission cost drivers

28. Transmission costs primarily include:

(a) trenching costs: primarily influenced by wage levels and geographic factors (e.g. how rocky the terrain is); and

(b) transmission equipment: trunk and junction line transmission and multiplex equipment including carrier terminal repeater equipment, filters, line terminal equipment, equalisers and regenerators for coaxial and optical fibre links, all associated power plant wiring and cabling (excluding battery, rectifier and discharge cubicle interconnections) and transmission huts and shelters. Transmission equipment excludes any exchange service line or switchboard equipment, exchange equipment, cables and ducts.

29. Transmission costs increase with:

(a) the number of urban centres;

(b) the distance between centres (excluding inter-capital transmission);

(c) the number of customer locations;

(d) the distance between customer locations; and

(e) the cost (price) of transmission equipment and trenching.

3.1.2 Switching cost drivers

30. Switching costs primarily includes all equipment costs (local and trunk) for equipment located within exchange buildings.

31. Switching costs increase with:

(a) the number of exchanges; and

(b) the price of switching equipment.

32. The number of exchanges is a function of a number of exogeneous parameters including the number of customer locations (population scale), and the geospatial distribution of the population. However, it is also a function of the choices made in designing the network to service demand.

3.1.3 Network design

33. Given differences in local conditions (geographic characteristics, population size, geospatial dispersion of the population, and demand characteristics), optimal network design can result in cross-country differences in the cost shares of switching and transmission.

34. To provide a given set and volume of services, alternative network architectures can be applied with significant differences in the number of exchanges. Hypothetically, doubling the number of exchange buildings (and enclosed equipment) will double switching costs (abstracting from any economies of scale in switching technologies). Total transmission costs will also increase to the extent that a greater number of local exchanges are connected up the network hierarchy to trunk exchanges. However, transmission assets also include assets from the local exchange to the customer location, and the quantity/cost of these assets will not change significantly. Therefore, a technological solution which includes a greater number of exchanges will increase switching's cost share and decrease transmission's cost share in total PSTN costs.

3.1.4 Cost shares and price trends

Differences in cost shares

35. In the Analysys Model for the CORE or Inter-Exchange Network, ducting and trenching related costs form a significant part of total costs in Australia at roughly 66 per cent (Table 3). For British Telecom, the cost share of ducting and trenching is significantly lower at no more than 17.8 per cent (including repeaters), or less than a third of Australia's cost share[5].

36. Cost share data for all of the benchmark countries is not available.

5 NERA 2002, Benchmarking of International Interconnection Costs Against New Zealand Cost Conditions, Report for Telecom New Zealand, July.

Table 3 Cost shares

Analysys Model[a]	*(%)*	*BT LRIC Model*	*(%)*
Switching	26.2	*Switching*	*72.6*
Transmission	6.0	Local exchange concentrator	17.1
Duct & Trenching	66.4	Local exchange processor	37.6
Other	1.4	Tandem switch share	17.9
Total	100	*Transmission*	*27.4*
		Cable, duct & repeater	17.8
		Transmission end equipment	9.6
		Total	100

a Per cent of capital expenditure for Core Network.
Source: Analysys Model, NERA (2002)

Differences in price trends

37. In the Analysys Model, price trends for switching and transmission capital items are forecast to decline annually by between five and nine per cent. In contrast, ducting and trenching costs are forecast to increase by two per cent per annum (Table 4). These price trends - equipment prices falling and labour driven trenching costs rising - have been observed for some time (e.g. the trends were also evident in Telstra's 2006 undertaking).

38. Switching and transmission equipment prices are determined within competitive international markets so that price trends evident for Australia would be expected to be observed for other countries. Switching and non-duct/trenching related transmission costs continue to decline (Table 4). While labour is for the most part not traded in international markets and will be driven by labour productivity in each country, duct and trenching cost trends appear to be common across countries. This might be related to common technological trends or other factors that impact primarily on the cost of digging. Notwithstanding common trends, there could remain significant cross-country variation in the level of trenching costs as an important driver of those costs is the level of real wages which is related to the productivity of labour.

Table 4 Annual change in input prices

	Australia		Sweden	Denmark	
	PIE II price trend, 2006	Analysys price trend, 2009-2012	PTS Hybrid Core model[6]	International benchmarks	Hybrid Model (v 2.1)
Radio transmission	+0.1%	0.0%	-8.0%	-8.0%	-8.0%
Optical Fibre	-8.5%	-9.0%	-2.0%	-1.0%	-5.0%
Indirect capital	-1.9%				
Land & Buildings	0.0%	0.0%	+2.0%		+4.0% (land), 0.0% (bldg.)
SDH equipment	-8.5%	-5.0%	0.0%		
Local Switching	-8.5%	-5.0%	0.0 to -5.0%		
LAS software	-6.9%	-5.0%	-4.0%		
Signalling transfer point	-8.5%	-5.0%	-4.0%		
Transit switching	-8.5%	-5.0%	-5.0%		
TNS software	-6.9%		-4.0%		
Main conduit & trenching [a]	+4.2%	+2.0%	+2.0%	+2.0%	+3.0%
Pair Gain systems	-5.1%				

a As an indicator of trenching costs, IT- og Telestyrelsen (Denmark) use an index produced by Statistics Denmark of the costs of tenders for earth and asphalt work. The index is viewed as being a good proxy for the costs of digging trenches. Between 2005 and 2009, the index grew at an average annual rate of +3.5 per cent per annum.

Source: Analysys Model and Telstra (Submission in support of its 2006 undertakings), PTS Hybrid Core Model v2.4, Statistics Denmark, IT-og Telestyrelsen (2005)

Implication for price comparisons

39. The fact that different cost components of providing PSTN OA and TA services change in different directions means that the cost structure of carriers can change at different rates, even where price trends are equal. This is because different network designs imply differences in cost shares by asset type. Networks with a relatively greater investment in switching equipment will tend to experience relatively greater cost declines than networks where trenching costs contribute more to total costs.

40. Comparing Australia and the UK, the significant differences in ducting and trenching cost shares would contribute to significantly different rates of change in underlying costs, with a significant cost advantage to the UK.

41. An illustration is used to show how differences in cost shares and price trends can impact on underlying cost structures over time. Assume three carriers each with a cost base of $100. Cost shares, price trends and asset lives are set out below (Table 5). For simplification straight line depreciation is used and assets are revalued each year according to the price trends.

6 IT- og Telestyrelsen 2005, Report on the LRAIC Model: Revised Hybrid Model (version 2.3), December.

42. While all carriers start with the same cost base, costs are significantly different at the end of 10 years. Carrier C - with the highest cost share in ducting and trenching - has a cost base roughly forty per cent higher than Carrier A at the end of the ten years. As well as differences in price trends, differences in asset lives contribute to this outcome with duct and trenching asset lives being longer. Note that the duct and trenching cost share difference between Carrier A and Carrier C is less than the difference between the Analysys Model and BT LRIC model.

43. The ducting and trenching cost shares of other benchmark countries is likely to fall somewhere between the UK's and Australia's cost shares, given differences in density measures. Therefore, holding constant all other factors that drive network costs, I would expect to see the network costs of these countries declining at a slower rate (or increasing at a faster rate) than UK network costs. Given the substantial density advantages that most of these countries enjoy relative to Australia, and assuming differences in density are correlated with differences in cost shares, I would expect to see the duct and trenching price trends, combined with the cost share differences, resulting in Australia's relative cost of providing OA and TA services increasing against all benchmarks.

Table 5 Illustration of combined effect of differing cost shares and price trends

Cost shares				
Carrier	Switching equipment	Transmission	Duct & Trenching	Total
A	0.60	0.20	0.20	1.00
B	0.50	0.20	0.30	1.00
C	0.30	0.20	0.50	1.00
Initial Cost Base ($)				
Year	Switching equipment	Transmission	Duct & Trenching	Total
A	60	20	20	100
B	50	20	30	100
C	30	20	50	100
Price trend assumptions -	*% change*		*Asset Lives -*	
Switching equipment	-0.06		Switching equipment	20
Transmission	-0.04		Transmission	25
Duct & Trenching	+0.02		Duct & Trenching	40
Cost Base over time	*Carrier A*	*Carrier B*	*Carrier C*	
Year 0	100	100	100	
Year 5	66	70	79	
Year 10	46	53	66	

Source: Synergies

3.2 Population scale and dispersion

44. The physical characteristics of the operating environment such as terrain, density of spatial activity (population, line, 'tele' or traffic density) and distance, is an important cost driver, and must be adjusted for in a benchmarking comparison. Without adjustment, the informative power of a benchmarking study is limited.

45. In general, the most important factor is density because very low density areas, such as rural Australia, are significantly more costly to serve than metropolitan areas.

46. Density influences the potential for both economies of scale and scope:

> Higher population density and degree of urbanisation decrease network construction costs reflecting the economies of scale inherent in telecommunication networks. Network construction costs depend to a greater degree of geographical roll-out of the network than of number of customers served. This in turn influences the possibilities to reap the benefits of economies of scope as well because it can

prove difficult to achieve a sufficient customer basis for add-on products in scarcely populated areas to profitably exploit economies of scope.[7]

3.2.1 Density measures

47. Measures of density used in telecommunication studies include:

(a) population density measures, such as, population per square kilometre, proportion of the population in urban centres, or urban centres above a certain size;

(b) other proxy measures, such as, population per kilometre of road length; and

(c) telephone ('tele'), line density or access measures, such as, standard access lines per 100 inhabitants (or mobile lines, or broadband connections etc.), and access lines per square kilometre.

48. The measures can differ along two main dimensions:

(a) level of aggregation: whether the measure is a summary statistic for a whole country or whether it provides information at a lower level of aggregation; and

(b) the type of summary statistic: there are different ways to describe density, for example, comparisons based on the average of the distribution, reporting by percentiles, variance in density, the skewness of the distribution and so on.

49. Background on density measures is provided in Annexure B.

3.2.2 Density price adjustments

50. A number of other international benchmarking studies have recognised the importance of explicitly adjusting prices to take account of differences in densities. For this Report, two methods for making density adjustments were tested, both building on earlier studies:

(a) Method 1: adaptation of the traffic and line length adjustments based on a NERA submission[8] to an international benchmarking study undertaken by the New

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7 Norden 2004, Telecompetition: Towards a single Nordic market for telecommunication services?, Report from the Nordic Competition Authorities, no.1, September, p.13.

8 NERA (2002), Response to Commerce Commission Draft Determination: A Report for Telecom New Zealand, September, Sydney.

Zealand Commerce Commission (NZCC)[9]. The adjustments utilised British Telecom's LRIC model and New Zealand; and

(b) Method 2: adaptation of the average line density and indices of average line costs constructed by Cribbett for a small number of countries and range of US states. The estimated average line cost indices show average line costs relative to an Australian index score of 100. The index based on the Benchmark Cost Proxy Model (BCPM) was chosen over the index based on the Hatfield Associates Incorporated (HAI) regulatory cost model as the range of estimated adjustments is more conservative[10].

51. Method 1 produces a wider range of required adjustments to prices compared to Method 2 (e.g. some adjustments are greater than 100 per cent (Japan, Korea and the Netherlands)). Method 2 produces fewer "small" adjustments compared to Method 1. Further information on the methods is provided in the notes to Table 6.

52. Relative to Australian PSTN OTA prices, Denmark's prices would be raised by 45 per cent under Method 1 and 51 per cent under Method 2. Sweden's prices would be increased by 15 and 30 per cent, respectively. The smallest adjustments would be for Canada and Iceland.

53. Both methods would raise international prices relative to Australia for all countries. Under Method 1, the traffic and line length adjustment increases prices from a low of plus 1 per cent to a high of plus 124 per cent. Under Method 2, prices increase from a low of plus 2 per cent to plus 70 per cent.

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9 New Zealand Commerce Commission 2002, International Benchmarking Report: A Comparative Review of Interconnection Pricing, Wellinton, September.

10 The BPCM and HAI are forward looking engineering cost models used to estimate the total average cost (per line) of providing basic local telephony services in nine line density categories.

Table 6 Density adjustment methods

	Method 1			Method 2	
Benchmark	Traffic density (%)[a]	Line length (%)[a]	Traffic & Line Length (%)[a]	Inferred BCPM average line cost (%)[b]	Difference ((2)-(1)) (% points)
Austria	+12	+22	+34	+45	0.11
Belgium	+44	+80	+124	+70	-0.54
Brazil	+2	+2	+4	+17	0.13
Canada	+1	+1	+2	+2	-0.01
Chile	+1	+1	+3	+14	0.12
Denmark	+16	+29	+45	+51	0.05
Finland	+2	+3	+6	+16	0.10
France	+5	+24	+29	+51	0.22
Germany	+28	+50	+79	+62	-0.17
Ireland	+11	+18	+29	+42	0.13
Italy	+20	+35	+54	+54	0.00
Mexico	+4	+06	+11	+26	0.16
Netherlands	+26	+77	+103	+70	-0.33
New Zealand	+3	+4	+7	+19	0.12
Norway	+3	+4	+7	+17	0.11
Peru	+1	+1	+2	+11	0.09
Poland	+13	+23	+36	+46	0.10
Portugal	+12	+21	+33	+45	0.12
Spain	+12	+21	+33	+45	0.11
Sweden	+6	+10	+15	+30	0.15
Switzerland	+24	+42	+66	+59	-0.08
United Kingdom	+12	+54	+67	+62	-0.05
United States	+9	+8	+17	+30	0.13

a Method 1 traffic and line length adjustments based on NERA (2002). For countries not included in NERA (2002), adjustments were derived. A composite index of density measures was constructed and scores on that index were related to the magnitude and size of adjustments for countries included in NERA (2002). For the countries included in both datasets, a simple linear relationship provided a good fit. For countries not included in NERA (2002), composite index scores were inserted into the ordinary least squares equation in order to obtain an estimate of the traffic and line length adjustments. b Method 2 adjustment based on Cribbett (2000). The relationship between a composite density index (comprising population density, road density and access lines per square kilometre) and Cribbett's average line density by State was investigated for the states included in the Cribbett dataset. This allowed a new BCPM index to be inferred where the new BCPM was related to the composite index rather than average line density. BCPM index scores were then derived for countries not included in the original Cribbett study by inserting their composite index scores into an equation representing the relationship between the BCPM index and the composite density index. Differences due to rounding.

Source: NZCC (2002), NERA (2002), Cribbett (2000), Synergies estimates

4 Regulatory cost drivers

54. As noted in section 2, there are a large range of regulatory issues that can potentially impact on price comparisons. The terms of reference for this Report focus on:

(a) cost of capital; and

(b) the use of tilted annuities in calculating depreciation charges.

55. The impacts of cost allocations are also briefly discussed because they are affected by changing demand patterns.

4.1 WACC

4.1.1 Adjusted WACC comparisons

56. Variations in the required return on capital will have impacts on the cost structure of carriers and the prices charged for PSTN OA and TA services where prices reflect costs. Therefore, cross-country differences in regulated WACCs will contribute to cross-country price differentials. Differences in WACC will be the result of, in part, differences in corporate tax rates, the risk-free rate, market risk premium and debt risk premium.

57. A recent report[11] to the ACCC sought to adjust for these factors in benchmarking WACCs. Post-tax unadjusted WACCs for a set of European countries and Australia ranged from roughly 6.3 per cent for Italy to 11.5 per cent for Australia (Figure 3, upper panel)[12]. After making adjustments for issuance costs and differences in risk-free rates, market risk premium, and debt risk premium, OVUM found that WACCs ranged from roughly 6.1 per cent (Italy) to 7.5 per cent (Australia).

58. The effect of the adjustments is to significantly reduce the cross-country variation in WACCs. Prior to adjusting for issuance costs, the risk free rate, market risk premium, and debt risk premium, the difference between the highest WACC (Australia) and lowest (Italy) was 92 per cent[13]. After the adjustments, the maximum variance is reduced to 23 per cent (Australia at 7.5 per cent versus Italy at 6.2 per cent).

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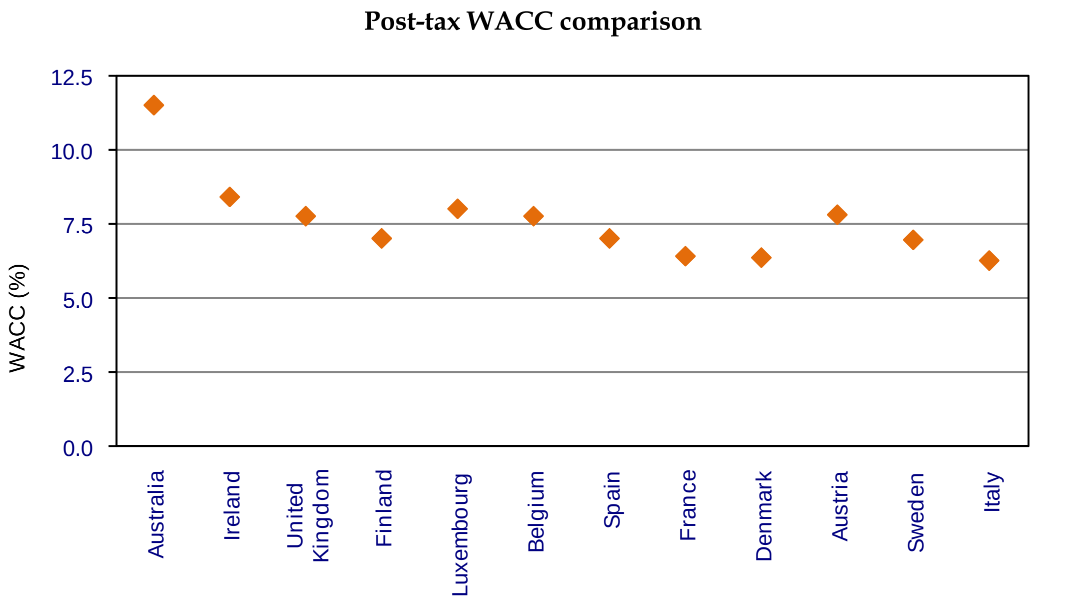
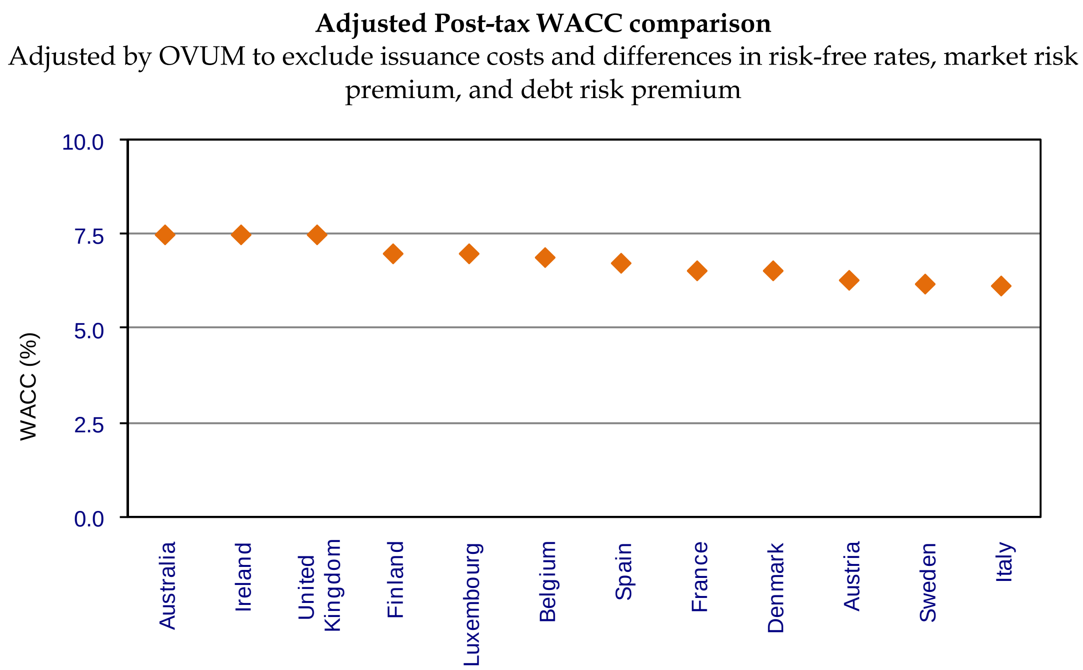
11 OVUM 2009, Telstra Efficient Access cost model – International WACC benchmark, An Advisory Note to the ACCC, January.

12 Some of the countries for which price information was available from OVUM were not included in OVUM's WACC benchmarking study.

13 Data are read from the figures in the OVUM report as the underlying data is not provided separately.

Figure 3 Post-tax WACC comparisons





Note: Ovum's report considers WACC values sourced from a number of regulatory decisions over the period 2004-2007. Most decisions were in 2006.

Data source: OVUM (2009)

59. Sensitivity tests using the Analysys Model indicated that a ten per cent increase in the WACC (equivalently, roughly a 100 basis points change given the level of WACCs

applying) results in a 4.5 per cent change in the PSTN OTA cost (including mark-ups for common costs).

60. A similar sensitivity of costs to changes in WACC was found by the NZCC. The NZCC undertook a benchmarking study of telecommunication interconnection prices in 2002 for the purpose of supporting its role in making access determinations. As part of its analysis, the NZCC obtained cost breakdowns of switch usage costs from BellSouth Corporation in the US as US regional comparators were used as benchmarks. NZCC used the data to perform a number of sensitivity tests to examine how BellSouth's costs should be adjusted to improve comparability to New Zealand. NZCC's analysis indicated that the largest impact was for equipment prices where a ten per cent increase in prices resulted in a 7.1 per cent increase in costs (Table 7). The implied adjustment for a ten per cent difference in the cost of capital was 4.0 per cent, which is close to the 4.5 per cent calculated above.

61. In the case of comparisons between BellSouth and New Zealand interconnections charges, the implied adjustments tended to be offsetting resulting in only minor changes in the benchmark rates.

Table 7 Cost driver impacts

Sensitivity test	Impact on interconnection costs
10% increase in economic life of assets	-3.85%
10% increase in equipment prices	7.10%
10% decrease in labour costs	-2.60%
10% increase in cost of money	4.04%
10% increase in tax rate	1.53%

Note: Shocks normalised to ten per cent
Source: NZCC (2002)

4.1.2 Indicative adjustments to prices for differences in WACC

62. Taking the OVUM (2009) adjusted WACCs at face value, and using the results of the sensitivity testing of the Analysis Model to differences in WACC, the implied upward adjustments to international OTA prices range from 0 per cent to 10 per cent (Table 8). Note that the unadjusted WACCs used by OVUM were taken from regulatory decisions and it is those WACCs which impacted on carrier cost structures. Therefore, the adjustments below are conservative since they are based on the compressed differences in the adjusted WACCs, and not the much larger differences in the unadjusted WACCs.

Table 8 WACC impact on costs and implied price adjustments

	Price adjustment (%)		Price adjustment (%)
Australia		Iceland	
Austria	+8.6	Ireland	0.0
Belgium	+3.9	Italy	+9.9
Canada		Japan	
Czech Republic		Korea	
Denmark	+6.5	New Zealand	
Finland	+3.2	Norway	
France	+6.5	Spain	+5.0
Germany		Sweden	+9.4
Greece		United Kingdom	0.0
Hungary		United States	

a WACC adjustments are based on the percentage difference between Australia's adjusted WACC and the overseas adjusted WACC with the adjustments made by OVUM as discussed in the body of the report. The percentage difference is combined with the responsiveness estimate of a 10 per cent change in WACC leading to a 4.5 per cent change in costs. A country's whose WACC is 20 per cent less than Australia's adjusted WACC receives an adjustment factor of 9.0 per cent. Adjustments assume that overseas differences in WACC have similar impacts on their respective cost structure as modelled in the Analysys Model.

Note: The adjustments are interpreted as the direction and magnitude of change required to make the international price more comparable to the Australian price.

Source: Synergies estimates, OVUM (2009)

4.2 Depreciation

4.2.1 Costing methodologies

63. Differences in originating and termination charges also arise from the use of different accounting methodologies and cost bases. The European Regulators Group (ERG) found[14] that, despite a trend towards harmonization, there are still differences between different countries.

64. Of the 25 countries with price control and/or accounting obligation, 84 per cent use current cost accounting and 64 per cent use LRIC/LRAIC as an accounting methodology for determining fixed call origination wholesale prices (Table 9). Slightly less use current cost accounting in determining fixed call termination wholesale prices.

[14] ERG (2008), Regulatory Accounting in Practice 2008, September.

Table 9 Most common Cost Base and Accounting Methodologies

Markets Recommendation 2007/879/EC	# of countries with price control and/or accounting obligation	Most common Cost Base	Most common Accounting Methodology	Most common Price Control Method
Fixed Call Origination Wholesale (Market 2)	25	84 % Current Cost Accounting	64 % LRIC/LRAIC	88 % Cost Orientation
Fixed Call Termination Wholesale (Market 3)	26	75 % Current Cost Accounting	61% LRIC/LRAIC	79 % Cost Orientation

Source: ERG (2008)

65. Costing methodologies still vary considerably across countries (Table 10).

Table 10 Costing Methodologies for voice origination and termination services

	Cost methodology		Cost methodology
Australia	TS-LRIC	Iceland	Benchmarking to EU
Austria	Hybrid LRAIC	Ireland	BU LRAIC
Belgium	TD	Italy	BU LRAIC
Canada	Benchmarking	Japan	
Czech Republic		Korea	
Denmark	Hybrid LRAIC	Netherlands	Wholesale price cap (informed by TD EDC)
Finland		New Zealand	TSLRIC
France	Hybrid LRAIC (for local only)	Norway	TD FAC
Germany	Benchmarking	Spain	Cost oriented
Greece	Benchmarking, TD LRAIC	Sweden	Hybrid LRAIC
Hungary	Benchmarking	United Kingdom	RPI – X charge control (informed by FAC (CCA))
		United States	TELRIC

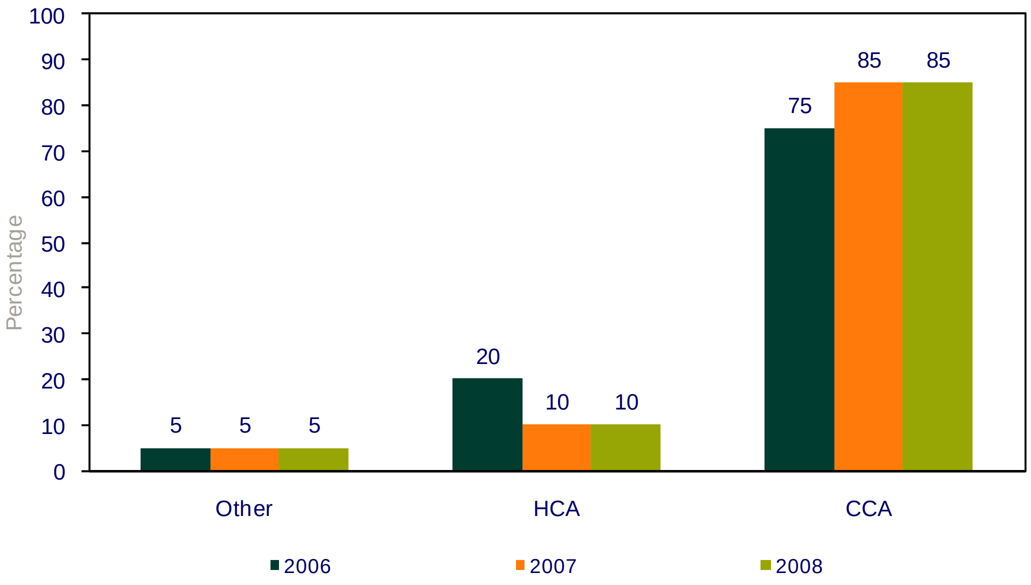
a TS-LRIC: total service – long run incremental costs; TD: top down; BU: bottom-up; Hybrid: combination of top-down and bottom-up model; EDC: embedded direct costs (similar to only incremental costs); FAC: fully allocated costs; LRAIC: long run average incremental costs.

Note: LCS does not have a comparable product in the EEA countries.

Source: Analysys Mason (2009

66. The number of countries using current cost accounting (CCA) increased by around 10 per cent between 2006 and 2008 (Figure 4). The total number of countries considered in the graph is 20. This implies that, in 2008, 17 countries used CCA as a cost base and only two countries used historic cost accounting (HCA).

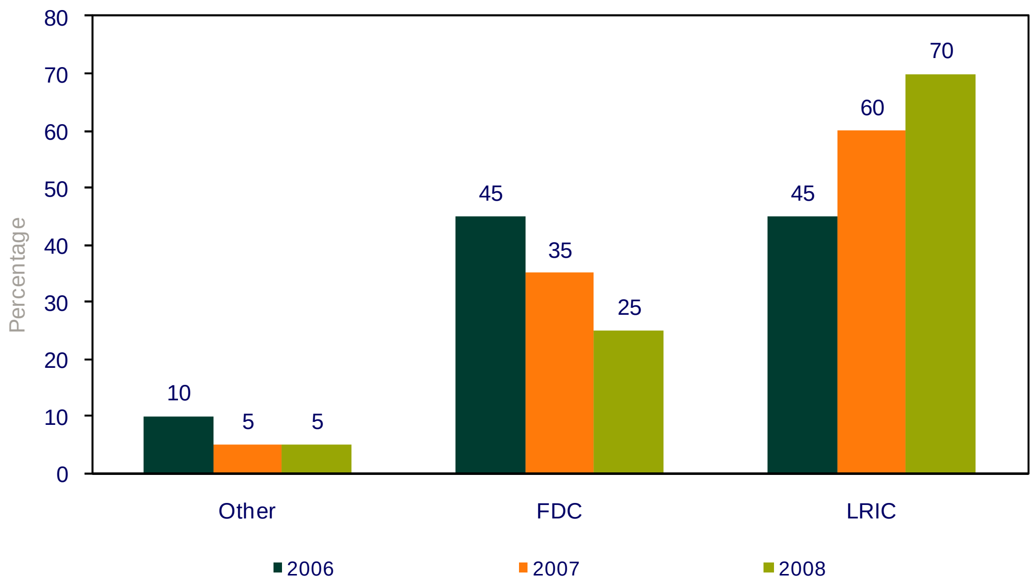
Figure 4 Cost Base Fixed Call Termination



Data source: ERG (2008)

67. In 2008, 14 of 20 countries used LRIC accounting methodologies and around five countries used fully-distributed cost accounting methodologies (Figure 5). The number of countries using fully-distributed cost methodologies decreased between 2006 and 2008, while the number of countries using LRIC increased.

Figure 5 Accounting Methodologies Fixed Call Termination



Data source: ERG (2008)

Implications

68. The differences in cost bases and accounting methodologies support an expectation that origination and termination charges will differ because of the regulatory framework approach. While there is progress towards greater consistency in regulatory approaches, price comparisons can still be significantly affected by remaining differences, particularly where prices used in benchmarking studies are based on older data.

69. There are many different components to the costing and depreciation of assets. This can result in a large number of differences in principles and in implementation choices applied by regulators. This makes it difficult to assess the direction, let alone magnitude, of price adjustments that should be undertaken to put price comparisons on a more equal footing. Further, differences in approaches to costing and depreciation can sometimes produce results that are not significantly different depending on, for example, price trends, and offsetting choices that are made.

4.2.2 Tilted annuities

Background

70. The Analysys Model annualises capital cost recovery using a tilted annuity (Box 2).

Box 2 Implementation of a tilted annuity in the Analysys Model

A standard annuity calculates the charge that, after discounting, recovers the assets purchase price and financing costs in equal annual sums. Originally, the payment will consist more of capital charges and less of depreciation charges; this reverses over time resulting in an upward sloping depreciation schedule. The increase in the depreciation charge over time exactly counterbalances the decrease in the capital charge with the result that the annualisation charge is constant over time.

If the price of the asset is expected to change over time, a tilted annuity would be more appropriate, although this produces a different profile than economic depreciation. A tilted annuity calculates an annuity charge that changes between years at the same rate as the price of the asset is expected to change. This results in declining annualisation charges if prices are expected to fall over time; for a large enough tilt the slope of the depreciation profile will also be negative. As with a standard annuity, the tilted annuity should still result in charges that, after discounting, recover the capital invested.

The tilted annuity methodology can be implemented to reflect that the modern equivalent asset (MEA) price for many assets changes over time. Tilted annuities are sometimes used as a proxy for economic depreciation, particularly where the output of the asset does not change significantly over the period. This is the case in fixed networks, more so than in wireless networks.

The annuity charge formula is calculated as follows:

$$Annuity\_Charge = \frac{WACC - (MEA\_price\_change + Tilt\_Adjustment}{1 - \left(\frac{1 + (MEA\_price\_change + Tilt\_Adjustment)}{1 + WACC}\right)^{Lifetime(\#ofyears)}} \times GRC$$

where MEA denotes Modern Equivalent Assets, and GRC denotes Gross Replacement Cost.

In this formula, the lifetime applied may be the financial lifetime or the economic lifetime (if different).

By the nature of the implementation of a tilted annuity cost annualisation algorithm, only the capital cost in the current year needs to be modelled.

Source: Analysys Consulting Ltd (2009), Fixed LRIC Model Documentation version 2.0, August.

Implication for price comparisons

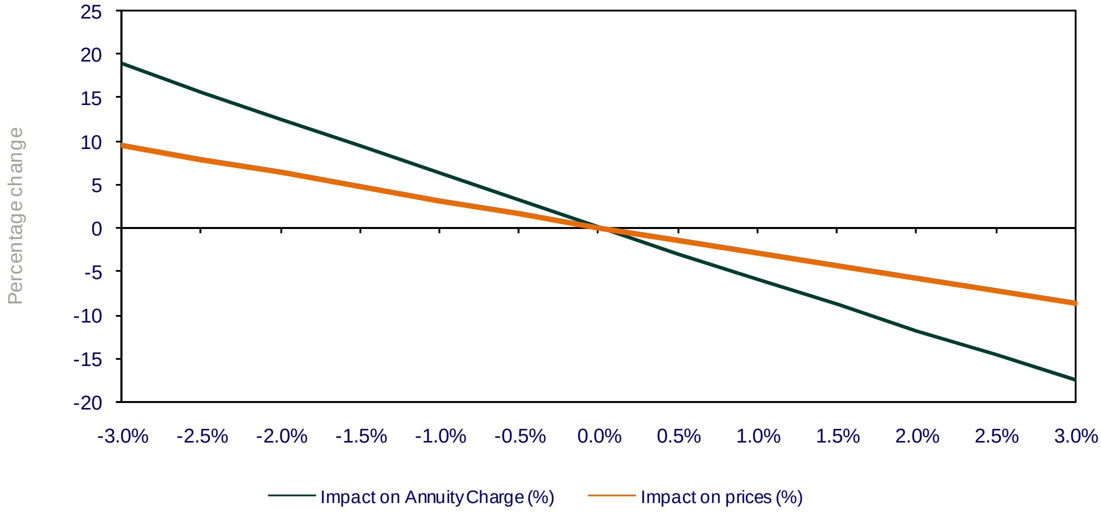
71. In the ACCC's draft indicative prices report, an overall tilt of +2.5 per cent is applied to all CAN and CORE (Inter-Exchange Network) assets. Potential impacts of different tilt rates on the depreciation (annuity) charge are illustrated below (Figure 6). A negative tilt increases the annuity charge relative to no tilt. A positive tilt decreases the annuity charge.

72. The implications for price comparisons will in part depend on each benchmark's ratio of capital costs (to which the annuity charge is related) to operating costs (which also contribute to the cost base). If this ratio was constant across chosen benchmarks, and all other aspects of the costing and depreciation of assets were the same other than for the application of a tilt, then differences in the tilt should translate into percentage differences in charges adjusted by the capital share. For example, comparing Australia's prices (incorporating a tilt of +2.5 per cent) against a benchmark with no tilt (implicitly a tilt of 0.0 per cent), and the parameter assumptions noted, would lead to a

cost advantage to Australia of about 7 per cent. The percentage impacts on total costs (and implicitly prices) is less than the percentage impacts on the annuity charge given that capital's share in total costs is less than one.

73. In a situation where the tilt and the non-tilt methods used in the benchmark are both set accurately to recover capital and financing costs, price comparisons will be impacted by the effect of the tilt in changing the profile of costs (and prices). Price comparisons at a point in time may be distorted given the impact of the different depreciation methods in deferring or bringing forward costs.

Figure 6 Illustrative impacts of different tilt rates



Note: Parameter assumptions: WACC of 7.88 per cent. Gross Replacement Cost of $100 dollars assumed for illustrative purposes. Modern Equivalent Asset expected price change of negative -0.05 per cent per annum. Capital share of 50 per cent. Mean asset lifetime of 21 years.

74. Denmark, Sweden and Norway[15] use a tilted annuity approach to calculating depreciation (Table 11). Tilted annuities have also been used extensively in US regulatory processes.

[15] This is according to the draft model specification from 19 June 2009 for the LRIC model for fixed networks.

Table 11 Overview – Depreciation Assumptions

Country	Use of tilted annuities
Australia	Yes. Tilt set at +2.5%
United States	Yes
United Kingdom	No. Operating capability maintenance (OCM) depreciation is used[16]
Denmark	Yes
Sweden	Yes
Norway	Yes
Finland	No. Replacement value calculated by using planned depreciation

Note: ERG/EC documents survey national regulators on the methods they use, but no information is provided on the use of tilted annuities.

Source: Publicly available information mainly obtained from national regulators

4.3 Demand volumes and cost allocation

75. As well as OTA services, PSTN assets are an input to the provision of the declared services ULLS, LCS, WLR, and LSS. Therefore, cost allocation choices become an issue in setting indicative OTA access prices, even if they do not drive actual PSTN costs from a whole of system perspective.

76. As an example of the potential significance of cost allocation on prices, in constructing indicative prices in 2003 the ACCC established a forward price or glide path with PSTN TA prices declining to 0.7 cents by 2006. In establishing indicate prices in 2006, the ACCC discussed how, relative to assumptions made in 2003, the changing pattern of traffic volumes supported an indicative headline price at 2006 of 1.0 cents (rather than 0.7 cents). The main driver of the higher indicative price was that the share of the PSTN TA service in aggregate traffic volumes using PSTN assets had declined (i.e. a common cost allocation issue)[17]. Mobile services and ULLS (related to ADSL) shares had increased.

77. Domestic telephone traffic per fixed telephone access path has declined sharply over the period 2000 to 2007 (or nearest year of available data) for almost all benchmark countries (Table 12). This common pattern of declining PSTN traffic volumes means that fixed network costs are spread over lower traffic volumes putting upward pressure on costs and prices for services provided by the PSTN, including OA and TA services.

16 OFCOM (2009), Review of BT network charge controls. Consultation on proposed charge controls in wholesale narrowband markets, March.

17 ACCC 2006, Pricing Principles and Indicative Prices: Local carriage service, wholesale line rental and PSTN originating and terminating access services, November. Draft indicative prices were released in ACCC, 2006 Local services review and Strategic review of the regulation of fixed network services: Summary of draft indicative prices, July.

Table 12 Declines in domestic telephone traffic per fixed telephone access path

	Year 2000 or nearest		Last year of available data		
Country	**Year**	**Volume**	**Year**	**Volume**	**% change**
United Kingdom	2000	4,100	2007	3,271	-20
Ireland	2002	3,931	2007	3,038	-23
Denmark	2005	7,001	2007	3,768	-46
Sweden	2000	9,523	2007	8,929	-6
Switzerland	2000	4,190	2007	3,301	-21
United States	-	-	-	-	
Italy	2000	5,062	2007	3,837	-24
Norway	2000	9,443	2007	12,162	29
France	2000	3,542	2007	3,198	-10
Germany	-	-	-	-	
Portugal	2000	2,378	2007	1,963	-17
Spain	2000	6,600	2007	3,233	-51
Austria	2000	2,892	2005	2,368	-18
Poland	2002	2,195	2007	1,996	-9
Mexico	2000	7,868	2007	8,893	13
Netherlands	-	-	-	-	
Belgium	2000	5,396	2007	3,161	-41
Chile	-	-	-	-	
Brazil	-	-	-	-	
Peru	-	-	-	-	
Finland	2000	5,883	2007	2,186	-63

Source: OECD (Communications Outlook 2009, Table 3.6)

78. The impact of declining PSTN volumes on interconnection prices are starting to be seen in European regulatory decisions setting OA and TA prices. The fees for Deutsche Telekom's (DT's) interconnection services are subject to the prior approval of the German Federal Network Agency (Bundesnetzagentur, BNetzA). On November 28, 2008 BNetzA approved new interconnection fees for DT from December 1, 2008 until June 30, 2011. For the first time since BNetzA started approving rates in 1999, it has increased interconnection fees by 4.4 per cent after having lowered the fees continuously. BNetzA justified the rise based on the considerable drop in PSTN traffic it has forecast for 2009-2011[18].

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[18] The WIK (Wissenschaftliches Institut für Infrastruktur und Kommunikationsdienste GmbH, Germany's leading research institute for communication services) has carried out a survey on the reduction of minutes due to fixed-mobile substitution. It estimates that in 2008 20-25% of the decrease of the traffic volume in PSTN was the result of substitution by mobile communication and that in 2010 40% of the decrease will be due to fixed-mobile substitution. The declines in German PSTN voice communication volumes via DT from 2002 to 2007 was 38 per cent (a decline from 145 billion minutes in 2002 to 89 billion minutes in 2007).

79. The main implication is that previously observed price declines in overseas interconnection prices are unlikely to continue, or will be at a much slower rate. This is confirmed by recently released interconnection price data that shows solid price declines in OA and TA prices from 1998 for the benchmark set of countries in this Report, but with the rate of price reduction declining over time and tending towards zero[19]. From the first quarter of 2008 to the second quarter of 2009, the unweighted average terminating price of the benchmark countries declined slightly. However, the prices of 8 out of 20 countries increased, and 5 remained unchanged.

[19] OVUM 2009, Historical Average Fixed Termination Charges workbook, September.

5 Implications for benchmark prices

80. The purpose of undertaking price benchmarking is not to make highly generalised and aggregated comparisons, but to inform regulatory proceedings determining prices for a declared service. The consequences of regulatory error impacting negatively on private investment are very significant, with the risk of setting access prices too low having particularly serious welfare implications. Therefore, accounting for the factors that impact on the comparability of international prices to Australian prices is important.

81. As discussed, the results of international price comparisons will be influenced by many factors, including cross-country differences in densities, network designs and cost shares, asset price trends interacting with differences in cost shares, cost of capital, and asset valuation and depreciation methods (e.g. the use of tilted depreciation) (Table 13). It is possible to quantitatively adjust prices for differences in the cost of capital and density. Other factors need to be taken into account qualitatively.

Table 13 Potential impacts of drivers analysed

Factor	Range	Quantification possible?	Impact
Density	Substantial variation in all density measures discussed in section 3 including customer locations per ESA	Yes. Two methods were tested	Wide variations in density translate into significant impacts on costs. Density adjustments increase all international prices relative to Australia. Adjustments range from 1-2 per cent to over 100 per cent (depending on method)
WACC	Post-tax unadjusted: 6.3 - 11.5%. Post-tax adjusted (OVUM): 6.1 - 7.5 %[a]. Australia has highest WACC	Yes	10% difference in WACC related to roughly a 4.5% difference in marked-up PSTN OA and TA costs. Adjustments for WACC increase all international prices relative to Australia
Cost shares and input price trends	Would not expect significant differences in prevailing equipment price levels given international markets. Variation in cost shares unknown. Input prices declining generally. Ducting and trenching costs rising	No. Insufficient cost share information	10% difference in equipment prices relates to roughly a 7.1% difference in interconnection costs. Network asset mixes can differ and different assets have different price trends. Therefore, underlying cost structures will change at different rates where cost shares differ. Trenching costs are increasing and is expected that trenchings' cost share in total costs varies significantly across countries given density and line length differences.
Tilt	Most potential benchmarks appear to have an implied tilt of zero per cent. Australian tilt set at +2.5%	No. Insufficient country information. Inter-relationships with other elements of costing and depreciating assets	The major impact of the use of tilted depreciation methods is to temporally shift costs in order to smooth annualised depreciation charges. Even where the Net Present Values (NPVs) are unchanged, the impact of the tilt can significantly raise or lower depreciation charges impacting on point-in-time price comparisons (if benchmarks are not undertaking the same type of adjustments and magnitude of adjustments)

a Adjusted for issuance costs, the risk free rate, market risk premium, and debt risk premium. b Based on comparisons between BellSouth and New Zealand interconnections charges.

Source: OVUM (2009 international price and WACC benchmarking reports), NZCC (2002), Synergies estimates

5.1 Adjusted price comparisons

82. The adjustment of prices for cross-country differences in conditions is an imperfect process. However, so long as the adjustments are in the right direction, and do not overshoot the "true" price by more than the underlying cost advantage/dis-advantage, then adjusted price comparisons are an improvement upon comparisons without adjustments.

83. Incorporating the density and WACC adjustments outlined earlier into the international prices, results in only the UK, Denmark and Ireland having a lower price than the Australian current OTA indicative price of 1.04 cents (Table 14, far right column). The prices of Denmark and Ireland at 1.00 cents and 0.99 cents, respectively, are very close to the Australian price.

84. The Analysys Model price of 0.80 cents is lower than the fully adjusted prices of all benchmark countries.

Table 14 Adjusted benchmark prices

Benchmark	Starting point blended price (cents)	Method 1: Traffic density (cents)[a]	Method 1: Line length (cents)[a]	WACC adjustment (cents)[b]	Full Adjusted prices (cents)
Australia ACCC cost model	0.80	-	-	-	0.80
United Kingdom	0.50	0.06	0.27	0.00	0.84
Ireland	0.74	0.08	0.13	0.04	0.99
Denmark	0.66	0.11	0.19	0.04	1.00
Australia current OTA indicative price	1.04	-	-	-	1.04
Sweden	0.90	0.05	0.09	0.08	1.12
Switzerland	0.68	0.16	0.29	0.03	1.17
United States	1.10	0.10	0.09	na	1.30
Italy	0.85	0.17	0.30	0.08	1.40
Norway	1.28	0.03	0.05	0.07	1.43
France	1.14	0.05	0.27	0.07	1.54
Germany	0.85	0.24	0.43	0.04	1.57
Portugal	1.18	0.14	0.25	0.06	1.62
Spain	1.29	0.16	0.27	0.06	1.78
Austria	1.29	0.16	0.28	0.11	1.83
Poland	1.63	0.21	0.37	0.08	2.29
Mexico	2.11	0.09	0.14	na	2.34
Netherlands	1.23	0.32	0.95	0.06	2.55
Belgium	1.12	0.50	0.89	0.04	2.56
Chile	2.84	0.04	0.04	na	2.92
Brazil	4.30	0.07	0.09	na	4.47
Peru	5.00	0.05	0.04	na	5.09
Finland	4.74	0.11	0.16	0.15	5.17

a Traffic and line length adjustments are described in the body of the report. b WACC adjustments based on OVUM (2009) adjusted WACCs. For European countries not included in the OVUM (2009) study, the sample average adjustment was used at 5.1 per cent. The OVUM (2009) WACC benchmarking study did not include South American countries.

Source: OVUM (2009 price and WACC benchmarking reports), NZCC (2002), NERA (2002)[20], Synergies estimates

85. For the density and WACC adjustments, Australia has a cost disadvantage relative to all of the countries included in the benchmarking. Australian densities are lower and costs of capital higher.

[20] NERA (2002), Response to Commerce Commission Draft Determination: A Report for Telecom New Zealand, September, Sydney.

5.2 Additional factors

5.2.1 Net effect of qualitative factors

86. The selection of countries for benchmarking is critical if prices cannot be adjusted to account for cross-country differences in conditions. Price comparison studies typically:

(a) select their benchmark set primarily guided by the availability of data;

(b) give significant leeway to the inclusion of benchmarks that are widely different on key factors impacting on price comparisons, particularly differences in densities; and

(c) implicitly rely on the idea that "many errors will average out" - that each benchmark will have both cost advantages and disadvantages and that their magnitudes will be offsetting;

    (i) at least for the density related and cost of capital adjustments made in this study, the impacts do not average out as all international prices are increased relative to Australia for both adjustments.

87. There are many other potential impacts on the PSTN OTA price comparisons presented other than density and cost of capital (Box 1 earlier). It is not possible to know if the net impact of these other influences "average out" for all countries as the individual influences have not been quantified. Their net effect may reduce the magnitude of the upward adjustment to prices for some countries, while increasing it for others. Overall, I would expect that their net effect would be modest relative to the size of the quantified adjustments for density and cost of capital. In particular, I would not expect quantification of their effects to reverse the key finding that Australia's current OTA indicative price is low versus international benchmarks, and that the Analysys Model price at 0.80 cents is very low relative to international benchmarks.

5.2.2 Price trends

Relative increasing costs of service provision

88. The earlier comparison between Australia and the UK showed how differences in cost shares when combined with differences in price trends will contribute to differences in rates of change in PSTN network costs. In particular, the larger share of duct and trenching costs in Australia will put significantly more upward pressure on costs in Australia than in the UK.

89. The differences in price trends between equipment costs (costs declining) and ducting/trenching costs (costs increasing), would contribute to Australian costs declining at a rate slower than for most if not all benchmark countries, or increasing at a faster rate. Given cost-reflective pricing, a similar impact on PSTN OA and TA prices would be observed.

Upward pressure on OA and TA service costs

The Analysys Model estimate of 0.80 cents would apply in Australia in 2011-12. The international benchmark prices used in this Report are for 2008-09. While 0.80 cents is lower than all adjusted benchmark prices (considerably lower in most cases), it might be argued that continued declines in overseas interconnection costs will result in continued declines in interconnection prices such that, by 2011-12, 0.80 cents may be above some European countries. However, almost all of the benchmark countries are experiencing declining PSTN traffic volumes which is already having impacts on regulatory price setting as evidenced by the case of Germany. Therefore, while there may be some downward movement in OA and TA prices for some countries, there is also likely to be increases in some countries, and price stability in others. It is likely that a price of 0.80 cents in 2011-12 will continue to look very low when compared to prevailing prices at that time.

5.3 Summary

International benchmarking does not provide evidence that Australia's current OTA indicative price at 1.04 cents is inefficiently high. After accounting for cross-country differences in the cost of capital and, in particular, density differences, the only country with a measurably lower price is the United Kingdom.

Given cross-country differences in network designs and cost shares, equipment prices declining, but duct and trenching costs rising, the costs of providing OA and TA services in Australia can be expected to increase relative to benchmark countries.

Similar to Australia, overseas countries are experiencing reductions in PSTN traffic volumes which is putting upward pressure on costs and is beginning to reverse the trend of regulated OA and TA prices declining.

As current OTA indicative prices in Australia are not high, and the relative costs of providing OA and TA services is likely to increase, a rollover of current OTA indicative prices would be more in line with the evidence provided by international benchmarking than would the establishment of a glide path to 0.80 cents by 2011-12.

Declining PSTN volumes and the upward pressure that has on OA and TA costs further support maintaining current price levels for the services.

I, Jeff Lassen, have made all the inquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Commission.

A Curriculum Vitae of Jeff Alan Lassen

Position	Director
Business address:	Level 8 10 Felix St Brisbane
Telephone number:	61 7 3227 9558
Mobile:	61 439 879 936
Fax number:	61 7 3221 0404
Email address	j.lassen@synergies.com.au

Current Position

Director, Synergies Economic Consulting (since 2004)

Qualifications

Bachelor of Economics, University of Queensland, 1989
Bachelor of Economics (Hons, 2A), University of New England, 1992
Master of Economic Studies, University of Queensland, 2000

Career History

1990 – 1991	Economist, Industry Commission
1991 – 1993	Economist, Trade Practices Commission
1993 – 2004	Economist/Director, Queensland Treasury
2004 -	Director, Synergies Economic Consulting

Relevant Experience

Telecommunications

- Prepared advice on the concept and measurement of network externalities associated with the provision of mobile telephony. The advice also provided a review of the treatment of network externalities in regulatory decisions
- Prepared a paper on pricing of mobile termination charges and the application of Ramsey prices from a conceptual and applied perspective. The paper also discussed the reason regulators are reluctant to adopt Ramsey pricing arrangements
- Prepared an assessment of market structure, growth and competition in the major telecommunications markets (fixed line, mobile, data) for an energy provider considering diversifying into telecoms

- Advised a major telecommunications company on the economic regulation of providing declared wholesale telecommunication transmission services, including issues associated with determining the total cost of providing services and issues in the allocation of costs to different routes while reflecting service quality issues

- Prepared a literature review on the economic impacts of broadband to inform the development of a Queensland Government vision for the deployment of a broadband network in Queensland and is considering its role in the achievement of this vision. This paper provided a literature review of impact studies and policy statements which have addressed the economic impact of broadband deepening. The broader literature which covers a number of topics touched upon in the paper such as the role of public infrastructure in economic development, the role of new technologies in economic development and the economics of networks were also discussed at a high level

- Prepared a report in anticipation of an arbitration of access disputes concerning transmission services. This report examined the inherent limitations of benchmarking approaches to price setting. It also addressed the range of issues that would need to be considered if the ACCC were to rely on a benchmarking approach, including measurement and comparability issues, with a view to shaping, as far as possible, any benchmarking study ultimately undertaken by the regulator

- Prepared advice for Telstra on the arguments put forward by Optus in support of reliance on an overseas benchmarking study to inform MTAS prices in Australia. In preparing its submission Optus has at least attempted to take account of criticisms and observations made by the Australian Competition Tribunal and the regulator on adjustments that need to be made to benchmarking data in order for it to be appropriate for Australia

- Assessed the business case for State Government development of a very high speed fibre to the curb network in South East Queensland (while at Queensland Treasury)

- Assessed State Government telecommunications purchasing strategy including network development conditions proposed in tender responses (while at Queensland Treasury)

General Benchmarking

- Lead the development of a regional competitiveness benchmarking model for a minerals province in Northern Queensland

- Lead the development of an input cost benchmarking model for Xstrata
- Developed a benchmarking framework for enforcement functions of the Environmental Protection Agency
- Lead the development of a benchmarking model for school bus services (while at Queensland Treasury)

B Density measures and data

90. The average cost of providing telephone services varies with the distribution of a country's population. For a given population size, different distributions of the population often result in different telecommunication cost structures.

91. The choice of density measure also affect cross-country density rankings. Of the countries in Table 15, Australia is ranked as having low density when measured as population per square kilometre, access lines per square kilometre (in both cases land mass is the denominator), and road density measures. Australia is ranked as having mid to high density if measured as the per cent of the population living in urban areas, the percent of the population living in cities of one million or more, or access lines per 100 inhabitants.

Table 15 Population and density comparisons

	Pop. density	Urban pop.	Pop. in urban centres > 1 million	Road density	Access lines	
Country	Pop. / km^2	% of Total	% of Total	Length of total roadways / km^2	Per 100 inhabitants	Per km^2
Australia	2.8 (20)	88.6	61	0.11	44.46 (10)	1.21
Austria	98.7	66.9	28	1.28	40.08	39.85
Belgium	345.8	97.3	17	4.99	42.08	145.98
Brazil	22	85.1	38	0.21	21.43	4.83
Canada	3.3	80.3	44	0.10	55.37	1.83
Chile	22	88.2	34	0.11	20.99	4.66
Czech Republic	130.6	73.5	11	1.63	22.08	28.89
Denmark	126.1	86.4	20	1.68	45.56	57.71
Finland	15.6	63	21	0.23	31.11	4.88
France	115.1	77.1	22	1.73	56.42	63.46
Germany	230.8	73.6	9	1.81	62.60	144.25
Greece	84.3	60.8	29	0.89	53.65	45.28
Hungary	108.3	67.1	17	1.72	30.90	33.26
Iceland	3.0	92.2	n/a	0.13	60.58	1.81
Ireland	62.0	61.1	25	1.37	49.63	31.33
Italy	195.4	67.9	17	1.62	33.61	66.47
Japan	338.1	66.3	48	3.17	40.21	135.56
Korea	484.9	81.2	48	1.03	44.29	213.85
Mexico	52.9	76.9	34	0.18	18.92	10.46
Netherlands	400.5	81.3	12	3.26	44.31	176.29
New Zealand	15.6	86.4	30	0.35	41.37	6.54
Norway	14.4	77.4	n/a	0.29	42.16	6.15
Peru	22	71.3	29	0.06	9.98	2.24
Poland	121.9	61.4	4	1.36	27.11	33.06
Portugal	114.5	58.8	39	0.90	38.60	44.75
Spain	87.3	77	24	1.35	45.41	39.97
Sweden	20.2	84.5	14	0.94	57.83	11.82
Switzerland	183.0	73.4	15	1.73	63.91	116.77
United Kingdom	247.3	89.9	26	1.64	54.24	136.32
United States	32.0	81.4	43	0.66	51.33	16.12

Source: OECD Communications Outlook 2007, UN – World Population Prospectus: the 2008 revision, International Telecommunications Union, World Bank World Development Indicators, OECD Telecommunications Database 2005, European Competitive Index 2006/07, and Wikipedia for road density numbers for non-OECD countries.

B.1 Population per km^2

92. OECD comparisons of population per square kilometre indicate that Australia's population density is low and similar to Sweden, Finland, New Zealand, Iceland, Norway, United States and Canada.[21] Of the twenty countries in Table 15, Australia's population density was ranked 20th (i.e. lowest rank).

93. Data on population density suggest that the scale and distribution of the Australian population would increase costs relative to virtually any country in an international sample.[22]

B.2 Road density

94. There is a large degree of overlap in the footprint of the PSTN and road networks as cables tend to 'follow' roads. For example, in the ITST cost model of Denmark's access network, road length data is used to obtain estimates of trench lengths:[23]

> The main methodological assumption that has been adopted in the bottom-up model in order to model trench requirements is that trenches in Denmark have a direct relationship with road paths… For each of the sixteen types of road, a factor (ranging from 0 to 2) has been assumed to convert road length into trench length. These are referred to as conversion factor.

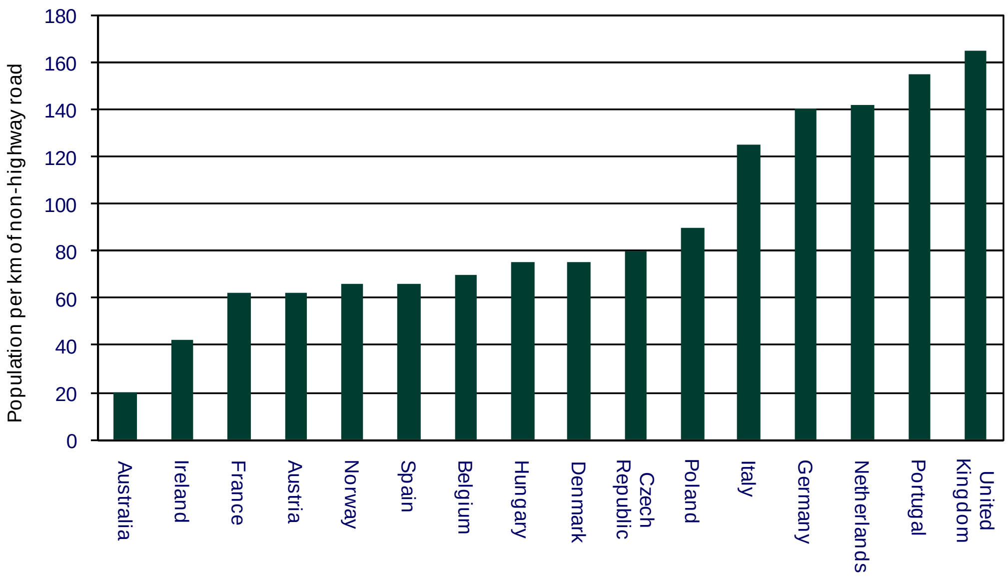
95. Road density can be measured as the length of motorways per square kilometre as per the table above. However, while motorways might be an appropriate measure where the distances between urban centres is the primary cost driver, for PSTN OA and TA services, road network densities within urban centres should be captured. One such indicator is population per kilometre of non-highway roads. This indicator shows that Australia has the lowest density of sixteen countries (Figure 7).

[21] OECD Communications Outlook 2007. The ITU also publishes a range of relevant statistics.

[22] Only Finland, New Zealand and Australia were included in both OECD (2007) and Cribbett (2000). For the United States, Cribbett (2000) used state-level data for a small selection of states.

[23] IT- og Telestyrelsen 2005, Report on the LRAIC Model: Revised Hybrid Model (version 2.3), December. p.46.

Figure 7 Road density measured as population per km of non-highway roads



Data source: Ingenuous Consulting Network (2008)[24]

96. Other measures that could be used as proxy for the relationship between the scale and distribution of the population and the average costs of providing telecommunication services rank Australia as having higher density:

(a) degree of urbanisation; and

(b) telephone or 'tele' density.

B.3 Degree of urbanisation

97. Based on the proportion of the total population in urban centres and in urban centres greater than one million people, Australia's population distribution is ranked as being highly dense (with rankings of four and one, respectively). However, these measures do not capture the fact that a large proportion of Australia's telecommunications network and maintenance costs reside outside urban areas, and it is that characteristic that drives network costs, discussed further in the next section. They also do not recognise that Australia's urban areas are significantly less dense than overseas comparators.

B.4 Telephone, 'tele', or line density

24 Ingenuous Consulting Network 2008, Commentary on the use of international benchmarking in setting interconnection rates, December.

98. The location of users plays an important part in determining the pattern of demand for services and network design. Network design affects average telephony costs because the cost of the network varies significantly with the number of lines in an area per square kilometre ('line density').

99. The Australian number of access lines per 100 inhabitants is ranked tenth with a higher number of lines indicating greater density. As is common in making international comparisons, the measure is based on the aggregate population and aggregate number of lines for a country. The measure does not take into account the spatial distribution of the lines and its effect on average line costs (as discussed in Cribbett).[25]

100. Benchmarking comparisons should be made on the measure of density that is most closely linked to differences in average line costs. Line density measured at a disaggregated level is a better measure of the relationship between the distribution of a country's population and average line costs as it is directly related to network costs. The measure is expressed as a cumulative distribution function showing the proportion of a country's lines in different intervals of 'density'.

101. The cumulative distributions for line density used in Cribbett take a disaggregated approach and correct for the situation where country-wide average densities are not a good indicator of what drives average line costs.

102. Australia and New Zealand had a similar proportion of lines in very low density areas. Only Alaska had a larger share in areas where the line density was between zero and 1.93 lines per square kilometre (Table 16).

[25] Cribbett, P. 2000, Population Distribution and Telecommunication Costs, Productivity Commission Staff Research Paper, AusInfo, Canberra, August.

Table 16 Density distribution of lines

Cost schedule categories (lines per km sq)	Alaska	Finland	Australia	Oregon	New Zealand	Washing-ton	California	Nevada	Ohio	Pennsyl-vania	Illinois	Massa-chusetts	New York
0 to 0.1	6.24	0.06	0.7	0.22	0.13	0.03	0.01	0.79	0	0	0	0	0
0.1 to 0.2	1.52	0.14	0.55	0.22	0.22	0.05	0.03	0.64	0	0	0	0	0
0.1 to 1.93	7.03	4.09	3.92	3.07	5.07	2.04	0.62	3.23	0	0.11	0.23	0	0.08
1.93 to 38.58	19.2	35	12.2	17.49	9.22	10.77	4.08	7.12	16.83	14.12	10.27	3.38	8.55
38.58 to 77.16	4.79	6.51	2.81	4.06	2.4	6.06	1.9	3.54	6.47	7.68	2.8	4.55	2.88
77.16 to 250.76	14.26	11.18	10.4	11.42	8.71	12.2	5.33	5.76	11.44	10.36	8.45	14.38	5.28
250.76 to 327.92	2.62	3.88	4.26	3.14	3.32	3.92	2.25	3.14	3.95	3.24	2.17	4.07	1.85
327.92 to 983.76	16.08	19.64	27.8	26.78	30.26	28.13	14.68	15.94	25.56	20.1	18.88	21.86	12.37
983.76 to 1928.94	19.83	9.61	25.97	23.42	35.78	25.36	22.81	31.08	19.12	13.87	19.09	14.43	10.03
1928.94 to 3857.88	7.42	7.35	7.62	8.73	4.85	9.36	26.31	22.98	13.02	11.88	14.02	13.06	11.35
3857.88 and above	1.01	2.54	3.76	1.44	0.04	2.08	21.97	5.81	3.6	18.64	24.08	24.27	47.61
Very low density (0 to 1.93 lines per km sq) -													
Per cent of lines	14.79	4.29	5.17	3.51	5.42	2.12	0.66	4.66	0.00	0.11	0.23	0.00	0.08

Source: Cribbett (2000)

103. Data on both population density and the percent of lines in very low density areas suggest that the scale and distribution of the Australian population would increase costs relative to virtually any country in an international sample.[26]

104. Cribbett found that, depending on assumptions about the cost of providing each line, average line costs in low-density areas of Australia of less than 2 lines per square kilometre were between 6 and 10 times the average cost per line in the rest of Australia.

105. Low density areas were estimated to account for some 25 per cent of the total cost of providing local telephone services, despite having only about 5 per cent of the total number of lines. This compares to a 25 per cent cost share for the equivalent low-density areas in Washington State and a much lower 5 per cent cost share for those areas in California.[27]

106. Alger and Leung (1999) used similar methods to Cribbett and found that, "...the unit cost of local wireline service falls very steeply as density increases, but at a decreasing rate. Costs differ hugely between rural areas and urban areas".[28]

B.5 Exchange service areas

107. Exchange Service Areas (ESAs) are served by one specific telephone exchange. These are the basic building blocks of the Telstra network and there are 5,254 in Australia. With 7.8 million PSTN subscribers, this implies that there are around 1,500 PSTN subscribers per ESA.[29]

108. Customer locations by ESA data was obtained for 5,254 ESAs from the Analysys Model. The mean number of customer locations per ESA was 1,510. Almost seventy-five per cent of ESAs contain less than one thousand customer locations (Figure 8).

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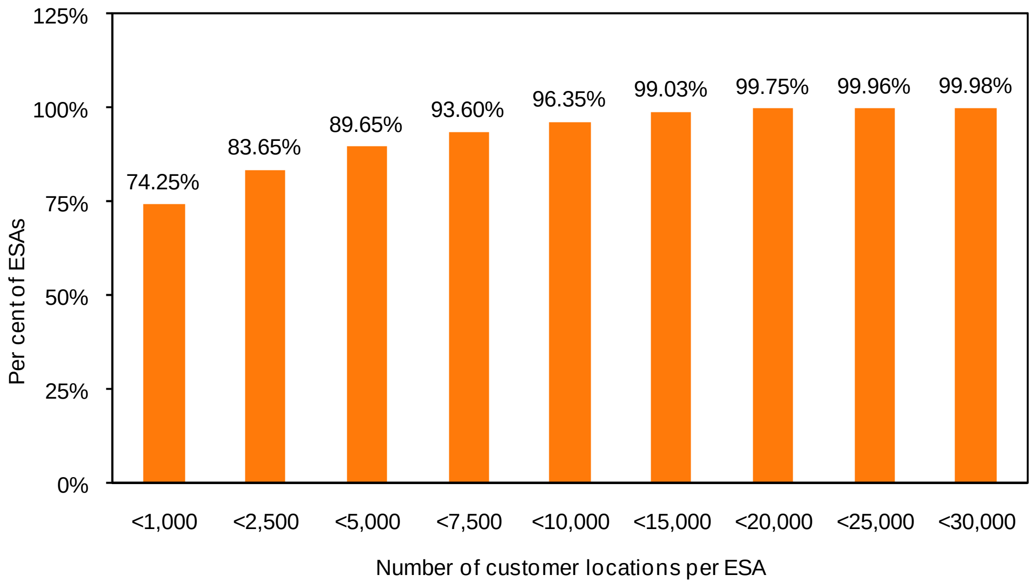
[26] Only Finland, New Zealand and Australia were included in both OECD (2007) and Cribbett (2000). For the United States, Cribbett (2000) used state-level data for a small selection of states.

[27] Cribbett (2000), p. IX

[28] Alger, D. and J. Leung 1999, The Relative Costs of Local Telephony Across Five Countries, NZ Institute for the Study of Competition and Regulation (NZISCR), Wellington, New Zealand, p. 6. Cribbett identified issues related to the comparability of the data used in the Alger and Leung study, resulting from differences in levels of aggregation, that affected the robustness of the density estimates. Cribbett, P. p. 3.

[29] This is calculated with data used in the Analysis cost model. Total PSTN subscribers divided by number of ESAs.

Figure 8 Australian customer locations by ESA



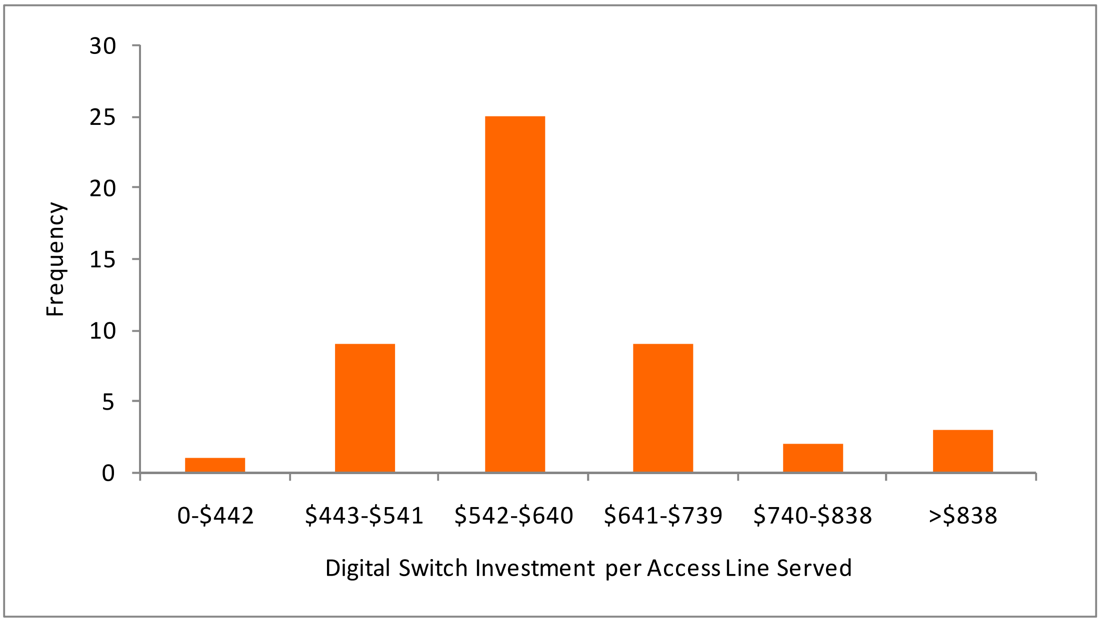
Data source: Analysys Model

B.1 US State densities

109. There are significant differences in telecommunication densities across states within the United States (Table 17). Digital switch investment per access line also varies across states, but not to the same extent (Figure 9)[30]. This suggests that there are economies of scale in switching technologies. However, the economies in switching technology would appear to be only strong enough to partly offset density differences.

[30] The ratio of the standard deviation to the mean for population per km squared, access lines per km squared, population per sheath km of cable and fibre, and digital switch investment per access line is 2.4, 3.2, 0.7 and 0.2, respectively.

Figure 9 Digital switch investment per access line served



Note: Frequency is the number of US states falling in each investment band

Data source: FCC ARMIS Database

110. Data is available by US state data on sheath kilometres of cable and fibre installed so that road measures do not need to be used as a proxy. It can be seen that significant variation exists in investment per access line.

Table 17 US State densities

	Population per km sq (#)	Access lines per km sq (#)	Population per sheath km (cable + fibre) (#)	Digital Switch investment per access line ($)
ALABAMA	53	18	37	570
ARKANSAS	32	9	38	546
ARIZONA				618
CALIFORNIA	135	65	65	458
COLORADO	27	12	36	627
CONNECTICUT	391	186	43	594
DISTRICT OF COLUMBIA			81	446
DELAWARE	204	109	37	442
FLORIDA	161	60	193	517
GEORGIA	91	31	40	600
IOWA	32	8	44	614
IDAHO SOUTH				495
ILLINOIS	136	57	49	592
INDIANA	106	41	37	550
KANSAS	21	6	32	647
KENTUCKY	63	13	52	583
LOUISANA	54	20	37	564
MASSACHUSETTS	378	171	54	696
MARYLAND	276	153	50	516
MAINE	23	9	23	715
MICHIGAN	65	24	33	618
MINNESOTA	36	10	49	703
MISSOURI	51	17	45	544
MISSISSIPPI	37	13	24	526
MONTANA	4	1	26	613
NORTH CAROLINA	97	23	56	614
NORTH DAKOTA	6	1	34	918
NEBRASKA	14	2	42	1135
NEW HAMPSHIRE	86	35	28	782
NEW JERSEY	615	313	61	472
NEW MEXICO	10	3	39	577
NEVADA	13	2	121	452
NEW YORK	219	82	75	659
OHIO	158	46	51	582
OKLAHOMA	31	10	31	591
OREGON	23	8	45	643
PENNSYLVANIA	167	66	55	517
RHODE ISLAND	433	131	54	819

	Population per km sq (#)	Access lines per km sq (#)	Population per sheath km (cable + fibre) (#)	Digital Switch investment per access line ($)
SOUTH CAROLINA	80	24	39	614
SOUTH DAKOTA	6	1	30	1041
TENNESSEE	86	29	39	550
TEXAS	51	19	40	610
UTAH	17	6	57	651
VIRGINIA	107	47	41	574
VERMONT	40	19	18	648
WASHINGTON	53	20	48	704
WISCONSIN	52	15	46	550
WEST VIRGINIA	46	17	33	631
WYOMING	3	1	18	564

Source: FCC ARMIS Database

C Structure of benchmark prices

111. All benchmarks have charges that include a component that varies with duration of use. Most but not all countries have a flagfall charge. Other characteristics of the structure of prices differ significantly across benchmarks (Table 18). A minimum call duration does not appear to be in use in any of the countries.

Table 18 Structure of benchmark prices

Network Operator	Country	Fixed charge (flagfall)	Minimum call duration[a]	De-averaged by time of day	Geographically de-averaged
BT	United Kingdom			✓	✓
Telecom New Zealand	New Zealand		"minute + second" charging		
TDC	Denmark	✓		✓	
Swisscom	Switzerland	✓		✓	
Eircom	Ireland	✓		✓	
Telstra	Australia	✓			✓
Deutsche Telekom	Germany			✓	
Telecom Italia	Italy			✓	
Telia	Sweden	na	na	na	na
Fixed operators – USA[b]	United States	Varies by state	Varies by state	Varies by state	Varies by state
France Telecom	France	✓		✓	
Belgacom	Belgium	✓		✓	
Portugal Telecom	Portugal	✓		✓	
KPN	Netherlands	✓		✓	
Telekom Austria	Austria	na	na	na	na
Telefonica	Spain			✓	
Telenor	Norway	na	na	na	na
TPSA	Poland	✓			
Telmex	Mexico	na	na	na	na
CTC Telefonica	Chile	na	na	na	na
Brazilian fixed operators	Brazil	na	na	na	na
Telefonica del Peru	Peru	na	na	na	na
Finnish SMP operators	Finland	✓		✓	

a For example, minute plus charging. b Colorado, Minnesota, North Dakota, South Dakota and Washington have charges that do not include a flagfall, are geographically de-averaged, and are distance dependent. Arkansas, Kansas, Nevada, Oklahoma, and Texas have charges that do not include a flagfall, are not de-averaged by time of day or geography, but are distance dependent. Missouri has charges that do not include a flagfall, are not de-averaged by time of day, are geographically de-averaged, and are distance dependent. Connecticut and Pennsylvania are charges do not include a flagfall, and are not de-averaged by time of day or geography, but are distance dependent. None of the other country benchmarks have charges that are distance dependent.

Source: Network Strategies 2005, Analysis of one minute minimum and per-second charging, August.

D Instructions from Telstra

112. To assist Telstra in providing comment on the indicative prices, Synergies has been contracted to:

(a) assemble and examine international PSTN OA and TA prices for comparison to Australia's current OTA indicative price and the ACCC's draft indicative prices; and

(b) analyse the cost drivers underlying OA and TA services that have implications for price comparisons. Where feasible, this may involve identifying order of magnitude adjustments which would improve the validity of price comparisons.

E National fixed network operators

Country OTA prices based on the national fixed network operators as listed below.

Table 19 National fixed network operators

Network Operator	Country	Network Operator	Country
Fixed operators – United States	United States	France Telecom	France
BT – British Telecom	United Kingdom	Belgacom	Belgium
TDC	Denmark	Portugal Telecom	Portugal
Swisscom	Switzerland	Telenor	Norway
Eircom	Ireland	Telmex	Mexico
Telecom Italia	Italy	Telekom Austria	Austria
Telia	Sweden	CTC Telefonica	Chile
Deutsche Telekom	Germany	Telefonica del Peru	Peru
TPSA	Poland	Finnish SMP operators	Finland
Telefonica	Spain	Brazilian fixed operators	Brazil
KPN	Netherlands		

F Reviewed documents

ACCC 2006, Pricing Principles and Indicative Prices: Local carriage service, wholesale line rental and PSTN originating and terminating access services, November.

ACCC 2009, Draft pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS, LSS, August.

Alger, D. and J. Leung 1999, The Relative Costs of Local Telephony Across Five Countries, NZ Institute for the Study of Competition and Regulation (NZISCR), Wellington, New Zealand.

Analysys Consulting Ltd 2009, Fixed LRIC Model Documentation version 2.0, August.

Analysys Mason 2009, Report for the Australian Competition and Consumer Commission, International benchmarking analysis, Analysis of WLR, LCS, LSS and PSTN OTA, August.

Cribbett, P. 2000, Population Distribution and Telecommunication Costs, Productivity Commission Staff Research Paper, AusInfo, Canberra, August.

ERG 2008, Regulatory Accounting in Practice 2008, September.

Ingenuous Consulting Network 2008, Commentary on the use of international benchmarking in setting interconnection rates, December.

IT- og Telestyrelsen 2005, Report on the LRAIC Model: Revised Hybrid Model (version 2.3), December.

NERA 2002, Benchmarking of International Interconnection Costs Against New Zealand Cost Conditions, Report for Telecom New Zealand, July.

NERA 2002, Response to Commerce Commission Draft Determination: A Report for Telecom New Zealand, September, Sydney.

Network Strategies 2005, Analysis of one minute minimum and per-second charging, August.

New Zealand Commerce Commission 2002, International Benchmarking Report: A Comparative Review of Interconnection Pricing, Wellington, September.

Norden 2004, Telecompetition: Towards a single Nordic market for telecommunication services?, Report from the Nordic Competition Authorities, no.1, September.

OECD 2009, Communications Outlook, Paris, OECD.

OFCOM 2009, Review of BT network charge controls. Consultation on proposed charge controls in wholesale narrowband markets, March.

OVUM 2008, Europe and Americas additional benchmarks and tables, Q2.

OVUM 2009, Historical Average Fixed Termination Charges workbook, September.

OVUM 2009, Telstra Efficient Access cost model – International WACC benchmark, An Advisory Note to the ACCC, January.