Past cost recovery and asset valuation

A report for Optus

March 2010

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1. Executive summary

1. In December 2009 the Australian Competition and Consumer Commission (ACCC) issued a discussion paper seeking input on issues that relate to the implementation of a regulatory asset base (RAB) to determine prices for fixed line services.[1]

2. Optus has asked the Competition Economists Group (CEG) to provide our opinion on the appropriate methodology for defining the opening RAB and other issues around network provider compensation and undertake some high level quantitative analysis to estimate the extent of Telstra's recovery of costs under the current regime.

3. This request mirrors some of the conceptual issues raised by the ACCC in its discussion paper regarding:

   - which approach should be used to value the asset base in setting the RAB and prices; and
   - how past compensation should be taken into account in setting the RAB and prices

4. In responding to these issues we have considered the legislative criteria for 'reasonableness' set out in Part XIC of the Trade Practices Act (the Act). The criteria which appear to us most relevant to these conceptual issues are: (i) the promotion of competition, (ii) the promotion of economic efficiency, and (iii) the legitimate business interests of the access provider.

5. We conclude in this report that the legislative criteria involve an element of trade off in setting the initial RAB for a new regulatory regime for telecommunications. Specifically, the first two criteria ((i) and (ii)) point to a low, or zero, value for existing assets in the initial RAB. This is because the existing assets used to provide fixed line services are by and large sunk.

6. In terms of the economic efficiency criteria, the opportunity cost of using sunk assets to provide a service is, by definition, zero. That is, the cost to society of using the assets today, given that they have already been put in place, is zero. For example, the copper wire, trench and duct that connect a house to the telephone exchange are sunk.

7. In this situation, any price that exceeds the price necessary to cover the future expenditures required to maintain the service potential of the existing assets will tend

[1] ACCC, *Review of 1997 guide to telecommunications access pricing principles for fixed line services: Discussion paper*, December 2009

to discourage the efficient use of the asset. The higher the value that is placed on sunk assets the higher will be access, and ultimately retail, prices. This will cause some end users to be discouraged from using the asset (eg, to cease to use a fixed line telephone or use it less intensively). Such an impact will be inefficient because the cost to the access provider (and society more generally) of them using those sunk assets is zero. That is, end users will be (economically) inefficiently discouraged from using the assets even though the cost of them using the assets is zero.

8. With regard to the promotion of competition, it is important to note that the access provider of fixed line services in Australia is vertically integrated. In this context, the promotion of competition is achieved if the access seekers and the access provider compete in the downstream market on equal terms. In practice this can only occur if access seekers face marginal prices for access which are equal the marginal cost the access provider faces when using the network. However, the access provider faces a zero cost of using its sunk assets and, consequently, for access seekers to be on an equal footing they must face a price based on a RAB that assigns a zero value to sunk assets.

9. As a result, the only factor not pointing to a nil or low value for existing assets in the RAB is the requirement to satisfy the legitimate business interests of the access seeker. An access provider that has made prudent investments in the past would legitimately expect the investment to be recovered in future revenues, and to earn a reasonable return on that investment in the meantime. To some extent the legitimate business interest criteria can also be interpreted as an efficiency objective. If the legitimate business interests of access providers are disregarded, with the effect that the access provider cannot earn a reasonable return on past prudent investments, access providers may be less willing to make future prudent investments – which would tend to undermine the promotion of efficiency. However, so long as the legitimate business interests of the access provider are met (eg., the regulatory regime provides a mechanism to include future capital expenditure in the RAB going forward) efficient investment should not be discouraged.

10. In this report we consider what asset values might be considered to be consistent with an access providers' legitimate business interest. We consider asset valuation approaches based on what might be considered to be the 'reasonable expectations' of investors consistent with their legitimate business interests. We also consider asset values which might be considered to be 'fair' to the asset owner.

11. We note that economic principles may be of a limited assistance in determining what a 'fair' value for existing assets is. Moreover, 'looking into the minds' of investors to determine what their expectations were (or are) is inherently difficult. Nevertheless, in our view it would be desirable for the valuation approach to have economic foundations or at least be applied in an economically sensible and consistent fashion. However, apart from that, any approach should not obviously be construed to have more economic merit over another in the context that one promotes competition or

efficiency more than the other. Ultimately, economic efficiency is promoted by adopting the lowest possible value for the RAB that is consistent with the legitimate business interest of the access provider.

12. The main conclusions of this report are as follows:

- Asset values determined according to depreciated optimised replacement costs (DORC) are a commonly used asset valuation method when a service is being subject to regulation for the first time. In the current context, Telstra has already been regulated for an extended period and so a current DORC value may be of less relevance to determining a fair valuation if it is at odds with asset valuations that have regard to the past history of regulation;
- Nonetheless, were a current DORC valuation undertaken it is important to note that the thought experiment underlying DORC has its foundation in a hypothetically contestable market for infrastructure. In any such valuation the thought experiment must consider the difference in service quality between the optimised and the existing network;
- In the context of the ACCC's approach to periodically revaluing assets it may be that investors would not have, or could not reasonably have, considered recent asset values as 'bankable' asset values on which to base an expectation of future cost recovery;
- In order to be 'fair' to investors it is relevant to consider what reasonable expectations were for the value of Telstra's regulated assets around the time Telstra was privatised. That is, given the regulation that Telstra was subject to at that time, what is a reasonable valuation that investors could have placed on Telstra's assets at that time (and has this been over or under compensated since)? This approach assumes 'legitimate business interests' of investors needs to be anchored at some point in time and the earliest point in time for such an exercise is the privatisation of Telstra;
- As the fixed line network was sold in a bundle of other assets, we cannot simply derive a value from the share issue price. Instead, we examine the circumstances around the time of the privatisation of Telstra that might have influenced investors' expectations of future revenues from the fixed line network (the customer access network in particular). We consider:
  - the Retail Price Controls which were implemented immediately prior to privatisation;
  - the regulatory asset value implied by the ACCC's first implementation of its Access Pricing Principles post privatisation (using the NERA model); and
  - the depreciated historic cost of the fixed line network at the time of the privatisation.

- If a reasonable asset value can be calculated to reflect the expectations of initial investors in the fixed-line network it would need to be 'rolled forward' or depreciated to today. Consistent with the investors legitimate business interests, they would expect to have received a normal return on the depreciated value of that investment, where the depreciated value is calculated as the initial value (in 1997) less net compensation received in charges for network services; and
- Access providers may face incentives to submit high forecasts for expenditures if forecast expenditures are rolled into the RAB. It is not uncommon for there to be large discrepancies between out-turn expenditure and forecasts expenditure despite scrutiny of forecasts by the regulator.

13. This report contains a 'high level' assessment of Telstra's recovery of costs under the current regime (ie. since 1997). The analysis indicates substantial cost recovery, after allowing for a normal return on the initial asset values.

14. In order to illustrate the implications of these alternative asset valuation approaches we have estimated asset values for the customer access network which could be used to inform the setting of an initial RAB for regulating future access prices (see Table 1 below). These estimates are based on publically available information and have required numerous assumptions which are outlined in this report.

Table 1: Alternative opening RABs for Telstra's CAN, 2010

Method	Description	Value
Financial	Based on expectations of investors after privatisation	$7.4 billion
DORC	NPV-adjusted NERA ORC	$8.0 billion
DHC	Based on historic asset values in ACCC NBN report, deflated to 1997	$2.7 to $6.6 billion
DORC	NPV-adjusted Analysys ORC with service quality adjustment	$11.3 to $16.4 billion

Source: CEG analysis

15. The structure of this report is as follows:

- section 2 considers the principles of asset valuation in the context of the legislative arrangements for telecommunications access regulation in Australia;
- section 3 outlines four estimates of a 'fair' value for the customer access network and details the logic upon which they are based and how they are calculated;
- section 4 provides an approach for the measurement of recovery of costs since Part XIC came into operation in 1997; and finally,
- section 5 considers some incentive issues in the treatment of expenditure in the roll-forward mechanism from the initial RAB.

2. Principles guiding valuing existing assets

16. This section considers what principles should guide the valuation of existing fixed-line telecommunications assets in Australia if they are transitioned out of the existing regulatory regime for telecommunications to a new regulatory framework based on 'locking in and rolling forward a RAB'.

17. We assume that any new regulatory framework would operate under Part XIC of the Trade Practices Act 1974, which provides the statutory foundation for the existing access regime for telecommunications networks. We begin therefore by considering the economic principles relevant to valuation contained within Part XIC.

18. We conclude that the task of placing a valuation on the existing sunk assets of an access provider is to strike a balance between the objectives of achieving efficiency and 'fairness' to the access provider. Economic discourse on different methods of regulatory valuation generally focuses upon which gives rise to the most efficient prices. However, economics does not provide guidance as to what method might provide a valuation that is 'fair' to Telstra and its shareholders. Consequently, when estimating the initial RAB we see no *a priori* economic reason to favour one method of valuation over another to the extent that the objective is to achieve 'fairness'.

2.1. The requirements for a 'reasonable' access price under Part XIC

19. The telecommunications access regime does not prescribe a particular asset valuation approach or suggest a range of asset valuation approaches to which regard should be had. This contrasts most notably with the gas access regime (the Gas Code) which specifies a range of asset valuation approaches and factors which may be had regard to in setting the value of existing assets when they are initially regulated under the regime.

20. Nevertheless, the telecommunications access regime, under Part XIC does require the ACCC to reject access prices which are not 'reasonable', where reasonableness is defined as follows:[2]

> *(1) For the purposes of this Part, in determining whether particular terms and conditions are reasonable, regard must be had to the following matters:*
>
> *(a) whether the terms and conditions promote the long-term interests of end-users of carriage services or of services supplied by means of carriage services;*

[2] *Trade Practices Act 1974* 152AH

(b) the legitimate business interests of the carrier or carriage service provider concerned, and the carrier's or provider's investment in facilities used to supply the declared service concerned;

(c) the interests of persons who have rights to use the declared service concerned;

(d) the direct costs of providing access to the declared service concerned;

(e) the operational and technical requirements necessary for the safe and reliable operation of a carriage service, a telecommunications network or a facility; the economically efficient operation of a carriage service, a telecommunications network or a facility.

(2) Subsection (1) does not, by implication, limit the matters to which regard may be had.

21. Where the 'long-term interest of end-users' is defined as being in the objectives:[3]

(c) the objective of promoting competition in markets for listed services;

(d) the objective of achieving any-to-any connectivity in relation to carriage services that involve communication between end-users;

(e) the objective of encouraging the economically efficient use of, and the economically efficient investment in:

(i) the infrastructure by which listed services are supplied; and

(ii) any other infrastructure by which listed services are, or are likely to become, capable of being supplied.

22. In considering the value to be placed on existing assets, the most relevant legislative matters to have regard to appear to be the objectives of promoting competition and encouraging economically efficient use of and investment in infrastructure, and whether due regard is had to the legitimate business interest of the access provider. We consider each of these in the following sections.

[3] *Trade Practices Act 1974* 152AB

2.2. Promoting competition with a vertically integrated access provider

23. In cases where the access provider is vertically integrated into markets downstream of the access services, consideration may need to be given to the effect a higher or lower value on existing assets (ie, RAB) may have on competition between access seekers and the access provider in the downstream market.

24. Access prices will promote competition in the downstream market when they do not influence the success of one competitor over another in the market. That is, competition is promoted when access prices provide a 'level playing field' in the downstream markets such that all competitors (access seekers and the access provider) have the equivalent ability and incentives to compete for all customers.

25. Importantly, a vertically integrated access provider does not face a cost in using its own sunk assets when it competes in the downstream market. By definition these assets are sunk and have no opportunity cost to society or the access provider.[4] In contrast, an access seeker faces an opportunity cost equal to the access price when they use the assets for the access provider. To the extent that access prices include a cost to reflect the use of the access provider's sunk assets, the access seeker will be at a disadvantage in competing for customers in the downstream market.

26. The promotion of competition objective can only be achieved if the access seekers and the access provider compete in the downstream market on equal terms. In practice this can only occur if access seekers face marginal prices for access which are equal the marginal cost the access provider faces when using the network (ie, close to zero).

27. Therefore, to the extent the RAB includes any value on sunk assets and this influences marginal access prices then it will not fulfil the objective of promoting competition in the downstream market.

2.3. Efficiency objectives also point to a lower value on existing assets in the RAB

28. The objective of promoting economically efficient use and investment, when applied to existing assets point to a low or zero value in the RAB. As noted above, the opportunity cost of using sunk assets to provide regulated access services is, by definition, zero.[5] That is, the cost to society of using the assets today, given that they have already been put in place, is zero.

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[4] Apart from the opportunity cost of selling the input to an access seeker at the regulated price so it can serve the customer.

[5] As Jevons famously observed in the mid-19th century, 'bygones are forever bygones'. The implications of sunk costs on efficiency are commonly misunderstood or ignored in the context of monopoly regulation. For a reasonably comprehensive discussion of the basics of sunk costs see Pindyck & Rubinfeld (2005), *Microeconomics*, 6th edition

29. For example, the copper wire, trench and duct that connect a house to the telephone exchange are sunk. A large proportion of the costs of these assets is in labour and installations and these costs cannot be reversed. In other words, the salvageable value of the network is likely to be very low compared to the historic cost of building the asset.

30. In this situation, any charge for the uses of services on the existing network that exceeds the charge necessary to cover the future expenditures required to maintain the service potential of the existing assets will tend to discourage the efficient use of the asset. The higher the value that is placed on sunk assets the higher will be access, and ultimately retail, prices. This will cause some end users to be discouraged from using the asset (eg, to cease to use a fixed line telephone or use it less intensively).

31. Such an impact will be inefficient because the cost to the access provider (and society more generally) of them using those sunk assets is zero. That is, end users will be (economically) inefficiently discouraged from using the assets even though the cost of them using the assets is zero.

2.4. Legitimate business interests point to a higher value, but how high?

32. The ACCC set out its interpretation of the requirement to consider the legitimate interests of access providers in its 1997 Access Pricing Principles.[6]

> *Regard to the legitimate business interests of access providers requires an access price that at least provides a normal commercial return on prudent investment. The services to which Part XIC will mostly apply are provided using highly capital intensive and specialised infrastructure, the costs of which are largely sunk before the service is provided. It is legitimate for the carrier or carriage service provider to seek to recover the costs of prudent investment from its commercial activities, including providing access.*
>
> *However, it is unlikely the legitimate business interests extend to achieving a higher than normal commercial return through the use of market power. For example, an access price should not, in most cases, be artificially inflated by the lack of competition in the supply of infrastructure services.*

33. We agree that an access provider that has made prudent investments in the past would legitimately expect the value of that investment to be recovered in future revenues, and to earn a reasonable return on that investment in the meantime. However, this observation is insufficient as it does not define the value of past prudent

[6] ACCC, *Access Pricing Principles – Telecommunications: A guide*, 1997, p. 9

investment by the access provider, though it does indicate that a value which reflects the monopoly characteristics of the network would not be legitimate.

34. As such an asset value that is consistent with the 'legitimate business interests' criteria would be thought as one which is fair to investors having regard to their normal (not monopoly) business interests. In order to be fair to investors it may be relevant to consider what reasonable expectations they have legitimately formed over time. It may also be relevant to consider a hypothetical market value for the asset where the value is not influenced by the lack of infrastructure competition.[7]

35. We note that economic principles cannot be definitive regarding what are 'legitimate business interests' and may be of a limited assistance in determining what a 'fair' value for existing assets is. Moreover, 'looking into the minds' of investors to determine what their expectations were (or are) is inherently difficult. Ultimately, economic principles simply tell us that economic efficiency and competition are promoted by adopting the lowest possible value for the RAB that is consistent with the legitimate business interest of the access provider.

36. Nevertheless, in our view it would be desirable for the valuation approach to have economic foundations or at least be applied in an economically sensible and consistent fashion. However, apart from that, any approach should not obviously be construed to have more economic merit over another in the context that one promotes competition or efficiency more than the other.

37. To some extent the legitimate business interest criteria can also be interpreted as an efficiency objective. If the legitimate business interests of access providers are disregarded, with the effect that the access provider cannot earn a reasonable return on past prudent investments, then access providers may be less willing to make future prudent investments – which would tend to undermine the promotion of efficiency. However, so long as the legitimate business interests of the access provider are met (and the regulatory regime provides a mechanism to include future actually incurred capital expenditure in the RAB going forward) efficient investment should not be discouraged

38. Similarly, the legitimate business criteria may also be interpreted as a promotion of competition objective. In order for the vertically integrated access provider to remain viable, it must recover from its own retail customers costs it has actually incurred in the past and costs it will actually incur in the future, therefore to be competitively neutral it must do the same from access seekers.

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[7] Of course, attempting to observe or calculate an actual market value would not be helpful, because the market value for the asset would simply be a function of discounted stream of regulated revenues. This is circular given the whole purpose of the exercises is to determine the stream of regulated revenues (and we are seeking to set a regulated asset value on which to set regulated revenues).

3. Placing a value on the existing assets in the CAN

39. As described in the previous section, access prices for fixed line services in Australia that are most consistent with Part XIC of the Act are likely to be those that are as low as possible whilst still providing a sufficient return to provide for the legitimate business interest of the access provider. The legitimate business interests of the access provider therefore define the valuation exercise for existing assets which are to be rolled into the new regulatory framework.

40. In this section we consider some asset valuation approaches which might be considered to be consistent with an access provider's legitimate business interest. We consider asset valuation approaches based on what might be considered to be the 'reasonable expectations' of investors consistent with their legitimate business interests. We also consider asset values which might be considered to be 'fair' to the asset owner.

41. The problem of valuing existing assets when being brought under regulation for the first time has been considered in other industries. In this section we also briefly consider the approach in the gas industry.

42. The table below summarises four alternative valuations of the CAN[8] that might reflect the expectations of investors as to the fair value of their investment in Telstra's customer access network that must be recovered in the future. These values are established at different points in time, some recent, some reflecting the expectation of investors around the time of Telstra privatisation.

Table 2: Alternative 'fair' valuations for the CAN

Method	Year	Description	Value
Financial	1997	Based on expectations of investors after privatisation	$10.3 billion
DORC	1998	NPV-adjusted NERA ORC	$10.5 billion
DHC	1997	Based on ACCC NBN report, deflated to 1997	$9.1 to $10.1 billion
DORC	2009	NPV-adjusted Analysys ORC with service quality adjustment	$11.0 to $16.0 billion

Source: CEG analysis

3.1. Approach to valuing existing assets when first regulated under the Gas Code

43. Section 8.10 of the Gas Code (to which the Gas Rules refer) describes a number of asset valuation methods for setting the initial asset value. Like the proposed 'locked in

[8] This report focus on the valuation of the CAN as sufficient information is available to allow some calculation of values, albeit indicative given the magnitude of assumptions required.

RAB' regulation proposed by the ACCC for telecommunications, under the Gas Code that initial asset valuation is never revisited.

44. The approaches to asset valuation described in the Gas Code include:

- Depreciate actual cost of building the network, calculated as the historic capital costs of building the network (if these are known) less accumulated depreciation;
- The depreciated optimised replacement cost (DORC) method which is the cost of replacing the existing network with an optimally configure network less an assessment of depreciation;
- A value based on past pricing practices allowing for economic depreciation of the asset and historic returns; and
- The price paid for the asset if it has been recently purchased (depending on the circumstance of the purchase).

45. We consider each of these methods in the following section.

46. However, a potentially important distinction between the context of the gas industry and the current context is that existing gas pipelines regulated and valued under the Gas Code were by and large being regulated for the first time. In contrast, fixed line telecommunications infrastructure has been regulated by the ACCC (and at the retail level by the Government) for more than 10 years (since 1997 the ACCC has regulated access under Part XIC).

47. During this period, regulated prices have been set for services provided by the fixed line telecommunications network. Implicit in each of these regulated prices was a value for the assets used to provide the regulated service. As such, determining an asset value today which is entirely inconsistent with the history of regulation and the past expectations of investors in the access provider (including the compensation they have subsequently received) may be viewed as inconsistent with the access provider's legitimate business interests.

3.2. A recent estimate of the 'fair' value of the CAN

48. This section provides an estimate of the 'fair' value of the CAN based on recent cost modelling undertaken by the ACCC. This estimate is consistent with CEG previous estimate of an optimised replacement cost of the CAN.[9] However, in this case we estimate a DORC recognising that we are seeking an asset value to be used in the RAB 'lock-in roll-forward' approach rather than the TSLRIC revaluation approach.

[9] CEG, *Contestable market asset valuation for the unbundled local loop*, A report for Optus, October 2009.

3.2.1. A recent estimate of Depreciated Optimised Replacement Cost

49. DORC is an asset valuation method which seeks to identify a 'fair' valuation of an asset given its service capability and depreciated state.[10]

50. DORC arises from hypothetical thought experiment to try to identify an asset value 'as if' the access provider and access seekers were freely entering into commercial negotiations to identify a current market value for the asset. The thought experiment asks:

> *If the supply of the monopoly network could now be put to a competitive tender, what is the maximum amount access seekers would need to pay the access provider to compensate it for the use of its existing network (noting in the hypothetical tender they had the alternative of another access provider providing an optimally configured replacement asset)?*

51. The answer to this thought experiment is the depreciated optimised replacement cost (DORC) method of asset valuation which the ACCC has constructed (in the context of electricity access regulation) as:[11]

> *"... the price that a firm with a certain service requirement would pay for existing assets in preference to replicating those assets"*

52. DORC represent a hypothetical valuation in which there is competition 'for the market'. Of course, it is clear that such competition is hypothetical. In reality, there are significant sunk costs which mean that there can be no such market (and in fact if this were not the case then there would be no reason to regulate). In this regard it is important to note that DORC is not an attempt to set prices that create incentives for efficient entry or bypass by a new entrant. In addition, a DORC valuation does not reflect the opportunity cost of using the assets. DORC is simply an economic thought experiment to put a fair or market value on the asset, by constructing a hypothetical in which that asset was tradeable in a open market (which, by definition, it is not).

3.2.2. A service quality adjustment is necessary for a current DORC to be considered 'fair'

53. The differences between the existing asset and the optimally configured replacement asset become critical to the correct definition of DORC. In particular, the willingness of

[10] As noted above, DORC is the asset valuation that is widely used, albeit in different guises, for valuing regulated monopoly networks and is, for example, prescribed in the Gas Code as an important reference point for determining the Initial Capital Base of a gas pipeline when it is first subject to regulation.

[11] ACCC (1999) Draft Statement of Principles for the Regulation of Transmission Revenues, page 39.

access seekers to pay for the existing network if they have the option of a replacement network would depend on differences in the:

- Future cost of operating the existing asset relative to the future costs of operating the replacement network. For example, an important cost saving associated with the existing asset is that it avoids the need to incur the upfront expenditures of building a new asset today. Offsetting this somewhat may be that the operating costs of a new asset could be lower than the operating costs of the existing asset[12]; and
- The service quality offered by the replacement network in advance of (or in deficit to) the existing network. For example, a new network may be more reliable or have some other attributes that are valuable and which the existing network does not have.

54. When fully investigated, a DORC valuation would need to consider all possible replacement networks that might be considered by a new entrant. For example, in valuing the existing copper local loop telecommunications network a new entrant might consider another copper local loop, a fibre local loop, or a wireless local loop in order to provide access seekers with the ability to provide their end-users with calling and broadband services.

55. In contrast, if the optimally configured new network involved an alternative technology then differences in the value of services provided by the alternative technology relative to that provided by the copper network would need to be factored into the valuation of the existing network. Consideration of service potential might result in a lower valuation of the existing asset if the alternative technology provided higher quality services (eg, a fibre local loop network would provide faster broadband and so would have a higher service potential making the existing copper network less valuable in the eyes of access seekers).

56. Without depreciation to reflect the difference in service quality between a replacement asset and the existing asset the DORC would represent an overstatement of the 'fair' value of the network, because it would protect the value from depreciation which it would face if it faced competition from replacement cost networks today. The hypothetical market value created in a DORC valuation relies on an assumption of market contestability, therefore it assumes away scale barriers to entry – competition is on an 'all or nothing' basis. But it does not 'assume away' the potential for replacement cost networks to be more efficient technologies (including greater service potential). A 'fair' estimate of the value of the network *today*, therefore must consider the replacement networks that exist *today*. To do otherwise would be inconsistent with the notion that the legitimate business interests should ensure that "an access price

[12] Milner Consulting (2009) *Using the ACCC Analysys Network Model for Modeling Fibre to the Premise*, Prepared for Optus.

should not, in most cases, be artificially inflated by the lack of competition in the supply of infrastructure services"[13].

3.2.3. A recent DORC estimate based on the Analysys model

57. In order to calculate a DORC estimate we have relied on the modelling of Analysys. Analysys was recently commissioned by the ACCC to estimate an ORC for Telstra's network for the 2009 financial year. In relation to the CAN, Analysys estimated a replacement cost of $35.1 billion on the optimised assets.

58. As discussed in a previous CEG report for Optus,[14] the Analysys model is not truly optimised because it assumes a copper structure for the access network, despite the costs of a fibre deployment likely being cheaper and providing a greater service capacity. CEG estimated that the replacement cost for an optimised fibre asset based on a passive optical network deployment to be $32.6 billion. At Analysys' cost of capital of 10.77%, the present value of this and all future replacement expenditures amounts to $34.4 billion.

59. A DORC estimate for this adjusted Analysys network can be estimated by comparing the present value of expected future costs on Telstra's existing network against the present value of expected future costs on the hypothetical Analysys fibre network. We do this under the assumption that operating expenditures on the two networks are the same, and that the differences lie in capex. This assumption is likely to be conservative to the extent that the elder of the two networks (the existing network) is likely to require greater opex than a replacement network.

60. Assuming future capital expenditure of $900 million per year on the existing network, the future costs of maintaining and replacing that network are $8.4 billion. This implies a willingness to pay for the existing network of $26.0 billion.[15]

61. However, the definition of DORC assumes a given service requirement from both the replacement and existing networks. In this case, the replacement network is based on fibre infrastructure and is able to provide a much richer range of services on a far more ubiquitous basis than is possible over a copper network. In our previous report for Optus we estimated a conservative value of the service increment provided by fibre over copper to be in a range from $10 billion to $15 billion.[16]

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[13] ACCC, *Access Pricing Principles – Telecommunications: A guide*, 1997, p. 9

[14] CEG, *Contestable market asset valuation for the unbundled local loop*, A report for Optus, October 2009

[15] Assuming that opex is approximately the same on both networks.

[16] CEG, *Contestable market asset valuation for the unbundled local loop*, A report for Optus, October 2009

62. Accordingly, a revised value of DORC that makes this service requirement adjustment lies in a range from $11.0 billion to $16.0 billion.

Table 3: A recent 'fair' valuation of the CAN

Method	Year	Description	Value
DORC	2009	NPV-adjusted Analysys ORC with service quality adjustment	$11.0 to $16.0 billion

63. As a recent valuation placed on the CAN by the ACCC this value reflects the cost of replacing the trenches, duct and copper cable today. If it is accepted that these assets cost more to replace today than at the time at which they were incurred or at any time in the past, (see for example Table 7 below in this report), they may not represent an asset value that investors would have historically expected to recover. It may nevertheless represent a 'fair' value of the asset today.

64. In the context of the existing regulation of telecommunications prices, the access provider faces both upside and downside risk to its prices. If the cost of copper decreases, or new technology makes the laying of ducts cheaper, then the access provider's asset value may fall below previous valuations, albeit it appears to have risen substantially above previous values at the present time.

65. Given the ACCC's approach to periodically revaluing assets, it is likely that investors would not have, or could not reasonably have, considered recent asset values as 'bankable' asset values on which to base an expectation of future cost recovery. Consequently, the earlier that a valuation is taken, the less likely it is to reflect windfall gains or losses above or below the past reasonable expectations of investors.

3.3. Three estimates of a 'fair' value for the CAN based on investors' legitimate expectations

66. An obvious starting point for considering a 'fair' value for the CAN is around the time of privatisation of Telstra through the share offer in 1997. This was the first occasion that private investors took an equity stake in Telstra, which they acquired based on their expectations about Telstra's future performance.

67. From the perspective of giving weight to Telstra's legitimate business interests, privatisation was the first date at which investors demanding a commercial rate of return could have been considered to have made an 'investment' in Telstra. Prior to privatisation the government retained full ownership of Telstra. Whether the government has a 'business' interest in receiving a 'commercial' rate of return on its assets is debatable. For this reason the privatisation may represent a potentially relevant time in which legitimate business interests and business expectations were formed.

68. As the fixed line network was sold in a bundle of other assets, we cannot simply derive a value from the share issue price. Of course, if the CAN had been sold as a single asset at a price specified by the Government, then we could simply observe the amount specified by the Government on the date of privatisation. Investors would reasonably expect that the amount paid would be reflected in the regulatory regime.

69. It is for this reason that we consider the circumstances *around the time* of privatisation of Telstra that might have influenced investors' expectations of future revenues from the fixed line network (the customer access network in particular). We consider:

- the Retail Price Controls which were implemented immediately prior to privatisation;
- the regulatory asset value implied by the ACCC's first implementation of its *Access Pricing Principles* post privatisation (using the NERA model); and
- the depreciated historic cost of the fixed line network at the time of the privatisation.

70. Note that in considering the factors influencing investors' expectations we are not tied to the precise date of the privatisation. We are simply interested in the factors which may have influenced investors' earliest expectations of a value for the regulated assets around that time and within the context of the new regulatory regime in 1997. Though potentially messy, this history is important as it defines the 'investment' in existing assets that investors could reasonably have considered to have made and expected to be reflected in the regulatory regime.

71. The estimates of the valuations from each of the above considerations are given in the table below.

Table 4: Historic estimates of a 'fair' value for the CAN

Method	Year	Description	Value
Financial	1997	Based on expectations of investors after privatisation	$10.3 billion
DORC	1998	NPV-adjusted NERA ORC	$10.5 billion
DHC	1997	Based on ACCC NBN report, deflated to 1997	$9.1 to $10.1 billion

Source: CEG analysis

3.3.1. A past 'fair' value based on retail price controls at the time of privatisation

72. As noted above, the privatisation of Telstra may be a natural point at which to assess the reasonable expectations by investors of future recovery and thus estimate a value for Telstra's CAN.

73. It is important to note the timelines relating to the regulatory regime placed on Telstra and its privatisation. Part XIC of the Trade Practices Act 1974 came into force in April 1997, whereas Telstra's partial float occurred in November of the same year.

74. Telstra was also subject to retail price controls between 1995 and 1999 that are the subject of an ACCC report.[17] Under these controls, eight of Telstra's core services were capped to increase in price at CPI – 7.5%. A number of these services, including line rental for residences, were placed on individual price caps of CPI – 1%.

75. At privatisation, investors paid approximately $14 billion for one third of the company. Although this appears to value Telstra at $42 billion, it is not straightforward to estimate what value this implies that investors placed on the CAN.

76. However, it is possible to construct an imputed financial valuation for the CAN in 1997 that represents the likely expectation of investors in Telstra at that time. This valuation will likely depend upon:

- the prices received by Telstra at the time of privatisation;
- the expected path of future line rental/basic access prices based on retail price controls existing at the time;
- the expected path of future lines numbers;
- Telstra's gross operating margins on the CAN; and
- a forward-looking cost of capital estimated in 1997.

77. Each of the parameters above is subject to some (potentially significant) imprecision, both in terms of the expectations of investors in 1997 and from the perspective of measuring them today. Table 5 sets out what we consider to be reasonable estimates for these parameters, and our reasons for adopting these values. Under these assumptions, we estimate a value for Telstra's CAN by investors of $10.3 billion in 1997.

[17] ACCC, *Telecommunications charges in Australia: 1995-99*, April 2000.

Table 5: Range of parameters for financial valuations of Telstra's CAN in 1997

Parameter	Value	Comment
Revenue per line in 1997	$15.51	Average revenue per line in 1997
Expected growth in prices from 1997	CPI – 1%	Price cap placed on residential access line charges. Overall price cap was CPI – 7.5%
Expected growth in lines served	-1.0%	To apply from 2009. Use actual line data up to 2009. Reflects current trend in total lines served
Telstra's cash operating margin	60%	Reflects a possible estimate of what investors might have expected Telstra to be earning on revenues looking forward from 1997, net of all costs including retail costs. The upper bound of a benchmarked range[18]
Cost of capital	11.94%	Reflecting contemporaneous financial variables and regulatory WACC assumptions[19]
Valuation	**$10.3 bn**	

Source: Telstra annual reports, CEG calculations

78. It is important to note that the parameters in Table 5 above reflect an estimate of the expectations of investors prior to privatisation in 1997. They do not necessarily represent desirable parameters from a regulatory perspective and should not be interpreted in this light.

3.3.2. A past 'fair' value based on a DORC valuation derived from the ACCC/NERA ORC calculated in 1998

79. NERA was commissioned by the ACCC to estimate the optimised replacement cost (ORC) of Telstra's access network for the 1998 financial year.[20] This asset valuation exercise represented the first asset value set for the CAN by the ACCC under its *Access Pricing Principles*.

80. NERA estimated that the optimised replacement cost of Telstra's access network was $16.3 billion in dollars of the day. The breakdown of assets that comprised this hypothetical network is shown in Table 6 below.

[18] Based on Ovum research the ACCC benchmarked Telstra's margins against other operators and found these to be between 50% and 60%. See: ACCC, *Ovum report: Telstra financial and economic profit analysis*, October 2001.

[19] Based on a nominal risk-free rate of 7.85% and debt risk premium of 1.24% for 1997. Other WACC parameters are as summarised for 1998 in Table 9 below. We note that this is generally consistent with the WACC applied by NERA in 1998 of 12%.

[20] NERA, *Estimating the long run incremental cost of PSTN access: A draft report for the ACCC*, October 1998.

Table 6: Breakdown of NERA ORC

Network component	Investment cost ($ million)
Pillars	338
Copper cable	3,996
Trench	8,302
Line cards	2,392
Other NTS part of switch	1,047
Additional costs for remote rural customers	241
Total	**16,316**

Source: NERA

81. The ORC estimated by NERA was the first cost study of Telstra's assets made after privatisation in 1997. Investors at the time of privatisation could not have had regard to the results of the study in informing their expectations of Telstra's future earnings at privatisation, given that it was released in 1998.

82. Nonetheless the study may provide a useful alternative valuation of Telstra's network. In contrast to the value around above it:

- is not subject to imprecision, since it is the single outcome of NERA's modelling exercise; and
- represents a value accepted by the ACCC. We note that NERA's study was commissioned soon after privatisation.

83. We note that NERA's ORC is undepreciated and is therefore unlikely to represent the value that investors in Telstra could attribute to its access network. The network was not new in 1999. As above, a depreciated optimised replacement cost (DORC) has been defined by the ACCC as:[21]

> *"…the price that a firm with a certain service requirement would pay for existing assets in preference to replicating the assets."*

84. In this context, the DORC represents the value of Telstra's existing network in preference to building an entirely new network with an investment cost of $16.3 billion as estimated by NERA.[22]

[21] ACCC, *Draft statement of principles for the regulation of transmission revenues*, May 1999, p. 39

[22] Here we ignore the prospect that the two networks may deliver different quality of service, since both Telstra's existing network at the time and the NERA optimised replacement network used the same technology.

85. As we did with the Analysys model, we can estimate a DORC value in 1998 by comparing the present value of expected future costs on Telstra's existing network against the present value of expected future costs on the hypothetical NERA network. We do this under the assumption that operating expenditures on the two networks are the same, and that the differences lie in capex. This assumption is likely to be conservative to the extent that the elder of the two networks (the existing network) is likely to require greater opex than a replacement network.

86. Based on data obtained from Telstra annual reports between 1998 and 2008, the average annual capital expenditure on its access network is around $900m in nominal terms. This level does not appear to be rising or falling over time in any obvious sense and likely reflects the network is in a reasonable 'steady state' of replacement and refurbishment. At NERA's 12% nominal WACC, the present value of these future costs is $7.5 billion.

87. In addition to the one-off expense of building the replacement network for $16.3 billion, the costs of maintaining it with future replacement capex amount to a further $1.7 billion in present value terms, for a total of $18.0 billion in capex.[23]

88. Consequently, the value of the existing depreciated network is $10.5 billion since this represents the surplus from continuing to operate it rather than investing in a replacement network.

3.3.3. A past 'fair' value based on a DHC valuation in an ACCC report

89. There is little publicly available information about the historic cost of Telstra's fixed line assets. The most recent information that has been made available was released in an ACCC report outlining assessment of proposals to build the national broadband network (NBN) in January 2009.[24]

90. At page 59 of this report, the ACCC shows a breakdown of the historic and costs of Telstra's CAN for the 2008 financial year. These figures are replicated in Table 7 below.

[23] Future replacement capex requirements have been calculated using average asset life and price tilt information contained in appendix A of the NERA report.

[24] ACCC, *Assessment of proposals: National broadband network process: Report to expert panel*, January 2009

Table 7: Historic and current CAN values estimated by ACCC, 2007-08

Description	Historic ($m)		Current ($m)	
	Depreciated	Gross	Depreciated	Gross
Ducts and pipes	3,932.8	6,598.8	11,768.4	22,609.1
Copper cables	2,683.4	6,422.8	4,450.9	12,393.4
Other cables	11.4	12.5	11.4	12.5
Pair gain systems	1,097.5	3,101.8	1,271.3	4,075.4
Radio bearer equipment	237.9	839.4	107.0	1,118.1
Other CAN	1.8	1.8	1.8	1.8
Total	**7,964.9**	**16,977.0**	**17,610.9**	**40,210.3**

Source: ACCC

91. The figures in Table 7 are useful to the extent that they represent the only publicly available estimate of the historic costs of Telstra's CAN. However, by themselves they do not represent a useful number to establish an initial RAB for Telstra's CAN. This is because:

- the sum of historic costs is unlikely to be adjusted for inflation and will therefore be lower than it should be once inflation on the historic costs have been considered; and
- the depreciated historic costs (DHCs) in Table 7 are not likely to use a method of depreciation that takes into account Telstra's historic compensation and so may either underestimate or overestimate what initial value is required to give fair compensation looking forward.

92. Using asset lives for each of the six categories in Table 7 above based on the Analysys ORC model, and assuming a constant capex spend in real terms on each asset type looking backward, we can estimate the extent to which an inflation adjustment should increase the gross historic cost.

93. We estimate that the figure of $17.0 billion should be revised upward to $26.1 billion to reflect these adjustments. The change is substantial because we assume that some of the expenditure on ducts and pipes may have occurred up to 40 years ago, over which time inflation has increased prices by a factor of ten.

94. The DHC can also be re-estimated on this basis. Without knowing exactly how it has been calculated, there are two options to estimate it:

- assume that it increases proportionately with the undepreciated value, or to $11.9 billion; or

- estimate a DHC based on straight-line depreciation of the estimated capex over the assumed lives of the assets, which returns a value of $13.3 billion.

95. Both of these DHCs are of interest in assessing a fair value for the network. However, because they have been estimated as at 2008, they are less useful because the depreciation embodied in the estimates is likely to be an accounting measure that does not reflect the recovery of value that Telstra has extracted from the CAN during the life of the assets. For this reason, neither of the DHCs above provides an estimate of what investors in Telstra might reasonable have expected the company to be able to recover on privatisation in 1997.

96. However, it is possible to use the ACCC's information, together with ABS inflation data to estimate a revised DHC as at the time of privatisation in 1997. Under the assumption used earlier that capex is evenly distributed in real terms over the lives of the assets, and under the very conservative assumption that the prices of individual assets have not increased in real terms between 1997 and 2008, it is possible to deflate a DHC in 2009 to a value in 1997.

97. The range resulting from this calculation is $9.1 billion to $10.1 billion in 1997 terms.

4. Taking into account past compensation on the asset base

98. In its discussion paper, the ACCC identifies as an issue how past compensation received on the existing fixed lines assets can be taken into account. For example, it states:[25]

> *If the opening RAB values existing assets at a depreciated value, for example, DORC or DHC — **which takes into account the past compensation received on the assets**...* [emphasis added]

99. The phrasing in the bolded section of the quote recognises the link between depreciation and compensation. That is, the ACCC acknowledges that a opening RAB set at a 'depreciated' value would take into account compensation earned in the past, but does not suggest a method by which such a depreciated value could be estimated.

100. We agree that taking into account the past compensation of the access provider is relevant to determining an opening RAB in 2010 for a new regulatory regime so as to ensure that access provider is not over- or under-compensated on a past asset valuation which was considered to be 'fair'. We discuss below how this compensation can be estimated and implemented in a practical sense.

4.1. How can past compensation be estimated?

101. Under regulation based on a RAB, allowed revenues are normally calculated to be equal to a reasonable return on the RAB plus depreciation and other costs (including opex and taxation). Often when determining revenue on a forward-looking basis, an accounting form of depreciation such as straight-line depreciation is used to estimate allowed revenues.

102. It is possible to look at Telstra's revenues and costs between our past (and recent) valuation of its CAN and the formation of the opening RAB in 2010 through the same prism. We can do this by setting the past (and recent) values as a RAB and rolling them forward using actual capex. To the extent that revenues in any year exceed (or fall short of) the a return on the RAB, actual opex and calculated taxation in any year, the balance can be ascribed as depreciation of the RAB, net of capex, or a return of capital to Telstra. The portion of the RAB that has been returned to investors in a given year no longer attracts a return on investment.

[25] ACCC Discussion Paper, p. 34

103. These relationships can be expressed using simple algebraic equations. The commonly understood formulae guiding the roll-forward of a RAB and the calculation of annual allowed revenues are:[26]

$$RAB_{t+1} = RAB_t + Capex_t - Depreciation_t$$

$$Revenue_t = WACC \times RAB_t + Opex_t + Depreciation_t + Tax_t$$

104. Based on a given level of revenue at time *t*, past depreciation can be made the subject of the second equation:

$$Depreciation_t = Revenue_t - WACC \times RAB_t - Opex_t - Tax_t$$

105. This level of depreciation is not an accounting measure, but estimates the extent to which the RAB should be adjusted, net of capex, based on actual recovery of revenues in excess of costs at time *t*. By establishing an initial RAB at a point in time, say in 1997, and using actual revenue and cost information over the intervening period, the above formulae can be used to estimate the extent to which the initial RAB should be increased or decreased to reflect recovery of costs over that time.

106. In this context, and generally in the context of utility-style regulation with a RAB, the recovery of costs refers to the recovery of the RAB and capital expenditure that has been rolled into the RAB at actual cost. This is consistent with the interpretation of legitimate business interests discussed at section 2.4 above. The process described above cannot be used to (and does not attempt to) estimate the recovery of a different measure of costs, such as contemporaneously measured ORC.

4.2. Projecting forward our past (and recent) asset values to estimate an opening RAB in 2010

107. Using the past (and recent) valuations for Telstra's CAN from Table 2 above as starting values, we estimate the opening value of the RAB in 2010 based on Telstra's recovery of revenue from the CAN since the establishment of the initial RAB, and based on costs imputed to the CAN over the same period.

108. This calculation requires a number of inputs, including:

- Telstra's revenue from the CAN between 1998 and 2009;
- Telstra's capital expenditure on the CAN between 1998 and 2009;

[26] For example, these formulae are applied by the Australian Energy Regulator in its post-tax revenue models (PTRM) for the regulation of electricity network businesses.

- Telstra's operating expenditure on the CAN between 1998 and 2009; and
- a weighted average cost of capital (WACC) for each year between 1998 and 2009.

109. Full details of the information sourced and assumptions made to support the modelling are included at Appendix A to this report.

110. Based on these inputs, the initial RABs calculated in Table 4 above have been projected forward, with depreciation net of capex calculated each year according to the equation shown at section 4.1 above.

111. Generally, the opening RAB in 2010 may not be similar to the matching past valuation estimated above. The extent that it increases or decreases from the past value will depend upon the number of years between 2010 and the year that the past value was established, and the balance of revenue and costs in those years. The opening RABs consistent with the alternative initial asset values are summarised in Table 8 below.

Table 8: Alternative opening RABs for Telstra's CAN, 2010

Method	Description	Value
Financial	Based on expectations of investors after privatisation	$7.4 billion
DORC	NPV-adjusted NERA ORC	$8.0 billion
DHC	Based on ACCC NBN report, deflated to 1997	$2.7 to $6.6 billion
DORC	NPV-adjusted Analysys ORC with service quality adjustment	$11.3 to $16.4 billion

Source: CEG analysis

112. The results in Table 8 vary depending upon the method of valuation used. It is interesting to note that the operation of the roll-forward model over a long period of time is very sensitive to the past asset value input. Differences of a few hundred million dollars in initial value magnify to differences of a billion dollars in the 2010 opening RAB. Therefore, whilst based on reasonable assumptions, the values are only indicative.

4.3. Implications of opening RAB values

113. An opening RAB of $8.0 billion in 2010 is consistent with an initial valuation of the CAN in 1997 of $10.5 billion, the value indicated by the NERA DORC based estimate. It is interesting to note that had Telstra been regulated on a RAB roll-forward basis since that time and its revenues determined using straight-line depreciation, its RAB would be approximately $12.5 billion in 2010. This indicates that over this period Telstra has recovered $4.5 billion more than it would have had it been regulated using a RAB roll-forward methodology in 1997.

114. The Analysys ORC established in 2009 was approximately $35 billion for the CAN. If this is set as the opening RAB in 2010, it will allow Telstra to 'lock in' future recovery of $27 billion more than it would have been allowed had the opening RAB been set at $8 billion (consistent with the NERA DORC based estimate).

5. Effect of RAB roll-forward methodology on Telstra's incentives

115. In designing an access regulatory regime it is important to be aware of the potential for a trade-off between compensating the access provider for the costs that it incurs and maintaining incentives for the access provider to incur costs efficiently.

116. The way in which these incentives manifest themselves and can be managed differs significantly between a RAB roll-forward and a forward-looking replacement cost regulatory regime.

5.1. Incentives under a replacement cost regime

117. Under a regime that sets revenues and prices based on replacement cost, allowed revenues have no relationship with the actual or forecast expenditure of the regulated firm. As a result, there is no incentive for the access provider to 'gold-plate' its network since this will not affect its revenues in any way and one may assume that the investments that are made by the access provider will be technically efficient.

118. However, technical efficiency does not imply allocative efficiency. Although the access provider cannot control the revenue it receives, it retains the monopolist's incentive to not expand or upgrade the network as fast as would be efficient. That is, the access provider faces incentives to keep capital expenditure inefficiently low and earn as much margin as possible off of the existing asset base.

5.2. Incentives under a RAB roll-forward regime

119. In general, if the access provider is able to roll all and any of its capital expenditure into its RAB and/or recover any operating expenditure that it makes, then it will have no incentive to incur these costs in a technically efficient manner. Additionally, to the extent that the allowed return of capital is higher than the firm's actual cost of capital it may 'gold-plate' its network through unproductive and allocatively inefficient investment, or incur additional costs in providing a level of service that is higher than would be provided by a firm acting efficiently.

120. In the regulation of Australian electricity networks, these incentives are managed by requiring service providers to forecast capex and opex at the start of each regulatory period. These proposals are subject to review by the regulator's technical advisors who recommend whether the proposed expenditure is likely to meet conditions of prudency.

121. This solution comes with its own problems. Knowledge of future demand, network condition, and the relationship between service quality and expenditure are essential

to forecasting expenditure requirements in incentive arrangements, yet these are the domain of the access provider rather than the regulator, particularly early in a regulatory regime where the regulator is yet to 'learn' how to judge expenditure forecasts as being prudent and required. Access providers may face additional incentives to over-forecast and/or delay planned capital expenditure if these forecast values are rolled directly into the RAB. It is common for there to be large discrepancies between out-turn expenditure and forecast expenditure despite scrutiny of forecasts by the regulator.

122. To counteract these incentives, regulators have considered mechanisms to elicit more truthful forecasts and/or minimise the power of incentives in light of uncertainty regarding forecasts. For example, in the electricity sector these incentives are managed by a 'trueing-up' procedure, conducted at the end of each regulatory period, which compares actual capex to forecast capex in each year to and strips the difference out of the RAB.

Appendix A. Data and assumptions for the roll-forward model

123. In section 4.2 above a considerable amount of information is required to be able to roll-forward an initial asset based for Telstra's CAN from as long ago as 1997 to 2010. The inputs to this calculation include:

- Telstra's revenue from the CAN between 1998 and 2009;
- Telstra's capital expenditure on the CAN between 1998 and 2009;
- Telstra's operating expenditure on the CAN between 1998 and 2009; and
- a weighted average cost of capital (WACC) for each year between 1998 and 2009.

124. We discuss each of these inputs in the sections below in terms of the information that has been used and any assumptions that have been made for modelling purposes. Table 9 on the following page summarises the base case inputs that have been used to roll forward values for the initial RAB.

Table 9: Inputs for Telstra's CAN, 1998 to 2009

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*
Revenue												
PSTN – retail lines	1,675.0	1,755.0	1,853.0	1,634.0	2,521.0	2,677.0	2,717.0	2,725.0	2,592.0	2,587.0	2,667.0	2,535.4
PSTN – wholesale lines	95.0	100.0	167.0	321.0	359.0	414.0	520.0	637.0	726.0	746.0	611.0	580.8
ISDN lines	856.0	991.0	1,186.0	1,259.0	1,037.0	951.0	927.0	890.0	807.0	1,014.0	978.0	942.0
Total	2,626.0	2,846.0	3,206.0	3,214.0	3,917.0	4,042.0	4,164.0	4,252.0	4,125.0	4,347.0	4,256.0	4,242.7
Capex												
Total	681.0	873.0	1,285.0	1,004.0	929.0	959.0	844.0	870.0	800.0	962.0	820.0	708.0
Opex^												
Total	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0
WACC												
Real vanilla	8.14%	7.52%	7.47%	7.23%	7.36%	7.17%	7.26%	6.64%	6.23%	6.38%	6.95%	7.79%
Nominal vanilla	8.86%	8.68%	10.90%	13.69%	10.40%	10.05%	9.92%	9.29%	10.46%	8.59%	11.77%	9.36%

** Telstra's 2009 annual report changed its reporting system for PSTN revenues. The 2009 revenue figures are estimated based on the overall change in PSTN revenues between 2008 and 2009.*
^ As described at section A.3 below, Telstra does not report operating expenditure by network assets. The base assumption is opex of $800m per year on the CAN.

A.1. Revenue from the CAN

125. We have obtained revenue data from Telstra's annual reports from 1997 to the present.

126. A complicating factor in determining the revenue that is attributable to the CAN is that Telstra does not report revenue in this way, and nor would it be expected to. Rather, it reports revenues by services to the extent that it disaggregates these in its reporting.

127. We have imputed to the CAN revenues from basic access and ISDN. These two revenues streams that are obtained primarily though the use of CAN assets. Whilst there are other revenue streams that are obtained through services that also utilise CAN assets to some extent, such as local calls, we have ignored these from the perspective of determining Telstra's recovery.

128. A further complicating factor is that the vast majority of revenues are retail revenues earned by Telstra selling access to its own customers. *A priori*, it might be expected that there is a retail cost associated with selling these services that should either be netted off from revenues or added to Telstra's costs in the calculation of its recovery over the relevant period.

129. ACCC imputation testing reports issued since 2003 indicate that Telstra has been making negative margins on its access service, which is cross-subsidised by strongly positive margins on its calling services. Since the calculation of these margins includes allowances for retail costs, this indicates that the fact these are not netted off revenues may not be significant since the revenues on basic access largely do not recover these costs in any case.

A.2. Capital expenditure on the CAN

130. In its annual reports, Telstra provides some disaggregated data on its network capital expenditure. The basis for reporting this has changed over time. We have utilised the categories relating to "customer access network" or "fixed access network" in our modelling and in Table 9 above.

A.3. Operating expenditure on the CAN

131. Telstra does not report operating and maintenance expenditure that is disaggregated at any level. It has therefore been necessary to make an assumption on the level of operating and maintenance expenditure specific to the CAN.

132. We have had regard to the NERA and Analysys models which both estimated operating expenditure on the CAN. The values produced by these models are wildly divergent.

133. NERA assume that the cost of direct network opex is between 7 percent and 13 percent of replacement cost, depending upon the type of asset. Based upon the breakdown of NERA's $16.3 billion of calculated investment costs, direct network opex would amount to approximately $1,871 million in 1998 terms. NERA assume an additional 45% of opex for overheads, bring the total opex to $2,715 million.

134. Analysys' model estimates a direct investment costs of $35.1 billion. Direct network opex mark-ups are as low of 0.02% for termination leads and 0.20% for ducts and trenches. The highest is 4.63% for microwave equipment. Based on these mark-ups, the total network opex is only $376 million, with a further $225 million of overheads bringing the total to $601 million, in 2009 terms.

135. Given the discrepancies between the NERA and Analysys models and lack of other useful information, we have had to make an assumption regarding the level of opex on Telstra's CAN. We have chosen as our base case $800 million per year, constant in nominal terms.

136. We note that the value of $800 million used corresponds to an EBITDA margin in the range between approximately 30% and 45% between 1998 and 2009. The ACCC data referenced in section 3.3.1 above suggests that Telstra and its peers have been able to earn higher margins (in the range of 45% to 60% of revenue) than this over time, which may point to this opex assumption being too high. As such the value of $800 million may favour Telstra by overestimating its costs and underestimating its recovery of the asset over time.

A.4. Weighted average cost of capital

137. In order to estimate a reasonable return on capital that Telstra is able to recover each year, we estimate a weighted average cost of capital (WACC) for each year between 1998 and 2009.

138. WACC parameters that are allowed to vary over this time period are: nominal risk-free rate, real risk-free rate, inflation, debt premium and the corporations income tax rate.

139. The nominal and real risk-free rates are estimated as the average interpolated 10-year yield on Commonwealth government securities and indexed bonds respectively over each financial year from 1998 to 2009. The debt premium is based on the average fair yield for A rated corporate bonds obtained from CBASpectrum over each financial year. Data was not available for 1998, so the debt premium data for 1999 was used instead.

140. The WACC has been calculated assuming a market risk premium of 6%, and equity beta of 1.0 and gearing of 40%. These are consistent with regulatory decisions for Telstra over a number of years.