Expert Report of Nigel Attenborough

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Executive Summary

This report has been prepared at the request of Gilbert + Tobin, solicitors to Telstra Corporation Limited (**Telstra**), for the purpose of giving evidence in response to the ACCC's "Draft pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS and LSS" (**Draft Pricing Principles and Pricing**) which were issued in August 2009.

In my instructions from Gilbert+Tobin I was asked to address a number of questions. These questions and a brief summary of my responses are set out below.

Q1. Having regard to international benchmarks, is it reasonable to use a top-down modelling approach to calculate Direct O&M, Indirect O&M, Indirect Capital and Network Support Asset factors collectively (Cost Factors) using Telstra's actual historical costs?

My own experience of constructing and reviewing many TSLRIC cost models is that it is standard practice in Europe and elsewhere to use a top-down modelling approach to calculate Cost Factors. Such an approach is also supported by the Federal Communications Commission (FCC) and adopted by many state regulators in the US.

The cost factors employed are normally either derived from accounting data or based on rules of thumb reflecting the actual experience of telecommunications operators in planning, constructing and operating networks.

This contrasts with the bottom-up modelling approach to calculating operating expenses, which involves looking at each of the activities of the business, estimating the quantities of labour and other resources required and then calculating the total cost of those resources. The problem with this approach, which is acknowledged by both Telstra and Analysys, is that there are many O&M-related and other business processes to which it cannot be applied.

The Cost Factors employed in the TEA Model were calculated using data from Telstra's accounts prepared under the Regulatory Accounting Framework (RAF), which is audited and provided on a regular basis to the ACCC. In the case of duct and copper cable, for which there may be a large gap between historic purchase costs of equipment and current replacement costs, the O&M Cost Factors were derived using modelled investment costs as the denominator (i.e. replacement costs).

Telstra's approach, including the use of the audited RAF data, is in line with international practice and in my opinion is reasonable.

Q2. Is the use of a capitalised overhead loading factor in the TEA Model reasonable?

If costs are incurred as a result of the capital investment program, it is reasonable that they be capitalised and recovered over the life of the equipment to which they relate. This is consistent with the principle of cost causation and means that the costs are recovered in line with consumption of the services of the capital equipment.

It is not within my remit to carry out an audit of Telstra's identification of relevant overheads and their allocation to different capital programs. I note, however, that the derivation of the overhead loading factor used in the TEA Model draws on data that is used in the preparation of the RAF accounts, which are audited, published and used by the ACCC. In addition a risk management and audit department review within Telstra concluded that the derivation of the indirect overhead was in accordance with Australian accounting standards and Telstra's corporate accounting policies.

What is described in the different statements available to me appears to be a reasonable process for deriving the capitalised overhead factor.

Q3. Are the Cost Factors used in the TEA Model reasonable having regard to other international benchmarks?

In order to test the reasonableness of the cost factors used by Telstra in the TEA Model, I derived two sets of international benchmarks:

- Cost factors provided by incumbent operators and new entrants in four developed European countries as part of the process of development of TSLRIC models in those countries;

- Cost factors derived from data for the US local exchange carriers (LECs) submitted to and published by the Federal Communications Commission (FCC) in its ARMIS database.

On the basis of these benchmarks, my conclusions are that:

- The O&M cost factors in the TEA Model are towards the bottom end of the international benchmark range;

- The overall total indirect expense cost factor (total indirect expenses divided by total O&M costs) in the TEA Model is higher than either the European and US LEC benchmarks. However, the classification of costs varies widely across countries, which means that such a comparison may not be reliable;

- In order to remove the effect of differences between countries in the way that costs are classified, I derived combined O&M and indirect expense cost factors for Telstra, the US LECs and the European operators. The combined cost factor from the TEA Model lies within the international benchmark range;

- Similarly, the combined indirect and network support asset factor in the TEA Model also lie within the international benchmark range.

On the basis of this comparison with international benchmarks, my conclusion is that the Cost Factors used in the TEA Model are reasonable.

Q4. Are the Cost Factors used in the Analysys model reasonable having regard to other international benchmarks?

Using the same set of international benchmarks, I found that the O&M factor for copper cable used in the Analysys Model is unreasonably low, and so too is the combined indirect and network support asset factor in the Analysys Model.

Q5. Please review the methodology used in the Analysys Model regarding calculation of the average cost per copper access line. Is it reasonable to include all access lines, including those served by fibre, in the calculation of average unit cost per copper access line in the calculation of a cost-based ULLS price?

The Analysys Model uses a standard methodology to calculate the total cost of copper lines in the CAN.

However, in calculating the average cost per copper line, the Analysys Model mistakenly divides the total cost of copper lines by the total number of subscriber lines (which includes both copper and fibre lines). In order to obtain the correct average cost per copper line, it is necessary to divide the total cost of copper lines by the number of copper lines only, since fibre lines do not use copper cable.

This fundamental mathematical error in the Analysys Model leads to an understatement of the average cost of copper access lines, and hence an understatement of the cost of ULLS. In Band 2 geotypes (i.e. geotypes 3 to 6 in the Analysys Model) this understatement of cost is substantial given that lines provided by fibre represent between 7% and 14% of total lines.

Q6. The Analysys Model has excluded the costs of "lead-ins" from the boundary of the customer's premises to the distribution pit. Is it reasonable for the costs of "lead-ins" to be excluded? If no, how should the Telstra Connection Charges be treated in the recovery of the costs for "lead-ins"?

In the Analysys Model, the cost of trench and conduit from the boundary of the customer's premises to the nearby distribution point ("pit") is excluded from the costs of the CAN and hence from the costs of access network services. In addition, the cost of cable from the network termination point at the customer's premises to the pit is similarly excluded.

These excluded components of the network (which are known as "lead-ins") are part of the cost of building the CAN. Without this lead-in infrastructure, the network would be incomplete and no cable based access services could be provided. The ACCC recognised that these costs are a legitimate cost of the CAN in its decision on the access dispute between Telstra and Chime.

The costs of lead-ins are caused by the provision of access network services and hence should be recovered in the prices of these services. It is therefore not reasonable for the costs of the lead-ins to be excluded from the calculated costs of the CAN. I am unaware of any other regulator who has used an access network cost model which excludes the cost of lead-ins.

The appropriate procedure to recover lead-in costs is to:

- Include lead-in costs when calculating the cost of unconditioned local loops in the CAN;
- Take account of the fact that customers have already partly contributed to the cost of lead-ins when they pay new service connection fees. This is done by subtracting the difference between the new service connection fees and the reconnection fees from the unconditioned local loop capital costs. As recognised by the ACCC, the difference between the new service connection fee and the reconnection fee is a proxy for the lead-in cost;
- Annualise the resulting capital costs (lead-in capital costs minus the difference between new service connection fees and reconnection fees);
- Add all operating expenses associated with the unconditioned local loop including lead-ins;
- Divide by 12 to get monthly costs.

By not following this procedure, the Analysys Model has understated the costs that need to be recovered in the ULLS monthly charge.

Q7. In the Analysys Model, a tilted annuity has been used in an environment of declining traffic volumes. Is the use of a tilted annuity reasonable? If you consider this approach to be unreasonable, please explain the consequences of adopting that approach and your views as to the appropriate approach to be adopted.

In assessing whether it is reasonable to use a tilted annuity, an important point of reference is economic depreciation, which is defined as the change in the value of an asset during a specified period of time (typically a year). The value of an asset at any point in time is equal to the sum of the discounted future net cash flows arising from its use.

Changes in the value of an asset (economic depreciation) over its life are brought about by changes in future cash flows, which in turn are caused by:

- changes in prices;
- changes in the output from the asset reflecting factors such as:
  - substitution by other technologies;

  - reduced productivity as the asset gets older;
  - loss of market share; and
  - changes in customer locations, which result in particular lines in the network becoming stranded and unusable; and
- changes in the cost of operating the asset over time.

Economic depreciation is regarded by regulatory authorities around the world as being the correct basis for measuring depreciation.

Taking the case of copper cable in the CAN, I compared the outcome from using a tilted annuity with economic depreciation. I found that:

- A standard tilted annuity only replicates economic depreciation when prices change but nothing else;
- Once declining output is taken into account (and declining output is assumed in the Analysys Model even in the first years of the life of the asset), a standard tilted annuity fails to replicate economic depreciation. It substantially understates economic depreciation in the early years of the asset's life, which is the relevant time period because the Analysys Model is being used as the basis for setting indicative prices over the next 3 years;
- When operating expenses increase during the asset's life, a standard tilted annuity also fails to replicate economic depreciation and leads to a substantial understatement in the early years of the asset's life. in the early years of the asset's life.

The tilted annuity formula in the Analysys Model differs from a standard tilted annuity in that it includes an adjustment factor that allows the user to increase or decrease the slope of the standard tilted annuity. If this adjustment factor has an appropriate value, it results in a depreciation schedule that broadly approximates to economic depreciation in the early years of the asset's life.

However, the Analysys Model applies a value for this adjustment factor that is perverse and results in a depreciation schedule where the understatement of economic depreciation in the early years of the asset's life is much greater than with a standard tilted annuity.

The approach taken in the Analysys Model flies in the face of common sense as it implies that Telstra must fund an ever increasing capital charge when its revenue is falling over time as a result of declining prices and volumes. In my view, no reasonable regulator would adopt such an approach to determine annual capital charges.

To a greater or lesser extent, the same conclusion applies with respect to other assets in the Analysys Model, including duct and switching equipment.

Q8. In relation to the planning process described in the Telstra Statement for a fibre build in the inter-exchange network (IEN):

(a) does Telstra's approach represent a reasonable approach to determining the number of fibres to be deployed?

(b) is Telstra's approach consistent with network deployment principles adopted in other jurisdictions?

(c) is it reasonable for the Analysys Model to assume that dark fibres are deployed for unknown future services?

The Telstra Statement describes the process by which Telstra determines the deployment of new fibre cables.

In my view this is a reasonable approach to determining the number of fibres in Telstra's network. There is correctly an emphasis on looking at the cost of alternatives to deploying more fibre and using those where appropriate. Forecasts of future demand and hence required capacity are based on existing and known future services, since what is unknown by definition cannot be forecasted.

Telstra's approach is consistent with that used by network planners and indeed cost modellers in other jurisdictions.

In contrast to the approach used by Telstra's network planners, the Analysys Model assumes that fibre capacity would be deployed for the purpose of providing unknown future services ("other fibre services"). The capacity of this so called "dark fibre" is determined in a completely arbitrary way in the Analysys Model.

In my view, it is not reasonable for the Analysys Model to assume that dark fibres are deployed for unknown future services. By definition it is not possible to forecast the capacity required for unknown future services. Arbitrarily installing large amounts of capacity on the off chance that some unspecified volume of unknown services might be provided in the future does not make economic sense and is contrary to the way that prudent operators dimension their networks.

Q9. In relation to the Analysys Model and given the evidence in the Telstra Statement, is the allocation of costs in relation to dark fibres for the IEN in the Analysys Model reasonable?

The Analysys Model allocates the total cost of IEN fibre, trench and conduit between existing services and "other fibre services" (that would use dark fibre if they existed) in proportion to the number of fibres deployed to handle existing services (current demand plus spare capacity) and the number deployed as dark fibre. For example, on links between trunk switches, 50% of the deployed fibres relate to existing services (including spare capacity) and hence existing services are allocated 50% of the costs. The remaining 50% of costs are allocated to "other fibre services". Since these services do not actually exist and therefore no revenue is received from them, these costs are not recovered.

This is not an appropriate allocation practice because, if a company is unable to recover its costs, it will make a loss and this is not a sustainable situation.

In my view, therefore, the allocation of costs in relation to dark fibres in the Analysys Model is not reasonable.

Q10. If the answer to 9 above is no, how should the costs of the dark fibres in the Analysys Model be treated and what is the effect of treating the costs in that way?

Reflecting the points made in answer to Q9, and considering that it is not the practice of network planners in Telstra or other jurisdictions to deploy fibre to meet unknown future demand for unknown future services, no allowance should be made for dark fibre in the Analysys Model. There is no evidence provided that there will be demand for dark fibre services over the next 3 years, which is the relevant period for setting prices.

Removing dark fibre from the Analysys Model would increase the unit cost of existing services since they would now be attributed all the costs for which they are responsible rather than a substantial portion being siphoned off and left unrecovered.

1. Introduction

1.1 I, Nigel Attenborough, of 15 Stratford Place, London W1C 1BE, am an economist and I specialise in the field of telecommunications. Attached to this report at Appendix A is a copy of my Curriculum Vitae.

1.2 I am a Director of NERA Economic Consulting (**NERA**) and Head of its European Communications Practice. I have held this position since 1997, having previously worked as a Senior Consultant and Associate Director at NERA. Prior to this, I worked at British Telecom, latterly as the Head of Regulatory Economics and Competition Policy.

1.3 I have a BA in Economics from Cambridge University, an MSc in Energy Economics from the University of Surrey and an MBA from Kingston Business School.

1.4 Since joining NERA in 1991, I have directed a wide range of telecommunications and related projects involving costing studies, pricing and regulation. Details of recent projects, with which I have been involved, are set out in my Curriculum Vitae (which is attached as **Appendix B** to this report).

2. Background and Instructions

2.1 This report has been prepared at the request of Gilbert + Tobin, solicitors to Telstra Corporation Limited (**Telstra**), for the purpose of giving evidence in response to the ACCC's "Draft pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS and LSS" (**Draft Pricing Principles and Pricing**) which were issued in August 2009.

2.2 I have been provided with a copy of:

- the Telstra Efficient Access Model (**TEA Model**), version 1.5;
- the model developed by Analysys Mason (**Analysys**) on behalf of the ACCC (**Analysys Model**), version 2.0;
- a statement from [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends] (**Telstra Statement**);

and have been asked to provide my opinion on the following questions:

TEA Model

1. Having regard to international benchmarks, is it reasonable to use a top-down modelling approach to calculate Direct O&M, Indirect O&M, Indirect Capital and Network Support Asset factors collectively (Cost Factors) using Telstra's actual historical costs?

2. Is the use of a capitalised overhead loading factor in the TEA Model reasonable?

3. Are the Cost Factors used in the TEA Model reasonable having regard to other international benchmarks?

Analysys Model

4. Are the Cost Factors used in the Analysys Model reasonable having regard to other international benchmarks?

5. Is it reasonable to include all access lines, including those served by fibre, in the calculation of average unit cost per copper access line in the calculation of a cost-based ULLS price?

6. The Analysys Model has excluded the costs of "lead-ins" from the boundary of the customer's premises to the distribution pit. Is it reasonable for the costs of "lead-ins" to be excluded? If no, how should the Telstra Connection Charges be treated in the recovery of the costs for "lead-ins"?

7. In the Analysys Model, a tilted annuity has been used in an environment of declining traffic volumes. Is the use of a titled annuity reasonable in such circumstances? If

not, what are the consequences of adopting that approach and what approach should be adopted?

Telstra Statement

8. In relation to the planning process described in the Telstra Statement for a fibre build in the inter-exchange network (IEN):

   (a) does Telstra's approach represent a reasonable approach to determining the number of fibres to be deployed?

   (b) is Telstra's approach consistent with network deployment principles adopted in other jurisdictions?

   (c) is it reasonable for the Analysys Model to assume that dark fibres are deployed for unknown future services?

9. In relation to the Analysys Model and given the evidence in the Telstra Statement, is the allocation of costs in to dark fibres for the IEN in the Analysys Model reasonable?

10. If the answer to 9 above is no, how should the costs of the dark fibres in the Analysys Model be treated and what is the effect of treating the costs in that way?

A copy of the instructions that I received from Gilbert + Tobin is attached as **Appendix A** and a list of all the documents that I relied on in preparing my report can be found in **Appendix C**.

3. TEA Model

Q1. Having regard to international benchmarks, is it reasonable to use a top-down model to calculate Direct O&M, Indirect O&M, Indirect Capital and Network Support Asset factors (Cost Factors) using Telstra's actual historical costs?

3.1 The TEA Model is an example of a bottom-up total service long run incremental cost (TSLRIC) model. In such a model, the unit costs of different services are derived using a process which can be broadly characterised as:

1. **Calculation of the amount of capital equipment required**: based on network design rules; the geographical and topological characteristics of the country concerned; the volume and geographical distribution of customers and the volume, time of day pattern and routing of different types of call and data service; engineering rules about the extent to which equipment can be utilised; the planning time horizon and so on.

2. **Calculation of the cost of purchasing the required amount of capital equipment**: using information on current equipment prices, together with the calculated amount of equipment required.

3. **Calculation of the cost of indirect capital assets**: using information on the volumes and costs of capital equipment that have been estimated in Steps 1 and 2. Indirect capital asset costs are the costs of equipment indirectly attributable to the provision of network services. These include assets such as buildings, vehicles, general purpose computers and office equipment and furniture.

4. **Calculation of direct operating expenses**: using information on the volumes and costs of capital equipment that have been estimated in Steps 1 and 2. Direct operating expenses include the costs of operating and maintaining equipment (O&M costs).

5. **Calculation of indirect operating expenses**: using information on the level of direct operating expenses. Indirect operating expenses include items such as finance and accounting, human resources, legal and regulatory and general administration.

6. **Annualisation of the cost of capital equipment**: using a chosen methodology.

7. **Adding a mark-up for common fixed costs such as business overheads**: using an appropriate methodology.

8. **Calculation of the unit costs of using different types of equipment**: using the annualised capital costs and operating expenses, together with line and call volumes and routing factors.

9. **Calculation of TSLRIC for different services**: multiplying routing factors for individual services by unit equipment costs in order to derive TSLRIC.

It is Steps 3, 4 and 5 that are the subject of the question that I have been asked to consider.

3.2 Telstra notes that it is common practice in TSLRIC models to use a top-down approach to estimate operations and maintenance (O&M) expenses (Step 4 above).[1] This involves multiplying the calculated level of investment for each type of equipment (derived from Steps 1 and 2 above) by the relevant ratio of O&M expenses to capital investment.[2] Such ratios are referred to by Telstra as "cost factors". Telstra further notes that the use of a top-down approach is supported by the FCC, has been adopted by many US state regulators, and is used in models built for regulatory authorities in other countries such as New Zealand and Germany.[3]

3.3 My own experience of constructing and reviewing many TSLRIC cost models is also that it is standard practice in Europe and elsewhere to use a top-down approach to calculate operating expenses and that the cost factors employed are normally based on rules of thumb reflecting the actual experience of telecommunications operators in planning, constructing and operating networks or derived from accounting data.

3.4 This contrasts with the bottom-up approach to calculating operating expenses, which involves looking at each of the activities of the business, estimating the quantities of labour and other resources required and then calculating the total cost of those resources. For example, energy costs could be calculated, for each type of equipment, by first estimating the energy consumption per unit of equipment, then multiplying this by the number of units of equipment and finally multiplying the result by the price of energy. The problem, however, is that many O&M-related processes are not readily susceptible to such a bottom-up approach. This point is agreed by both Telstra, which notes "the complexities associated with estimating efficient O&M expenses from the bottom up",[4] and Analysys, the builders of the ACCC's model, who argue that:

> "We recognise that certain O&M charges can be calculated on a bottom-up basis, for example energy costs of a platform based on the equipment's specification. However, we have not been able to model all O&M costs on a bottom-up basis and therefore believe it is more consistent to employ a top-down approach for all inputs." [5]

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1 Telstra Corporation Limited, ULLS Undertaking, *Operations and Maintenance and Indirect Cost Factor Study*, Public Version, 7 April 2008, paragraph 3.

2 ibid.

3 Telstra Corporation Limited, ULLS Undertaking, *Operations and Maintenance and Indirect Cost Factor Study*, Public Version, 7 April 2008, footnote 1.

4 Telstra Corporation Limited, ULLS Undertaking, *Operations and Maintenance and Indirect Cost Factor Study*, Public Version, 7 April 2008, paragraph 3.

5 Analysys, *Fixed LRIC model documentation – Version 2.0*, section 9.2.2, page 127.

3.5 Both Telstra and Analysys use a top-down approach to derive O&M cost factors from accounting data, although in the latter case it is not stated whose accounts have been used.[6] In the absence of such information, it is not possible to gauge whether the data in the Analysys Model are reliable and appropriate for use in a model of CAN costs in Australia.

3.6 The cost factors employed in the TEA Model were calculated using data from Telstra's accounts prepared under the Regulatory Accounting Framework (RAF), which is audited and provided on a regular basis to the ACCC.[7] However, recognising that, in the case of duct and copper cable, there may be a large gap between historic purchase costs of equipment and current replacement costs, the direct expense to investment cost ratios for these assets were derived using modelled investment costs as the denominator (i.e. replacement costs). The same forward-looking adjustment was not made for other types of asset. However, because the vast majority of O&M expenses are accounted for by duct and copper cable[8] and the other assets are unlikely to have such a large gap between historic and current prices (not least because they have shorter asset lives and hence have been in existence for a shorter period of time), this is unlikely to affect materially the estimates of direct expenses associated with ULLS. In my opinion, this is a reasonable approach.

3.7 Telstra also derives cost factors for indirect expenses (Step 5 above) and indirect capital assets (Step 3) using the RAF data, which is audited and provided on a regular basis to the ACCC:

- Indirect expense factors are calculated as indirect operating expenses divided by total direct expenses. Six adjustments are made to the indirect operating expenses: elimination of depreciation to avoid double counting; elimination of ULLS specific costs; elimination of installation costs; elimination of operator service costs; elimination of ACT Utilities Tax; and elimination of retail expenses.
- Network support asset factors are calculated as CAN network support assets divided by CAN direct assets.
- Indirect asset factors are calculated as indirect assets divided by total direct assets. Six adjustments are made: incorporation of accumulated depreciation; removal of retail depreciation; removal of non-communications assets; removal of retail investment costs; removal of software related investment costs already included in ULLS specific costs; and removal of other investment and receivables.

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[6] Analysys states that "Default inputs are derived from an examination of operator accounts" (see Analysys op.cit.)

[7] A description is provided in Telstra Corporation Limited, ULLS Undertaking, *Operations and Maintenance and Indirect Cost Factor Study*, Public Version, 7 April 2008

[8] According to Telstra, O&M expenses associated with assets apart from duct and copper cable account for only 4% of total O&M expenses in the CAN (see Telstra, op. cit., paragraph 20).

These adjustments all serve the purpose of realigning the accounting data from the RAF with the specific asset classification of the TEA Model, so that the TEA Model can be used to estimate ULLS costs. They all appear to be necessary and reasonable.

3.6 Indirect expenses are calculated in the TEA Model by multiplying the indirect expense factors by the calculated O&M costs. As with O&M costs, the network support costs and indirect asset costs are calculated in the TEA Model by multiplying the relevant cost factors by the modelled investment costs in the 'Annual Cost Summary' sheet.

3.7 In conclusion, it is standard practice in TSLRIC models to use a top-down approach, based on accounting data, to estimate O&M costs, indirect expenses and indirect assets. The use of such an approach by Telstra, including the use of the audited RAF data, to calculate the different Cost Factors in its model is therefore in line with international practice and in my opinion is reasonable.

3.8 It should be noted that the Analysys Model also uses a top-down approach based on data from the Telstra RAF to estimate indirect expense and indirect asset factors.[9] This contrasts with its use of data of unknown origin in deriving O&M factors.

Q2. Is the use of a capitalised overhead loading factor in the TEA Model reasonable?

3.9 If costs are incurred as a result of the capital investment program, it is reasonable that they be capitalised and recovered over the life of the equipment to which they relate. This is consistent with the principle of cost causation and means that the costs are recovered in line with consumption of the services of the capital equipment. This is how capital installation costs are normally treated by telecommunications operators around the world.

3.10 Given that, in principle, it is appropriate to capitalise overheads that are associated with the capital investment program, the question is whether the capitalised overhead loading factor used in the TEA Model is reasonable. To answer this, it is necessary to consider the process that Telstra undertook to derive the relevant overheads and thence calculate the loading factor.

3.11 In his Statement of 12 August 2008, [TC1 c-i-c commences] [redacted] TC1 c-i-c ends] describes how the overhead loading factor was derived. Telstra incurs a variety of 'Internal Overheads' that are directly attributable to the capital investment program.[10] These include "Planning Overhead" and "Support Overhead". Planning Overhead consists of internal planning activity (e.g. network planning and design) and internal support activity (e.g.

9 See Analysys, op. cit., pages 131-143.

10 Statement of [TC1 c-i-c commences] [redacted] [TC1 c-i-c ends], 12 August 2008, paragraph 10

management and supervision costs).[11] These costs are capitalised and allocated to the relevant capital costs in Telstra's financial accounts.[12]

3.12 The majority of the direct capital program relating to the CAN is carried out by external contractors.[13] Consequently, most of the Support Overheads are excluded, the exceptions being lines of business (LOB) relating to logistics and delivery management, which are carried out irrespective of whether the capital project is undertaken by Telstra's internal work force of by external contractors. [14]

3.13 In each of Telstra Services, Telstra Integrated Logistics and Network and Technology, an analysis is carried out, for each LOB sub group, of which costs relate to the capital investment program.[15] These costs are collectively known as the "Overhead Cost Pool". The Overhead Cost Pool is allocated to different capital programs on the basis of expenditure and the mix of internal and external workforce.[16] Each of the capital programs is then classified according to whether it 100% CAN related, 80% CAN related, 20% CAN related or 0% CAN related. This allows the total capitalised overheads attributable to CAN capital investment to be estimated.[17]

3.14 Finally the ratio of CAN capitalised overheads to CAN capital investment is calculated. The capitalised overhead loading factor for the two years ended 30 June 2007 and 30 June 2008 was derived by dividing the CAN-related Planning, Delivery Management and Telstra Integrated Logistics Overhead by the CAN related direct capital costs, and was calculated to be [TC1 c-i-c commences][[redacted]TC1 c-i-c ends].[18] This figure was updated in December 2008 to [TC1 c-i-c commences][[redacted]TC1 c-i-c ends]owing to an updated figure for the Total Overhead Cost Pool, which affected the amounts allocated to particular Initiatives associated with the CAN.[19] However, in the TEA Model, Telstra adopted a capitalised overhead loading factor of 13 percent, which was in fact lower than the capitalised overhead loading factor calculated by [TC1 c-i-c commences][[redacted]][TC1 c-i-c ends].

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11 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends], 12 August 2008, paragraph 11

12 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends], 12 August 2008, paragraph 10

13 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends], 12 August 2008, paragraph 12

14 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends], 12 August 2008, paragraph 14

15 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends], 12 August 2008, paragraph 19 and Statements of [TC1 c-i-c commences][redacted] [redacted][TC1 c-i-c ends]

16 Statement of [TC1 c-i-c commences][redacted]][TC1 c-i-c ends, 12 August 2008, paragraph 20

17 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends, 12 August 2008, paragraph 26

18 Statement of [TC1 c-i-c commences] [[redacted] [TC1 c-i-c ends, 12 August 2008, paragraph 28.

19 Supplementary statement of [TC1 c-i-c commences][redacted]][TC1 c-i-c ends, 12 December 2008, paragraphs 4, 5 and 8.

3.15 It is not within my remit to carry out an audit of Telstra's identification of relevant overheads and their allocation to different capital programs. What is described in the different statements available to me appears to be a reasonable process for deriving the capitalised overhead factor. I am not in a position to comment on whether it has been implemented correctly. That said, confidence in the process is enhanced by the fact that the derivation of the overhead factor draws on data that is used in the preparation of the RAF accounts, which are audited, published and used by the ACCC. In addition, the statement of [TC1 c-i-c commences][redacted] TC1 c-i-c ends] states that a detailed review of the calculation of the internal overhead process within Telstra was undertaken by a risk management and audit area within Telstra which confirmed that the derivation of the indirect overhead was in accordance with Australian accounting standards and Telstra's corporate accounting policies.[20]

Q3. Are the Cost Factors used in the TEA Model reasonable having regard to other international benchmarks?

3.16 In order to test the reasonableness of the cost factors used by Telstra in the TEA Model, I derived two sets of international benchmarks:

- Cost factors provided by operators in four developed European countries as part of the process of development of bottom-up fixed network TSLRIC models in those countries;[21]
- Cost factors derived from data for the US local exchange carriers (LECs) submitted to and published by the Federal Communications Commission (FCC) in its ARMIS database. The ARMIS database contains information on different categories of O&M costs, indirect expenses and assets for individual local exchange carriers (LECs). The latter are obliged to provide such data to the FCC which issues detailed guidelines on definitions and categories in order to obtain data that is on a comparable basis across different operators.

3.17 The data for the European benchmarks was, for three of the countries concerned, provided by industry working groups in which a number of fixed operators, including new entrants, each submitted their own estimates of the different cost factors. In the fourth country, the data were provided by the incumbent operator alone. In the countries where more than one operator provided information on cost factors, a simple average was taken. Having obtained cost factors for each country, a simple average was then taken across the four countries to derive the benchmark European cost factors.

3.18 For the US LECs, I had information from a previous NERA study which had ranked the 68 LECs in terms of their overall efficiency.[22] [23] From this, the top 25% companies (i.e.

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20 Statement of [TC1 c-i-c commences][redacted]TC1 c-i-c ends], 12 August 2008, paragraph 8.

21 These data are available to NERA because we were responsible for building the cost models concerned. For reasons of commercial confidentiality the identities of the countries have been withheld and data is not separately presented for each country.

the top 17 US companies) were chosen. Focusing on the best performers means that the resulting ratios should reflect those of efficient operators. The cost factors were then derived as follows:

1. For each type of expense, the total cost across all 17 companies was calculated.

2. For each company, the gross replacement cost (GRC) of each type of asset was calculated by starting with historical gross book values and converting them to values based on current prices using information on average asset ages and asset price indices from the US Bureau of Labour Statistics and the US Statistical Abstract.[24]

3. For each asset type, the total GRC across all 17 companies was calculated.

4. Cost factors were then calculated.

3.19 The results for O&M cost factors are presented below:

[TC2 c-i-c commences]

[redacted]

[TC2 c-i-c ends]

It can be seen that the cost factors in the TEA Model are consistently lower than the equivalent European benchmarks, while they are sometimes lower and sometimes higher than the US benchmarks. The overall weighted average O&M cost factor in the TEA Model (which is calculated using the shares of the different assets in total assets in the TEA Model) is slightly higher than that for the US LECs but much lower than that for the European operators.

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22 NERA, *The Comparative Efficiency of Openreach*, Report for Ofcom, 17 March 2008, Table 4.2. http://www.ofcom.org.uk/consult/condocs/llcc/efficiency.pdf

23 Ranking by overall efficiency means that the companies are ranked on the basis of their total costs after allowing for differences in volume of services, product mix, network coverage area, and customer density. This is done using an econometric model.

24 The asset price index that the US Bureau of Labour Statistics produces for cable is based on a weighted average for fibre and copper. This allowed us to revalue the cable assets of the US LECs which do not distinguish between fibre and cable.

3.20 It is important to note that the weighted average US figure is likely to understate the true position for the customer access network (CAN). The cost factor of 2.88% for cable for the US LECs relates to all types of cable combined because no distinction between copper and fibre cables is made in the FCC's ARMIS database and there is also no distinction between CAN and IEN fibre cable. It is therefore a weighted average of the underlying O&M cost factors for fibre in the core network and both fibre and copper cable in the CAN. In contrast, the TEA Model and the European benchmarks use O&M cost factors that specifically relate to copper cable in the CAN. The cost factor for copper in the CAN can be expected to be higher than the overall cost factor for all cable (even after allowing for differences in the purchase costs of copper and fibre) because copper cable requires much more maintenance than fibre cable.

3.21 A second point to bear in mind is that the TEA Model O&M factors are calculated after excluding capitalised overheads. Such exclusion does not occur in the case of the FCC data or the European benchmarks. In order to ensure full comparability, the TEA Model figure should be put on the same basis. When I make the necessary adjustment, the overall O&M cost factor in the TEA Model increases from 1.27 to 1.37.[25]

3.22 Given that, for the reasons given in paragraph 3.20, the true overall US LEC cost O&M factor is likely to be higher than that in Table 1, my overall conclusion remains that the O&M cost factors in the TEA Model are towards the bottom end of the benchmark range and therefore in line with those of efficient operators in other countries.

3.23 The position for indirect expenses is shown in Table 2. Included within the category 'indirect expenses' are the O&M expenses associated with indirect capital equipment (buildings, vehicles, general purpose computers etc) and overheads such as accounting and finance, human resources and general management.

[TC2 c-i-c commences]

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25 The basis for this adjustment is as follows. According to the Statement of [TC1 c-i-c commences][[redacted]][TC1 c-ic ends], 12 December 2008, paragraph 5, Telstra's capitalised overheads relating to the CAN amounted to [TC2 c-i-c commences][redacted] [TC2 c-i-c ends] million over the two year period ending 30 June 2008. Dividing this by 2, I get an annual figure of [TC2 c-i-c commences][redacted][TC2 c-i-c ends] million. Meanwhile Telstra's CAN O&M, as reported in the RAF and submitted as part of its ULLS undertaking, was [TC2 c-i-c commences][redacted]] [TC2 c-i-c ends]million in 2006/7. CAN O&M reported in the RAF does not include capitalised overheads. Inclusion of capitalised overheads would increase CAN O&M to [TC2 c-i-c commences][$[redacted]] [TC2 c-i-c ends]. The adjusted O&M factor for the TEA Model can then be calculated as 1.27% (the unadjusted factor) x [TC2 c-i-c commences[redacted]][TC2 c-i-c ends] = 1.37%.

[redacted]

[TC2 c-i-c ends]

3.24 Table 2 shows that the overall total indirect expense factor (total indirect expenses divided by total O&M costs) in the TEA Model is substantially higher than the European and US LEC benchmarks.[26] This could indicate that the indirect expense cost factors in the TEA Model are above international benchmark levels or alternatively it could reflect a classification of expenses between O&M and indirect in the TEA Model that differs from the one used in the European and US benchmarks. For example, supervisory activities sometimes lie on the boundary between direct and indirect expenses and different classifications may be made in different jurisdictions.

3.25 In order to examine this further, I conducted an additional comparison between the TEA Model and the European and US benchmarks in which the O&M and indirect expenses are combined into one cost factor. This was done by starting with the weighted average O&M cost factor in Table 1 (e.g. 1.27% for the TEA Model) and then grossing this up by the overall ratio of indirect expenses to O&M costs in Table 2 (e.g. 104.29% in the case of the TEA Model). This gives total O&M costs and indirect expenses as a percentage of direct capital investment. The result is shown in Table 3 below.

[TC2 c-i-c commences]

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26 If O&M costs are adjusted to include capitalised overheads (see paragraph 3.21), the indirect expense cost factor is reduced. This is because indirect expenses stay the same while O&M costs increase. Total O&M for all Telstra's networks, as reported in the RAF in 2006/7, was [TC1 c-i-c [redacted] [TC2 c-i-c ends]million. This does not include capitalised overheads. Inclusion of capitalised overheads would increase total network O&M to [TC1 c-i-c commences][$ [redacted] [TC2 c-i-c ends]. The adjusted indirect expense factor for the TEA Model can then be calculated as 104.29% x [TC1 c-i-c commences] [redacted] TC2 c-i-c ends]= 101.90%.

[redacted]

[redacted]

[TC2 c-i-c ends]

3.26 As can be seen in Table 3, when the O&M and indirect expense factors are combined, thereby removing problems of non-comparability in the classification of costs as O&M or indirect expenses, the overall cost factor in the TEA Model lies between the European and US benchmarks and in my opinion can be viewed as reasonable. When considering these figures, it is important to bear in mind that, for the reasons given in paragraph 3.20, the actual US benchmark is likely to be higher than the one shown in Table 3. At the same, the TEA combined O&M and indirect expense factor would increase to 2.77 if capitalised overheads are included.[27] These two considerations do not change my overall conclusion since, when they are taken into account, the overall cost factor in the TEA Model remains well within the benchmark range.

3.27 The final types of cost factors in the TEA Model relate to indirect capital assets. The TEA Model has two types of indirect asset factors: Network Support Asset factors and Indirect Asset Factors. The Network Support Asset factors include land, buildings, network power systems etc related to the CAN. Taking the case of network buildings as an example, the associated Network Support Asset factor measures the required investment in buildings as a percentage of total direct CAN investment (duct, copper cable etc). Indirect Asset factors comprise items such as information technology and related software, vehicles, building improvements and so on. Using information technology as an example, the related Indirect Asset factor is the ratio of information technology investment to total network investment.

3.28 The various Network Support Asset and Indirect Asset factors from the TEA Model are shown in Table 4 below. Together they sum to 5.75% of direct network investment. This is higher than the equivalent US benchmark but lower than the European one.[28] My conclusion, therefore, is that the TEA Model's overall Network Support Asset and Indirect Asset factor lies within the range defined by the European and US benchmarks and can therefore be regarded as reasonable

[27] This is calculated as 1.37 grossed up by 101.90%. This is the same as the calculation described in paragraph 3.25, except that the O&M cost factor and the indirect expense to O&M cost ratio have been replaced with the equivalent values when capitalised overheads are included in O&M costs.

[28] The TEA Model also includes network power and network management equipment as indirect network assets, rather than direct assets, whereas in the models from which the European benchmark is derived these types of equipment form part of the direct network asset base. The FCC data for the US LECs aggregates such equipment with direct network assets (e.g. switching equipment). In order to make like for like comparisons of indirect asset factors, network power and network management equipment have therefore not been included in indirect assets.

[TC2 c-i-c commences]

[redacted]

[TC2 c-i-c ends]

4. Analysys Model

Q4. Are the Cost Factors used in the Analysys model reasonable having regard to other international benchmarks?

4.1 As in the case of the TEA Model (paragraph 3.19), it is possible to compare the O&M cost factors from the Analysys Model with the European and US benchmarks. The results are shown in Table 5.

Table 5: O&M Cost Factors (Analysys Model)

Analysys Model		**European Benchmark (NERA Studies)**		**US LECs (FCC database)**		*TEA Model*
Asset description:						*Weights:*
Duct	0.21%	Access, copper duct	1.27%	Conduit	0.39%	*16.27%*
Duct	0.21%	Access, copper duct	1.27%	Conduit	0.39%	*58.11%*
Cable	2.93%	Access, copper cable	5.26%	All Cable	2.88%	*14.25%*
Cable	2.93%	Access, copper cable	5.26%	All Cable	2.88%	*10.05%*
Transmission	3.24%	Multiplex stations	5.97%	Transmission equipment	1.79%	*0.60%*
Switching equipment	6.49%	Switch hardware	7.98%	Digital Switching	3.04%	*0.60%*
Cable	2.93%	Transmission, fibre cable	4.23%	All Cable	2.88%	*0.12%*
Weighted Average	**0.93%**		**2.31%**		**1.02%**	*100.00%*

Note: In each case the O&M cost factor is equal to the ratio of O&M expenses to the cost of the asset

4.2 The O&M factors in the Analysys Model are all lower than the European benchmarks. In contrast they are higher than the US benchmarks except in the case of duct/conduit. However, this is important. Duct typically represents the largest single asset class within the CAN and as a result, despite being higher on other O&M line items, the overall Analysys Model O&M factor is materially lower than the equivalent US figure. This by itself says nothing about the reasonableness or otherwise of the O&M cost factors in the Analysys Model. As noted in paragraph 4.4 below, it could reflect a different definition of what represents O&M costs and what represents indirect expenses What is clear is that the Analysys Model uses an overall average cost factor for cable, covering both copper and fibre, rather than separate factors for each of copper and fibre cable. As was explained in paragraph 3.20, the O&M cost factor for copper cable (which is what is relevant for the CAN) can be expected to be higher than that for fibre (and hence higher than the overall cable cost factor) because copper cable is substantially more expensive to maintain.[29] By using an overall cost factor for cable, the Analysys Model is therefore likely to have understated O&M costs in the CAN.

4.3 Turning to indirect expenses, the total cost factor (total indirect expenses divided by total O&M costs) in the Analysys Model is higher than the European and US LEC benchmarks (see Table 6).

[29] Reflecting this, it can be seen in Table 5, that the European benchmarks show a higher O&M factor for copper cable than for fibre.

Table 6: Indirect Expense Cost Factors (Analysys Model)

	Analysys Model	European Benchmark (NERA Studies)	US LECs (FCC database)
Total	**59.77%**	**30.93%**	**30.76%**

Note: This shows the ratio of indirect expenses to O&M costs. Indirect expenses include overheads and also O&M costs associated with indirect capital equipment

4.4 Again, the higher indirect expense cost factor in the Analysys Model could possibly reflect a different categorisation of costs between O&M and indirect expenses. A combined cost factor for O&M costs and indirect expenses was therefore calculated for the Analysys Model and compared with similarly combined benchmark cost factors. As can be seen in Table 7, when the combined cost factor is used, the Analysys Model lies within the range defined by the US and European benchmarks.

Table 7: Combined O&M and Indirect Expense Cost Factors (Analysys Model)

	Analysys Model	European Benchmark	US LECs (FCC database)
O&M and Indirect Expense	**1.49%**	**3.02%**	**1.34%**

Note: The combined O&M and indirect expense cost factor is the weighted average O&M cost factor (Table 5) grossed up by the total indirect expense cost factor (Table 6)

4.5 The fact that the combined O&M and indirect expense cost factor from the Analysys Model lies within the range defined by the international benchmarks does not of itself demonstrate the reasonableness of this factor. This is because, as noted in paragraph 3.20, the correct US benchmark is likely to be higher than the one shown in Table 7. This means that in reality the Analysys Model's combined cost factor may lie outside the benchmark range. Moreover, even if it were in the benchmark range, it is still lower than it should be for modelling of a copper network because of the use of an all cable O&M cost factor rather than a specific copper cable one.

4.6 The final cost factor in the Analysys Model relates to indirect assets. This is a combined cost factor that covers network support and indirect assets. The value of this cost factor in the Analysys Model is very low compared with international benchmarks (see Table 8 below). The difference is so great that it casts doubt on the reasonableness of this cost factor in the Analysys Model.

Table 8: Network Support Asset and Indirect Asset Factors

	Analysys Model	European Benchmark (NERA Studies)		US LECs (FCC database)	
		Buildings	2.28%	Land & Buildings	3.17%
		Vehicles	0.86%	Vehicles	1.50%
		General purpose computers	1.60%	General purpose computers	0.64%
		Other equipment	1.25%	Other equipment	0.05%
Total	**1.97%**		**5.98%**		**5.36%**

4.7 Pulling together the conclusions regarding the Analysys Model, it is evident that:

- While the TEA Model is near the lower end of the benchmark range for O&M factors, the Analysys Model is below that same benchmark range;
- The Analysys Model's O&M factor for copper cable is too low because it is an average for both fibre and copper cable and fibre has a lower O&M factor than copper;
- The total indirect expense factor in the Analysys Model is higher than the European and US benchmarks, although not as high as the TEA Model;
- The Analysys Model's relatively low O&M factors and high indirect expense factor may reflect differences in the classification of costs between O&M costs and indirect expenses;
- When a combined cost factor for O&M costs and indirect expenses is derived, the Analysys Model, like the TEA Model, lies within the international benchmark range. However, both the lower end of the benchmark range (as defined by the US LECs) and the Analysys Model figure are too low because of the failure to allow for the fact that copper cable has a higher O&M cost factor than fibre;
- In contrast to the TEA Model, which has an indirect and network support asset factor that lies within the benchmark range, the equivalent factor in the Analysys Model is a long way below the benchmark range, suggesting that its value is too low.

4.8 Reflecting these points, my conclusion is that the O&M factor for copper cable in the Analysys Model is unreasonably low and so too is the combined indirect and network support asset factor in the Analysys Model.

Q5. Please review the methodology used in the Analysys Model regarding calculation of the average cost per copper access line. Is it reasonable to include all access lines, including those served by fibre, in the calculation of average unit cost per copper access line in the calculation of a cost-based ULLS price?

4.9 The methodology used in the Analysys Model to calculate the average cost per copper access line (unbundled local loop) in a particular geotype consists of the following steps:

1. For each geotype, the total cost of each constituent network element is calculated. The required investment and costs are primarily driven by the characteristics of each constituent exchange area, including size, line density and line length. Examples of network elements include copper cables of different capacities in the main and distribution networks, duct of different capacity and pits, joints, pillars and so on.

2. The unit cost of each network element is then calculated by dividing the total cost (derived in Step 1) by total volume of use. The calculation of total volume of use can be illustrated by taking copper cable in the distribution network as an example. First it is necessary to identify which types of line use that type of cable.[30] Then, for each

[30] The different types of line include PSTN exchange lines, ISDN exchange lines, ULLS lines, WLR lines and so on.

type of line that uses copper cable in the distribution network, the number of lines is multiplied by the average number of times that such cable is used by that type of line.[31] The results for each type of line are then summed together to obtain total volume of use for copper cable in the distribution network.

3. The unit cost of ULLS in a particular geotype is then derived by multiplying the unit cost of each network element by the number of times that element is used by ULLS.

4.10 This methodology is uncontroversial and is typical of the way that the costs of a particular type of access line are calculated in a bottom-up TSLRIC model. The way that it is implemented in the Analysys Model is, however, incorrect. Looking at Step 2 above, it is clear that calculation of the correct unit cost of each type of network element is crucially dependent on the correct calculation of the volume of use of that element. This volume calculation in turn requires the correct number of lines to be used. However, as explained below, the Analysys Model does not use the correct number of lines.

4.11 In calculating the unit costs of network elements such as copper cable in the distribution network, the Analysys Model uses the total number of subscriber lines, rather than the total number of copper lines (which is a subset of the total number of subscriber lines because a proportion of subscriber lines are fibre). This can be seen by tracing back through the different worksheets and spreadsheets in the Analysys Model. The unit costs of different elements are calculated using line numbers that are drawn from cells K33 to N5286 in the 'In.Subs' worksheet of the spreadsheet Core.xls. These cells include fibre as well as copper lines. In order to obtain the correct unit cost for copper cable in the distribution network it is necessary to divide by the number of copper lines only, since fibre lines do not use copper cable in the distribution network. This means that cells V33 to Y5286 in the 'In.Subs' worksheet of the spreadsheet Core.xls, which show numbers of copper lines, should have been used when calculating the unit costs. They were not.

4.12 This mathematical error in the Analysys Model leads to an understatement of the unit cost of copper access lines, and hence an understatement of the cost of ULLS, in geotypes where access is not solely provided by copper. In practice, this means all the geotypes. In Band 2 geotypes (i.e. geotypes 3 to 6 in the Analysys Model) this understatement of cost is substantial given that lines provided by fibre represent between 7% and 14% of total lines.

4.13 In summary:

- ULLS is a service provided over copper access lines, not fibre. Therefore the unit cost to be calculated is the unit cost per copper access line. Fibre access lines have to be excluded;

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31 The average number of times a network element is used by a type of line is known as a routing factor. In practice, in the Analysys Model, all the routing factors are either 1 or zero. In other words, a given type of line either uses a particular type of network element once or it doesn't use it at all.

- The Analysys Model has correctly excluded the cost of fibre lines when calculating total cost, but has incorrectly included fibre lines when dividing the total cost by the total number of lines to derive the unit cost per copper line;
- This is equivalent to calculating the unit cost of production of a motor car by taking the total cost of cars and dividing by the total number of cars and trucks produced;
- This is patently nonsensical; and
- As a result, the Analysys Model substantially underestimates the unit cost of ULLS.

Q6. The Analysys Model has excluded the costs of "lead-ins" from the boundary of the customer's premises to the distribution pit. Is it reasonable for the costs of "lead-ins" to be excluded? If no, how should the Telstra Connection Charges be treated in the recovery of the costs for "lead-ins"?

4.14 From inspection of the Analysys Model, it is clear that the cost of trench and conduit from the boundary of the customer's premises to the near by distribution point ("pit") is excluded from the costs of the CAN and hence from the costs of access network services. This infrastructure is present within the model but has a zero unit price so that the costs do not appear in the calculation of the network costs. In addition, the cost of cable from the network termination point at the customer's premises to the pit is similarly excluded.[32] The cable is sometimes referred to as a "lead-in" because it leads in from the pit to the customer's premises. Again, this cable is also present in the model but has a zero unit price.

4.15 These components of the network are part of the cost of building the CAN. The trenches and conduits are installed when the network is constructed, rather than installed each time a customer connects to the network. Without this lead-in infrastructure, the network would be incomplete and no cable based access services could be provided. Put another way, the costs of these and other access network components are caused by the provision of access network services and hence should be recovered in the prices of these services. It is therefore not reasonable for the costs of the trench, conduit and cable components of the lead-ins to be excluded from the calculated costs of the CAN.

4.16 The ACCC itself recognised that these costs are a legitimate cost of the CAN in its decision on the access dispute between Telstra and Chime:

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32 Cells H33 and H41 in the worksheet 'TA.Access' in the spreadsheet 'Cost.xls', which respectively show the unit capital cost of duct from the pit to the property boundary and the unit cost of cable from the pit to the customer's premises, both have the value zero. Consequently the costs of these network components are excluded from the calculated cost of the access network and hence ULLS. Any duct from the property boundary to the customer's premises is provided by the customer and hence is legitimately excluded from the access network cost base.

"The ACCC notes firstly that lead-in costs are a legitimate expense and that those costs should be recovered. However, the ACCC considers that those costs should not be recovered in ULLS monthly charges." [33]

4.17 The reason why the ACCC concluded that lead-in costs should not be recovered in ULLS monthly charges is that it believed that Telstra had already recovered these costs as part of its service connection charges.[34] In reaching its conclusion, the ACCC made the assumption that Telstra's connection charges were cost based and that there was therefore nothing left to recover.[35] However, the evidence on costs from the TEA Model indicates that this is not the case. In Version 1.5 of the TEA Model the average cost of a lead-in is $282.91, provided that the copper cable does not exceed 20 metres in length. For lead-ins that are longer than 20 metres, there is a further cost per additional metre of copper cable, including placement, of $1.68. A reasonable proxy for the revenue that Telstra receives for each lead-in can be approximated by the difference between the fee for new service connection (which includes the placement of lead-in cable and a visit by a field service personnel and the fee for reconnection where service previously existed and the lead-in cable was already in place (which involves just a visit by field service personnel). This amounts to $174 including GST ($299 minus $125).[36] The unrecovered cost for each lead-in not exceeding 20 metres in length is therefore $124.73 (i.e. $282.91 minus $174/1.1) and the shortfall is even greater for longer lead-ins.

4.18 Given that the cost of lead-ins is not fully recovered in connection fees, it is not correct to do what the Analysys Model has done and exclude the cost of lead-ins when calculating the cost-based ULLS monthly charge. The appropriate procedure is to:

1. Include lead-in costs when calculating the cost of unconditioned local loops in the CAN. This would include the cost of the trench and conduit from the distribution pit to the property boundary and the cable from the distribution pit to the network termination point in the customer's premises;

2. Take account of the fact that customers have already partly contributed to the cost of lead-ins when they pay new service connection fees. This is done by subtracting the difference between the new service connection fees and the reconnection fees from the unconditioned local loop capital costs. As recognised by the ACCC, the difference

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33 ACCC, *Unconditioned Local Loop service: Access Dispute Between Telstra Corporation Limited (access provider) and Chime Communications Pty Ltd (access seeker), Statement of Reasons for Final Determination,* March 2008, paragraph 523

34 ibid., paragraph 524

35 ibid., paragraph 525

36 These are the fees used by the ACCC in its decision on the access dispute between Telstra and Chime March 2008. A check with Telstra's website reveals that they still apply today http://www.telstra.com.au/movinghome/newcustomer.cfm

between the new service connection fee and the reconnection fee is a proxy for the lead-in cost.

3. Annualise the resulting capital costs (lead-in capital costs minus the difference between new service connection fees and reconnection fees).

4. Add all operating expenses associated with the unconditioned local loop including lead-ins.

5. Divide by 12 to get monthly costs.

By not following this procedure, the Analysys Model has understated the costs that need to be recovered in the ULLS monthly charge. The cost understatement is likely to be substantial given the large number of customer lines involved. I am unaware of any other regulator who has used an access network cost model which excludes the cost of lead-ins. In my view it is not a reasonable approach for a regulator to take.

Q7. In the Analysys Model, a tilted annuity has been used in an environment of declining traffic volumes. Is the use of a tilted annuity reasonable? If you consider this approach to be unreasonable, please explain the consequences of adopting that approach and your views as to the appropriate approach to be adopted.

4.19 The Analysys Model employs a tilted annuity to annualise the capital costs of equipment in both the CAN and the IEN (core network). This takes the form:

$$A = \frac{C\left(r - \left(\dot{P} + Adj\right)\right)}{1 - \left(\frac{\left(1 + \dot{P} + Adj\right)}{\left(1 + r\right)}\right)^{L}}$$

where: A is the annualised capital cost; C is the gross replacement cost of the asset concerned; r is the cost of capital (WACC); $\dot{P}$ is the annual rate of change of the price of the asset; Adj is an adjustment factor and L is the useful economic life of the asset. This is the standard formula for a tilted annuity apart from the addition of the adjustment factor (Adj). The role of this factor and how it is used in the Analysys Model is discussed in more detail in paragraphs 4.37 to 4.39.

4.20 In assessing the appropriateness of the use of a tilted annuity, an important point of reference is economic depreciation, which is defined as the change in the value of an asset during a specified period of time (typically a year).[37] The value of an asset at any point in time is equal to the sum of the discounted future net cash flows arising from its use. Changes

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[37] H. Hotteling (1925), "A General Mathematical Theory of Depreciation", *Journal of the American Statistical Association*, Vol. 20, pp 340-353.

in the value of an asset (economic depreciation) are brought about by changes in future cash flows, which in turn are caused by:

- changes in new equipment prices and hence in output prices;[38]
- changes in the output from the asset reflecting factors such as:
  - substitution by other technologies, for example fixed wireless access and mobile phones;
  - reduced productivity as the asset gets older. For example, the speed at which broadband services can be provided over copper lines diminishes with the number of joints and repairs;
  - loss of market share, which results in particular lines in the network becoming stranded; and
  - changes in customer locations, which result in particular lines in the network becoming stranded and unusable;
- and changes in the cost of operating the asset over time.

4.21 Economic depreciation is regarded by regulatory authorities around the world as being the correct basis for measuring depreciation. For example, the FCC concluded that, when modelling the cost of network elements, “an appropriate calculation will include a depreciation rate that reflects the true changes in economic value of an asset”.[39] Similarly, the position of the IRG, which is the group of regulatory authorities from EU countries, is that:

> “It is widely accepted that annualised costs should be calculated on the basis of economic depreciation which would include an appropriate allowance for the cost of capital. While conceptually not difficult, economic depreciation is in practice very difficult to calculate. The main problem is that estimating economic depreciation is very information intensive.
>
> Because of the practical difficulties with calculating economic depreciation more simple approaches are often preferred. However, the yardstick by which these simpler

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38 In a competitive market a new operator setting up business will purchase new equipment and set its output prices taking the cost of the new equipment into account. In order to avoid losing business, existing operators will be forced to set their own output prices as if they too had purchased new equipment. Thus, falling new equipment prices induce falling output prices and so on. The situation is the same if the new entrant purchases second hand equipment since the price of second hand equipment will be determined by the price of new equipment. Where the market is not competitive but is regulated in a way that seeks to secure prices that would exist in a competitive market (e.g. via the use of TSLRIC modelling), changes in equipment prices will similarly affect output prices.

39 Federal Communications Commission, FCC 96-325, August 1996, paragraph 703

approaches should be judged is how close they are likely to come, given the nature of the asset concerned, to the theoretically correct measure of depreciation.

The following are a number of commonly used surrogates for economic depreciation which can be appropriate and may be preferred: (tilted) annuity, (tilted) straight line, and 'sum of the years digits' depreciation." [40]

4.22 The ACCC, in its 1997 Access Pricing Principles, also recognised that depreciation schedules should reflect the expected decline in the economic value of assets:

"Consistent with the TSLRIC methodology, depreciation schedules should be constructed and based on the expected decline in the economic value of assets using a forward looking replacement cost methodology. ……The decline in economic value of an asset is determined by a range of factors including its expected operational life and expectations concerning technological obsolescence." [41]

4.23 Whether it is reasonable to use a tilted annuity in the Analysys Model therefore depends on how well a tilted annuity approximates to economic depreciation. To examine this I have adopted a four stage process. I first look at the case where only asset prices change during the life of an asset, which is the situation that a tilted annuity is designed to deal with.[42] I then go on to look at the situation where output also changes during the life of an asset since the question that I have specifically been asked to address is whether the use of a tilted annuity is reasonable in an environment of declining volumes. Next, I briefly consider the case of changing operating expenses. Finally, I examine what would be an appropriate approach.

4.24 Reflecting this multi stage process, I have assumed initially that output from the asset and the associated operating expenses remain constant until the very end of the asset's life. [43] The only thing that changes over time is the price of the asset. These assumptions about output and operating expenses are not intended to be realistic and I show the impact of making realistic assumptions later. The purpose of initially just considering asset price changes before moving on to take account of changes in output is to illustrate what a tilted annuity is and is not capable of taking into account.

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40 Independent Regulators Group, *Principles of Implementation and Best Practice Regarding FL-LRIC Cost Modelling,* 24 November 2000, pages 7-8

41 ACCC, *Access Pricing Principles - Telecommunications*, July 1997, page 45

42 The purpose of the $\dot{P}$ term in the tilted annuity formula (paragraph 4.18) is to try to capture the impact of asset price changes.

43 To keep things simple it is also assumed that there is only one product (or service) produced by one asset. However, the analysis remains fundamentally the same if there is more than one product (or service) and more than one asset.

(a) Stage 1: Only Prices Change

4.25 The market is assumed to be competitive (or regulated in a manner that secures competitive prices). Reflecting this, the price of the service has to be such that two conditions are met:

- the price changes over time in line with the change in asset prices (see paragraph 4.20 above);
- in each year, revenue is just sufficient to cover operating expenses plus depreciation and the required rate of return ("cost of capital") on the remaining value of the asset (i.e. the replacement cost of the asset minus accumulated depreciation).[44]

These assumptions regarding the evolution of prices, volumes and operating expenses over time determine the pattern of future cash flows and hence economic depreciation.

4.26 This situation is illustrated in Figure 1 below, using the following inputs in the Analysys Model that relate to copper cable in the CAN:

- the purchase cost of the asset is $100;[45]
- operating expenses of new equipment amount to 2.97% of the purchase cost;
- the price of new equipment falls by 0.71% per year;
- the asset life is 20 years; and
- the cost of capital is 10.77%.

The gap between revenue and operating expenses is equal to economic depreciation plus the associated cost of capital and it can be seen that this gap shrinks slowly over time.

4.27 Figure 2 shows the sum of economic depreciation plus the cost of capital and how it varies over the life of the asset. Also shown is the annual capital charge using the tilted annuity formula in paragraph 4.19. It can be seen that the two lines are identical. What this means is that, if it were the case that it is only asset prices that change and there were no changes in output or operating expenses until right at the very end of the asset's life, a tilted annuity would replicate economic depreciation. However, such an assumption about output is not realistic. It is also inconsistent with the decline in output assumed in the Analysys Model (see paragraph 4.29).

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[44] The process of competition prevents revenue from exceeding operating expenses plus depreciation plus the cost of capital.

[45] This assumption is made so that that the resulting annual capital charges can readily be interpreted as percentages of the investment cost.

Figure 1: Forecast Revenue and Operating Expenses

0.71% p.a. fall in asset prices, no change in output or operating expenses

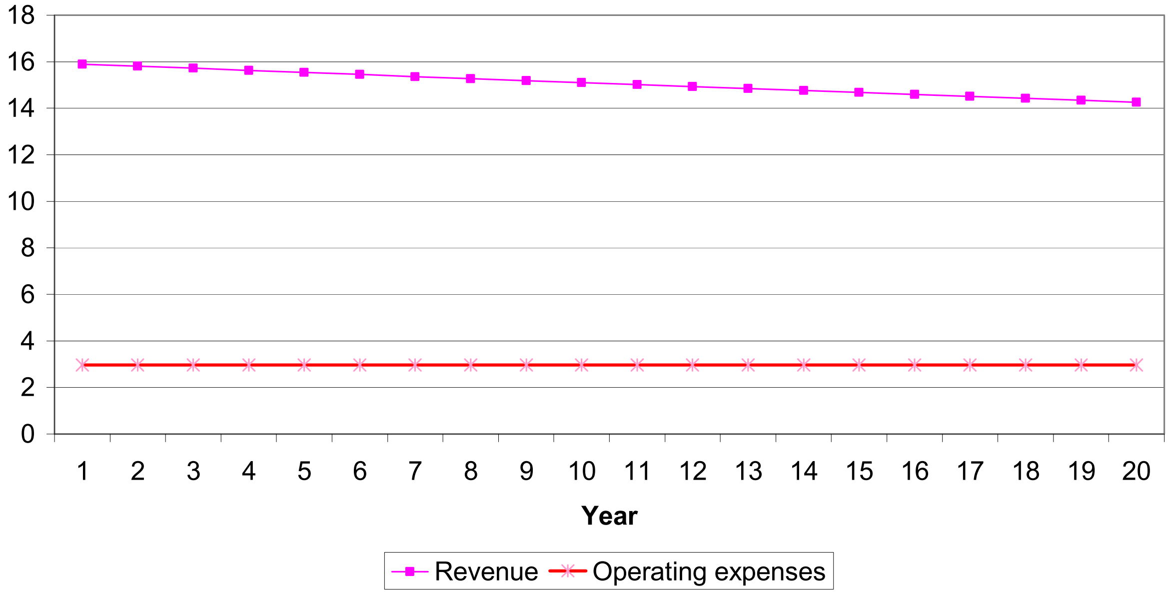
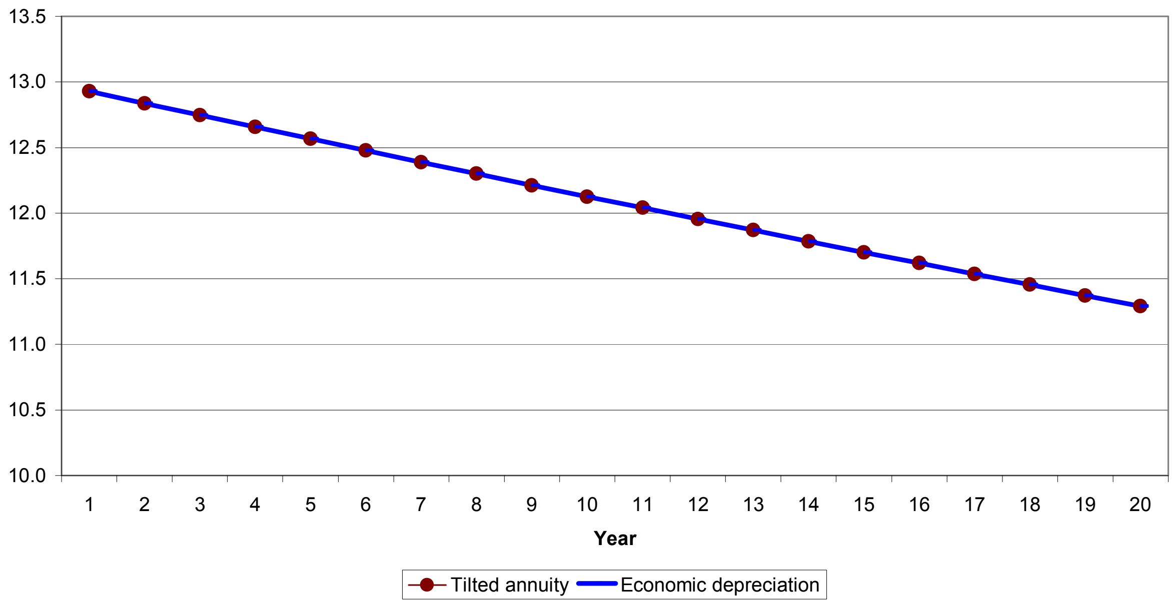


Figure 2: Annual Capital Charge

0.71 p.a. % fall in asset prices, no change in output or operating expenses



(b) Stage 2: Output also changes

4.28 As already mentioned in paragraph 4.19, output will typically decline due to substitution by other technologies, reduced productivity as the asset gets older, loss of market share, and changes in customer locations. Moreover, in the case of assets in the fixed telecommunications CAN such as trench and cable, such a decline does not happen cataclysmically at the very end of an asset's life. Rather, it occurs progressively over time. In addition, it is generally the case that maintenance of copper cable in the CAN, to take an example, becomes more expensive as the cable gets older and is subjected to an increasing number of repairs and joints etc. As a result, operating expenses are generally not constant as equipment grows older.

4.29 A standard tilted annuity (i.e. one with Adj, the adjustment factor in the formula in paragraph 4.16, set to zero) no longer provides a close approximation to economic depreciation. This is because it only copes with the change in asset prices and cannot deal with changes in the volume of output (or indeed operating expenses). To illustrate this, I have again taken the case of copper cable in the CAN. The difference now is that the following changes in output are assumed over the asset's life:

- 0.8% p.a. reduction in the first five years, consistent with the reduction in the demand for lines assumed in the Analysys Model between 2007 and 2012;46
- 3.5% p.a. reduction in the next five years;
- 7.5% p.a. reduction in the next five years;
- 17.5% p.a. reduction thereafter.

4.30 These values were chosen firstly to represent an accelerating decline in output and secondly because, together with the reduction in price, they cause revenue to decline so that by the end of year 20 it no longer exceeds operating expenses. This is necessary because otherwise the useful economic life of the asset (which is the period during which revenue exceeds operating expenses) is not consistent with the 20 year life assumed by Analysys.[47]

4.31 The result can be seen in Figure 3, which shows the reduction of revenue until it converges with operating expenses in year 20. Meanwhile, Figure 4 compares the annual capital charge using economic depreciation with the annual capital charge using a standard tilted annuity (which is the same as in Figure 2 since it takes no account of output changes). It can be seen that a standard tilted annuity substantially underestimates the annual capital charge based on economic depreciation in the early years of the asset's life and overstates it in the later years.

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46 See rows 9 and 10 of the worksheet 'Input.Demand' in the Analysys Model spreadsheet 'Cost.xls'.

47 It does not make economic sense to continue to operate the asset once operating expenses exceed revenue, since this involves making a loss.

Figure 3: Forecast Revenue and Operating Expenses
0.71% p.a. fall in asset prices, progressive decline in output , no change in operating expenses

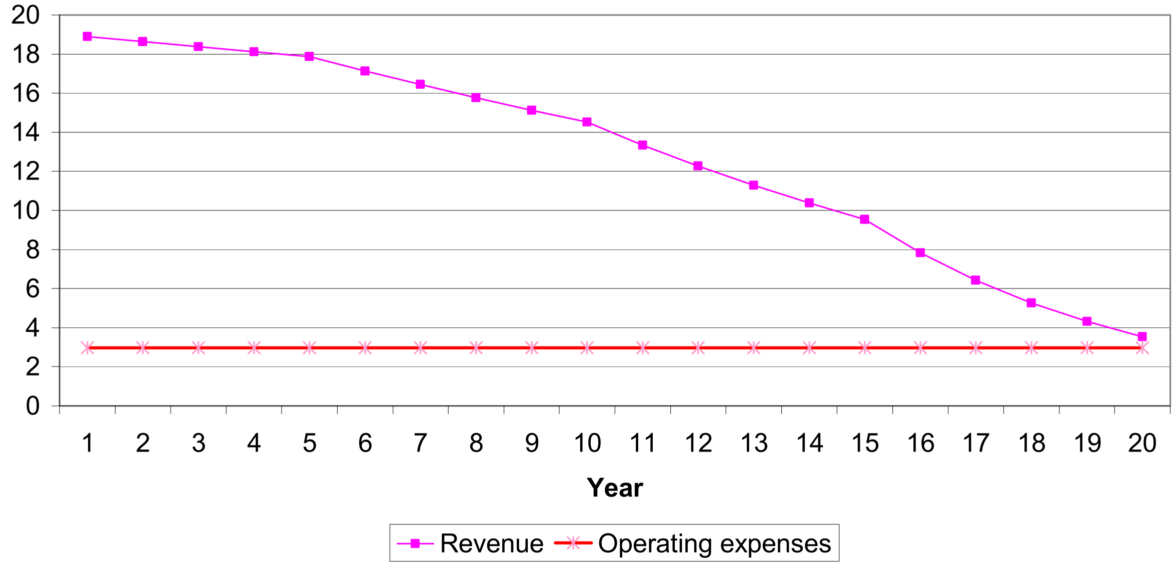
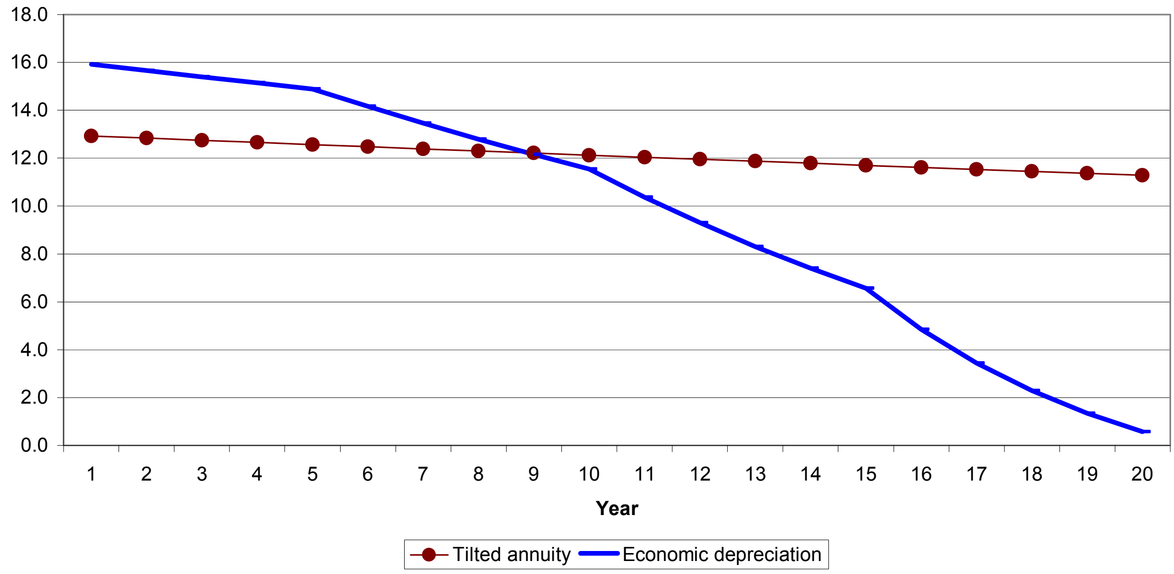


Figure 4: Annual Capital Charge
0.71% p.a. fall in asset prices, progressive decline in output , no change in operating expenses



4.32 Given that it is the costs of a new network that are being estimated by the Analysys Model and that the indicative pricing from the model is to be applied to only 3 years, it is the early years of the asset's life that matter. Thereafter the regulated prices will be reset at regular intervals starting each time with a brand new network. Consequently, both now and going forwards one will effectively always be in the early years of an asset's life. Looking at the early years, it is clear from Figure 4 that a standard tilted annuity substantially underestimates the correct annual capital charge. My conclusion therefore is that when output declines during the life of an asset it is not appropriate to use a standard tilted annuity.

4.33 Exactly the same conclusion holds if one is considering duct or any other asset in the CAN or indeed assets in the core network. If output volumes decline over the life of an asset, the use of a standard tilted annuity is not reasonable since it is not capable of taking account of changes in the output of an asset.

(c) Stage 3: Operating expenses are also likely to change

4.34 It is important to note that increases in operating expenses over the life of an asset have a similar impact to reductions in output volumes. In practice, the fact that copper in the CAN has a 20 year asset life, rather than lasting substantially longer, is likely to reflect both output reductions and increases in operating expenses. To show the impact of allowing for increases in operating expenses, I changed the assumptions regarding output changes for copper cable in the access network to:

- 0.8% p.a. reduction in the first five years, consistent with the reduction in the demand for lines assumed in the Analysys Model between 2007 and 2012;48
- 2.5% p.a. reduction in the next five years;
- 5% p.a. reduction in the next five years;
- 7% p.a. reduction thereafter.

and assumed that operating expenses would change as follows:

- 3% p.a. increase in the first five years;49
- 4% p.a. reduction in the next five years;
- 5% p.a. reduction in the next five years;
- 6% p.a. reduction thereafter.

4.35 This combination of reducing output and increasing operating expenses leads to the annual capital charges shown in Figure 5. The time profile of annual charges using economic depreciation is similar to that in Figure 4. As a result, the gap between the annual charges using economic depreciation and the unchanged tilted annuity is also similar.

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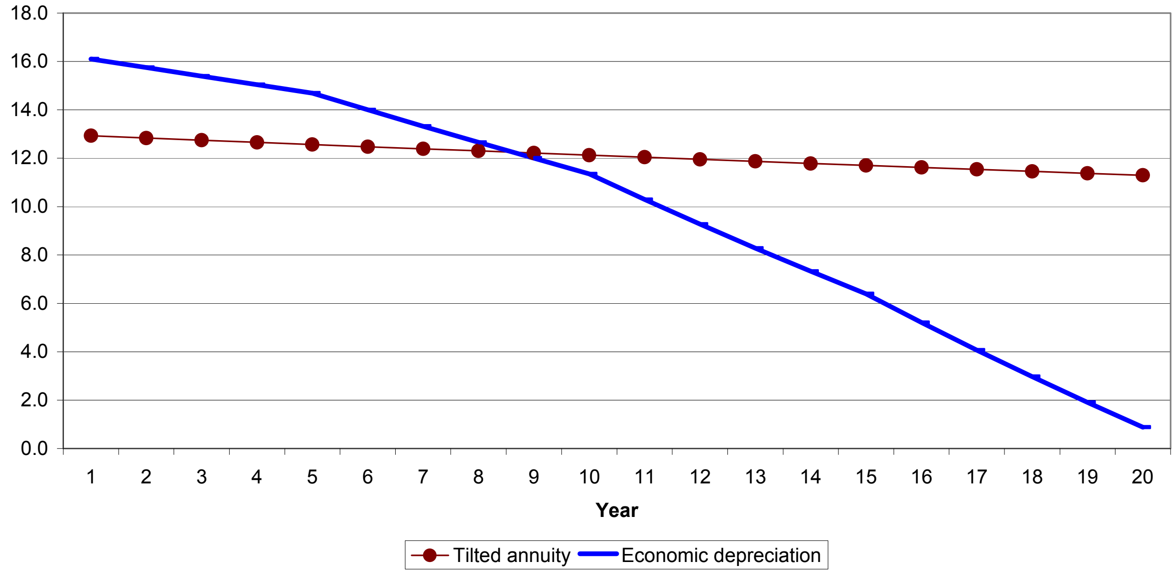
48 See rows 9 and 10 of the worksheet 'Input.Demand' in the Analysys Model spreadsheet 'Cost.xls'.

49 See rows 9 and 10 of the worksheet 'Input.Demand' in the Analysys Model spreadsheet 'Cost.xls'.

Figure 5: Annual Capital Charge

0.71% p.a. fall in asset prices, slower decline in output , increasing operating expenses



4.36 The inability of a standard tilted annuity to take account of either changes in output or operating expenses means that it is not appropriate to use it for deriving annual capital charges in an environment where output is declining and operating expenses are increasing. In such circumstances, its use leads, in the early years of an asset's life, [50] to a substantial underestimate of the true annual capital charge that would result from the use of economic depreciation.

(d) Stage 4: What would be an appropriate approach?

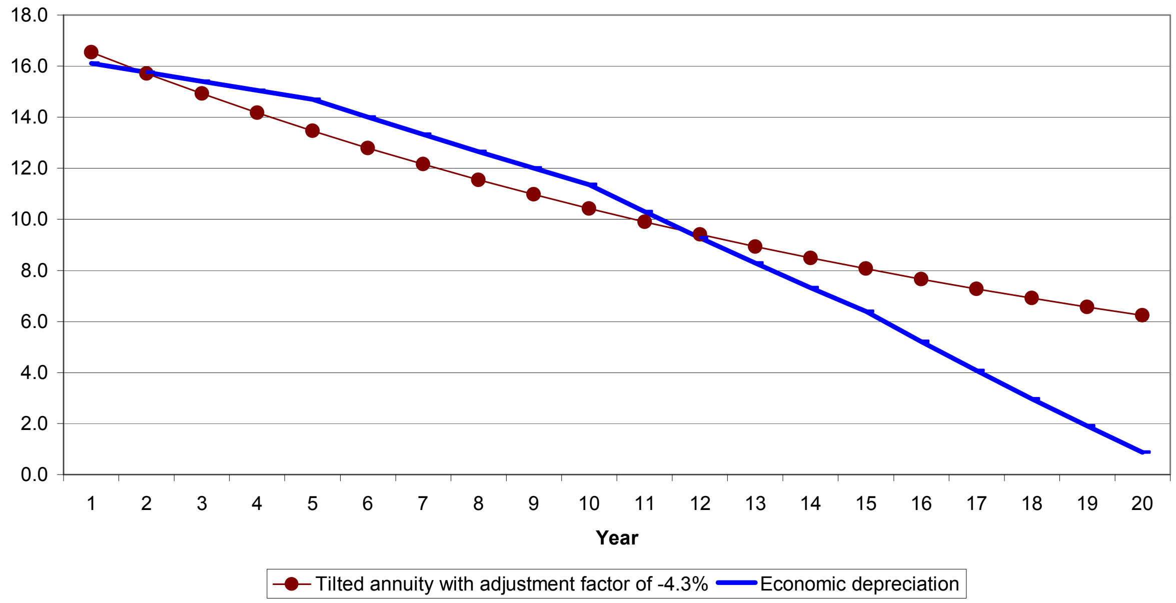
4.37 In the light of this conclusion, the question arises as to what would be a more appropriate approach. One option would be to use directly an economic depreciation model that forecasts future cash flows based on forecasts of future asset prices, output volumes and operating expenses and then calculates the change in discounted future cash flows from one year to the next. An alternative approach that provides a reasonable approximation to the use of economic depreciation would be to use the adjustment factor, *Adj* , that already exists in the tilted annuity formula in the Analysys Model to change the slope of the tilted annuity schedule (i.e. the brown line with circles in Figure 5) so that it comes broadly into line with the slope of the schedule of annual charges using economic depreciation (the blue line in Figure 5).

[50] As explained in paragraph 4.32, this is the relevant period in the context of setting ULLS prices for the next few years.

4.38 If the adjustment factor has a value of -4.29%, the tilted annuity schedule changes to the one shown in Figure 6 where it can be seen that it gives a reasonable approximation to the economic depreciation schedule during the first 3 years of the asset's life.

Figure 6: Annual Capital Charge

0.71% p.a. fall in asset prices, slower decline in output , increasing operating expenses



4.39 In contrast, the current version of the Analysys Model (Version 2.0) has a value of +2.5% for the adjustment factor for copper cable in the CAN (and indeed for all other assets). As a result, the adjusted tilted annuity schedule for copper cable is actually upward sloping over time (see Figure 7).[51] This is completely inconsistent with the time profile of annual capital charges using economic depreciation. Moreover, it implies that copper cable in the CAN has an infinite economic life, which is not consistent with day to day experience. The reason it implies an infinite life is as follows: if the annual capital charge increases every year, the gap between revenue and operating expenses must be increasing since it is this gap that funds the capital charge.[52] If this is the case, revenue always remains above operating expenses and the asset has an infinite life unless some kind of cataclysmic failure of the equipment occurs. In the case of copper cable such a failure is highly unlikely to occur particularly within a 20 year period. The approach taken in the Analysys Model is therefore not reasonable. It also leads to a very large understatement of the annual capital charge in the first 3 years of the asset's life (which, as explained above, is the relevant period).

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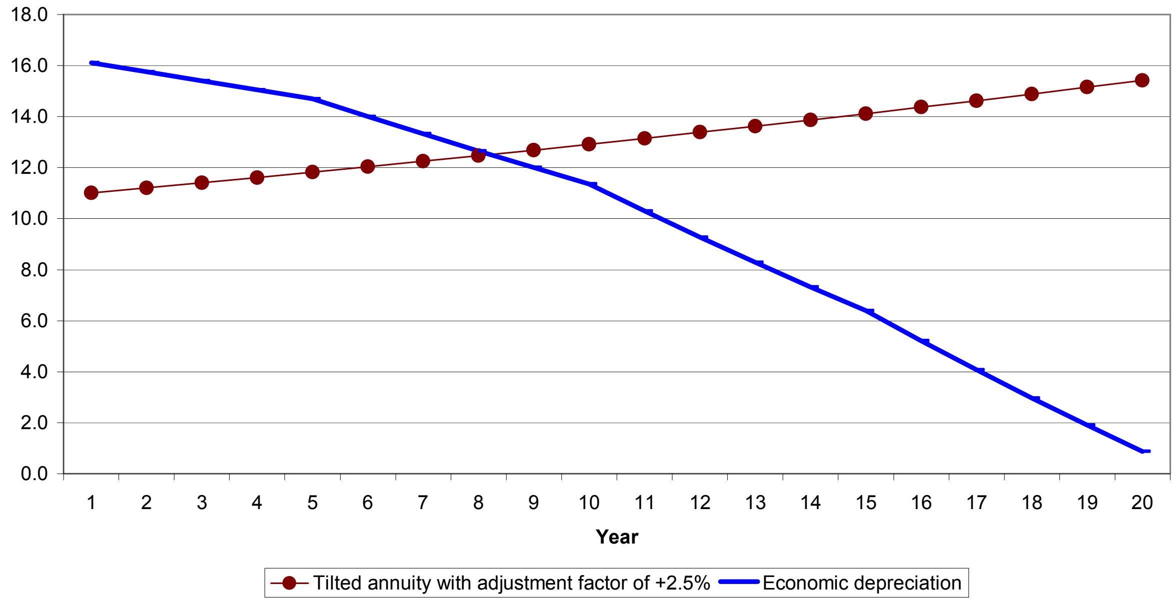
[51] The impact of the 1% p.a. asset price reduction is more than offset by the 3% adjustment factor, which is applied annually.

[52] Assuming, as before, that the market is competitive or regulated as if it were competitive, revenue each year equals operating expenses plus the annual capital charge. This in turn means that the annual capital charge is equal to revenue minus operating expenses. If the annual capital charge is increasing over time, so is the gap between revenue and operating expenses.

Figure 7: Annual Capital Charge

0.71% p.a. fall in asset prices, slower decline in output , increasing operating expenses



4.40 Despite the fact that the Analysys Model forecasts that both copper cable prices and line volumes will fall, even in the first few years of the asset's life, it uses a depreciation schedule that slopes upwards over time. As shown above, this is completely inconsistent with economic depreciation. It also flies in the face of common sense as it implies that Telstra must fund an ever increasing capital charge when its revenue is falling as a result of declining prices and volumes. In my view, no reasonable regulator would adopt such an approach to determine annual capital charges.

4.41 To a greater or lesser extent, the same conclusion applies with respect to other assets in the Analysys Model, including duct and switching equipment. This is because they too are subject to declining output and increasing operating expenses but the Analysys Model completely fails to take this into account when determining annual capital charges.

5. Telstra Statement

Q8. In relation to the planning process described in the Telstra Statement for a fibre build in the inter-exchange network (IEN):

(a) does Telstra's approach represent a reasonable approach to determining the number of fibres to be deployed?

(b) is Telstra's approach consistent with network deployment principles adopted in other jurisdictions?

(c) is it reasonable for the Analysys Model to assume that dark fibres are deployed for unknown future services?

5.1 The Telstra Statement describes the process by which Telstra determines the deployment of new fibre cables.

5.2 Telstra's practice differs between regional and metropolitan areas. In regional areas, Telstra would generally not deploy new fibre to allow future services to be provided if there was a viable alternative available.[53] [54]

5.3 In metropolitan areas, the required amount of new fibre is determined by forecasting demand from existing services and allowing for known specific initiatives involving future services.[55] Fibres are not deployed to handle unknown future services because there is no basis for forecasting the volume of such services and consequently any investment to handle them might be wasted.[56]

5.4 In my view this is a reasonable approach to determining the number of fibres in Telstra's network. There is correctly an emphasis on looking at the cost of alternatives to deploying more fibre and using those where appropriate. Forecasts of future demand and hence required capacity are based on existing and known future services, since what is unknown by definition cannot be forecasted.

5.5 Telstra's approach is consistent with that used by network planners and indeed cost modellers in other jurisdictions. Normal practice is firstly to determine the investment lead time. It takes time to plan and implement investment projects. Also, consideration has to be given to the fact that it is expensive to dig up trenches and lay duct and cable and hence the frequency with which new cable is laid needs to be kept to a level that minimises costs. Once

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[53] Telstra Statement, paragraph 12

[54] The Telstra Statement does not cite an example of what such an alternative might be but one possibility would be to increase the capacity of the existing equipment at the ends of the fibre and another would be to introduce dense wavelength division multiplexing (DWDM) which allows multiple optical signals to be carried on a single fibre.

[55] Telstra Statement, paragraphs 13 and 15

[56] Telstra Statement, paragraph 15

the lead time is established, demand is forecast that far ahead and the required amount of capacity determined based on peak hour demand and maximum utilisation levels. In doing so, account is taken of the need for network diversity. The required capacity is then implemented in the most cost effective way.

5.6 In contrast to the approach used by Telstra's network planners, which itself is consistent with practice in other jurisdictions, the Analysys Model assumes that dark fibres would be deployed for the purpose of providing unknown future services ("other fibre services"). The name "dark fibres" is given to fibres to which no equipment is attached. They are unusable unless subsequent investment is also made in equipment. The capacity of dark fibre in the Analysys Model is determined in a completely arbitrary way. For example, in the case of transmission links between trunk network switches (TNS), the number of fibres required to handle existing services is calculated. This is then doubled to provide spare capacity.[57] It is then doubled again to provide dark fibre capacity. Why there should be as many fibres in the form of dark fibre as are required to provide existing services plus related spare capacity is not explained.

5.7 In my view, it is not reasonable for the Analysys Model to assume that dark fibres are deployed for unknown future services. By definition it is not possible to forecast the capacity required for unknown future services. Arbitrarily installing large amounts of capacity on the off chance that some unspecified volume of unknown services might be provided in the future does not make economic sense and is contrary to the way that prudent operators dimension their networks.

Q9. In relation to the Analysys Model and given the evidence in the Telstra Statement, is the allocation of costs in relation to dark fibres for the IEN in the Analysys Model reasonable?

5.8 The way that fibre costs are allocated in the Analysys Model is to look at each type of transmission link and split the total cost of fibre, trench and conduit between existing services and "other fibre services" (that would use dark fibre if they existed) in proportion to the number of fibres deployed to handle existing services (current demand plus spare capacity) and the number deployed as dark fibre.[58] Thus, for example, on links between TNS, 50% of the deployed fibres relate to existing services (including spare capacity) and hence existing services are allocated 50% of the costs. The remaining 50% of costs are allocated to "other fibre services". Since these services do not actually exist and therefore no revenue is received from them, these costs are not recovered.

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57 The relevant parameters can be seen in cells H131 and H136 of the worksheet 'In.Network' which is part of the spreadsheet 'Core.xls'.

58 This is explained in Analysys, Fixed LRIC Model Documentation – Version 2.0, Section 9.6.2. It is should be noted that there is no allocation of trench and duct to "other duct services". The allocation calculation can be seen in cells D459:K466 in the worksheet 'NwDes.4.Core.Nodes' in the spreadsheet 'Core.xls'.

5.9 This is not an appropriate allocation practice because it does not allow full recovery of costs. If a company is unable to recover its costs, it will make a loss and this is not a sustainable situation.

5.10 In this context, it is important to note that costs do not increase in line with capacity. Thus, for example, suppose the cost of trench, conduit and fibre on a particular transmission link when there are 10 fibres is $100. The cost if there were 20 fibres would be nothing like as high as $200. Let us suppose it is $120.[59] If that is the case, doubling capacity to incorporate dark fibre means that, under the system of cost allocation in the Analysys Model, existing services would be allocated 50% of $120, i.e. $60, when previously they were allocated $100 (100% of $100). The impact of introducing an arbitrarily determined amount of capacity to serve unknown demand for unknown services is therefore to reduce the costs that can be recovered from existing services by $40 while increasing total costs by $20. Half the costs ($60) are not recovered. This is nonsensical.

5.11 In my view, therefore, the allocation of costs in relation to dark fibres in the Analysys Model is not reasonable.

Q10. If the answer to 9 above is no, how should the costs of the dark fibres in the Analysys Model be treated and what is the effect of treating the costs in that way?

5.12 Reflecting the points made in answer to Q9, and bearing in mind that it is not the practice of network planners in Telstra or in other jurisdictions to deploy fibre to meet unknown future demand for unknown future services, no allowance should be made for dark fibre in the Analysys Model. There is no evidence provided that there will be demand for dark fibre services over the next 3 years, which is the relevant period for setting prices.

5.13 Removing dark fibre from the Analysys Model would increase the unit cost of existing services since they would now be attributed all the costs for which they are responsible rather than a substantial portion being siphoned off and left unrecovered (as explained in paragraph 5.10).

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

59 This figure is chosen for illustrative purposes and is not meant to be an estimate.

Appendix A. Instructions from Gilbert + Tobin

1 October 2009

By email: nigel.attenborough@nera.com

Nigel Attenborough
NERA Economic Consulting
15 Stratford Place
London W1C 1BE

Dear Nigel

ACCC Review of Fixed Line Wholesale Services Pricing 2009 to 2012

Background

As you are aware, the ACCC has issued "Draft pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS and LSS" (**Draft Pricing Principles and Pricing**) in August 2009. Interested parties have been invited to make written submissions on the Draft Pricing Principles and Pricing by 5pm on Friday, 25 September 2009.

You have been provided with the Telstra Efficient Access Model (**TEA Model**) and the Analysys model developed on behalf of the ACCC (**the Analysys Model**). You will also be provided with a statement from a Telstra employee. We confirm that we wish to engage you on behalf of Telstra to prepare an expert report setting out your opinion on a number of questions regarding each of those models and statement. The specific questions are set out below.

Instructions

Your expert report should address the following questions:

TEA Model

1. Is it reasonable to use a top-down model to calculate Direct O&M, Indirect O&M, Indirect Capital and Network Support Asset factors (**Cost Factors**) using Telstra's actual historical costs having regard to international benchmarks? Please explain your reasons.

2. Is the use of a loading factor for indirect overhead in the TEA Model reasonable? Please explain your reasons.

3. Are the Cost Factors used in the TEA Model reasonable having regard to other international benchmarks? Please explain your reasons.

Analysys Model

4. Are the Cost Factors used in the Analysys model reasonable having regard to other international benchmarks? Please explain your reasons.

5. Please review the methodology used in the Analysys model regarding calculation of the average cost per copper access line. Is it reasonable to include all access lines, including those served by fibre, in the calculation of average unit cost per copper access line in the calculation of a cost-based ULLS price?

6. The Analysys Model has excluded the costs of lead-ins from the boundary of the customer's premises to the distribution pit. We have attached an extract from Telstra's "Customer Terms" for a basic Telephone service which sets out the various connection charges made by Telstra (**Telstra Connection Charges**). In your opinion, is it reasonable for the costs of "lead-ins" to be excluded from the Analysys Model? If no, how should the Telstra Connection Charges be treated in the recovery of costs for "lead-ins"?

7. In the Analysys model, a tilted annuity has been used in an environment of declining traffic volumes. Is the use of a titled annuity reasonable, including in these circumstances of declining traffic volumes? If not, what are the consequences of adopting that approach and what approach should be adopted?

Telstra statement

Please review the Telstra statement to be provided to you (**Telstra Statement**) and provide your expert opinion on the following questions:

8. In relation to the planning process described in the Telstra Statement for a fibre build in the inter-exchange network (**IEN**), please address the following questions:

    i. is Telstra's approach in determining the number of fibres to be deployed reasonable?

    ii. in your experience, is the approach adopted by Telstra consistent with network deployment principles adopted in other jurisdictions; and

    iii. is it reasonable for the Analysys Model to assume that dark fibres are deployed for unknown future services?.

9. In relation to the Analysys Model and given the evidence in the Telstra Statement, is the allocation of costs in relation to dark fibres for the IEN in the Analysys Model reasonable?

10. If the answer to 8 above is no, how should the costs of the dark fibres in the Analysys Model be treated and what is the effect of treating the costs in that way?

Contents of Report

In the preparation of your report you should:

a) have regard to the *Guidelines to Expert Witnesses for Proceedings in the Federal Court of Australia* (Expert Guidelines) and expressly confirm in your report that you have read those guidelines and that you agree to be bound by them (see enclosed Expert Guidelines);

b) include a detailed *curriculum vitae* setting out full details of all of your relevant qualifications, expertise and experience;

c) include a statement of the questions that you have been asked to address;

d) set out a list of all documents you have relied on in the preparation of your report;

e) expressly state all assumptions you have made in preparing your report and the reasons for making those assumptions; and

f) set out the reasons for each opinion expressed in the report.

Timing

Once you have had the opportunity to review the above instructions, please contact us to discuss the likely timing for completion of your report.

We may revert to you with further questions or issues for consideration prior to the finalisation of your report. In the interim, please do not hesitate to contact us if you have any questions or if you consider you require any further information to prepare your report.

Yours faithfully
Gilbert + Tobin

Peter Waters Partner T +61 2 9263 4233 pwaters@gtlaw.com.au	

Appendix B. Curriculum Vitae

Nigel Attenborough

Director

NERA Economic Consulting
15 Stratford Place
London W1C 1BE
Tel: +44 20 7659 8514
Fax: +44 20 7659 8515
E-mail: nigel.attenborough@nera.com
Website: www.nera.com

Overview

Nigel Attenborough has a BA in Economics from Cambridge University, an MSc in Energy Economics with Distinction from the University of Surrey and an MBA from Kingston Business School, where he won the BPP prize.

Since joining NERA in 1991, Nigel has undertaken and directed a wide range of projects for telecommunications companies, regulatory authorities and government departments in Europe, Africa, Asia, Australasia and South America. These have involved a whole variety of topics including market definition and the analysis of competition, the impact of liberalisation, regulation of NGNs, assessment of different regulatory regimes, development of regulatory strategy, pricing strategy, the setting of price caps, tariff rebalancing, price discrimination and price squeezes, universal service, number portability and allocation and spectrum management and allocation. He also has extensive experience of the construction of LRIC models of interconnection costs, cost allocation, accounting separation, efficiency comparisons, benchmarking studies, licence valuations, demand forecasting and financial and price cap modelling, cost benefit analyses and economic impact studies.

Nigel has also testified as an expert witness on: the valuation of BT for the purposes of setting business taxes; the setting of mobile termination rates in Australia; two cases involving the estimation of damages in relation to the delayed start up of and restricted access to submarine cables; the estimation of damages relating to breach of a telecommunications revenue sharing contract in Poland; the estimation of damages resulting from the loss of a mobile telecoms licence in a middle eastern country; and the existence of a price squeeze and the related damages in a case involving mobile phone operators in Belgium.

Prior to joining NERA in 1991, Nigel worked for 5 years at BT, latterly as the head of regulatory economics and competition policy. He provided directors and senior managers with advice and analyses on economic issues relating to regulation and pricing, and also managed teams responsible for policy development and analysis of fair trading and competition issues and for dealings with Oftel on matters relating to financial regulation. Earlier he was an economic adviser to the Department of trade and Industry and to the Monopolies and Mergers Commission.

Qualifications

1988-90	**KINGSTON BUSINESS SCHOOL** MBA: Winner of BPP prize
1980-83	**UNIVERSITY OF SURREY** MSc in Energy Economics: Pass with Distinction
1968-71	**TRINITY COLLEGE, CAMBRIDGE**
B.A.	Economics

Career Details

Time working in telecommunications industry: 23 years
Time working as telecommunications consultant: 18 years

1997 - present	**NERA ECONOMIC CONSULTING, LONDON** Director of NERA and Head of NERA's European Telecommunications Practice
1994 Associate	Director
1991 Senior	Consultant
1990	**BRITISH TELECOM** Manager, Economics and Fair Trading
1988	Manager, Pricing and Regulatory Analysis
1986	Economist/Senior Commercial Analyst
1981 DTI	
Econom	ic Adviser
1978 DUNLOP	**LTD** Corporate Planning Department (secondment)
1976 MONOPOLIES	**AND MERGERS COMMISSION (secondment)** Senior Economic Assistant/Economic Adviser
1972 DTI	Economic/Senior Economic Assistant
1971 ARTHUR	**YOUNG**
Articled	Clerk

Project Experience

Expert witness

- Expert report on Telstra's model of the cost of its local loop infrastructure with particular reference to the cost of providing unbundled local loops (2009);
- Expert evidence in a case where Belgacom, the largest Belgian mobile operator, is being sued by the other operators for implementing a price squeeze and depriving them of customers. The case involves assessing whether there has been a price squeeze and, if so, what is the value of damages (2008-9);
- Expert evidence in an Austrian arbitration case while involves estimation of damages resulting from breach of a revenue sharing contract relating to the Polish long distance telecommunications backbone (2008-9);
- Expert evidence in a case involving the estimation of damages resulting from the loss of a mobile telecommunications licence (2007-8);
- Expert evidence in ICC arbitration case regarding the value of damages suffered by FLAG as a result of being prevented from accessing VSNL's submarine cable landing station in Mumbai (2006-7);
- Expert evidence in connection with AJC's claim for losses to be recovered from its insurance policy as a result of delay to launch of cable that resulted from accidental damage (2005-6);
- Expert evidence in connection with judicial review of the ACCC's decision regarding the appropriate mobile termination rate in Australia. Evidence covered how costs should be derived and prices set (2004-5);
- Expert evidence to the Lands Tribunal on behalf of Valuation Office Agency (UK) which, among other things, involved constructing a detailed future cash flow model for BT, as part of producing a rating valuation for BT (1999-2000);
- Appearance before Monopolies and Mergers Commission on behalf of T-Mobile (1998);
- Presentation of T-Mobile's case to Ofcom during an investigation into unfair cross subsidisation (1998);
- Expert evidence on damages caused by the failure of equipment used by an international reseller (1997).

Costing studies

- Construction of mobile operator LRIC models for MOC, the Israel regulator (2009)
- Review and assessment of Telstra's cost model for unbundled local loop services (2008);

- Assessment of BT Openreach's relative efficiency using econometric techniques for Ofcom (2007);
- Construction of LRIC cost model for mobile operator in Pakistan. Results of modelling are to form part of submission to regulatory authority (2007);
- Review and critique of the regulatory authority's mobile LRIC model for Netcom, the Norwegian mobile operator (2006 and 2007);
- Development of methodology for top-down LRIC model for an Italian mobile operator and advice on its implementation (2006 and 2007);
- Construction of bottom-up fixed network and mobile network LRIC models for the Oman telecommunications regulator (2006);
- Development of bottom-up mobile LRIC model for an Italian mobile operator (2005/6);
- Construction of bottom-up fixed network and mobile network LRIC models for the Malaysian communications regulator, MCMC (2005);
- Review of mobile bottom-up LRIC model built for the Romanian telecommunications regulator, on behalf of Orange Romania (2005/6);
- Comparative efficiency assessment of KPN, for the Dutch regulator, OPTA (2005)
- Review of a fully allocated cost model developed by a Israeli mobile operator to estimate its costs of different types of mobile call (including interconnection traffic) and development of top-down LRIC model to estimate mobile termination costs (2004);
- Comparative efficiency assessment of BT's fixed network services, for Ofcom (2004);
- For Korea Telecom, development of bottom-up LRIC model of its access network in a representative sample of areas in order to measure universal service costs (2004);
- Advice to the Chinese Academy of Science on how to construct top down and bottom up LRIC models of the costs of terminating calls on fixed and mobile networks (2003);
- Assessment of the efficiency of NTT West and NTT East for MPHPT, the Japanese Ministry of Communications, (2003);
- Support and assistance to a major European communications operator in its development of a top-down LRIC access cost model (2003);
- For KTF, the Korean mobile operator, the construction of a large LRIC interconnection model for 2G and 3G services (2002);
- Updates of the bottom-up LRIC model of KPN's network costs for OPTA, the Dutch telecoms regulator (2002 and 2003);
- Assessment of comparative cost efficiency for a large European telecommunications operator (2002);

- Assessment and advice on redevelopment of a cost allocation model for a major European cable TV operator (2002);
- Developing a model of the impact of a cost based wholesale access product in the UK for Centrica Telecommunications (2002);
- Validation of costs underlying Eircom's reference interconnection offer for ODTR, the Irish telecoms regulator (2001);
- Construction of bottom-up LRIC models for fixed and mobile networks for CMC, the Communications Commission in Malaysia (2001);
- Construction of a new bottom-up LRIC model of KPN's network, for OPTA, the Dutch regulatory authority (2001);
- Advice to the Irish regulator (ODTR) on the reconciliation of the results of bottom-up and top-down models for the incumbent's costs (2001);
- Construction of unbundled local loop cost model of Deutsche Telekom, for Mannesmann (2000);
- Review of Telecom Italia's estimate of its unbundled local loop charges and its access deficit, for the Italian Telecommunications Authority (2000);
- Advice to the Italian Telecommunications Authority on the definition of an accounting system based on current costs (2000);
- Construction of a bottom-up LRIC model of Eircom's network, for ODTR, the Irish regulatory authority (2000);
- Construction of a bottom-up LRIC model of Swisscom's network, for Bakom, the Swiss regulatory authority (1999);
- Estimate of the costs of different elements of Eircell's GSM network, for Esat Digifone, the Irish mobile telephone operator (1999);
- Interconnection cost study, involving the construction of a bottom-up LRIC model, the review of a top-down embedded direct cost model and the reconciliation of the results, for OPTA, the Dutch regulator (1998 and 1999);
- Estimation, using a hybrid bottom-up and top-down methodology, of LRIC for network and retail services, for Singapore Telecom (1997);
- Construction of a bottom-up model of Telstra's call conveyance and access networks, for the Australian Competition and Consumer Commission (1998 and 1999);
- Estimation of LRIC of France Telecom's conveyance and access networks, for a group of new entrants in France (1998);
- Advice on bottom-up modelling of interconnection costs for NTT in Japan (1999);
- Estimation of the fully allocated, historic costs of terminating calls on Vodafone and Cellnet's mobile networks, for a UK new entrant fixed network operator (1996);
- For O.tel.O, estimation of LRIC for Deutsche Telecom's network Services using a bottom-up model (1997);

- Advice to OFTEL on the methodology and development of bottom-up and top-down models of BT's access and call conveyance network, and reconciliation of the results of the two different approaches (1996 and 1997);
- Estimation of the costs of interconnection and individual services for a regional UK operator and advice on accounting separation and cost allocation (1994);
- Estimating individual service costs for Telefónica in Spain and for the Ministry of Economics in Argentina (1995);
- Modelling the costs of two UK new entrants (1995 and 1996);
- Modelling interconnection and universal service obligation costs for a major European operator (1995);
- Defining and estimating long run incremental costs in the UK (for retail services and for interconnection) using top-down and bottom-up methodologies for Oftel, the UK regulator (1992);
- Modelling the costs of different means of accessing telephone customers, for a UK operator (1995);
- Study of the costs of different mobile telecommunications networks for an Australian operator and, more recently, for a UK operator (1993);
- Study, for a major UK utility, of the costs of outsourcing its telecommunications requirements (1994).

Regulation

- Advice to Ofcom on the possible bases for capacity charging for interconnection to a next generation network (2008);
- Literature review and econometric analysis for Zain as to whether there is a point beyond which the entry of additional mobile operators into a market can have an adverse effect on consumers and the economy (2008);
- Assistance to Belgacom Mobile in abuse of dominance case brought by the Belgian competition authority (2008);
- Development of new licensing regime in UAE, for the Telecommunications Regulatory Authority (2007);
- Assessment of the case for licensing MVNOs in Israel and the need for mandated access terms if such licensing occurred, for the Minstry of Communications (2007);
- Advice and analysis for a Norwegian mobile operator on the basis for setting mobile termination charges and support to them in their negotiations with the Norwegian regulatory authority (2006 and 2007);
- Study for Vodafone on the rationale for and development of a model (using econometric estimates of price elasticities) to estimate the value of a network externality surcharge on interconnection charges in African countries (2006 and 2007)

- Advice to Wind in Italy on a variety of regulatory issues including bundling, issues raised by next generation networks, fixed and mobile interconnection charges, cost modelling and accounting separation (2006 and 2007);
- Advice to T-Mobile in Hungary on the development of MVNOs in Europe, the factors leading to success or failure, when regulation is necessary, the circumstances under which access terms should be mandated and the current circumstances in Hungary and their implications for MVNO development (2006);
- Report setting out the arguments relating to deregulation of broadband services and estimation of the potential benefits from doing so in four European countries using detailed input-output analysis, for a major European operator (2005/6);
- Report for UK mobile operator on the impact of national roaming, to support a submission to the regulator, Ofcom (2004);
- Advice and analysis for BT in assessing Ofcom's proposals for a modified price squeeze test for broadband services (2004);
- Market definition and assessment of competition in all the main communications markets in Malaysia for MCMC, the Malaysian regulatory authority (2004);
- Various studies for Ofcom, the UK regulator, including:
  - construction of model of BT's OSIS costs (2006);
  - identification of possible new uses for certain parts of the radio spectrum and assessment of the respective costs and benefits, in consortium with Red-M, Cardiff University, Roke Manor and BAE (2005/6);
  - estimation of the costs and benefits of allocating particular parts of the radio spectrum to different uses (2004);
  - assessment of the comparative efficiency of BT's network business (2004);
  - assessment of the comparative efficiency of Kingston Communications (2003);
  - construction of a model for assessing the potential profitability of firms renting exchange lines from BT (2003);
  - assessment of the profitability and efficiency of the UK mobile operators (2001);
  - assessment of the efficiency of BT (2000);
  - cost-benefit analyses of the introduction of number portability and equal access into the UK (1993 and 1995);
  - an analysis of BT's incremental costs and, more recently, a separate series of studies looking at existing models for measuring incremental costs of access and call conveyance and how their results can be reconciled (1992, 1996 and 1997);
  - evaluation of telecommunications provision in Wales and its impact on economic development (1992);
  - analysis of the UK and North American markets for resale (1994);

- Advice and analysis for NTT DoCoMo on regulation of mobile telecommunications and, in particular, the level of call termination charges (2003);
- Advice to the Rwanda government on various aspects of the liberalisation of Rwandatel (2003);
- Study for the World Bank of the comparative effectiveness of regulation in different African countries and the implications for future policy (2003);
- Advice and recommendations to CMC in Malaysia on the scale and possible methods of funding the losses made on line and local call services (2002);
- Advice to ComReg, the Irish regulator, on market definition and assessment of dominance in the context of determining which retail services should be subject to price cap regulation (2002);
- Development of a performance contract with the incumbent operator to address the unmet demand and extend the network for the Egyptian Telecommunications Authority (2000);
- Estimation of Telefonica’s universal service obligation costs (2000);
- Advice and recommendations to MCMC in Malaysia on the provision of universal service and the measurement and funding of the costs involved (2000);
- Review of Telecom Italia’s estimate of its universal service obligation costs, for the Italian Telecommunications Authority (1999, 2000 and 2001);
- Advice on radio spectrum policy in France for the Ministry of Industry (1999);
- Arguments for and against the introduction of mobile number portability and carrier selection and their application in 8 European countries, for Vodafone Airtouch (1999);
- Advice on the regulatory framework and priorities that should apply given the privatisation of the Bahamas Telecommunications Corporation (1998);
- Assistance to Botswana Telecommunications Authority in the development of a performance contract with BTC, and development of regulatory principles and guidelines for telecommunications prices (1998); A cost-benefit analysis of the introduction of mobile network number portability in Hong Kong, for OFTA (1998);
- Advice to Botswana Telecommunications Authority on the development of a strategy to enable it to meet its mandate (mission statement, organisational structure, staff qualifications, outsourcing needs, funding strategy) (1998-99);
- For DG XIII of the European Commission, study of the regulatory and legal issues associated with the creation of a regulatory authority at the level of the European Union (1997);
- Advice on development of costing system and price setting for OSIPTEL, the Peruvian regulatory authority (1996 and 1997);
- For DG XIII of the European Commission, study examining the implementation and impact of the Open Network Provision (ONP) in Member States (1996);

- Advice and recommendations to the Argentine Ministry of Economics on institutional restructuring of telecommunications regulation (1995);
- A study of the implications of EU telecommunications regulation for a major broadcasting company (1995);
- For a French mobile telecommunications operator, a comparative study of the regulation of fixed wireless local loop services in different countries (1996);
- Advice and analysis for CWC in formulating its strategy in the face of different possible future regulatory scenarios (1998);
- Advice on who should pay what for the costs of number portability, for Oftel in the UK and Optus in Australia (1996).

Liberalisation

- Literature review and econometric analysis for Zain as to whether there is a point beyond which the entry of additional mobile operators into a market can have an adverse effect on consumers and the economy (2008);
- Assessment of the interconnection and retail service costs and access deficit of Batelco, the Bahamas telephone company, and their implications, as part of the preparation for future privatisation and liberalisation (2003);
- Advice to the Algerian Ministry of Telecommunications on the introduction of competition in the mobile market via the award of a second GSM licence (2001);
- Analysis of the development of competition in the mobile market and the implications for regulation for the Greek regulatory authority (2000); For Vodafone Airtouch, an assessment of the state of mobile telephone competition in 8 European countries (1999);
- Analysis of the Greek mobile telecommunications market, including analysis of the state of competition and the development of a model to facilitate international mobile tariff comparisons, for EETT, the Greek telecommunications regulator (1999);
- Advice and analysis relating to feasible liberalisation options given the privatisation of the Bahamas Telecommunications Corporation (1998);
- Development of a framework for assessing whether a market is competitive, for regulatory purposes, for a group of new entrants in the UK (1996);
- Modelling the impact of various EU liberalisation measures on Portugal Telecom and examining the effectiveness of a number of alternative strategic responses (1996);
- Advice to Energis on its response to the DTI's consultative document on the liberalisation of UK international telecommunications services (1996);
- Forecasting the development of the UK telecommunications market and the share of different operators for a group of new UK operators (1995);
- Analysing and modelling the potential impact of liberalisation, and the sustainability of existing tariff structures in a competitive environment for Telefónica de España (1993).

Interconnection (for costing studies – see previous section)

- Advice to Ofcom on the possible bases for capacity charging for interconnection to a next generation network (2008);
- Assessment of interconnection cost benchmarking carried out by the NZ Commerce Commission on behalf of Vodafone NZ (2005/6);
- Review of fully allocated current cost mobile network cost model, used for estimating call termination charges, for an Italian operator (2005);
- Expert witness in judicial review of ACCC's decision on mobile termination charges (2004 and 2005);
- Report for UK mobile operator on impact of national roaming, to support a submission to the regulator, Ofcom (2004);
- Review of mobile network cost model, used for estimating call termination charges, for an Italian operator (2004);
- Advice and analysis for NTT DoCoMo on regulation of mobile telecommunications and, in particular, the level of call termination charges (2003);
- Provided advice to the Chinese Academy of Sciences on bottom-up and top-down LRIC cost modelling for fixed and mobile networks (2003);
- Advice on the desirability and feasibility of multiple year price controls for interconnection services and interconnecting leased lines for OPTA, the Dutch regulator (2002);
- Advice on the feasibility and design of a local interconnection roll out policy for OPTA, the Dutch regulator (2002);
- Advice and support to OFTEL in connection with the UK Competition Commission inquiry into charges for calls to mobile phones (2002);
- Advised Telefonica Centroamerica (in Guatemala) in a conflict with the fixed operator about fixed and mobile termination rates. The main focus was the issues affecting the cost of termination on fixed and mobile networks and the implications (2002) for interconnection charges;
- Advice to the Malta Communications Authority on the development of a strategy relating to the implementation of cost based accounting systems in the telecommunications sector (fixed and mobile) (2001);
- Analysis of existing LRIC cost models in Germany, for Mannesmann (2000);
- Regular advice on interconnection charges and cost accounting systems, for a variety of entrants in the UK, including CWC, Scottish Telecom, Worldcom, AT&T and Energis (1991-2001);
- Advice to One2One (now T-Mobile UK) in connection with the MMC inquiry into the price of calls to mobile phones (1998);
- Advice to Esat Digifone on the costs of interconnection, including benchmarking the price of terminating fixed calls on mobile networks and vice versa (1998);

- Advice to Telefonica on how its interconnection costs might be expected to differ from those specified in the benchmarks issued by the European Commission (1998);
- Advice to TeleDanmark on how its interconnection costs might be expected to differ from those of BT (1998);
- Study of the implications of a possible new interconnection charging regime for a regional UK operator (1998);
- Analysis, for Portugal Telecom, of the structure and level of interconnection charges, and the method by which they are set, in 14 European and non-European countries (1996);
- Study of the economic impact of a change in the UK system for determining international interconnection charges, for a new UK operator (1995);
- Advice to a major Asian telecommunications operator on number portability, interconnection and access deficit charges and universal service issues (1995);
- An assessment for Telecom Eireann of different interconnection charging options (1993);
- Helping a new UK operator to negotiate its terms and conditions of interconnection (1992).

Pricing

- Advice to Ofcom on the possible bases for capacity charging for interconnection to a next generation network (2008);
- Advice and analysis for Vodafone in Germany on the setting of mobile termination rates and the underlying costs (2006);
- Support for UPC in justifying its analogue cable TV tariffs to the Dutch Competition Authority (NMa) (2005);
- Development of interconnection price benchmarking system which takes operator and country differences into account for two German mobile operators (2005);
- Development of financial model for setting price cap for SingTel fixed network services, for IDA, the Singapore regulator (2004);
- Assistance to UPC in the construction of a cost model and the use of its output to justify its prices for analogue cable TV services (2003 and 2004);
- Construction of detailed financial models of NTT West and NTT East for the purpose of setting price caps for switched services and leased lines for MPHPT, the Japanese Ministry of Communications (2003);
- Examination of the possible extent of local tariff rebalancing and its implications, for MCMC the Malaysian regulatory authority (2002);
- Advice on the desirability and feasibility of multiple year price controls for interconnection services for OPTA, the Dutch regulator (2002);

- Market analysis, efficiency assessment, construction of a financial model and economic advice to ODTR, the Irish regulator, as part of the setting of a new retail price cap (2002);
- Advice to a European regulator on the development of pricing structures for voice and Internet traffic, and the impact of pricing on competition (2001);
- Construction of a model and forecasts of the revenue, cost and capital expenditure of KPN to estimate the appropriate value of X in the price cap formula for retail telephone service prices, for OPTA, the Dutch telephone regulator (1999);
- Construction of a UK mobile price index for OFTEL, the UK telecommunications operator (1999);
- Advice to Telecom Italia about the acceptability and justification of volume discounts (1999);
- Advice on feasible tariff rebalancing and price controls in Botswana for the Telecommunications Authority (1999);
- Examination of the impact of liberalisation of international telecommunications services in the Bahamas and the extent of rebalancing required to maintain the viability of Batelco, as part of a pre-privatisation study for the Government of the Bahamas (1998);
- Advice on the impact and effectiveness of price regulation in the UK and US, for NTT in Japan (1997);
- Advice on pricing strategy to Orange (1997);
- Analysis of telephone tariffs in Argentina and recommendations regarding future rebalancing options to Ministry of Economics (1995);
- The development of a pricing strategy model for CWC (1994);
- Development of business planning models for several new UK operators (1994-1997);
- Advice to NTL on a wide range of regulatory issues including its price cap review (1991-1996);
- At various times, advice, analysis and modelling work relating to the review of BT's price cap, for Mercury, the cable TV operators and a number of regional new entrants (1992 and 1996);
- Analysis for and advice to Telefonica on the arguments for and benefits of tariff rebalancing (1993);
- Study of the economic impact (including economic efficiency and welfare implications) of a tariff rebalancing programme by Telecom Eireann (1993);
- Assessment of the possible existence of predatory pricing and cross-subsidisation in the leased lines market, for a UK new entrant (1991);
- Assessment of transfer pricing issues and pricing policy for Royal Mail (1991).

Mobile telecommunications (for costing studies – see above)

- Literature review and econometric analysis for Zain as to whether there is a point beyond which the entry of additional mobile operators into a market can have an adverse effect on consumers and the economy (2008);
- Development of demand models for mobile communications in South Africa and their application to assess the size of network externalities (2006/7);
- Estimation of price elasticities of mobile services for a group of European mobile operators (2005);
- Report for UK mobile operator on impact of national roaming, to support a submission to the regulator, Ofcom (2004);
- Advice and analysis for NTT DoCoMo on regulation of mobile telecommunications and, in particular, the level of call termination charges (2003);
- Construction of a LRIC interconnection model for use in Korea to determine the costs to be charged by KTF for the mobile market (2002);
- Advice to KTF on strategic issues (2002);
- In a consortium with BNP Paribas, NERA was selected to advise the Algerian Ministry of Communications on the allocation of a 2G license in Algeria. NERA also provided advice on the valuation of the spectrum (2001);
- Advice as part of a 'due diligence' exercise for PwC India (2001) on behalf of ICICI, who needed to evaluate the potential for funding SCL's (the cellular mobile telephone services provider) expansion and refinancing plans;
- Advice to Ben, a Dutch mobile operator, on the level of call mobile termination charges (2001);
- Construction of bottom-up LRIC models for GSM 900 and GSM 1800 mobile networks for CMC, the Communications Commission in Malaysia (2001);
- Assessment of the economic impact of the UK mobile market for the MTAG (mobile telecommunications advisory group) (2000);
- Analysis and advice to a European operator on the introduction of mobile communications in a subterranean rail network (2000);
- Advice to the Italian Ministry of Communications on the procedures and design of the 3G auction (2000);
- For Vodafone Airtouch, an assessment of the state of mobile telephone competition in 8 European countries (1999);
- Construction of a UK mobile price index, for OFTEL, the UK telecommunications regulator (1999);
- Arguments for and against the introduction of mobile number portability and carrier selection and their application in 8 European countries, for Vodafone Airtouch (1999);

- Analysis of the Greek mobile telecommunications market, including analysis of the state of competition and the development of a model to facilitate international mobile tariff comparisons, for EETT, the Greek telecommunications regulator (1999);
- Advice to One 2 One in connection with the MMC inquiry into the price of calls to mobile phones (1998);
- Advice to Esat Digifone on the costs of interconnection, including international benchmarking of the price of terminating fixed calls on mobile networks and vice versa (1998);
- A cost-benefit analysis of the introduction of mobile network number portability in Hong Kong, for OFTA, the telecommunications regulatory authority (1998);
- Advice on pricing strategy to Orange (1997);
- Estimation of the fully allocated, historic costs of terminating calls on Vodafone and Cellnet's mobile networks, for a UK new entrant fixed network operator (1996);
- Study of the costs of different mobile telecommunications networks for an Australian operator (1993).

Licence applications

- Construction of valuation model (using DCF model of detailed revenue and cost projections based on network roll out plan) for 2nd mobile licence in Algeria for the Algerian Ministry of Communications (2001);
- Development of UPC's business plan in support of its participation in the auction for LMDS licences in Switzerland (2000).
- Advice and inputs into the business and investment plans of Bouygues Telecom, and estimate of the impact on employment and GDP, when it bid for and won the third GSM licence in France (1994);
- Advice and inputs into the business and investment plans of Airtel, and estimate of the impact on employment and GDP, when it bid for and won the second GSM licence in Spain (1995).

Other projects relating to business plans and forecasting

- Forecasting BT's future cash flows for the purposes of determining BT's value for rating purposes, for VOA (2008-9)
- Expert evidence in a case involving the estimation of damages resulting from the loss of a mobile telecommunications licence (2007-8);
- Advice and analysis for VOA in connection with the state aid investigation mounted by the European Commission in connection with the way that the rating assessment of BT had been carried out (2006);
- Expert witness for insurance company regarding assessment of damages relating to delay in completion of trans-oceanic submarine cable (2004);

- Construction of a model and forecasts of the revenue, cost and capital expenditure of KPN to estimate the appropriate value of X in the price cap formula for retail telephone service prices, for OPTA, the Dutch telephone regulator (1999);
- Estimation of employment effects for TIW in respect of its bids for mobile telecommunications licences in Romania, Hungary and the Czech Republic (1997 and 1999);
- Expert assessment of a damages claim relating to the losses incurred by a telecommunications reseller as a result of the failure of its switching equipment (1997);
- Estimation of the impact on employment of liberalising postal services in the UK and France, for UPS (1996).
- Modelling the impact of various EU liberalisation measures on Portugal Telecom and examining the effectiveness of a number of alternative strategic responses (1996);
- Forecasting the development of the UK telecommunications market and the share of different operators for a group of new UK operators (1995); Designing an investment appraisal system for Slovak Telecom and SPT Prague (1995);
- Assistance to Torch Telecommunications in constructing its business plan (1994);
- Estimation of employment effects and advice and analysis in respect of business and investment plans and for the consortia which won the PCN licence in France and the second GSM licence in Spain (1994 and 1995);
- Analysing and modelling the potential impact of liberalisation, and the sustainability of existing tariff structures in a competitive environment for Telefónica de España (1993).

Publications

“Money, Oil and the Sterling Roller-Coaster: An Examination of the Causes of Recent Exchange Rate Changes”, MSc Dissertation, *University of Survey*, 1983.

“Employment and Technical Change: The Case of Microelectronic-Based Production Technologies in UK Manufacturing Industry”, *Government Economic Service Working Paper* No.74, Department of Trade and Industry, London, 1984.

“Government Regulation and the Development of Public Terrestrial Mobile Communications”, MBA Dissertation, *Kingston Business School*, May 1990.

“Economic Effects of Telephone Price Changes in the UK”, with Robin Foster and Jonathan Sandbach, *NERA Topics No. 8,* London, September 1992.

“Regulation of Competitive Telecommunications Markets”, *NERA Topics No 12*, London, September 1993.

“Pricing and the Development of Competition in UK Telecommunications”, published by *Datapro International*, April 1994.

“Measurement and Funding of USO Costs: Some Brief Concluding Thoughts” in “USO in a Competitive Telecoms Environment”, *Analysys Publications*, February 1995.

"Are Three to Two Mergers in a Market with Entry Barriers Necessarily Problematic?" with Fernando Jimenez and Gregory Leonard, *European Competition Law Review*, October 2007.

Presentations

"Privatisation and Competition: The Impact on BT", paper Presented to *CPC Conference*, Amersham, May 1991.

"What do Users want from the Regulators", Paper presented *to Networked Economy Conference*, Paris, March 1992.

"Local Loop Competition: The Key Regulatory Issues", paper presented *to 5th Economist Telecommunications Conference*, Vienna, September 1993.

"Pricing and the Development of Competition in UK Telecommunications", paper presented to *AIC Conference on Regulation and Infrastructure*, London, December 1993.

"How should Interconnection Charges be Set?", paper presented to *IIR Conference on Negotiating Interconnection Agreements*, London, April 1994, and also October 1994.

"Regulation and the Development of Competitive City Telecommunications", *AIC Conference on City Telecoms Networks*, London, October 1994.

"Measurement and Funding of USO Costs: Some Brief Concluding Thoughts", paper presented to a *Symposium on USO in a Competitive Telecoms Environment*, Magdalene College, Cambridge, December 1994.

"Telecommunications Liberalisation in the UK", paper presented to *IBC Conference on Competition in Asia's Telecom Markets*, Hong Kong, June 1995.

"Economic and Accounting Issues Relating to Interconnection Charges", paper presented to *IBC Interconnection Conference*, London, September 1995.

"Analysis of Proposed EC Interconnection Directive", paper presented *to IIR Cable Telephony Conference*, London, January 1996.

"Using Incremental Costs for Interconnection Charging" paper presented to IIR Interconnection '96 Conference, London, January 1996.

"Funding of Universal Service and Local Access Costs in the UK", *Vision in Business Conference on Costing and Accounting of Interconnection*, London, January 1996.

"Establishing a Regulatory Regime that Promotes Fair Competition", *IIR Conference on Telecoms Regulation*, London, April 1996.

"Liberalisation and Competition in International Services", *AIC Conference on International Telecoms Pricing and Facilities*, London, October 1996.

“Interconnection Charges: Where have we Come from and Where are we Going?”, SMi *Conference on Practical Strategies for the Negotiation of UK and European Interconnection Charges*, London, October 1996.

“Economic Aspects of Interconnection Agreements”, *AIC Seminar on Interconnection Agreements*, Frankfurt, October 1996.

“Employment Impact of Postal Services Liberalisation”, *Satisfying Consumer Needs in the Global Village: The Postal Challenge*, Global Panel, The Hague, December 1996.

“Setting Interconnection Charges: An Evaluation of the Alternatives”, *IIR Interconnection ’97 Conference,* London, February 1997.

“Impact of Regulation on Profitability of Telecommunications Investments: The Case of Cable Television Networks”, *Aspectos Juridicos de Las Telecomunicaciones,* Instituto de Fomento Empresarial, Madrid, March 1997.

“Long-run Incremental Cost and its Use for Setting Interconnection Charges”, *Vision in Business Workshop,* Brussels, March 1997.

“Measurement of Universal Service Costs in Telecommunications”, *Centre for Asia Telecoms Conference on Cost Allocation in Telecoms,* Singapore, April 1997.

“Current developments in Interconnection charging” *SMi Conference on Practical Strategies for the Negotiation of UK and European Interconnection Charges,* London, April 1997.

“How Should Interconnection Costs be Measured? *Vision in Business 4th International Interconnect Forum,* Brussels, September 1997.

“The Structure of Reform in Telecommunications Interconnection across Europe”, *SMi Conference on UK and European Interconnection Charges,* Brussels, November 1997.

“International Interconnection Rates and Costs”, *IBC 1997 International Forum on Interconnection,* Amsterdam, November 1997.

“Evaluation of Different Methods of Determining Costs and Setting Interconnection Charges”, *IIR Interconnection Conference,* London, January 1998.

"Measurement of Interconnection Costs and Setting Interconnection Charges", *Institute of Telecommunications*, Warsaw, June 1998.

"Why Use Long-Run Incremental Costs?", *IIR Conference on Allocating Costs in the Telecommunications Industry*, London, July 1998.

"Regulation and Number Portability", *IIR Conference on Developing Effective Regulatory Strategies for Telecommunications Operators*, London, October 1998.

"Using Conjoint Analysis to Forecast Demand and Determine Telecommunications Pricing structures", *IIR Conference on Market Forecasting for Telecommunications Operators*, London, November 1998.

Issues Arising from the MMC Inquiry into Charges for Calls to Mobile Telephones in the UK", *European Mobile Telecommunications Regulation and Competition Law Conference,* Brussels, March 1999.

"Regulation of Number Portability and Carrier Pre-Selection", *IIR Interconnection '99 Conference,* London, March 1999.

"Bottom-Up LRIC Modelling: What Does it Involve and How Can it be Used", *Vision in Business Conference on LRIC and Cost Allocation for Interconnection Pricing,* Brussels, April 1999.

"Number Portability: Challenges and Solutions", *IIR Conference on Technical and Commercial Strategies for Telecoms Operators,* London September 1999.

"Control of Mobile Interconnection Prices", *European Mobile and UMTS Regulation and Competition Law Conference,* Paris, April 2000.

"How Regulatory Considerations Affect Business Plans", *Vision in Business Valuation and Bidding Strategies Workshop,* Paris, April 2000.

"Regulating Wholesale Services: The European Experience", *London Business School Conference on Regulating Wholesale Services Prices,* London, April 2001.

"Competing in a Regulated Telecommunications Environment", *Infocom 2001*, Budapest, May 2001.

"Regulation of Dynamic Industries", *BT Conference on "The New World Order in Regulation"*, London, September 2001.

"Cost Allocation and Recovery for New Services", *IIR Conference on Cost Control and Profitability in Telecoms*, London, October 2001.

"Applying LRIC to Fixed to Mobile Interconnection", *Vision in Business Conference on Network Cost Reduction in Telecoms,* London, November 2001.

"Applying LRIC to Fixed to Mobile Interconnection", *Vision in Business Conference on Network Cost Reduction in Telecoms,* London, April 2002.

"Cost Based Pricing for Mobile Termination", Vision in Business Conference on Mobile Regulation and Competition Law, Brussels, July 2003.

"Implications of Broadband Deregulation for GDP and Employment in Europe: Some Case Studies Using Input-Output Analysis", London Business School Regulatory Seminar, June 2006.

Appendix C. List of documents relied upon

Listed below are all the documents and models that were relied upon in preparing this expert report:

- ACCC, *Draft pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS and LSS* (**Draft Pricing Principles and Pricing**), August 2009
- Telstra Efficient Access Model (**TEA Model**), version 1.5;
- Model developed by Analysys on behalf of the ACCC (**Analysys Model**), version 2.0;
- Statement from Tony Mew (**Telstra Statement**);
- Statement of Ewan Chandler, 12 August 2008
- Supplementary Statement of Ewan Chandler, 12 December 2008
- Statement of Gregory Ware, 12 August 2008
- Statement of Michael Choudhury, 19 December 2008
- Statement of Thomas Cooke, 17 December 2008
- Telstra Corporation Limited, ULLS Undertaking, *Operations and Maintenance and Indirect Cost Factor Study*, Public Version, 7 April 2008.
- Analysys, Fixed LRIC model documentation – Version 2.0.
- Data for the US local exchange carriers (LECs) submitted and published by the FCC in its ARMIS database.
- NERA, *The Comparative Efficiency of Openreach*, Report for Ofcom, 17 March 2008, http://www.ofcom.org.uk/consult/condocs/llcc/efficiency.pdf
- ACCC, Unconditioned Local Loop service: Access Dispute Between Telstra Corporation Limited (access provider) and Chime Communications Pty Ltd (access seeker), Statement of Reasons for Final Determination, March 2008.
- Telstra's website: http://www.telstra.com.au/movinghome/newcustomer.cfm
- H. Hotteling (1925), "A General Mathematical Theory of Depreciation", *Journal of the American Statistical Association*, Vol. 20.
- Federal Communications Commission, FCC 96-325, August 1996.
- Independent Regulators Group, *Principles of Implementation and Best Practice Regarding FL-LRIC Cost Modelling,* 24 November 2000.

ACCC, Access Pricing Principles - Telecommunications, July 1997.

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