



Telecom New Zealand's Report
to
the Commission
on
**Modelling of the TSLRIC toll-bypass
interconnect cost**

31 August 2004

PUBLIC VERSION

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A: BACKGROUND

Section 45 Notice

- 1 The Commission issued a section 45 notice to Telecom on 30 April 2004 (the "**Notice**"), requiring Telecom to calculate the price payable for interconnection with Telecom's PSTN in accordance with section 45(1) of the Telecommunications Act 2001 (the "**Act**"). Section 45(2) also requires delivery of a 'statement' that sets out how the interconnect price was calculated, and all information on which the calculation of the price was based (the "**Statement**"). The Notice reiterates the statutory requirement for a Statement.
- 2 To assist the Commission with the price review process, the Commission has suggested that Telecom's Statement should include the following:
 - 2.1 an explanation of all input and output values and processing steps in the calculation including the relevant metric and, when appropriate, the relevant time period;
 - 2.2 a statement as to whether the calculation relies on particular models or input files to provide values;
 - 2.3 all assumptions and formulae used in calculating the price and logic flow diagrams for each step of the calculation and, where possible, cross-reference to the relevant parts of the calculation;
 - 2.4 step by step instructions on how to calculate the price payable.
- 3 This Report, and the associated CostPro model on the CD, form Telecom's Statement. As part of Telecom's commitment to working with the Commission on TSLRIC modelling we have made every effort to follow the Commission's suggestions for the Statement, as set out above.
- 4 The main model is the CostProNZ model developed by the Commission to calculate the 01/02 TSO cost (the "**model**"). The input files and values used are as supplied by the Commission except where specified in this Report. All assumptions and formulae used are also as supplied by the Commission except where specified in this Report and detailed in the accompanying model.
- 5 We have recorded and explained every change in the CostPro model – either in this Report or as notes and comments on spreadsheets. Logic-flow diagrams remain as in the original CostPro model. Step by step instructions on how to run the model are provided in **Annex 6** to this Report. Note that we have not attempted to explain input values and assumptions that have

not been changed from those in the CostPro model given to us by the Commission.

- 6 We have also used the output of the models underlying the Commission's 02/03 draft TSO determination, in order to calculate the extent of the TSO/TSLRIC overlap. These models are described in detail in the Commission's 02/03 TSO Draft Determination (30 June 04) and this detail is not repeated here.
- 7 In addition to the above list, the Commission has suggested Telecom should include in its Statement:
 - 7.1 all input values;
 - 7.2 the source of each input value;
 - 7.3 a breakdown of costs including -
 - (a) annual costs by major cost category,
 - (b) capital investment by element type and LICA group,
 - (c) per minute cost by cost element,
 - (d) analysis of variance in per minute rates by LICA group; and
 - 7.4 information demonstrating the model is capable of performing sensitivities on traffic volumes, WACC, tilted annuity parameters, allocations of shared and common costs, and percentage mark-ups of operating expenses.
- 8 Telecom confirms that:
 - 8.1 the information sought by the Commission is contained either in this Report or in the spreadsheets within the model. (Again, we have not attempted to provide a source for input values that have not been changed from those in the CostPro model given to us by the Commission. However, we have identified and sourced all input values that Telecom has either added or changed);
 - 8.2 the model can provide the breakdown of costs by major cost category; and
 - 8.3 the model is capable of performing the sensitivities specified.

Choice of model

- 9 The requirements of the Notice, unlike the requirements issued by the Commission for the TSO modelling under section 83, do not stipulate what model Telecom must use to calculate the TSLRIC price. In theory, at least, Telecom had a choice about whether to use the Commission's CostPro model or to develop its own model.
- 10 At the outset of these proceedings, Telecom expressed a view to use the Commission's CostPro model. Telecom was compelled to this position for two interrelated reasons:
- 10.1 **Commission familiarity with the CostPro model:** Telecom recognises that Commission staff have been actively involved in developing the CostPro model, have subjected the CostPro model to extensive testing and appraisal, and the Commission has now used the CostPro model in at least two draft determinations and one final determination; and
- 10.2 **the TSO precedent:** in the TSO context, the Commission has required Telecom to use the Commission's models when calculating the TSO net cost each year, despite Telecom's concerns over the appropriateness of the models under the Act. In the TSLRIC context, the Commission has already stated it intends to use the CostPro model for its calculation of the TSLRIC price. Given Telecom's TSO experience, Telecom felt constrained to also use the CostPro model for its calculation of the TSLRIC price, or risk substantial (unnecessary) expenditure developing a model that the Commission was likely to render worthless for calculating the TSLRIC price.
- 11 The CostPro model is large and complex. Not surprisingly it has errors. Where possible Telecom has sought to rectify the errors in the current model. The errors in the spreadsheets have been easy to rectify. However, errors in the source code could not be rectified by Telecom. The Commission's consultants have agreed that the CostPro model is in error, but have not supplied Telecom with a corrected recompiled version of the CostPro model.
- 12 To get around the source code problem we have done a series of 'workarounds' in the spreadsheets and the database. While these fixes are far less elegant than correcting the source code, they work the same. These workarounds are detailed in **Annex 5**.

General approach

- 13 The Commission has stated that the document *'Implementation of a Total Service Incremental Cost (TSLRIC) Pricing methodology for Access*

Determinations under the Telecommunications Act 2001: Principles Paper (the "**Principles Paper**"), is an appropriate guide for Telecom's TSLRIC calculation. We have therefore followed the *Principles Paper* closely. In particular:

- 13.1 the model used is the CostPro model developed for the Commission to measure TSO call costs. Though this has necessarily been revised to account for differences between a TSLRIC approach and that required for the TSO, the revisions are not major and do not affect the basic structure and assumptions of that model. Revisions made to convert the CostPro model to a TSLRIC model are detailed in **Annex 1**;
- 13.2 the CostPro model uses the scorched node approach, is based on Modern Equivalent Assets, is a bottom up model, is element based, and is geographically de-averaged. It therefore fulfils the requirements of Section 4 of the *Principles Paper*;
- 13.3 the CostPro model separates the access and core networks at the line card as required in Section 5 of the *Principles Paper*;
- 13.4 the TSLRIC calculation uses the tilted annuity approach with the same tilt, time-to-build, and asset life parameters as for the Commission's TSO modelling as required in Section 6 of the *Principles Paper*. We have added further parameters to cover the software cost category which was excluded from the TSLRIC model. Parameters used are shown in **Annex 1**;
- 13.5 the calculation of the cost of capital follows the guidelines in Section 7 of the *Principles Paper*. The cost of capital calculation is summarised below and detailed in **Annex 3**;
- 13.6 we have followed the guidelines as specified in sections 8 to 10 of the *Principles Paper* on: services included in the CostPro model, common cost allocations, and operating costs. The parameters used are covered in more detail in this Report;
- 13.7 equipment costs have been updated to take account of two factors – (i) changes in the original unit costs provided by Telecom, reflecting both a better understanding of how these are used in the model and correction of errors in our original data supplied to the Commission. Details of the unit cost changes are provided in **Annex 2**; and (ii) we have updated costs to 2002/03 nominal values. The method used to update values is described in Section B;

- 13.8 we have allowed for the potential double recovery of costs under the TSO and TSLRIC regimes as required in section 11 of the *Principles Paper*. Details of our methodology are provided in **Annex 4**.
- 14 In a number of areas the *Principles Paper* is either silent or ambiguous. Where this is the case, Telecom has developed its own numbers, and these are discussed as relevant in this Report.

B: MODELLING ISSUES

Asset prices

- 15 We have used the asset prices the Commission used in the 2001/02 version of the CostPro model apart from a small number of specific cases where these are considered to be in error. Those are detailed in **Annex 2**.
- 16 The CostPro model contains asset price data used in the TSO calculations but this is priced for the Dec01-June 02 period. We have followed the NERA report for the ACCC¹ and allowed for the asset prices to be valued at the start of the relevant period i.e. November 2002. To do this we have applied the tilt for seven months (end of March to beginning of November). Since that is a measure of real price change, we have then increased that by the rate of inflation for the period (1.7%). The resultant factors are shown in the second to last column of the Table below. The last column shows which table these factors were applied to in the model.
- 17 Land and Building mark-up factors in the tbISwMiscFactors and tbITRMiscInvestFactors tables were also adjusted for 1.7% inflation.

USOA Category	Price Tilt (real, annual)	Inflation (march 02 to nov 02)	Price Change Factor Applied	Applied in
Aerial Fibre	[	1.7%	[	tbITRFiber
Building		1.7%		tbISWMiscFactors tbITRMiscInvestFactors
Buried Fibre		1.7%		tbITRFiber
Circuit		1.7%		TbITRTransEquip tbITRRmtFiberTerm tbITRCOFiberTerm
Conduit		1.7%		tbITRTrench tbITRManhole
Land		1.7%		tbISWMiscFactors tbITRMiscInvestFactors
Pole		1.7%		tbITRAerialStruct
Radio		1.7%		tbITRRptrEquipTower

¹ NERA: Estimating the Long Run Incremental Cost of PSTN Access: Final report for ACCC, January 1999.

				tbITRRadioTower tbITRDigitalMWRadio
Submarine Fibre		1.7%		tbITRFiber
Switch		1.7%		tbISWSwitchSub61E tbISWSwicthSubRemotes tbISWITU7Invest tbISwITU7SCP
Underground Fibre		1.7%		tbITROptDistFrameBlk tbITRFiber
Software	] CCRI	1.7%	] CCRI	tbISWITU7SCP

Services included in the model

- 18 The model includes all fixed PSTN calling services. As in the CostPro model account is taken of data services in the cost sharing/common cost assumptions. It should be noted that the model includes ISDN traffic but this is modelled as analogue traffic. The CostPro model appears to be partially setup to dimension and cost ISDN separately. However for some reason it does not appear to have been completed or used. We have removed this ISDN dimensioning section of the model to provide greater clarity to the changes in the switch dimensioning we have proposed below. However we would be happy to discuss with the Commission how to include ISDN as a separate service at a later date. We believe that the way ISDN is currently handled probably means costs are lower than they should be.

Switch dimensioning

- 19 The dimensioning of the switch in the SwitchLogic workbook has been improved to reflect our concern that the CostPro model does not dimension the NEAX switch the way it should be dimensioned, and hence does not correctly allocate costs. The changes required to rectify this are detailed in **Annex 2**.
- 20 The changes do mean some slight changes to overall switching costs compared to the CostPro model. To show the impact of these changes we have compared the original CostPro model with a model that has only changes to the SwitchLogic workbook (i.e. with all other parameters remaining as in the original model and no changes for things like traffic, unit costs etc). These are summarised below. The net effect of the changes, which are essentially dimensioning changes, is an increase in overall costs of just under \$60m. However, importantly in the context of the interconnect cost, it is the line related costs that have increased. These are

not used in the interconnect calculation. The minutes and call costs have reduced. It is these calling costs that are used in the Interconnect costs.

Switching Investments	Original model	Revised
Minutes	[[
Calls		
Subtotal (included in model)		
Lines		
TOTAL	] CCRI	]TCNZRI

Traffic data

- 21 The traffic data used is for the period 1 January 03 to 31 December 03, and is summarised in the table below.

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[All data in table is Telecom Restricted Information]

ESA-specific Touch Tables

- 22 To comply with the requirement to calculate costs by LICA (Local Interconnect Calling Area), as required by the Notice, it was necessary to change the Touch Table (tblSWTouch). This table contains percentages of Intra-Office, Incoming, Outgoing, Tandem and Gateway calls for each of the 12 Call Types in the CostPro model (800, 900, Local, etc). These percentages are used to split the total traffic volume for each ESA into the 5 categories. In the CostPro model the same national average percentages are used for all ESAs.

- 23 In reality the percentages are different for each ESA, especially for Toll Bypass Interconnect calls, where some ESAs are Points of Interconnect (POIs), but many are not. Telecom has produced touch tables for each ESA and then made appropriate changes in the CostPro database to enable these ESA-specific touch tables to be used correctly in the calculations. The changes are detailed in **Annex 2**.

Mark-ups for operating costs

- 24 In line with the *Principles Paper* recommendations, mark-ups are made for operating and maintenance costs, indirect operating costs and indirect capex costs. These are sourced from the *Principles Paper* and detailed in **Annex 1**.

- 25 One operating cost for which the *Principles Paper* provides no guidance is the operating cost directly associated with interconnect². This covers the product management, policy and planning costs incurred in providing other communications providers with interconnect services. They include:

25.1 the interconnect group (being the personnel in Telecom's Wholesale Services Group who deal with interconnect management and operations, and their associated overheads);

25.2 the Telecom regulatory function, insofar as it relates to TSLRIC and interconnect issues;

25.3 external legal and other consulting costs in connection with TSLRIC and interconnect issues;

25.4 network management personnel specifically dealing with interconnect issues.

- 26 Telecom asked PwC to estimate the cost that Telecom actually incurred performing these functions. As part of this PwC reviewed the recent reports² on BT's product management, policy and planning (PPP) costs. The definitions used by PwC in their analysis for Telecom were broadly consistent with those adopted by Ofcom except in two areas:

² The ACCC/NERA report (see Appendix 1 of the Principles Paper) does include, within the indirect opex markup, a markup for 'carrier services' but no further description of what is included here. We presume this is for wholesale services and it is possible that, within this, there is an allowance for the direct interconnect opex. However the amount allowed for seems very low if it is meant to include such an allowance so we have calculated it separately here.

² Ofcom's "Review of BT's product management, policy and planning (PPP) charge" June 2004, and a report to Ofcom by Ovum and Robson Rhodes, February 2004, "An investigation into BT's costs of product management, policy and planning".

- 26.1 BT's PPP charges include an allocation of "general overheads" in accordance with general attribution methods. This includes allocated costs from such areas as the Chairman's Office and BT Group Secretariat. The PwC summary of Specific Interconnect Costs does not include any such allocation of general overheads.
- 26.2 There is a potential small difference in the treatment of network management costs. PwC have separately identified the network management cost and included this in the Interconnect Cost. It is unclear from the Ofcom and Ovum reports whether similar costs have been included in the PPP definition. However, PwC consider any difference in treatment is unlikely to be material.
- 27 Where possible, PwC have referred to costs incurred over the period November 2002 to October 2003. However, in some cost categories they have estimated costs over that period, based on the available data from other financial years. The total annual cost is [\$] TCNZRI (total takes account of rounding in the component parts) as shown below. This is then divided by the total number of interconnect minutes [] TCNZRI from para 21, above) to give the cost per minute. This cost is added to the modelled cost in Section D.

Item	[Annual cost (\$m)
Interconnect Group	
Network Management	
Regulatory	
External Legal	
Total	
Per interconnect minute	] TCNZRI

Assumptions on structures

- 28 The CostPro model has assumptions on:
- 28.1 ***the extent of buried, ducted and aerial plant.*** We have retained the numbers in the model as provided.
- 28.2 ***Different trenching conditions.*** We have revised the numbers in the model based on our fibre plant records. Our records do not show percentages in asphalt or concrete but do show what is under roadways and what under footpaths. In the revised numbers shown below we have equated 'asphalt' to 'footpaths' and 'concrete' to 'roadway'. These changes will reduce the trenching costs in the model.

[Note: Costpro column CCRI and Telecom column TCNZRI]

		CostPro %	Revised%
Metro	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway		
Urban/Suburban	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway		
Rural	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway	CCRI]	TCNZRI]

28.3 **Unit trenching costs.** We have revised the unit costs in the model to reflect costs the Commission has used in the HCPM model. The revised numbers are shown below.

		\$/m
Metro	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway	[
Urban	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway	
Suburban	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway	
Rural	Plow Trench & Backfill Asphalt/Footpath Concrete Trench/Roadway	CCRI]

28.4 **Unit cost changes for different areas.** CostPro has a Density Factor table which marks unit trench costs down in rural areas, and up in metro areas. These 'density factors' were originally sourced from Telecom. Given that we have now used the Commission's preferred trenching costs, this weighting is no longer necessary. We have therefore set the density factors to 1. We suspect that the net effect of the unit cost changes and the scrapping of the density factor is probably cost neutral.

Common Costs

29 Common costs are among the most difficult and contentious aspects of TSLRIC modelling, not least because any allocation is inevitably arbitrary. The Commission has indicated it will allocate costs by network usage (*Principles Paper*, para 297). However in some cases, for example trenches shared between the access and transport networks, or trenches shared between different utilities and carriers, there is no common usage measure. This method is therefore not feasible. PwC recommended at the conference, in the absence of Ramsey pricing, an equal shares method as the best option. This is also the option used by NERA in Australia where there was no common usage measure³.

30 We have been pragmatic and allowed for both forms. These have been used as indicated below.

Common cost allocations in transport network

31 **Sharing with other utilities:** While Telecom does not generally share core network trenches with other utilities, it does share fibre sheaths with, and lease fibre off, other carriers. We estimate this amounts to around [% **TCNZRI**] of the core network. We have therefore allowed for [% **TCNZRI**] of trench lengths to be shared 50:50 with others.

32 **Sharing with the access network:** Telecom has good plant records on fibre optic cable plant from which to establish the degree of sharing. For copper cable plant, which comprises the bulk of the access network, the records are less comprehensive. In this case however this is not a major problem. Sharing with copper is only likely with ducted plant, and then only where there are a large number of ducts in a trench. Sharing is unlikely when plant is buried. Hence one would expect that sharing is most likely in the metro areas. Our fibre records already indicate that [% **TCNZRI**] of the core transport plant shares trenches with access plant in metro areas, so there is very little anyway that could be shared with copper access plant. In other areas some sharing between fibre and copper plant is probable but less likely. We do not have any means to readily identify the extent of this.

33 We have interrogated our fibre cable plant records to establish the proportion of core transport trenches that are shared with the access network. This is shown below. We recognise that this probably slightly underestimates the degree of sharing actually occurring because copper plant is not yet included. Where there is sharing we have assumed costs are split 50:50.

³ NERA: Estimating the Long Run Incremental Cost of PSTN Access: Final report for ACCC, January 1999. page 28

	Proportion of core transport trenches shared with the access network
Metro	[%
Urban/Suburban	%
Rural	%] TCNZRI

- 34 **Sharing between data and PSTN:** We have interrogated our plant records to establish the proportion of 2 Mbps equivalent circuits on the core network that are for voice (PSTN) usage rather than data . This is shown below. In this case we have a usage measure by which to allocate costs. Thus, as per the *Principles Paper*, costs of trenches are allocated according to these ratios.

	Proportion of 2 Mbps equivalents that are voice
Metro	[%
Urban/Suburban	%
Rural	%] TCNZRI

Summary of sharing assumption in transmission network:

- 35 The table below summarises the impact of these assumptions. This shows the percentage of trench costs which are allocated to the fixed PSTN network.

	Values in the CostPro model	Revised values in Telecom's model
Metro	[%	[%
Urban/Suburban	%	%
Rural	% CCRI]	%] TCNZRI

- 36 On the surface there appears to be a big difference between the original CostPro percentages and our revisions. However the original CostPro numbers are used in the context of the TSO and therefore exclude any allowance for common costs. They measure the portion of trenches not shared with access, or other utilities. As would be expected they are low. The numbers used in the Telecom model are higher as allowance is made for common costs..

Sharing of Fibre Sheaths

- 37 The CostPro model does not allow for the sharing of fibre sheaths (eg between the access and core networks). We are not sure why not and this may reflect the Commission's view that such sharing is unlikely in a forward looking network. However in Telecom's network there is a considerable amount of sharing and we have included provision for this in our model as shown below. The numbers indicate the percentage of sheath costs allocated to the fixed PTSN core network.

	Values in the CostPro model	Revised values in Telecoms model
Metro	[%	[%
Suburban	%	%
Rural	%CCRI]	%] TCNZRI

Common cost allocations in switching.

- 38 Common cost allocations in the switching side of the model have all been made on a usage basis as requested in the *Principles Paper*.

Summary

- 39 In summary Telecom has followed the Commission's *Principles Paper* and the CostPro model default data closely. We have only moved away from it where no clear guidance was given, or we could source better values.

C: REASONABLE RETURN ON CAPITAL

- 40 Telecom has asked PwC to estimate an appropriate cost of capital for interconnect services as at November 2002. The following summarises the inputs to the WACC calculation. A full copy of the PwC report is provided as **Annex 3**.

Version of CAPM

- 41 PwC have used the simplified Brennan-Lally version of CAPM as specified in para 168 of the *Principles Paper*.

Risk free rate

- 42 The risk free rate of 6.6% included in the WACC calculation is based on government bonds with maturities of 8 to 10 years, taking the average yield over the six months immediately prior to November 2002, after converting to an annualised yield and rounding. These longest maturity actively traded government bonds are the best available match for typical asset lives used to provide the interconnect service.

Debt premium and gearing

- 43 The *Principles Paper* is open to how this will be calculated but suggests Telecom's actual premium and leverage will be taken into account (para 230). PwC propose that the gearing ratio is 30% debt to debt plus equity, and debt margin is 2%. They note that a gearing ratio of 30% is consistent with the gearing ratio previously applied by the Commission, it happens to be the average level of Telecom's actual gearing over the past five years to 30 June 2003, and it is not significantly lower than Telecom's actual gearing as at 31 October 2002. The 2% margin is based on actual estimates of Telecom's average debt margin around November 2002.

Investors' tax rate

- 44 The Commission suggest a rate of 33% (*Principles Paper*, para 235). PwC believe a reasonable investors' tax rate estimate for use in the Brennan-Lally CAPM as at November 2002, and one that accords with best practice in New Zealand, is 28%. PwC have used 28% as their estimate.

Asset Beta

- 45 The *Principles Paper* recognises that the appropriate beta will be different from the TSO beta (para 217) and provides some guidelines for how it might be determined. In PwC's view, relevant comparators indicate that the asset beta is within a range from 0.75 to 0.85. The mid-point of 0.8 is selected for the WACC estimate.

Tax adjusted market risk premium

- 46 PwC propose using 7.5% for the Tax Adjusted Market Risk Premium. They show that this estimate is consistent with both a short term and a long term risk free rate. We believe this is consistent with the *Principles Paper*.

WACC

- 47 The resulting post corporate tax, nominal WACC for TSLRIC based costing of Telecom's interconnect services as at November 02 falls in the range 10.7% to 11.4%. We have used the midpoint, 11.1%, to calculate the modelled cost. Key parameter values are shown below

Cost of debt before taxes	8.6%
Risk free rate	6.6%
Debt premium	2.0%
Market value of debt	30%
Market value of equity	70%
Investors effective tax rate	28%
Asset beta	0.75 – 0.85
Tax adjusted market risk premium	7.5%

D: INTERCONNECT COST

- 48 The average interconnect cost (that is the average of the outgoing and incoming interconnect cost) based on these modelled assumptions is 1.71 c/min. To this we have to:
- 48.1 add an allowance for direct interconnect annual operating costs of **[\$ TCNZRI]**(para 27). This is equivalent to [c/min **TCNZRI**]; and
- 48.2 deduct [**\$ CCRI**] to account for the TSO overlap (**Annex 4**). This, divided by the number of interconnect minutes, is [c/min **TCNZRI/CCRI**].
- 49 This gives a final interconnect modelled cost of 1.86 c/min.

ANNEX 1: DETAILS OF CHANGES REQUIRED TO CONVERT THE COMMISSION'S TSO MODEL TO A TSLRIC MODEL

A1.1 The CostPro model models the PSTN calling network. The Commission has said it will use the same model, suitably modified, for its TSLRIC calculation. The CostPro model has obviously been designed to do a TSLRIC calculation as well as its TSO cost calculation. Hence the modifications necessary to convert the model to a useful TSLRIC model in this case are straightforward:

- a. Use of the 'working cost' definition rather than 'capacity cost',
- b. Use of a long run incremental operating cost estimate rather than the avoidable operating cost concept used in the TSO modelling,
- c. Addition of some common costs related to switching which were excluded in the TSO modelling.

A1.2 Our assumptions on each of these are addressed in turn in this Annex.

Working vs Capacity cost

A1.3 The CostPro model encompasses two main definitions of cost – capacity cost and working cost. These are described in Para A7.38 – A7.40 in the TSO 02/03 draft determination. The capacity cost measurement does not include the unused capacity of equipment and is deemed by the Commission to be the most appropriate measurement in the TSO context. The working cost concept represents the

'... unitization of the network investments by the working capacity rather than useable capacity. This Working cost is akin to the FCC's TELRIC costs.' Para A7.39

A1.4 As far as we can ascertain the working cost concept is the nearest appropriate cost concept to meet the definition of TSLRIC in the *Principles Paper* that the model readily supports. It meets the definition of the increment (para 247) and long run (para 267). There is some debate, as yet unresolved⁴, as to whether a TELRIC model produces the same cost numbers as a TSLRIC model. At this point we have put that issue to one side. The Commission in the *Principles Paper* has stated its opinion ' ... that an element-based approach is the most appropriate for TSLRIC modelling'

⁴ See Gans J, King S.: Comparing TSLRIC and TELRIC: A Report on behalf of AAPT Ltd, 2003

(para 104). Hence our modelling has used 'working cost' rather than 'capacity cost'.

Operating costs

A1.5 Operating costs are identified in the *Principles Paper* to include:

'... both costs that are directly attributable, and costs that are indirectly attributable...' (para 300)

A1.6 The Commission's preferred approach to calculating operating costs is then stated as:

' In modelling interconnection services, operating and maintenance costs and indirect costs should be calculated using percentage mark-ups applied to the capital asset base.' (para 327)

A1.7 In para 328 the Commission suggests that, where possible, the same rate should be used in the TSO and TSLIC modelling. However it notes that:

'...some adjustments may be required, due to differences in how the Act defines costs for the TSO and interconnection services.'

A1.8 In this case we do consider adjustments are required. The TSO cost calculation is an avoidable cost calculation. It seeks to establish what costs would be saved if the CNVC were not served. This calculation should not usually include common costs. In the interconnect cost calculation on the other hand the Act specifically allows for an allocation of common costs.

A1.9 Given that an adjustment is required the Commission then suggests that:

' ... the mark-up rate should be developed after considering the rates used by other regimes.' (para 329)

A1.10 The Commission provides three suggestions from other regimes in Appendix A (ACCC/NERA modelling in Australia), Appendix B (EER/EU Adaptable Interconnection model), and Appendix C (Data from analysis of the German Network by WIK) of the *Principles Paper*. The WIK data is specifically for a USO calculation and, as such, presumably on an avoided cost basis. The mark-ups are similar to those used in the TSO modelling, as would be expected. They are considerably lower than the other two reports which are specific to a TSLRIC interconnect calculation. Further, unlike the other two reports, the WIK study has no suggested mark-up for indirect costs. For these reasons we prefer the ACCC/NERA and EER/EU rates. In practice these two reports give very similar numbers.

A1.11 We have used the ACCC/NERA mark-ups here. These have been sourced largely from a new entrant (Optus), although other data and US ARMIS data in particular was also used. Unlike the EER/EU rates, the ACCC/NERA rates have been subject to considerable scrutiny and debate in a regulatory process.

Direct operating costs

A1.12 For direct operating costs, the ACCC/NERA mark-ups are for a more detailed breakdown of capital costs than is used in the CostPro model. We have no data on which to average the NERA data to suit the CostPro classification. However since the mark-up is common across many items we have made an estimate of the appropriate number. The mark-ups used are shown in the second column of Table A1.

Table A1: Operating cost markups

Asset	Opex mark-up for direct costs	Opex allowance for Network Management	Opex mark-up for indirect costs	Mark-up for indirect capex cost	Total Opex mark-up used in model
Aerial Fibre	10%	1%	1.3416	1.0567	16%
Building	11%	1%	1.3416	1.0567	17%
Buried Fibre	11%	1%	1.3416	1.0567	17%
Circuit	6%	1%	1.3416	1.0567	10%
Conduit	10%	1%	1.3416	1.0567	16%
Land	11%	1%	1.3416	1.0567	17%
Pole	10%	1%	1.3416	1.0567	16%
Radio	11%	1%	1.3416	1.0567	17%
Submarine Fibre	11%	1%	1.3416	1.0567	17%
Switch	7%	1%	1.3416	1.0567	11%
Underground Fibre	11%	1%	1.3416	1.0567	17%

Network management

A1.13 ACCC/NERA use a markup of 62% per switch node to allow for the network management centre. We do not know how to apply this in the context of the CostPro model. We have therefore used the EER/EU percentage given in Appendix B of the *Principles Paper* which suggests 1% each for switching, transmission and infrastructure management. This is allowed for in the third column.

Indirect operating costs

A1.14 ACCC/NERA use US and BT data to estimate indirect operating costs relevant to interconnection. We have averaged the 'local' and 'trunk' uplift factors specified in Appendix A of the *Principles Paper*. These suggest an uplift factor of 34.16%.

Indirect capital cost.

A1.15 ACCC/NERA make adjustments for indirect capital costs. This adjustment is not mentioned in the *Principles Paper* but was covered in the earlier TSLRIC Pricing Methodology discussion paper. Here the Commission quoted the ACCC/NERA study which used 5.16% (this to be applied to capital costs) for the average of the local and trunk network. The ACCC/NERA report is silent on the opex costs associated with this capex. We have therefore followed the EER/EU report in Appendix B of the *Principles Paper* and used 10%. This gives a total of 5.67% (5.16×1.1). This is shown in the fourth column.

Total opex mark-up

A1.16 The total Opex mark-up used is shown in the last column of Table A1. This is used in the Opex Rate field of the Annual Capital Cost Factors table in CostPro.

Adjustment for excluded costs

A1.17 One major cost is not included in the TSO version of the model but needs to be included here – the NEAX software file. There are two components of this – the general file which is common to all call types, and the part of the file that is specific to interconnect.

Item	Investment Cost
Neax Software Base File	[\$ TCNZRI]
Neax Interconnect Software	\$ TCNZRI]

A1.18 STP and SCP costs, although included in the CostPro model, are excluded in the calling cost calculation here due to the changes made in the SwitchLogic workbook. They have however been added back, along with the NEAX software costs above, in the processing of the cost outputs.

ANNEX 2: UNIT COST AND INPUT PARAMETER CHANGES

[TCNZRI / CCRI]

ANNEX 3 : COST OF CAPITAL (PWC REPORT)

[separate Report **attached**]

ANNEX 4: CALCULATING THE ALLOWANCE FOR THE TSO/TSLRIC OVERLAP

A4.1 This Annex addresses a number of issues arising out of the application of the definition of “forward-looking common costs” in the Telecommunications Act 2001, and in particular the proviso “does not include any costs incurred by the service provider in relation to a TSO instrument”.

Interpretation in the *Principles Paper*

A4.2 This definition has been the subject of submissions by Telecom and TelstraClear, at conference and post-conference, and the Commission has given its interpretation in its *Principles Paper* dated 20 February 2004.

A4.3 TSLRIC is defined by the Act to include “(b) a reasonable allocation of forward-looking common costs.” The statutory definition of “forward-looking common costs” states it “does not include any costs incurred by the service provider in relation to a TSO instrument”.

A4.4 The key interpretation issue is the interpretation of the proviso “does not include any costs incurred by the service provider in relation to a TSO instrument”. The Commission records its conclusion on the proper interpretation at paragraph 353 of the *Principles Paper*:

The Commission considers that a purposive approach to interpretation would therefore treat the reference to “... any costs ... in relation to a TSO...” as referring to those costs that are recognised as qualifying for contribution from liable persons and the service provider because they were involved in discharging TSO obligations.

A4.5 Telecom’s calculation is consistent with this interpretation.

Applying the Commission’s interpretation in the *Principles Paper*

A4.6 As noted above, Telecom agrees with the Commission that what must be deducted from the calculation of forward-looking common costs is a proportion of the TSO cost (paragraph 353 of the *Principles Paper*). Telecom also agrees the plain objective of the statutory provision is to avoid double recovery (paragraph 356 of the *Principles Paper*).

A4.7 This does mean, however, that the Commission will have to refine the methodology described in paragraphs 348 to 356 of the *Principles Paper*. Some parts of that discussion appear to propose that all network asset costs from a non-viable ESA will be deducted from forward-looking common costs, without any consideration of the revenue earned by Telecom in that

ESA (see for example para 348). That is inconsistent with the interpretation of the Act that the relevant cost is the TSO cost.

- A4.8 It is also the case that not all of the assets in a non-viable ESA will be relevant to the TSLRIC calculation. The Commission's position in the *Principles Paper* is that the access network is not a common cost for interconnection. This means that assets in the access network in the ESA, even when contributing to the TSO cost, should not be deducted from the calculation of forward-looking common costs. Only those assets that would otherwise be a common cost in the TSLRIC calculation are relevant, as the relevant proviso is only a gloss on the definition of forward-looking common costs.
- A4.9 Further, only those TSO costs allocated to, and paid for by, other carriers should be excluded from the calculation of forward looking common costs. This is consistent with the objective of avoiding double recovery by Telecom. The outcome required by the Act is that the costs paid for by liable persons under the TSO should not appear in the TSLRIC calculation.
- A4.10 Telecom notes the *Principles Paper* also suggests all traffic from an unprofitable ESA should be excluded. For similar reasons, Telecom does not think this is consistent with the statutory definition. Traffic in an unprofitable ESA will have generated revenues that offset the core network costs in the TSO calculation. For this reason, the traffic should not be excluded.

Telecom's calculation

- A4.11 For the 02/03 draft TSO determination 144 ESAs were determined to be non-viable. The table below summarises all related revenues and costs for those ESAs.

	\$000's
Incremental Traffic costs	[
ESA costs	
Less Call related revenues	
Net call cost as included in the Commission's TSO cost estimate	] CCRI

A4.12 The incremental traffic costs (calculated by the CostPro model) exclude any contribution to common costs. The ESA costs are the costs of local switches and associated transmission costs which are saved where the ESA as a whole is not viable.

A4.13 It is these ESA call related costs that are common to both the TSO and TSLRIC calculation. However these costs are, in the TSO cost calculation, offset by the call revenues. To identify the contribution to the TSO cost call revenues must be deducted, which gives the [\$ **CCRI**] net call cost included in the Commission's TSO cost determination.

A4.14 Liable persons contribute 26.5% of the TSO cost. 26.5% of the portion of the TSO cost arising from costs common to both the TSO and TSLRIC calculations is [\$ **CCRI**]. Therefore, to avoid double dipping between the TSO and TSLRIC, the TSLRIC annualised costs need to be reduced by [\$ **CCRI**].

ANNEX 5: ERRORS IN THE COSTPRO MODEL AND WORKAROUNDS TO DEAL WITH THESE

[TCNZRI / CCRI]

ANNEX 6: PROCEDURES TO RUN THE MODEL

The following is the procedure to be followed when re-running the CostPro TSLRIC database, so as to re-evaluate the final TSLRIC interconnect cost per minute for each of the 24 LICA Groups. It is complicated because of the workarounds we have made to allow for errors in the source code. Telecom would be happy to assist Commission staff in running the following procedure:

- A6.1. Complete any changes required to the CostPro scenario.
- A6.2. Run CostPro for that scenario (Process All).
- A6.3. To correct RingPath distances that are incorrect due to an error in the CostPro code, follow the following steps:
 - a. Close CostPro and open the scenario database in Access.
 - b. Export a copy of the tbISYSRingTraffic table as an Excel file with this name. For later use, export a copy of the tbISYSRingPathMaster file as well, and then close Access.
 - c. In Excell, open the two exported files (tbISYSRingTraffic.xls and tbISYSRingPathMaster.xls), plus the scenario TransportLogic workbook.
 - d. In the PreProcessing sheet, click the macro button labeled "Click button to update table after opening copy of tbISYSRingTraffic.xls" at cell A9. This will paste a sorted copy of the tbISYSRingTraffic data into the ProProcessing sheet at B12, and close the tbISYSRingTraffic.xls file.
 - e. Click also the macro button labeled "Click button to update table after opening copy of tbISYSRingPathMaster.xls" at cell A1018. This will paste a copy of the tbISYSRingPathMaster data into the ProProcessing sheet at B1021, and close the tbISYSRingPathMaster.xls file. Although this step is not required to update Ring distances, it is a convenient time to do it.
 - f. If cell F8 still says "yes", then there has been no change to the rings since the last time the scenario was run that would necessitate the recalculation of corrected distances over in column BW. Close the file and proceed to step A6.4.
 - g. If cell F8 says "no", then click on the macro button at cell F9 labeled "Click if, after running macro at left, above cell indicates "No"".

This will recalculate the distances over in column BW. Save the updated TransportLogic file, and start again at A6.2 above, ie, re-run CostPro for this scenario (Process All).

A6.4. To correct the error of a missing factor of 2 in SumStep16 (top of page 60) of the current CostPro code (which causes the calltype cost reports, when multiplied by call volumes, not to reconcile with Density cost reports for MOU and SU costs), follow the following steps:

- Close CostPro and open the scenario database in Access. There are a series of queries (qryRPTxxx) which have been added into the scenario database
- Run qryRPT2 (updates ESATouchMOUs for 'Remote' CostElement, applying the correction provided by CostQuest) by double clicking on it and clicking on "yes" in each of the two dialog boxes that will appear.
- Run qryRPT3 (runs the first short SQL on page 60).
- Run qryRPT4 (runs the second short SQL on page 60).
- Run qryRPT5_MOU (runs the third short SQL on page 60 – for MOU).
- Run qryRPT6_Lines (runs the last short SQL on page 60 – for LINES).
- Run qryRPT7_SU (runs the first short SQL on page 61 – for SU).
- Run qryRPT8_TotDirESA (runs the 2-line SQL on page 62, calculating TotalDirectESAInv and TotalDirectESACost in every record).
- Run qryRPT9_PerCust (runs the last SQL on page 61, calculating per customer Capacity investment and cost, and per customer Working investment and cost).
- Compact the database (Tools, Database Utilities, Compact and Repair Database), then close Access

A6.5. So as to calculate total Land and Building investment markup on Transmission equipment, and to check the total Transport Investment calculated in the TransportLogic workbook compared to the total investment passed back to CostPro:

- Open CostPro again and create a TransportLogicCheck file.
- Open the TransportLogicCheck file in Excel, go to the Node Investment Summary sheet and click the macro button at C16 to run a macro which runs all the tbISYSRingTraffic records through the workbook and records the investment result for each record. Note that total Land and Building investment markup, which is not currently passed back to CostPro, is given in cells P11:Q11. Similarly, click the button in

Segment Investment Summary sheet cell C16 to run a macro which runs all the tblSYSRingPathMaster records through and records the result.

- A6.6. If a check is wanted of the total Switching Investment calculated in the SwitchLogic workbook compared to the total investment passed back to CostPro, create a SwitchLogicAudit file by using the CostPro audit option. Open the excel file created, and click on the button at cell B39 in the Investment Summary sheet to run a macro which runs all the PreProcessing records through and records the result.
- A6.7. If parameters in the Annual Capital Cost Factors table have been changed, go to the input screen in CostPro and select Common, Annual Capital Cost Factors, and send a copy to excel. Open Excel and paste a copy of the exported table into the ACF sheet of the TSLRIC Output Report excel file at cell B3.
- A6.8. If Call Volumes have been changed, close CostPro, open the scenario dB in Access, and run qryCallTypeQTYByESA. Export the resulting table to Excel, and paste a copy into the Volume Report sheet of the TSLRIC Output Report excel file at cell B4.
- A6.9. In CostPro, run the following five reports, pasting a copy of each into the TSLRIC Output Report excel file as directed:
- Density report by Cost Family, Cost Component, Cost Primitive, for Sum of Total Working Investment, and Sum of Total Working Cost. Paste a copy into the DensityReport sheet at cell A3, and refresh the two pivot tables at H3 and H21 by clicking on them and selecting "Refresh Data" from the Data menu.
 - ESA CallType report by Cost Primitive, for Sum of CallType Working Investment, and Sum of CallType Working Cost. Sort the report by CostPrimitive descending, by ESA ascending, by CallType ascending, and paste a copy into the ESACallType sheet at cell A7. The rest of the sheet should recalculate automatically. Check that the total variance in Total Working Investment compared to the Density report at cell H5 is not excessive (say not greater than +/- \$50,000). A table at column J will calculate the total cost per minute by CallType by ESA from the CostPro table. A third table at column R calculates the weighted average total cost per minute for Toll-Bypass Interconnect calls by major LICA group. Note these are still only CostPro costs, to which additional costs not in the CostPro costs still have to be added (this is done in the TSLRIC Interconnect sheet).

- Density report by Cost Primitive, by USOA Category for Sum Total Working Investment, and Sum Total Working Cost. Paste a copy into the DensityUSOA sheet at cell A3, refresh the pivot table at G3, and check the total variance in Total Working Investment compared to the first Density report at cell K18 (should be \$0). The pivot table at G3 calculates the annual costs by major cost category as required by the Notice.
 - ESA report by Cost Element by Cost Primitive for Sum Total Working Inv and Sum Total Working Cost, and paste a copy into the ESACostElement sheet at cell A3. Refresh the pivot table at cell H3, and check the total variance in Total Working Investment compared to the first Density report at cell K36 (should be \$0). The pivot table at H3 calculates the capital investment by elementtype and LICA group, as required by the Notice.
 - Density report by Cost element, by Cost Primitive for Per Customer SU, Per Customer Calls, Per Customer MOU, for Sum Total Working Inv and Sum Total Working Cost. Paste a copy into the DensityCostElement sheet at cell A3, and check the total variance in Total Working Investment compared to the first Density report at cell M12 (should be \$0). The small table at L3 calculates the per minute cost by cost element (see cells O5:O9), as required by the Notice.
- A6.10. The Summary Investment sheet gives a comparison of total Switching and Transport investments by Cost Primitive by Cost Component from the Density report with the total investments from the SwitchLogicAudit and TransportLogicCheck workbooks, once the linkages in the Summary Investment sheet (B20:G25) to these Logic workbooks are updated.
- A6.11. The TSRIC Interconnect sheet calculates the total cost per minute of Toll By-pass Interconnect calls for the 24 main LICA groups, including the addition of a portion of common costs not included within the CostPro model results (see rows 58 – 87). The final payable Interconnect price is determined by adjusting these costs as in Section D of this report to allow for direct interconnect opex costs and TSO overlap.