



**TELECOM NEW ZEALAND SUBMISSION ON THE
TSO 02-03 DRAFT DETERMINATION**

13 August 2004

Public Version

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A EXECUTIVE SUMMARY

- 1 Telecom continues to disagree with the framework used by the Commission to calculate the TSO net cost. In particular, Telecom disagrees with the Commission's use of an efficiency standard no real-world telco can meet. This amounts to a fundamental departure from the arrangement entered into by Telecom and the Crown, which addressed the actual, not hypothetical, loss Telecom makes, and undermines the statutory regime.
- 2 Addressing the Commission's framework on its own terms, there are some significant aspects of the Commission's model that do not reflect the real-world realities faced by Telecom. These are:
 - 2.1 the costs of the wireless cap;
 - 2.2 the estimation of the operating costs;
 - 2.3 the extensive use of the aerial plant; and
 - 2.4 the estimation of a reasonable rate of return.
- 3 These aspects of the Commission's model are addressed in detail in this submission. We also comment on the Commission's approach to trenching costs. There are other areas where we disagree with the approach taken by the Commission. Many of these issues were addressed at last year's conference or in our submissions on May 21 2004 in response to the Commission's request for data, and are not repeated here.
- 4 A major focus at the conference is likely to be the allocation of the TSO net cost. Industry participants have signalled disagreements with the Commission's approach to:
 - 4.1 the definition of "liable person";
 - 4.2 the definition of "revenue"; and
 - 4.3 the application of the Commission's definition of revenue to particular revenue streams.
- 5 Telecom addresses key issues in this submission, and will respond to the submissions of other parties at the conference. Telecom submits that the onus is on the Commission to address these issues in a way that results in a robust framework, consistently applied.
- 6 More generally, Telecom submits that the Commission must provide reasons for its approach to issues raised by Telecom and the liable persons. There is a statutory

requirement in section 88(g) of the Act for the Commission to provide reasons in TSO draft determinations, and Telecom considers that the Commission is also required to provide reasons in a final TSO determination issued under section 92 of the Act. As a matter of due process and fairness, it is standard practice in New Zealand for decision makers to provide reasons for their decisions, not least so that affected parties can make informed decisions about their appeal rights. The need for reasons is even more evident in an on-going regime: a failure by the Commission to explain its rationale for adopting certain approaches to issues raised by Telecom or any of the liable persons will result in inefficient and costly relitigation of issues year after year.

- 7 Telecom looks forward to discussing these issues further at the conference on the draft determination for the 02-03 TSO period ("Draft Determination").

B TSO NET COST CALCULATION

8 Telecom's submissions on the TSO net cost calculation are divided into the following sections:

B1 Issues in the 02-03 model;

B2 Other aspects of the modelling framework; and

B3 Reasonable rate of return.

9 Telecom addresses each separately below.

B1 ISSUES IN THE 02-03 MODEL

10 For the 02-03 TSO period, the Commission has again used its own cost models to calculate the net cost for the TSO period, namely:

- (a) The HCPM model; and
- (b) The CostPro New Zealand model.

11 Telecom reiterates its view that Telecom's top-down model, developed by PwC to calculate the actual TSO net cost for the 01-02 TSO period, is a more accurate and reliable model than the models used by the Commission. In part, this is due to the fact that Telecom's model is able to go down to the customer level.

12 However, Telecom notes that the Commission has chosen to continue using the HCPM and CostPro models, consistent with its decision for the 01-02 TSO period. In response to the Commission's models, Telecom addresses in this submission four issues relating to the inputs used in the HCPM model for the 02-03 TSO period:

- (a) Wireless cap;
- (b) Trenching terrain data review;
- (c) Operating costs; and
- (d) Aerial plant.

13 We also briefly address general issues arising from the use of the CostPro model.

Wireless cap

14 In its final determination for the 01-02 TSO period the Commission introduced the concept of a wireless cap. This reflected concerns expressed at the conference that the HCPM model assumed all customers were served by a wired network. In the Draft Determination, the Commission invites submissions on the appropriate costs for wireless local loop systems in rural areas of New Zealand (paragraph A1.38).

15 For the reasons set out below, Telecom submits that:

- (a) The Commission should model CMAR technology for its wireless cap;
- (b) The Commission should revise its modelling so that:
 - (i) it uses the equipment costs of \$[***Restricted Information***] to provide a cap on feeder costs (rather than total costs); and

- (ii) in areas where this cap is breached, and therefore a radio solution is optimal, the Commission use the distribution cabling costs as calculated by the HCPM model for that area.

Background

- 16 At present, a little over 11,000 Telecom customers are served by wireless technology. This amounts to less than 1% of Telecom's total lines and is largely confined to customers who are in remote locations that are extremely difficult to serve. These customers are largely beyond cellphone coverage, beyond coverage envisaged by competitors such as BCL and Woosh, and beyond conventional planning/design assumptions. Many have problems around terrain and access to basic services such as power, and so require imaginative and unique solutions. These customers are a core part of the TSO obligation. They incur the bulk of the TSO cost. Accordingly, they are the customers for whom the modelling assumptions need to be robust.
- 17 Telecom's main wireless solution is Customer Multi Access Radio (CMAR). This is a feeder technology, meaning that radio is used to link a cabinet to the local exchange. However, the customer's house is linked to the cabinet by copper wire in the conventional manner. This allows the customer to use conventional phones. This mixture of wireless and cabling has significant cost advantages over a pure wireless solution in the extreme fringes of the network where it is used. Pure wireless depends on line of sight. In these areas this is very expensive to achieve given the often inhospitable terrain. With CMAR, Telecom ensures total cost is minimised by optimising the trade-off between radio and cable.

CMAR technology as the model input

- 18 At paragraphs A1.34 to A1.37 of the Draft Determination, the Commission considers the potential use of BCL's Airspan 40204 wireless DSL technology to provide the most "efficient" TSO service. The conclusion appears to be that the cost of using Airspan would be less than CMAR in extreme areas.
- 19 It is important to remember that CMAR is provided to service Telecom's most challenging customers. The per customer cost quoted by the Commission at paragraph A1.36 of the Draft Determination for the Airspan service to the first 28 site footprint is not the cost for servicing extreme areas. Less than 1% of Telecom's CMAR customers would fall within the first 28 site footprint. Not surprisingly, per customer costs increase as the footprint is extended. For example:
- (a) For the next 20 sites, the per customer cost for Airspan is likely to be **[Restricted Information]** times greater than those quoted by the Commission. Even then, the proportion of Telecom's CMAR customers covered would still be less than 1%.
 - (b) Extending the footprint to a further 25 sites means that more of Telecom's CMAR customers would be covered (but still less than 4%).

However, the per customer costs for Airspan would rise further still and would be well beyond CMAR costs.

20 In practice, the BCL Airspan technology is simply not as suitable or cost effective in the very extreme fringes of the network where Telecom is installing the majority of its CMAR sites – areas where there is no power (CMAR repeaters and outstations are often solar fed) and where sharing is severely constrained by the relative isolation of each customer. Airspan works on there being a line of sight path between the base station and the customer's house. It is impossible to "see" many houses from a base station in the remote parts of New Zealand where CMAR exists. Thus, CMAR is more suitable as it allows copper cable to be distributed to all the houses that can't be seen from the base station. Airspan and similar systems are only economic where there are a lot of customers in the direct line of sight of a base station. Base stations are expensive and need to be offset by the large number of customers. To cover customers in the remote parts requires too many base stations – in the extreme one base station per customer. In such cases, CMAR is more economic as the outstation can power copper which can connect all the 'out of sight' customers. In other words, Airspan was not designed for these areas, would not be economic in these areas, and is not being installed by BCL in these areas.

21 CMAR is not the only technology used by Telecom. Other wireless technologies in place include point to point radio systems, country sets and, for a few customers, analogue mobile. CMAR is however the main radio technology for a purely voice service. Telecom has in the past investigated use of mobile technology to deload some of the existing CMAR systems. This was unsuccessful. Although sites appeared to fall within a mobile cell site footprint, in many instances the signal at the customer's home was not sufficient for reliable service. Accordingly, Telecom's actual experience is that CMAR is the most efficient technology to provide radio service to customers in extreme areas.

Equipment Cost

22 Telecom submits that the equipment costs used for calculating wireless cap should be lower than those quoted in the Draft Determination. The costs quoted were for the most recent projects in the Marlborough Sounds, which are among Telecom's more difficult sites.

23 Telecom's desktop study of all its current CMAR sites indicates the average cost for radio equipment and installation is closer to \$[**Restricted Information** per customer (excluding distribution cabling costs). In addition, cable distribution costs need to be included, as calculated by HCPM.

Distribution cabling input into HCPM model

24 Detailed data previously supplied to the Commission shows that the average distribution cable length for a radio site in the Telecom network is just over 3 km. When using CMAR, Telecom takes care to optimise the trade-off between the costs of the copper distribution network and the radio feeder network so that overall costs are

minimised. Accordingly, Telecom submits that the amount of distribution cabling required for CMAR in the Commission's model should be the same as what occurs in practice in Telecom's network.

- 25 At present, the Commission's costings for wireless cap exclude any allowance for distribution cabling. The cable costs that are in the Commission's calculations are in fact for some cabling in the feeder network (sometimes it is cheaper to have the feeder network part wire, part wireless). This distinction between distribution cabling and cabling may not have been clear from the data supplied by Telecom.
- 26 To calculate the costs for cabling for CMAR customers the Commission should use the distribution cabling as calculated by the HCPM model. In the HCPM model the average distribution cable length per customer in clusters where the Commission suggest radio is used is 2.8km. Although this is slightly under the Telecom average, the difference is not significant in this context.
- 27 At paragraph A1.33 of the Draft Determination, the Commission notes that MAR sites are often limited by extreme geographical boundaries which prevent standard network design. The Commission states that MAR systems are required to provide a larger number of small distribution servicing areas and MAR costs cannot be treated simply as feeder replacement. However, in areas where CMAR is used, the HCPM modelled distribution cable lengths are very close to Telecom's actual experience. Logically, Telecom optimises the trade-off between radio sites and distribution cabling to ensure the lowest overall cost. Hence the Commission can be assured that the optimised distribution cabling, that is a feature of the HCPM model, is appropriate in this particular circumstance, as it is consistent with Telecom's actual experience.

Trenching costs

- 28 Trenching costs are one of the most important drivers of the TSO cost. Trenching costs are influenced by terrain conditions. If it were possible, Telecom would prefer that terrain classification was based on detailed and objective terrain data, as envisaged by the FCC in the HCPM model. Telecom does not have any such data and both TelstraClear's expert consultant, Dr Bell, and the Commission have indicated that this kind of data is not available in New Zealand.
- 29 In the absence of detailed and objective terrain data, the terrain classification will always be subjective and therefore open to debate. This is not ideal. However, the original terrain data used by the Commission for the 01-02 TSO calculation was supplied by independent, publicly listed companies that were contractors to Telecom and other carriers, and have detailed knowledge of their areas. This data has now been largely verified by two experienced and independent consulting firms engaged by the Commerce Commission to review that data – Amos Aked Swift in 2002 and Azimuth in 2004.
- 30 Telecom accepts that, at this point in time, this is as robust a set of data as it is feasible for the Commission to use. In particular, given the results of the two

independent reviews of the terrain data, Telecom does not expect ongoing “tweaking” of the terrain data to have a significant impact on the TSO number. We would expect changes in one area to be countered by changes in other areas. Given this, and the overall reliability of the base data as shown in the reviews, we would expect the overall impact of changes, if applied consistently, to be insignificant.

- 31 Telecom agrees with the Commission at paragraph A1.16 of the Draft Determination, that the changes in the definition of terrain conditions suggested by Dr Bell will have both a significant impact on unit costs and reduce further the already highly averaged trenching cost differentiation. Telecom believes that the unit cost for trenching is already very low. The Commission’s costs are more typical of those that might be possible in very large projects, rather than the costs Telecom faces in the day-to-day delivery of the TSO. Telecom may wish to address the issue of trenching unit costs further at the conference in light of the further trenching cost work which we understand is being undertaken by TelstraClear’s consultants.

Operating costs

- 32 Telecom submits that, based on both the Commission’s wholesale decisions and recent NERA estimates outlined in the Commission’s recent [TSLRIC Principles Paper](#), the operating cost savings of \$10.7m included in the TSO calculation is too low. Telecom recommends here a fresh approach that uses the Commission’s own estimates in the wholesale decisions, and takes advantage of the work done by PwC on Telecom’s costs and cost drivers. This would result in the model using the approach outlined in Table 3 below.
- 33 The original Commission calculation purported to be an average of operating cost data presented by Telecom and TelstraClear.¹ In Table 3 below, Telecom proposes a more robust approach to estimating operating cost for the final TSO determination for 02-03. To understand Telecom’s proposal, it is useful to first discuss Telecom’s concerns with the Commission’s approach in the Draft Determination.
- 34 Telecom commented in depth on its concerns about the Commission’s approach prior to the release of the Draft Determination; in particular, that the net cost determination underestimates the total costs which should be attributed to commercially non-viable customers (“CNVCs”) by missing some valid costs and by allocating costs on a per line basis. The Commission responds to some of these concerns in paragraphs A1.27 to A1.29 of the Draft Determination. The Commission’s response raises four issues.

¹ However, the Telecom number used in this averaging was only one part of the number provided by Telecom. In the 01-02 TSO proceedings, at the Commission’s request, Telecom provided information on operating costs and their drivers. However, in both the draft and final 01-02 TSO determinations, the Commission only took half the costs that Telecom had submitted were relevant (i.e. the costs related to lines), and excluded, without explanation, the remainder (i.e. the costs related to network size and the retail costs associated with voice calls). At the time of the 01-02 TSO conference Telecom assumed that the exclusion of part of Telecom’s costs was an inadvertent error due to a misunderstanding of the data Telecom supplied. However the Commission did not change its number or method of calculation for the final TSO determination in 01-02, or for the Draft Determination.

- 34.1 *Top-down analysis (which is the basis of Telecom's numbers) is likely to overestimate costs.* In this case, the PwC top-down estimate for 01-02 is in fact below the likely range of bottom-up numbers presented in Table 1.
- 34.2 *For the purposes of the TSO cost calculation, the allocation of costs by investment cost, rather than lines, does not accurately reflect operational costs.* Telecom agrees that this is the case. Therefore, Telecom submits that those costs driven by customers be allocated by lines, and those driven by network size be allocated by investment cost. This differs from the Commission's approach which allocates all costs by lines only. This is dealt with in more detail below.
- 34.3 *Telecom has stressed to the Commission that operational costs are inversely proportional to capital spend.* This raises two issues – (i) the level of opex spending; and (ii) what drives it. In many cases, the level of opex spend may be inversely proportional to capital spent. But the key issue here is what drives opex cost. The fact that the level of Telecom's opex costs may be inversely proportional to capital spend does not negate the fact that some of this low opex cost is driven by the size of the network rather than the number of customers. This is discussed in more detail below.
- 34.4 *Per minute costs are captured in the CostPro model and should not be separately accounted for.* Telecom agrees. It is our understanding that the operating cost in the CostPro model is network operating cost only. It is not clear whether the Commission has accounted for retail costs, but they may have been inadvertently omitted. In Telecom's modelling, the retail costs associated with calling were added in separately as a per minute cost.
- 35 These issues can be divided into two key matters that Telecom considers need to be resolved:
- (a) What is the appropriate level of operating costs in the model? and
 - (b) How should these operating costs be allocated?

- 36 Since the final TSO determination for 01-02, the Commission has released two papers that give some guidance on both these issues – the [Residential Wholesale determination](#) and the [TSLRIC Principles Paper](#). In particular, both documents provide guidance for determining the lower and upper bound for an avoided cost estimate in the present case.

Appropriate level of operating costs

- 37 In determining the appropriate level of operating costs, these costs are best thought of, for calculation purposes, as those operating costs that could be avoided in the long run if Telecom did not serve part of its customer base. The costs include both avoidable retail and avoidable network costs. The inclusion of 'long run' means that costs which

are fixed in the short run, but avoidable in the long run, should be included. As to the allocation of costs, it seems to us incontrovertible that costs should be allocated by cost driver.

- 38 In the [Business Wholesale](#) and [Residential Wholesale](#) determinations the Commission determined that the costs avoided when Telecom wholesaled, rather than retailed, a service was equivalent to 16% of the retail revenue.² As this avoided cost only covers retail, and not network costs, it would be the lower bound for any avoided cost estimate in the present case – that is, it would be the appropriate number if there were no avoidable network costs. Given that a large part of the access (feeder and distribution) network would not be built under the Commission’s TSO cost calculation, and a lot of that would be aerial plant with high opex costs, it is inconceivable that there would be no network operating cost savings.
- 39 To estimate an upper bound we have considered the steer given by the Commission in its [TSLRIC Principles Paper](#) as to a reasonable estimate of operating costs in a TSLRIC context. The Commission cited work done on this in Australia by NERA. This [NERA report](#) suggests operating costs running at around 10% of capital cost in the core network and 12% of capital cost in the access network.³ To the extent to which these operating cost estimates include common costs (though it is not obvious that they do include any), they will overestimate the operating costs required in the TSO context. So if they are added to the Commission’s avoidable retail cost, the resulting number can be considered as the upper bound for operating costs.
- 40 These two bounds for operating costs are shown in Table 1. They suggest that the total avoidable operating costs are within the range of \$381-\$950m. The equivalent number used by the Commission is around \$185m. Clearly, the Commission’s number is inconsistent with its decisions elsewhere.

Table 1: Potentially Avoidable Operating costs

	Lower Bound	Upper Bound	Commission
Retail avoidable opex at 16% revenues	\$381m	\$381m	
Network incremental Opex at 10 – 12% variable Investment costs		\$569m	
	\$381m	\$950m	\$185m

² Note that the Commission was not required in the [Residential Wholesale Determination](#) to estimate avoidable retail costs associated with residential line rentals, as the Act specifies an actual cost standard. However one could expect, given the other Commission decisions on residential discounts, that this number would have been estimated to be the same as that for business line rentals – 16%.

³ National Economic Research Consultants, *Estimating the long run incremental cost of PSTN access: Final Report for ACCC.*, January 1999, <http://www.nera.com/image/3851.pdf>, Appendix B page 80/81.

Allocation of costs

- 41 The second issue is the driver of this cost. The Commission has provided no rationale for the drivers it uses (i.e. customer lines and minutes of use).⁴ Yet the drivers used are the most conservative that could possibly be used. Telecom has provided the Commission with research carried out by PwC setting out the proportion of costs driven by customers, minutes of use, and capital costs (a proxy for network size). Despite the fact that close to half the access network would not be built in the Commission's model, and nearly \$100m revenues would be lost, the operating costs savings are very small – just over \$10m. Had the Commission used the assumptions underlying its wholesaling decisions (and calculated retail cost savings as a percentage of revenues), and used [NERA's guidelines](#) to allocate the opex cost savings, the savings would have been around \$123m (Table 2). Details of this calculation are provided in **Annex A**.

Table 2: Commission estimate of operating cost savings for CNVCs by cost driver

	Retail avoidable costs		Network avoidable costs		Total
	Residential customers	Business customers	Access Network opex savings	Core network savings	
<i>Actual Commission estimate</i>	\$5.1m	\$1.7m	<i>(Inc in bus and res customer column)</i>	\$4.0m	\$10.7m
<i>Alternative based on wholesale decision and NERA guidelines</i>	[\$] Restricted Information (retail only)	[\$] Restricted Information (retail only)	\$95.5m	\$12.1m	\$122.9m

- 42 The Commission's low number is based on the assumption that all operating cost savings in the access network are driven by customer numbers and not network size. No reasons are given, anywhere, for this assumption, despite the fact that it is very conservative.⁵ A substantial proportion of the operating costs are related to the size of the access network. For example, repairing faults is a large cost. The number of faults is in part customer driven (such as CPE equipment) and in part simply a factor of the amount of cable in the ground. On-going maintenance is also related to network

⁴ Telecom reiterates its submission, which is discussed more fully at paragraph 6 above, that the Commission must provide reasons for its approach to issues raised by Telecom and the liable persons.

⁵ Again, Telecom reiterates its submission, which is discussed more fully at paragraph 6 above, that the Commission must provide reasons for its approach to issues raised by Telecom and the liable persons.

size. For example, when roads are realigned, Telecom is required to re-lay its cable. This activity is related to the size of the network. In other words, the Commission's assumption (that no operating costs are related to the size of the network), is simply inconceivable in practice. By the same token we believe an assumption that all network operating costs are driven by the size of the network, the alternative assumption in Table 2 above, is equally extreme.

- 43 In summary, Telecom submits that not only has the Commission underestimated the level of operating costs potentially avoidable compared to its decisions elsewhere, but it has also adopted the most extreme position it possibly could on cost drivers. No rationale has been provided for this extreme stance.⁶ Telecom submits that the model be revised as per Table 3 which is based on both the Commission's wholesaling decision (retail cost savings) and the PwC operating cost modelling work done for the first TSO determination.

Table 3: Recommended Operating Cost drivers

Total potentially avoidable opex	Driven by customer revenue (@ 16% of revenues)	Driven by access capital cost (@ 1.4% capital cost)	Driven by number of customer lines (\$23 per residential line and \$39 per business line)	Driven by core network capital costs (@ 4.0% capital cost)
\$540m	\$381m	\$53m	\$60m	\$46m

Aerial plant

- 44 Despite the changes made in the final TSO determination for 01-02 in response to concerns raised at the 01-02 conference, the percentage of aerial plant is too high and inconsistent with the Commission's low opex cost assumptions. Telecom has estimated that the Commission's model has just over a quarter of its plant as aerial. The actual percentage in Telecom's network is about 3%.
- 45 Telecom submits that it is not appropriate to use aerial plant in a forward looking cost model. This is consistent with the view of the Commission's own consultants, Amos Aked Swift, which state in their report to the Commission that aerial cabling is not a forward looking technology.⁷

⁶ Telecom reiterates its submission, which is discussed more fully at paragraph 6 above, that the Commission must provide reasons for its approach to issues raised by Telecom and the liable persons.

⁷ Amos Aked Swift; Telecom Access Model – Engineering Inputs Review, Nov 02, <http://www.comcom.govt.nz/telecommunications/pdf/AASTelecomEngineeringInputsReview.pdf>, page 32 & 33.

- 46 In Australia, NERA (consultants to the ACCC), and the ACCC itself, took a similar view on the appropriateness of aerial cabling in the local access network. After commenting on Telstra's view that aerial cabling was around 10% in their network and likely to decline in the future, NERA commented that:

*"It is the ACCC's view that, on a forward looking basis, it is unlikely that there will be much aerial cabling. In addition, the costs of aerial cabling are uncertain as aerial cabling now requires negotiation with local councils. For these reasons we have assumed zero aerial cabling for the forward looking network."*⁸

- 47 Telecom considers that, if the Commission is truly concerned with modelling the TSO on a forward looking basis, aerial cable must be excluded. This is consistent with regulatory precedent overseas, the advice of its own consultants, and Telecom's actual practice. If the Commission does not accept this, then at the very least the costs in the Commission's model need to be increased to take account of:

47.1 the higher operating costs associated with aerial cable. The 50% add-on that TelstraClear has suggested for wireless plant might also be appropriate here.

47.2 The model's underestimate of aerial cable terminal costs. In the confidential version of our May 21 response to the Commission's data request, we suggested higher costs based on our experience. The Commission has not indicated why it has not accepted these.⁹

- 48 It is possible that one of the reasons there is an unrealistically high level of aerial cable in the Commission's model is that the Commission's low unit costs make the aerial option artificially attractive compared to burying plant.

Realism of the HCPM model, and consistency with the CostPro TSLRIC model

- 49 The HCPM model is an optimised model of the local access network. The Commission acknowledged in the draft TSO determination for 01-02 that the "... HCPM model optimises the network so the amount of plant and equipment assumed to be required by the model is likely to be less than that used by an actual network" (at paragraph 398). In other words, it sets a standard which Telecom, and every other real-world incumbent, can not be expected to reach. Telecom notes the Commission's comments in paragraphs 34 to 36 of the Draft Determination, where it disagrees with this point. Telecom intends to address this issue more fully at the conference.

- 50 In addition, the model has errors. At least one has been acknowledged to date by the expert who built the model. Telecom can not determine in detail what impact this error has on the TSO number – this will not be known until the model is recompiled.

⁸ *Estimating the long run incremental cost of PSTN access: Final Report for ACCC: National Economic Research Consultants, January 1999, <http://www.nera.com/image/3851.pdf>, at para 3.3.2, page 53.*

⁹ Telecom reiterates its submission, which is discussed more fully at paragraph 6 above, that the Commission must provide reasons for its approach to issues raised by Telecom and the liable persons.

CostPro model

- 51 Prior to the 01-02 conference Telecom had very little time to review the CostPro model. We have now reviewed the model in some depth but in the context of developing it as a TSLRIC model, rather than for its adequacy for the TSO calculation. Accordingly, Telecom does not consider that it is able to provide detailed comment on the appropriateness of the CostPro model in the TSO context at this stage.
- 52 However, Telecom would like to comment on two general issues that the Commission should be aware of:
- (a) Like any large and complex model such as the CostPro model there are errors in the underlying code and/or spreadsheet formulae. Telecom has identified a number of potential errors and these are being reviewed by CostQuest. We do not believe these errors would have a significant impact on the TSO number.
 - (b) At a more general level, Telecom does not believe that the degree of optimisation found in the CostPro model is appropriate in the TSO context. The CostPro model is a theoretical abstraction. The modelled network sets a standard no incumbent operator could meet in practice. In the TSO context, the Act requires the Commission to assess the actual cost of meeting CNVC needs over time in the most efficient manner. Telecom does not seek compensation through the TSO for any inefficiencies in meeting the needs of its most far flung and expensive customers. What the Act compensates for is the practical and reasonable costs of meeting these needs as efficiently as possible over time. An appropriate modelling approach would be to accept the network that has evolved over time, but to update asset costs on the basis of the cost of Modern Equivalent Assets.

B2 OTHER ASPECTS OF MODELLING FRAMEWORK

- 53 Telecom continues to disagree with a number of other aspects of the Commission's approach to the modelling framework. In particular, Telecom considers that the Draft Determination again fails to give sufficient weight to Part 3 of the Act. Similarly, Telecom disagrees with the Commission's approach to defining "Efficient Service Provider", and the appropriate unit of calculation.
- 54 Telecom substantially repeats in the Appendix to these submissions its submissions from last year on these points.

B3 REASONABLE RATE OF RETURN

- 55 The Commission states that its assessment of the cost of capital in the Draft Determination builds upon the position taken in the final TSO determination for 01-02. Telecom's comments and those of the experts PricewaterhouseCoopers (PwC) (in **Annex B**) and Glenn Boyle, Graeme Guthrie and Neil Quigley (in **Annex C**) relate to the Commission's calculation in the Draft Determination, and to the methodological issues common to both the Draft Determination and the final TSO determination for 01-02.
- 56 The Commission's preliminary view is that the post tax WACC for the TSO is 7.4%, and no allowance is made for any additional increment to the WACC to recognise the deficiencies of CAPM. Telecom's position is that the WACC for the TSO is 11.1%. Further, a conservative estimate of the appropriate increment, to reflect the deficiencies of CAPM is 2%. This results in a reasonable rate of return of 13.1%. The expert analysis that produced these estimates is contained in the in the attached PwC report (at **Annex B**) and the report prepared by Boyle, Guthrie and Quigley (at **Annex C**).
- 57 The two key reasons for the difference between the Commission's and Telecom's estimates of the cost of capital are outlined in this section. The first is differences in the estimates of the asset beta. This drives the difference between the Commission's preliminary estimate of WACC of 7.4% and the Telecom's WACC of 11.1%. Second, the Commission has not included an increment to reflect the deficiencies of CAPM when estimating a reasonable cost of capital for the TSO.

TSO Asset Beta

- 58 The PwC report attached at **Annex B** notes that much of the Commission's methodology for determining the asset beta of the TSO draws on the Treasury handbook "[Estimating the Cost of Capital for Crown Entities and State-Owned Enterprises](#)". PwC notes the context of the handbook is to provide a methodology for estimating the cost of capital for Crown entities that do not have traded shares. The challenge in that context is to identify a set of comparator companies that are similar in some respects to the Crown entity, and then estimate their asset betas. If there is a large set of good comparators, then there might be some averaging process to arrive at an estimate of the asset beta for the Crown entity.
- 59 It might be argued that this approach is appropriate for estimating the asset beta for the TSO business, as, like a Crown entity, the ownership interest in the TSO cannot be traded. However, in applying the approach set out in the Treasury handbook, the Commission ignores the fact that the TSO business is part of Telecom, which does have traded shares. It follows that there is a significant amount of information that can be observed in the market that is highly relevant to determining the asset beta and more generally the cost of capital of the TSO. The approach of the Treasury handbook does not incorporate this information because it assumes a context in which the information is not available. However, the starting point for determining the cost of

capital of the TSO business is that information about Telecom's cost of capital is available, which is not the case for Crown entities and state owned enterprises. Rather than ignore this information, the Commission's starting point should be an estimate of Telecom's own market based characteristics, followed by analysis of comparable companies in the same industry (i.e. telecommunications). Boyle, Guthrie and Quigley explain in the attached paper (**Annex C**) that since firms outside the telecommunications sector will not face comparable systemic risk associated with capital prices and demand, the fundamental starting point for the Commission's estimation of the asset beta for the TSO should be the business of Telecom New Zealand and similar telecommunications companies in other countries.

- 60 Using this starting point, PwC presents a transparent methodology for estimating the asset beta for the TSO that is reconciled with the observable data on Telecom and other similar telecommunications companies. PwC adjusts for a number of facts, including the fact that Telecom includes a mobile business and an ISP, as well as the "insurance effect" of the TSO, to arrive at an estimate of the asset beta for the TSO of 0.8. This compares with the Commission's estimate of 0.4.
- 61 The attached expert reports (**Annexes B and C**) make a number of other points about the Commission's estimate of asset beta. Boyle, Guthrie and Quigley show that the one year term of the TSO regulatory cycle increases the sensitivity of the TSP to systematic risk, and thus increases the asset beta. PwC points out that the Commission's reliance on the ACCC's beta analysis is flawed and presents work by [Fama and French](#) that demonstrates that the CAPM significantly underestimates the expected rate of return for companies with low asset betas, which is relevant given the Commission's estimate of the asset beta for the TSO.

Increment to the WACC

- 62 In their report, Boyle, Guthrie and Quigley present three deficiencies in the CAPM, identified in the literature. These deficiencies are that the CAPM does not allow for market frictions, imperfect labour and product markets, and investment irreversibility.
- 63 Market frictions, imperfect labour and product markets, and investment irreversibility are real-world features of Telecom's investment in the TSO. In a world with market frictions, the fact that Telecom is required to invest in the TSO places a constraint in its ability to raise capital for other projects. In addition, the TSO diverts Telecom's personnel from commercial activity. Personnel cannot simply be employed in order to carry out this commercial activity as labour markets are imperfect. Finally, a significant proportion of the investment in the TSO includes investment in the access network, which are large investments and once made are irreversible.
- 64 Telecom submits that it is inappropriate for the Commission to disregard the implications of these deficiencies in the CAPM. A conservative estimate of the 2% increment is 2%, as submitted by Telecom during the 01-02 TSO determination.

C ALLOCATION OF TSO COST

65 As noted at paragraph 227 of the Draft Determination, the allocation of the TSO net cost among the liable persons is an essential part of the TSO determination.

66 The Commission has used the same methodology to determine cost allocation for the 02-03 TSO period as that set out in its final TSO determination for 01-02. Telecom has some concerns with the Commission's approach, some of which are new.

67 Telecom's submissions on the allocation of the TSO net cost for the 02-03 TSO period are set out in the following sections:

C1 Consistency;

C2 Liable persons;

C3 Liable revenue; and

C4 Audit requirements.

C1 CONSISTENCY

- 68 Telecom reiterates that it is important that the tests applied by the Commission (e.g. who is a liable person, what constitutes liable revenue and what type of audit report needs to be provided) are consistently applied. To ensure a fair and legal allocation of net cost, it is obviously important that each liable person is assessed according to the same set of rules.
- 69 In the final TSO determination for 01-02, there was little confirmation provided by the Commission that its tests were applied, and liable revenue values calculated, on a consistent basis.
- 70 Telecom appreciates the Commission has made more information available for the 02-03 year, which enables some assessment of consistency. Moves such as disclosing each liable person's (and Telecom's) liable revenue calculation on 20 July 2004 are a positive step.
- 71 However, while this may enable the parties to perform a high-level analysis of consistency, ultimately it is not Telecom's, or any liable person's, responsibility to do such analysis. Telecom reminds the Commission that it is the Commission's responsibility to determine that its tests are consistently applied by each liable person and Telecom. Accordingly, Telecom recommends that, once it is determined what revenue is "liable revenue", the Commission engage an independent auditor to review the responses provided by each liable person and Telecom. The costs of this audit could (through the Commission's working budget) be allocated in a pro rata fashion to each liable person and Telecom.

C2 LIABLE PERSONS

72 A number of carriers argue that they should not be considered as liable persons, or that other persons qualify as liable persons. In respect of these arguments, Telecom notes the following points:

72.1 in respect of CallPlus' arguments, the Commission notes at paragraph 241 of the Draft Determination that it has sought further information from CallPlus Services Limited and related companies to enable the Commission to reach a view as to the status of that company. Telecom requests that the Commission disclose a copy of this information to Telecom. At that time, Telecom will consider whether to make submissions on CallPlus' claims.

72.2 in respect of Vodafone's arguments (see for example point 1 in their letter dated 17 May 2004), Vodafone argues that it may not have been interconnected with a fixed PSTN operated by Telecom during the 02-03 TSO Determination period. Telecom disagrees. Throughout that period Vodafone operated a network that was interconnected with Telecom's fixed PSTN, and calls passed between the Telecom fixed PSTN and the Vodafone network.

72.3 Telecom agrees with the Commission that pure ISPs (who do not have a network) should be excluded from the definition of liable person.

C3 LIABLE REVENUE

Gross revenue appropriate measure

- 73 There has been considerable discussion of the appropriate measure of revenue, including whether the Commission should adopt a gross, net, or retail revenue test. In its Draft Determination the Commission requests that the parties address [Vodafone's submission](#) to the Commission on the merits of the net revenue and retail revenue approaches at the conference on the Draft Determination.
- 74 Telecom's position is and always has been that the correct interpretation of "revenue" for the purposes of allocating the cost of the TSO amongst liable persons is "gross revenue." This is based on the plain meaning of the Act. The Act requires the net cost to be allocated on the basis of "revenue", and makes no distinction between retail or otherwise. The Act simply does not say "net revenue" or "gross retail revenue", and it does not give the Commission any discretion to deduct from "revenue" any of the input costs incurred by liable persons.
- 75 Telecom has made submissions to the Commission on this basis on a number of occasions. Telecom reiterates its view that the Commission does not have discretion under the Act to allocate the costs of the TSO amongst liable persons on any other basis than a gross revenue calculation. Telecom's position is that the Commission would be acting in error should it allocate the net cost of the TSO amongst liable persons on the basis of a gross retail or net revenue calculation, as opposed to a simple gross revenue calculation.
- 76 The Commission has previously noted some concern that allocating the net cost on the basis required by the words of the Act would result in distortion. But distortions are a given in any taxation regime. The TSO Deed creates a distortion, and there are other aspects of the TSO regime that are not competitively neutral.

Weighted revenue approach inappropriate

- 77 Telecom agrees that an unweighted approach is appropriate and agrees with the Commission that robust and reliable data on demand elasticities and price-marginal cost margins for telecommunications services in New Zealand is not available to support the use of a weighted-revenue approach.
- 78 Telecom refers to, and repeats as part of this submission, the expert paper prepared by National Economic Research Associates provided to the Commission last year on this point ([Efficient Recovery of TSO Costs](#) (October 2003)).

Liable revenue and information provided by liable persons

- 79 There is still uncertainty as to which revenue qualifies as "liable revenue". The Commission's instructions in its letters dated 5 April 2004 were difficult to interpret and required each party to make a number of assumptions about the treatment, and exclusion, of certain types of revenue. Further, some of the specific guidance given by

the Commission (e.g. the exclusion of dial-up internet revenue and inclusion of SMS revenue) has been queried by the parties.

- 80 In response to the Commission's instructions, each liable person and Telecom provided the Commission with a revenue response. In Telecom's response, Telecom went to some length to ensure transparency and detailed each assumption it made in relation to the treatment of revenue.
- 81 The Commission disclosed to Telecom on 20 July 2004 copies of the liable revenue calculations provided by each liable person. The information provided by liable persons is of varying utility and detail. Based on the information provided, it is difficult to ascertain whether liable persons have made consistent assumptions during the preparation of their responses. The assumptions made by each of the liable persons are not comprehensively identified in their responses.
- 82 Some of the apparent inconsistencies are resolved by reference to the Draft Determination. For example, Compass claims that certain revenue (i.e. revenue from toll by-pass calls switched by Compass for TelstraClear customers, revenue from direct dial calls switched by TelstraClear on behalf of Compass, and calling card revenue from calls not switched by Compass) is not liable revenue. Telecom agrees with the Commission's preliminary view that all such revenue is liable revenue.
- 83 However, some inconsistency issues remain. For example, Telecom is unable to identify whether, when a carrier notes that it has removed "data revenue", liable persons have incorrectly removed any revenue for dial up data services which should have been included.
- 84 The Commission notes in the Draft Determination that in some cases the information has not yet been audited and the Commission has not yet decided whether the information supplied gives the correct calculation of liable revenue. As noted in paragraphs 68 to 71 above, consistency in approach is crucial and it is the Commission's responsibility to determine that its tests are consistently applied by each liable person and Telecom. Telecom suggests that engaging an independent auditor would meet this responsibility.

C4 AUDIT REQUIREMENTS

- 85 Telecom is concerned about the possible disparity between the audit reports provided by each liable person in support of its liable revenue response. In order to confirm whether suitable audit reports have been provided, Telecom requests the opportunity to view each liable person's audit report (with confidential information removed). Telecom believes it likely that many of the audit reports provided by liable persons are insufficient to meet the purpose for which they are provided.
- 86 Telecom has sought comment from its auditor, KPMG, on the types of audits and reporting engagements that auditors can perform. A copy of KPMG's response is attached as **Annex D**. In summary, there are 3 categories of engagement, and each engagement results in a different report: audit engagement; review engagement; and agreed procedures. The minimum level of detail that must be included in each type of report is governed by individual Institute of Chartered Accountants of New Zealand standards.
- 87 To date Telecom's auditors (KPMG) have performed an audit engagement and provided a long-form audit report. For the following reasons, Telecom submits that this is the preferred type of report, as:
- (a) in the Commission's instructions dated 5 April 2004 the Commission asked each liable person and Telecom to "provide a report prepared by a qualified auditor that includes a statement of whether or not all the information provided complies with all of the Commission's requirements";
 - (b) the Commission's instruction in (a) requires a positive assurance from a qualified auditor. An audit engagement is the only form of engagement that provides such a positive assurance;
 - (c) in an audit engagement, the auditor's opinion helps to establish the credibility by providing a high (but not absolute) level of assurance on the matter subject to examination;
 - (d) preparing a long form report and expressing a positive assurance opinion is the only way that an auditor can confirm that the information complies with the Commission's requirements.
- 88 Telecom doubts whether anything less than an audit engagement would be sufficient to satisfy the Commission's instructions dated 5 April 2004. Telecom further submits that a requirement to produce an audit engagement report best fits with the legislative framework and, in particular, the wording of section 81.
- 89 Although Telecom considers that a long form audit engagement report is preferable and best fits with the wording in the Act, Telecom acknowledges that, due to the cost

involved, requiring each liable person to produce such a report may not be pragmatic. Taking this into account, Telecom submits that the Commission should require that all listed companies provide a long form audit engagement report, as:

- 89.1 the cost of a long form audit report will be significantly reduced for listed companies (i.e. Telecom, TelstraClear, Vodafone and TeamTalk) who are obliged to have their annual reports audited; and
- 89.2 the need for a long form audit engagement report is more acute for carriers with larger, more complicated revenue streams. The revenue of carriers with less revenue tends to be more easily classified into easily defined categories (e.g. direct calling revenue, dial-up internet revenue and calling card revenue), which are relatively easy to assess against the liable revenue tests (once resolved). However, carriers with more revenue often have complicated revenue streams and costs which are more difficult to reconcile with the Commission's instructions (e.g. inbound international calling revenue, revenue from consultancy type services and outsourcing payments).

D TSO COMPLIANCE

- 90 Telecom complied with all of its TSO obligations for the 02-03 TSO period. This is demonstrated by the Service Quality Measures Report provided by Telecom on 22 September 2003.
- 91 The Commission's comments in paragraphs 302 to 304 of the Draft Determination are wholly inappropriate. The Commission should not discuss in any draft determination or determination relating solely to one period (in this case the 02-03 TSO period) compliance measures and processes which may apply to future TSO periods. Telecom will not comment in this forum on compliance for the 03-04 period.

APPENDIX

The Legislative Framework

- 1 Telecom considers that the Draft Determination again fails to give sufficient weight to the purpose of Part 3 of the Act. Telecom repeats the submission it made in response to the draft TSO determination for 01-02, as follows:
 - 1.1 It is fundamental that the meaning of the language of Part 3 of the Act be ascertained not only from the text but also in light of the purpose: [Interpretation Act 1999](#), section 5. Any fair reading of Part 3 conveys that its purpose is to give effect to negotiated bargains between the Crown and a telecommunication service provider. In particular, the legislation was enacted with full awareness of Telecom's position.
 - 1.2 In other words, the TSO regime enables the Crown to achieve a public good (extension of telecommunication services to those who might otherwise be disadvantaged) through the agency of a provider. In circumstances involving the Crown, there are expectations of good faith dealing; and with commercial parties, the expectation must be to seek rational economic outcomes. Thus there is a framework for fair reimbursement for real services provided.
 - 1.3 There is more than analogy with contract here. The TSO Deed is a real contract, and the Commission has an agency role in the performance of the Crown's obligations relating to it. Given this contractual environment, the legislative intention is properly understood as one which would replicate contractual outcomes — at least to the extent that these would not be irrational, or such that no commercial party would enter into them voluntarily. The chilling effect of such outcomes on the ability of the Crown to negotiate future TSO arrangements is of obvious importance.
 - 1.4 The TSO requires delivery of the public good through the use of private assets — here the assets of Telecom. And it is a well established principle of law that, in these circumstances, judicial or quasi-judicial decision-makers are not to be niggardly in ensuring that the private assets are fairly compensated.
 - 1.5 The core principle is found in the expropriation jurisprudence, and the line of authority that runs (at least) from *Attorney-General v De Keyser's Royal Hotel* [1920] AC 568, HL, to *R v Wells* [1999] 3 SCR 1999, SCC.
 - 1.6 However, the principle extends to the regulatory environment as well. There is a general principle that an Act should not be construed so as to interfere with or prejudice established private rights unless undoubtedly intended to do so: 44(1) Halsbury's Laws of England (4th ed, 1995), para 1464.

- 1.7 One of the authorities cited by Halsbury is *Methuen-Campbell v Walters* [1979] 1 QB 525, where Buckley LJ said (at 543):

I agree with the view expressed by Goff LJ that in an Act ... which, although it is not a confiscatory Act is certainly a dispropriatory Act, if there is any doubt as to the way in which the language is to be construed, it should be construed in favour of the party who is dispropriated rather than otherwise.

- 2 Telecom submits that the final 02-03 TSO determination should give more weight to these principles, and the Commission should provide reasons for its decision explaining how it has taken these principles into account.

The efficiency standard

- 3 Telecom continues to disagree with the Commission's approach to defining "Efficient Service Provider". Again, Telecom reiterates its previous submissions to the Commission on this point:
- 4 Telecom continues to view as critical the Commission's decision to interpret the "Efficient Service Provider" proviso in the definition of "net cost" as setting a standard no real-world Telco can meet. This severs the link between the Commission's estimate of a fair net cost and the real-world in which Telecom is delivering the TSO services.
- 5 When the Crown and Telecom negotiated the TSO Deed, and contemplated the TSO regime in the Telecommunications Bill, the focus was on real-world service delivery. The "Efficient Service Provider" proviso was seen as a protection against Telecom, or any future TSP, receiving compensation for real-world inefficiencies. There was no intention or contemplation that this proviso set an efficiency standard beyond the reach of a real-world provider. The Crown knew Telecom, or a future TSP, would never agree to such under-compensation.
- 6 In the Parliamentary context this would have been seen as a form of appropriation of property rights. While it was always clear the Telecommunications Act would place some restrictions on the exercise of Telecom's property rights, it was never contemplated Telecom should be penalised for not meeting an impossible efficiency standard.
- 7 The task set by the Act is for the Commission to determine the net cost "to the TSP" of providing the TSO services (sections 88(a)(i) and 92(a)(i)). This affirms the focus on the real-world agent delivering the social services contracted by the Crown.
- 8 The definition of "net cost" contains the "Efficient Service Provider" proviso. To interpret this, as the Draft Determination does, as requiring the Commission's calculation to be divorced from a real-world standard is to supplant the primary objective – identification of the net cost to the TSP – with a different objective – identification of the net cost to a hypothetical provider. This is a misunderstanding of

the role of the “Efficient Service Provider” proviso, and, as previously discussed with the Commission, is inconsistent with the intention of the Crown, Parliament and Telecom.

- 9 The correct interpretation of the “Efficient Service Provider” proviso is that it sets a real-world efficiency standard. This is consistent with the context in which Parliament contemplated the TSO regime would operate. For the Commission to apply an unachievable standard would render a significant part of the TSO regime unavailable for future use by the Government, defeating the intention of Parliament. A real-world standard is required by the particular words used in Part 3 of the Act, where the Commission is set the task of determining the net cost to the TSP, and not a hypothetical provider.
- 10 Telecom’s submission here is consistent with regulatory jurisprudence in the USA. The general requirement that public utilities charge rates that are “just and reasonable” is matched by one that there be no confiscation of property, which in turn requires a fair return on the property which is subject to regulation. It is clear from the US case law that such return must be sufficient to assure confidence in the financial integrity of the enterprise so as to maintain its credit *and* to attract capital “under efficient and economic management”: *Federal Power Commission v Hope Natural Gas Co* 320 US 591 (1944, USSC); and *Stuart v Utah PSC* 885 P 2nd 759 (1994, Utah SC).
- 11 The reference to “efficient and economic management” connotes a real-world context. The same thing may be achieved in Part 3 by reading “efficient” consistently with its ordinary usage, “efficient” meaning not wasteful or foolish. There is simply no reason to overlay the “net cost” definition with the unworldliness of “perfect” (allocative only) competition. Alternatively, the “net cost” definition’s “efficient” criterion may be considered as having an implied “reasonableness” requirement. This is analogous with judicial interpretation of “necessary” as “reasonably necessary” in various contexts: see, for example, *Carlton and United Breweries v Minister of Customs* [1986] 1 NZLR 423, 430 (CA) (interim judicial review order); and *Valks v BNZOPA* [1996] 1 NZLR 735, 737 (non-party discovery).
- 12 An efficiency standard not capable of being met by a real-world telecommunications provider will not advance the long-term benefit of end-users. The Commission’s approach to optimisation will reduce dynamic efficiency and the long-term benefits provided to end-users because it will penalise the TSP for investments which were efficient ex ante but become inefficient ex post as a result of unforeseen changes in demand or technology. The TSP will rationally respond to the incentives provided by this regime with reduced investment: even though this is welfare reducing, it minimises the TSP’s private costs of regulation.

The appropriate unit of calculation

- 13 Telecom and the Commission now agree the appropriate counterfactual must be based on the reality that Telecom’s network is in place, and customers are connected

(see paragraph 41 of the Draft Determination). The question is what would Telecom do absent the TSO?

- 14 Absent the TSO, Telecom would adjust its connection, rental and calling prices to ensure it earned a reasonable rate of return on the assets used to service each customer. Only if a customer was unwilling to pay these prices would it be disconnected. To set its prices Telecom would use the detailed cost information it has available. In this regard, the Commission is wrong when it asserts costs cannot be attributed to customers below the cabinet level.
- 15 The Commission has previously disagreed that the customer is the appropriate unit of analysis. This objection was driven, however, by an earlier counterfactual used by the Commission. When contemplating a telco that is subject to a TSO price cap rolling out a network, the Commission suggested decisions would be made at an area/cluster/cabinet level. This was the result of the hypothetical telco being unable to accurately predict whether future revenues would recover costs on a customer by customer basis. However under the counterfactual now used by the Commission, and agreed to by Telecom, the network is in place and the telco can price to recover cost.
- 16 Given the new counterfactual, the basis for the Commission's rejection of the individual customer as the unit of analysis is not robust.
- 17 As a matter of fact, both Telecom and TelstraClear make pricing and network investment decisions at the individual customer level. TelstraClear discussed its approach to investment decisions at length in the wholesale process, where it claimed the decision to serve SMEs in areas where TelstraClear had network was made on a customer by customer basis.
- 18 Telecom agrees that in many areas, especially urban areas, a network provider may roll out a network cluster by cluster. However the TSO cost mostly arises in rural areas. In these areas there are no efficiencies in rolling out network to unprofitable customers. Most of the cost of customers are cabling/trenching and CT costs. These can be estimated in advance with considerable accuracy. Telecom has many network planners who do this as their main job. This is not unique to Telecom – Telecom does not see many instances of competitors extending their networks to the rural fringes of the urban areas they serve.
- 19 Telecom has been developing the HCPM model so that it can calculate the TSO loss at a smaller geographic unit than the cluster. This work is not yet complete, although we hope to report on it at the conference.