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Costing issues in pricing the UBA

Final Report

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COMPETITION ECONOMISTS GROUP

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Executive Summary

1. We understand that the purpose of the initial pricing principle for the unbundled bitstream access (UBA) service is to approximate the outcome of a final pricing principle for the UBA in a low-cost process. The final pricing principle requires the Commerce Commission (the Commission) to estimate the cost of the UBA increment using total service long-run incremental cost (TSLRIC) modelling.

2. It is therefore relevant to consider the issues associated with an implementation of the final pricing principle in New Zealand when applying the initial pricing principle. These considerations are relevant to selecting which jurisdictions to benchmark against, determining quantitative adjustments to the raw benchmarked prices and, if such adjustments cannot be made, assessing qualitative factors to take into account in approximating the cost of the UBA increment in New Zealand.

3. There are number of factors that are likely to be material to the calculation of the TSLRIC of the bitstream increment in benchmark jurisdictions and New Zealand:

    a. The spatial density factors associated with each jurisdiction. We showed in our previous cost drivers report that the Danish and Swedish cost models would estimate unit costs for the UBA increment that are 53.9% and 14.1% higher than the raw benchmark prices when applied to New Zealand's characteristics.

    b. The geographic coverage of the regulated service. Excluding areas with low unit costs from the calculation of the regulated UBA price could result in the spatial density adjustments from Denmark and Sweden increasing further to 75.0% and 19.6%, depending upon the nature of the exclusion applied.

    c. The sharing of network assets between services giving rise to economies of scope, meaning that unit costs can be reduced. In the benchmarked models many of the assets used to provide the UBA increment are also utilised in the provision of voice services. In New Zealand, we understand that Chorus' network does not carry significant voice traffic between the DSLAM and the handover point. This will have a tendency to raise the costs of providing the UBA increment in New Zealand relative to other jurisdictions.

    d. The technology that is used to model the provision of services has important effects on the balance of costs in the network and may influence the relative size of the UBA increment. In addition, even networks with the same technology may employ alternative definitions for the bitstream access service. These differences must be considered in benchmarking prices to New Zealand conditions.

4. The sum of these considerations suggests that implementing an initial pricing principle using unadjusted prices from benchmark jurisdictions will not achieve its purpose of approximating the outcome of a final pricing principle. The importance of the spatial density factors can be shown quantitatively, but there are other qualitative

factors (such as the sharing of network assets and the modelled technology) that should be considered in the benchmarking process.

5. In its submission, Analysys Mason presents four raw benchmark prices and suggests that the Commission can take 'comfort' in the fact that they are closely aligned with one another. Telecom, in its submission, suggests that the spread of these benchmarks is indicative of the simple nature of the UBA service, using elements that are 'all' sourced from international providers. In light of this, Telecom asserts that the similarity in raw benchmark prices is not surprising, and that modelling the UBA increment in a final pricing principle would in practice be a very simple task for this reason.

6. Aside from being internally inconsistent, Telecom's submission abstracts away the myriad potential complexities of modelling the TSLRIC of the UBA increment in New Zealand. In doing so, it assumes away the possibility that the underlying costliness of providing the UBA increment may differ between benchmark jurisdictions. In this report, we show that there are likely to be significant underlying cost differences between the benchmark jurisdictions, and also significant cost differences between these jurisdictions and New Zealand.

7. In light of these differences, no comfort can be taken from a narrow range of raw benchmark prices. It is the range of benchmark prices which have been adjusted for expected differences in underlying cost between the benchmark jurisdictions and New Zealand that is relevant, not the range of the raw benchmark prices. Considering adjusted benchmark prices represents an application of the initial pricing principle that is consistent with the objective of approximating the outcome of the final pricing principle.

1 Introduction

8. Chorus has asked the Competition Economists Group (CEG) to prepare this report commenting on the issues that would be associated with preparing a TSLRIC model of the unbundled bitstream access (UBA) service in New Zealand, as well as on how these issues should be considered by the Commerce Commission in applying the initial pricing principle.

9. The initial pricing principle requires the Commission to benchmark the additional costs of supplying the UBA above the cost of UCLL (the 'UBA increment') against prices in comparable countries using forward-looking cost-based methodologies. Its purpose is to provide a proxy for the result of applying the final pricing principle. The final pricing principle requires the Commission to estimate the cost of the UBA increment using total service long-run incremental cost (TSLRIC) modelling.

10. On this basis, we consider that it is important to consider the issues associated with an implementation of the final pricing principle in New Zealand when applying the initial pricing principle. These considerations are relevant to selecting which jurisdictions to benchmark against, determining quantitative adjustments to the raw benchmarked prices and, if such adjustments cannot be made, assessing qualitative factors to take into account in approximating the cost of the UBA increment in New Zealand.

11. The Commission has received submissions that a number of raw benchmark prices are 'tightly grouped' around a particular price point; and that this should provide the Commission 'comfort',[1] or indeed that it is indicative of the comparative simplicity with which the cost of the UBA can be modelled such that one would not expect to achieve a wide range of benchmarks.[2] These comments are made without giving explicit consideration to a range of issues relevant to the estimation of TSLRIC which are likely to give rise to differences in unit costs between the benchmark jurisdictions and New Zealand, and indeed between the benchmarks themselves. These differences in underlying cost may be masked in the apparent similarity of the raw benchmark prices.

12. The remainder of this report is set out as follows:

    - **section two** describes the purpose of the initial pricing principle and how the requirements of the final pricing principle are relevant to its implementation;
    - **section three** outlines the considerations that would be relevant to modelling the TSLRIC of the UBA in New Zealand, including:

[1] Analysys Mason, *Comments on UBA service benchmarking review*, 30 January 2013, p. 7

[2] Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, p.1

- reviewing our previous work on spatial density factors and analysing the effect on the average cost of supplying the UBA increment in areas that might not be excluded from regulation;
- discussing the sharing of network elements between services and the effect on the cost of UBA of Chorus not providing voice services; and
- explaining why issues of technology choice and the definition (or scope) of the UBA may be material to its modelled TSLRIC cost.

- **section four** brings together these considerations to assess whether an apparent similarity across a small number raw benchmark prices should provide the Commission comfort that picking a value within this range would be reasonable.

2 Purpose of the initial pricing principle

2.1 An approximation for the final pricing principle

13. The initial pricing principle requires the Commission to determine the price of UBA to be:[3]

> *The price for the designated access service entitled Chorus's unbundled copper local loop network, plus benchmarking additional costs incurred in providing the unbundled bitstream access service against prices in comparable countries that use a forward-looking cost-based pricing method*

14. The Commission has stated that *"the initial pricing principle is a proxy for the final pricing principle"*.[4] In its earlier discussion paper, it further stated that it is *"intended to provide a cost-effective and timely approach for determining the cost-based price of a service that would be determined using the final pricing principle"*.[5] The final pricing principle (FPP) requires the price of UBA to be:[6]

> *The price for Chorus's unbundled copper local loop network plus TSLRIC of additional costs incurred in providing the unbundled bitstream access service.*

15. It is therefore important to consider the issues associated with an implementation of the final pricing principle in New Zealand when applying the initial pricing principle. This guidance could take a number of forms but must begin by asking the question*: what issues are likely to be significant to modelling the TSLRIC of the UBA increment in New Zealand and will these issues give rise to differences in the estimated unit costs between each benchmark jurisdiction and New Zealand?*.

16. We note that there are a number of ways in which the requirements of the final pricing principle can be utilised in the implementation of the initial pricing principle. These considerations are relevant to:

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3 *Telecommunications Act 2001*, Schedule 1

4 Commerce Commission, *Unbundled Bitstream Access Service Price Review*, 3 December 2012, p. 41 (hereafter: 'Draft Determination').

5 Commerce Commission, *Unbundled Bitstream Access Service Price Review Consultation: Discussion Paper*, 26 July 2012, p. 5

6 *Telecommunications Act 2001*, Schedule 1

- deciding which jurisdictions provide services that are comparable for the purpose of benchmarking the cost of the UBA increment in New Zealand;
- determining quantitative adjustments that can be made to raw benchmark prices in order to render them comparable to New Zealand; and
- where quantitative adjustments cannot be made, assessing whether qualitative factors should be taken into account in using benchmark prices to approximate the cost of the UBA increment in New Zealand.

17. If differences between the benchmark jurisdictions and New Zealand that are known to be significant to the outcome of a TSLRIC model are not accounted for - or at least considered in the application of the initial pricing principle - then describing the outcome of that process as an 'approximation' of a final pricing principle is potentially misleading.[7]

18. We do not consider these conclusions to be either unusual or unreasonable. Indeed, in the process of the UCLL and UBA reviews, instances of these types of considerations have been either proposed or adopted by the Commission. For example, during the UCLL review the Commission:

- determined that a number of jurisdictions were not comparable to New Zealand by reference to their spatial density characteristics. In the current UBA review, the Commission proposes to exclude Belgium on the basis that it considers that the handover point is materially different in that jurisdiction; and
- allowed the inclusion of benchmarks with different spatial density characteristics, but only after adjusting for the expected difference in UCLL costs arising from differences between each jurisdiction and New Zealand in these characteristics.

19. When adjustments of the type described above are not made in analysing and interpreting the results of raw benchmarking, this may lead to an error in assessing the significance and relevance of the results of process to New Zealand.

2.2 Conclusions based on raw benchmarks

20. In its UBA Draft Determination, the Commerce Commission proposed to set the price for the UBA increment at $8.93 per month, based on the average of two benchmarks sourced from Denmark and Sweden. In its proposed implementation of the initial

[7] It is important to note that this should not be interpreted as suggesting that the Commission must investigate all matters that would have an effect on the TSLRIC of the UBA increment. We consider that it should investigate only matters that can be shown to be significant to cost and only to the extent that these can be quantified or the direction of any adjustment established using tools that are proportionate to the scope and timing of the initial pricing principle.

pricing principle, the Commission did not make any quantitative adjustments, or cite any qualitative factors, that would cause it to consider that the raw benchmarks it is using should be varied to reflect New Zealand characteristics to best approximate the outcome of a final pricing principle.[8]

21. The Commission has since received a submission from Analysys Mason, on behalf of Telecom, that proposes changes and updates to the way that it uses the Danish and Swedish prices. Analysys Mason also proposes that the modelled prices for Belgium be included in the benchmark set and that Hungary contains access network information that may be relevant to the assessment of the UBA increment. It estimates a 'synthetic' UBA increment for Hungary based on this access network information combined with core network information averaged from the Danish and Belgian cost models.[9]

22. Analysys Mason concludes that its four proposed benchmarks range from $8.32 per month for Belgium to $9.80 per month for Hungary. It notes that the concentrated range of these benchmarks may provide some 'comfort' to the Commission in the context of relying on such a limited sample.[10]

23. Telecom's submission goes further, concluding that this tight range of benchmarks is indicative of the 'simple' nature of conducting modelling of the UBA:[11]

> *Where countries have set forward-looking prices, those prices are tightly grouped around NZD$9. In fact the over-riding conclusion we have drawn from examining these benchmarks is that the possible range of forward-looking cost based prices is very small. This is not all that surprising, given that all we are costing is a small number of network elements, all of which are sourced from a small number of providers internationally.*

24. Telecom goes on to state:[12]

> *As we have noted in other submissions in connection with the UCLL process, there are a number of issues in cost modelling which can lead to a range of variations in modelled prices. In the present case, however, a*

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8 As discussed extensively in section 3 below, we believe that several factors exist that would lead one to believe that some adjustments to raw benchmark prices are necessary to reflect expected differences in costs between New Zealand and the benchmark jurisdictions.

9 Analysys Mason, *Comments on UBA service benchmarking review*, 30 January 2013, pp. 2-3, 5-7

10 Analysys Mason, *Comments on UBA service benchmarking review*, 30 January 2013, p. 7

11 Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, p.1

12 Ibid, p. 8

> *forward looking view of the additional cost elements and cost drivers in the additional costs incurred in providing the unbundled bitstream service results, suggests FPP cost modelling would be a comparatively simple modelling exercise. A FPP process would unlikely be complex or unduly costly for parties if they were concerned at the IPP based price.*

25. It is important to note that Telecom's potentially far-reaching conclusion is based on a range of raw benchmark prices. Aside from ensuring that these are estimated on the basis of TSLRIC, no effort has been expended by Telecom or Analysys Mason to examine whether there may be factors relevant to modelling the costs of the UBA increment in these benchmark jurisdictions and in New Zealand that would give rise to differences in the expected level of unit costs.

26. An alternative explanation for the range of raw benchmark prices collected by Analysys Mason is that their similarity to each other is generally coincidental and that the underlying costliness of the benchmark jurisdictions is quite widely spread. Under this hypothesis, when the raw benchmark prices are adjusted to be expressed on the basis of New Zealand's characteristics, a much greater variation in the range of prices is exposed.

27. We do not believe that Telecom has established the reasonableness of the underlying assumptions that would allow it to set aside this alternative explanation. In our view, this alternative is the more plausible of the two interpretations of the reasons for the narrow range of raw benchmark prices sourced by Analysys Mason.

28. The next section discusses issues that are likely to be canvassed in the implementation of a final pricing principle in New Zealand and how these should be considered in the context of applying the initial pricing principle.

3 Issues in modelling the cost of the UBA service in New Zealand

29. The task faced by the Commission is to apply the initial pricing principle, the purpose of which is to approximate the outcome of a final pricing principle through benchmarking. Consistent with its approach to normalisation in the UCLL final decision, this means that differences between benchmark jurisdictions and New Zealand that give rise to variations in costs must be considered and, to the extent possible, accounted for in its benchmarking methodology.

30. This section examines issues that are salient to the preparation of a TSLRIC model of the UBA increment by asking which issues could potentially give rise to significant differences in cost between New Zealand and benchmark jurisdictions. Specifically, we investigate:

    - the effect of spatial density factors on costs and the differences between spatial density factors in the benchmark jurisdictions and New Zealand. We also consider some additional issues relating to spatial density in different geographic areas that are raised by Telecom's discussion of a competition test;
    - the sharing of network elements that occurs in all telecommunications models and gives rise to considerable economies of scope. We discuss the likely effect on unit cost given the range of services provided by Chorus, compared to those modelled in benchmark jurisdictions; and
    - the technology assumptions and the scope of the bitstream service required to model TSLRIC. Benchmark jurisdictions model different technologies to those employed in New Zealand. This may also give rise to the nature of the UBA service being different in those jurisdictions.

31. As this section makes clear, we do not consider the costing of the UBA increment to be so simple, as implied by Telecom's submission, that differences in unit costs between jurisdictions might be expected to be closely clustered.[13] In the next section we examine Telecom's claims more closely, both on its own merits and in the light of the analysis in this section.

3.1 Spatial density factors

32. Spatial density factors are important drivers of unit costs for telecommunications networks. Cost models take into account spatial density characteristics in a number of ways, such as:

[13] Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, pp. 1, 8

- modelling the spread of demand using population and locational data for very low level statistical areas (or at street level);
- using distance metrics for trenching and cabling using information about the nature of road networks in various geographical areas to assist in determining how close to a straight line between two points an average trench might be; and/or
- utilising specific demand and locational information from operators to directly assess the effects of spatial density factors.

3.1.1 The importance of spatial density factors to the UBA increment

33. In the context of the UCLL review, the Commission explicitly took into account differences between the spatial density characteristics of the jurisdictions that it benchmarked and New Zealand. These differences were used to formulate an adjustment for each raw benchmark to bring it into line with the spatial density characteristics of New Zealand.

34. In its Draft Determination on the UBA, the Commission has proposed not to make any adjustment for spatial density factors on the basis that the UBA increment is largely comprised of 'active network infrastructure' and accordingly is not likely to be strongly influenced by spatial density factors.[14]

35. Telecom's submission concurs with this general approach:[15]

> *Further, the costs relating to the physical transmission network are set separately and recovered in the UCLL price leaving the cost of electronic equipment and transport from the back of the DSLAM to the first data switch to be recovered as incremental. Accordingly, UBA costs are influenced far less by demographic differences affecting the extent of the physical transmission network build, (e.g. teledensity, urbanisation and population density at national or sub-national levels).*

36. In the same submission Telecom states that it considers that there might be some influence by spatial density factors on the cost of the UBA increment in the context of different areas of New Zealand:[16]

> *We expect that different geographic areas are likely to demonstrate different cost characteristics. In part, this is why unbundlers choose to primarily unbundle exchanges in urban areas. As noted above, while the*

[14] Draft determination, p. 19

[15] Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, p.8

[16] Ibid, p. 9

> *cost of the electronics is likely to be relatively consistent across most areas the cost of the transport component is likely to vary depending on the distance and density of the transport route from the exchange to the closest first data switch. These cost differences are captured in part, for example, in the differing benchmark prices depending on the handover point. In general, then, unbundled exchanges are more likely to be in areas closest to the first data switch and have a lower cost.*

37. It is important to note that both the Commission and Telecom do not appear to distinguish adequately in the quotes above between the total costs of providing the UBA increment and the unit costs of providing the UBA increment. That is, while both (explicitly or implicitly) agree that the transport component of the UBA increment may be associated with spatial density factors, they agree that in relation to active network infrastructure these factors will not strongly influence costs.

38. However, this is clearly not the case in respect of unit costs of the UBA increment. Electronic equipment such as DSLAMs are associated with a minimum capacity. In areas with dispersed population, it may not be possible to utilise this equipment to the full extent of this capacity. This means that the unit cost of this equipment is higher than in areas where its capacity can be utilised to a greater extent.

39. The statements made by the Commission and Telecom can only be reconciled to these facts if:

    - they have in mind an assessment of total costs, rather than unit costs (this seems clearer in Telecom's statement than the Commission's); or
    - they implicitly assume that a network could be efficiently structured with trench lengths as long as necessary to allow efficient utilisation of all electronic equipment in the network.

40. Since the assumption in the second point is unrealistic and contradicted by the models that the Commission benchmarks against, we believe it is reasonable to assume that the first is true. Of course, in relation to setting the price of the UBA increment, it is the unit costs of the UBA increment that should concern the Commission. The reasoning above suggests the unit costs of active network infrastructure are likely to be related to spatial density factors.

41. This is the subject of a much more detailed treatment in our previous report for Chorus, "Wholesale broadband cost drivers".[17] In that report, we analysed two important cost drivers for the unit cost of the UBA increment, being the number of lines per DSLAM location and the trench length per DSLAM location.

[17] CEG, *Wholesale broadband cost drivers*, January 2013. See in particular sections 3-5.

42. Our analysis showed that in New Zealand there was a significant relationship between these cost drivers and a directly measured spatial density factor, local area population density. Furthermore, we analysed the cost models that the Commission benchmarked in Denmark and Sweden and showed that these models contained enough information about specific local areas within the network to be able to estimate unit costs for these areas. We found that there was a significant relationship in these models between the two cost drivers and the unit cost of providing bitstream services (over and above the cost of the UCLL equivalent service).

43. When we applied the relationships derived in Denmark and Sweden to New Zealand characteristics, we calculated that these models would have estimated results that were higher for a network with New Zealand characteristics than was the case for the network actually modelled in those jurisdictions. For Denmark, we found that this difference amounted to a 53.9% increase on the raw benchmarked price. For Sweden, the difference was smaller but still amounted to a 14.1% increase.

44. The econometric relationships derived from these models, in combination with our understanding of the association between the cost drivers and spatial density factors, point to the fact that spatial density factors **are** significant in explaining the unit costs of the UBA increment. This understanding is consistent with the relative magnitude of the adjustments for Denmark and Sweden to bring these into line with New Zealand characteristics.

45. Given the spatial density characteristics of other jurisdictions for which benchmarks have been proposed by Analysys Mason, such as Belgium and Hungary, we consider that it is reasonable to assume that adjustments would also be required for these jurisdictions.[18]

46. The importance of spatial density factors in the design of and inputs into cost models suggests that it is reasonable to believe that New Zealand's spatial density factors would be a significant cost driver in a TSLRIC model of the UBA increment for New Zealand. Given the potential magnitude of these differences, as summarised above, the Commission should seek to take these into account in its benchmarking process, to the extent possible. That is, its implementation of the initial pricing principle should seek benchmarks that have been appropriately adjusted for differences in spatial density characteristics between the benchmark jurisdiction and New Zealand.

47. We note that considering only the spatial density adjustments derived above for Denmark and Sweden is enough to show that the closely bunched nature of the benchmarks sourced by Analysys Mason for Telecom is illusory. That is, while the raw benchmarks may be nominally close, these benchmarks reflect prices for

[18] In our cost drivers report, we estimated that an uplift 83% for Belgium on the basis of our modelling for Denmark and Sweden and adjusting for differences in spatial density as captured in fitted UCLL prices using the Commission's 2007 regression.

jurisdictions with significantly different unit cost characteristics between each other and New Zealand. Once these differences are adjusted for, these benchmarks are no longer tightly clustered.

3.1.2 The geographic scope of the regulated service in each jurisdiction

48. We understand that the regulated UBA price is only intended to apply to areas in which Chorus faces limited competition for the supply of bitstream access services. We note that Telecom has raised this issue in its submission and observed that the Commission may implement a competition test that would exempt Chorus from offering the UBA service at the regulated price in areas with sufficient competition. Telecom has noted in its submission that a possible outcome of the implementation of a competition test is that the Commission may:[19]

> *…adjust the UBA price so that the price reflects the average cost of the service in the remaining regulated areas, rather than the nationally averaged price…*

49. We do not offer an opinion on whether the Commission should or should not apply a competition test or whether it should make a price adjustment as described by Telecom above. However, it is reasonable to assume that more competitive areas are likely to exhibit lower average costs for the UBA increment than less competitive areas. This is because areas in which Chorus could potentially face competition will be areas in which there has been some unbundling activity, and unbundlers are likely to respond to commercial pressures by investing in areas where the average cost is lowest. It is reasonable to expect that the areas that have been unbundled will be amongst those with the lowest unit cost for the UBA increment.

50. It follows from this that if the Commission were to undertake and apply a competition test as described by Telecom, Chorus could not expect to be able to recover the total cost of supplying the UBA service if it could only charge the average network-wide cost in the non-exempt areas.

51. If the Commission applied a competition test and adopted the approach to pricing proposed by Telecom, it would represent another issue relating to spatial density that could be addressed directly by cost modelling in a final pricing principle. In a cost model, the localities that are exempt from UBA price regulation can be removed from the calculation of the average cost of the UBA increment across Chorus' network. Based on our conclusion above that the economies of spatial density are significant for the provision of the UBA increment, if this approach were adopted in the context of a final pricing principle we consider it likely that modelling this adjustment would have a significant effect on the regulated UBA price. This is because the exclusion of

[19] Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, p. 9

more competitive areas from the regulated UBA service is something that would be expected to affect the unit cost of the UBA increment in New Zealand. Specifically, the effect of this exclusion would be to give New Zealand lower density characteristics than it would otherwise have.

52. The effect of the exclusion of specific areas is relatively simple to model using the framework that we apply to estimate spatial density adjustments for the raw benchmarks from Denmark and Sweden. Using econometric relationships between cost drivers and unit costs from those models, we estimated the average unit cost of the UBA increment across New Zealand using Chorus data for cost drivers from its network. These cost drivers can be recalculated to ignore specific areas that might potentially be excluded.

53. We have re-estimated adjustments to the raw benchmark prices under six simple alternative competition tests, excluding specific exchanges based on:[20]

- the existence of one or more UCLL competitors at an exchange;
- the existence of two or more UCLL competitors at an exchange;
- the existence of three or more UCLL competitors at an exchange;
- UCLL competitors having at least 20% share of exchange-based lines at an exchange;
- UCLL competitors having at least 30% of exchange-based lines at an exchange; and
- UCLL competitors having at least 40% of exchange-based lines at an exchange.

54. These criteria are ordered from the most sensitive (ie, excluding the most areas) to the least sensitive (where very few areas are excluded). In general, we would expect that the most sensitive tests would exclude the greatest number of low-cost lines from the New Zealand data. These would also give rise to the greatest adjustments to the raw benchmark prices should the Commission pursue the implementation of the competition raised by Telecom.

55. Table 1 below shows the effect of these alternative criteria on the adjustments for spatial density estimated from the Denmark and Sweden models. Due to the effect of the modelled exclusions in reducing the spatial density of areas to which Chorus is obliged to supply UBA at the regulated price, the magnitude of the spatial density adjustment is higher if a greater number of low cost lines are excluded. The basis for the calculation of the adjustments in Table 1 is described in greater detail in Appendix A and in our February report on the cost drivers of the bitstream service.

[20] These alternative tests are simplified for modelling purposes and do not represent our view as to the criteria that the Commission should apply if it were to conduct a competition test.

Table 1 Denmark and Sweden spatial density adjustment for alternative competition test criteria

Competition test criterion	Denmark adjustment	Sweden adjustment
At least one UCLL entrant	75.0%	19.6%
At least two UCLL entrants	70.2%	18.6%
At least three UCLL entrants	66.9%	17.8%
UCLL market share of at least 20%	61.4%	16.2%
UCLL market share of at least 30%	58.2%	15.3%
UCLL market share of at least 40%	56.2%	14.7%
No criterion	53.9%	14.1%

Source: CEG analysis based on Chorus data and Danish and Swedish cost models

56. It is important to note that the investigation of these alternatives and the results shown at Table 1 above do not represent an endorsement of any of them as an appropriate competition test. It simply serves to assess a range of possibilities for the outcome of a competition test, if one were to be applied by the Commission as described by Telecom. It is also possible that any competition test proposed by the Commission would not fall within the range of outcomes investigated above (although by definition the Commission could not impose a test that was less restrictive than setting no criterion, consistent with the final row of Table 1).

57. This analysis demonstrates the potential for the exclusion of more competitive areas to have a significant effect on the spatial density and the average unit costs of the remaining areas. Specifically, the results of the analysis indicate that areas excluded by the competition test criteria tend to have spatial density characteristics that are associated with lower unit costs. This serves to reinforce the relationship between spatial density and costs that we established in our February cost drivers report.

3.1.3 Relevance of New Zealand reported costs for the UBA increment

58. We note that at least two submissions have raised the prospect that the costs of the UBA increment could be considered by reference to the costs of unbundling investments in New Zealand. For example, Telecom's submission states:[21]

> *Further, we have in New Zealand a number of service providers that have built UBA services themselves – including Chorus, Kordia, Vodafone, Compass Communications, Actrix and CallPlus – which can provide the Commission with real cost information to cross-check its benchmarked prices against.*

[21] Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, p. 1

59. Similarly, Flip's submission states:[22]

> *We know from our own experience that the additional cost of the equipment to convert unbundled copper into a full Internet service is in the range of $3.50 - $4.00 depending on how you value the cost of capital. And the per-unit cost for a large volume deployment such as undertaken by Chorus would be significantly less than this.*

60. From an economic perspective, these submissions also appear to suggest benchmarking the regulated UBA price to apply across New Zealand against cost information from specific geographical areas where unbundling investments have been made. This is highly unlikely to provide a reasonable proxy for the nationwide cost of supplying UBA. Consequently, this basis for cross-checking the price set for the UBA increment appears unlikely to yield relevant results.

61. Furthermore, if the Commission were to adjust the UBA price upon application of a competition test, as noted by Telecom above, then the areas that reflect the experience of unbundled local loop competitors may not be very relevant to the determination of the regulated UBA price.

3.2 Economies of scale and scope

62. Economies of scale and scope are important determinants of unit costs in telecommunications networks. Cost models capture the effects of these economies in a number of ways.

3.2.1 Sharing of network elements

63. An important aspect of TSLRIC cost modelling as it is practically applied involves consideration of the extent to which network elements are effectively shared between services.

64. In telecommunications networks, it is common to observe network elements with fixed capacities that are capable of being used for the purpose of providing more than one service. This will tend to give rise to economies of scope – that is, average costs that decline as more services are made available.

65. Economies of scope will be most significant where the fixed capacities of the assets are high relative to their likely utilisation by various services. For example, trenches are typically understood to have very significant economies of scale and scope because they are potentially capable of holding cables of many sizes, multiple cables and even potentially multiple infrastructure types (such as electricity cables and gas

[22] Flip, *Unbundled Bitstream Access Service Price Review Consultation*, undated, p. 3

or water pipelines). However, economies of scope are not restricted to assets such as trenches and ducts and even relatively smaller assets such as DLSAMs can give rise to significant economies of scale and scope at a local level.

66. In performing TSLRIC modelling of Chorus' network in New Zealand, it is necessary to take into account all types of infrastructure sharing, including the examples above. This would extend to accounting for payments that Chorus might efficiently receive from or make to other infrastructure operators for the right to share the use of network assets.

67. There is no reason to expect that the nature of infrastructure sharing in New Zealand as captured in a TSLRIC model is going to be the same as that in the benchmark jurisdictions. To the extent that there are differences, these should be carefully considered in the implementation of the initial pricing principle.

68. One difference that appears particularly important between the networks modelled in Denmark and Sweden and Chorus' network is the inclusion of voice services in the benchmark models. In these models, many of the assets that these models capture as being part of the UBA increment are also used to provide voice services, such as:[23]

    - the cost of DSLAM/MSAN/fibre access switches;
    - the cost of DSLAM/MSAN/fibre access switch processing;
    - costs associated with layer 2 processing and connectivity; and
    - the costs of the transmission path.

69. The sharing of these costs in the benchmark models is manifested by the DSLAMs containing both xDSL cards and voice cards. Additionally, the voice traffic is backhauled to the handover point over the same wavelength as the data and is aggregated using the same broad equipment types.

70. Because the DSLAM is a unit of equipment with a fixed level of capacity, in some localities provision of voice services may not require the installation of an additional DSLAM relative to the requirements of the broadband traffic only. Similar considerations apply to the processing and transport components of the shared costs, giving rise to economies of scope. We would expect, on average, that the unit costs of providing the UBA increment would be lower for a network that provided both data and voice services over the same infrastructure.

71. We raise the issue of voice services because it is particularly apparent in the Danish and Swedish cost models. However, in concept the differences could relate to any

[23] There are also some costs of the UBA increment that are not shared with voice services, such as the specific costs of DSL line cards and processing and aggregation costs specifically associated with broadband services.

service that shared assets utilised by the UBA increment including, as discussed above, payments from and to other infrastructure providers. For example, the Swedish cost model assumes that over 20% of trenching investment costs are effectively avoided due to sharing with other utilities. It is important to be mindful of the potential for these types of considerations to affect how relevant benchmarking New Zealand against raw prices from foreign jurisdictions is likely to be.

72. In Chorus's network, which does not carry significant volumes of voice traffic, most DSLAMs only contain xDSL cards. The overwhelming majority of voice traffic is carried on Telecom's network and is aggregated and switched on Telecom's legacy PSTN switches. In principle, one would expect this to result in higher unit costs for the UBA increment in New Zealand, relative to other jurisdictions. Consideration of whether this was in practice the case would turn on:

    - the extent to which the voice traffic carried on Telecom's network was carried in the same trenches and/or ducts as Chorus' data traffic, and potentially the commercial arrangements between the parties in respect of this sharing; and
    - whether there was other sharing of infrastructure (or potential to share infrastructure) between Chorus and Telecom that would have the potential to defray Chorus' average costs of providing the UBA increment.

73. Our understanding is that there are a number of network elements, such as DSLAMs, that Chorus does not have the ability to share with Telecom. To the extent that this is the case, this will have tendency to raise the costs of providing the UBA increment in New Zealand relative to other jurisdictions where voice traffic plays a significant role in sharing network costs.

3.2.2 Common costs and overheads

74. Common costs and overheads are also an important component of the TSLRIC methodology. They are relevant to economies of scale and scope because they tend to be fixed in nature, or subadditive, i.e., a business with twice the volumes or that was twice the size of a given firm would be expected to have common costs and overheads that were less than twice the amount incurred by that firm. A firm with greater volumes or more diverse activities would therefore be expected to have lower common costs and overheads per unit relative to a firm with lower volumes or fewer activities.

75. New Zealand is a less populous country than those benchmarked by the Commission. Although the Draft Determination shows it to have higher broadband penetration that the other benchmarks, it still has fewer broadband subscribers overall.[24] The

[24] Draft determination, p. 20

difference in scale is even greater when compared to other European countries that the Commission has chosen not to benchmark against.

76. This suggests that relative to these jurisdictions, a New Zealand network would not enjoy economies of scale over its common costs and overheads. Other things being equal, one would expect these costs to be higher per unit in New Zealand.

77. Furthermore, unlike the operators benchmarked by the Commission, Chorus is not a vertically integrated business. Its vertical separation is required by legislation and would be reflected in any New Zealand TSLRIC modelling.

78. This means that to the extent that there are any efficiencies to be gained in operating as a vertically integrated business, these will not be captured by Chorus. In particular, any systems that Chorus and Telecom must now maintain separately rather than sharing will represent higher unit costs for Chorus relative to a vertically integrated business. This includes organisational costs (including accounting, financing, senior management, human resources and legal) but also network support costs such as information technology systems, vehicle fleets and office equipment.

3.3 Technology choice and service definition

79. To construct a TSLRIC model estimating the unit costs of a particular service, it is first necessary to define:

- the technology that will be used to build the network and deliver that service; and
- the definition of the service to be costed in terms of its scope and the way in which it utilises network assets.

80. Indeed, in relation to the second point, it is in fact necessary to clearly define the scope of all services that will utilise the same assets in the model as the service of interest. Without this information it is not possible to ascertain the extent to which sharing of network elements will affect the unit costs of the service.

81. It is not necessarily the case that the technology modelled in the context of a New Zealand cost model would reflect the network assets operated by Chorus. However, in some cases assuming otherwise may give rise to logical inconsistencies. For example, both the initial pricing principle and the final pricing principle envisage the price of UBA being set as an increment on top of UCLL. These principles appear to envisage the architecture of an exchange-based copper network.

82. Suppose, despite the reality of Chorus' network, that a New Zealand cost model envisaged the deployment of a full fibre network. In these circumstances there are a number of ways to determine the price of UCLL and the size of the increment to UCLL to provide a UBA equivalent service on the hypothetical network.

83. Additionally, different technology choices may create variances in where the handover point is located, which in turn influences the balance of costs between the access and the core network. Given the requirements of the legislation in New Zealand and the definition of the services that would require modelling, implementing an initial pricing principle by benchmarking against prices determined using different technologies to those used in New Zealand may not provide a good approximation for the final pricing principle. For example, the balance of costs between the access network and the core network may be very different in the modelled network than in Chorus' actual network and the size of the UBA increment might be correspondingly greater or smaller than would be determined by modelling costs in New Zealand.

84. If Chorus' current copper network were reflected in the implementation of the TSLRIC cost model in New Zealand, then this would raise separate issues. Specifically, although there is a single regulated UBA price, Chorus provides UBA services through two different sets of infrastructure for exchange-based and cabinet-based lines. There is no *a priori* reason to believe that the unit costs of exchange-served UBA and cabinet-served UBA would be the same on average.

85. Benchmarking in this context can appear deceptively simple because this network dichotomy appears not to exist, or at least is not as important, in other jurisdictions. In the reference jurisdictions, the UBA consists of the UCLL plus costs associated with DLSAMs and transport back to the handover point. Because the distinction is not raised in other jurisdictions, the Commission can benchmark the 'UBA increment' to UCLL in those jurisdictions.

86. However, a cost model of the New Zealand network that took account of its actual architecture would be more complex than this. While the cost of some UBA services would resemble the 'UCLL plus UBA increment' paradigm, the cost of cabinetised UBA would include:

    - the cost associated with SLU;
    - the costs associated with the cabinet and its DLSAMs; and
    - the cost of SLU backhaul back to the handover point.

87. While these costs may have parallels in the infrastructure used to provide exchange-based UBA, they are not likely to have the same cost. For example, if the total trench length were assumed to be the same for exchange-based and cabinet-based UBA, then one might expect the unit costs of cabinet-based UBA to be higher due to the costs of cabinets and mini-DLSAMs and the lower scale that could be expected at this level of the network.

4 The range of raw benchmarks

88. In section 2.2 above we noted the submissions of Telecom, and Analysys Mason on behalf of Telecom, which cited the narrow range of raw benchmarks sourced from Denmark, Sweden, Belgium and Hungary.

89. As noted previously, Telecom draws further conclusions from the nature of this range:[25]

> *Where countries have set forward-looking prices, those prices are tightly grouped around NZD$9. In fact the over-riding conclusion we have drawn from examining these benchmarks is that the possible range of forward-looking cost based prices is very small. This is not all that surprising, given that all we are costing is a small number of network elements,* ***all*** *of which are sourced from a small number of providers internationally.* [Emphasis added]

90. We do not consider that ascribing the tightness of the raw benchmark range sourced by Analysys Mason to the simplicity of modelling the UBA increment is plausible.

91. It is well understood that the components of the UBA increment are not merely restricted to active equipment infrastructure sourced from international providers. The contribution of trenching and ducting to the unit costs of the UBA increment as estimated in the Danish and Swedish costs models are significant. This weighting is also reflected in the average life of the UBA bitstream assets reported in our previous paper about the effect of fibre on copper bitstream access prices, which showed that the annual unit costs were significantly weighted towards long-lived assets.[26]

92. This, combined with the discussion at section 3 above, suggests that Telecom's view that a final pricing principle for the UBA would be a "comparatively simple exercise" without much complexity is itself oversimplified. There are a great number of issues that would need to be addressed in the formulation of such a model. As discussed above:

    - issues of spatial density can be intensive to model, particularly if the network technology is re-optimised, or if a scorched earth assumption is made, since this requires approximating the location of demand without simply re-using operator data;

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25 Telecom, *Unbundled Bitstream Access Service Price Review: Submission*, 1 February 2013, p.1

26 CEG, *Effect of fibre on copper bitstream access prices*, January 2013, para. 15, p. 22

- the effect of sharing of network infrastructure will depend on the scope of services to be supplied over the modelled network and may need to take into account payments to and by third parties where infrastructure is shared; and
- technology choice underlies many of the complexities of bottom-up modelling. The current technology employed by Chorus is mixed, with large parts of its network having already been cabinetised. It is not clear how Telecom's view that modelling the UBA would be simple accounts for this complexity or what alternative assumption underlies it.

93. As discussed above, in contrast with Telecom's effective assumption that the cost of the UBA increment would only include active network infrastructure, it is likely that an allocation of passive network infrastructure to the UBA increment would be required in the model. Modelling the deployment of this infrastructure is also not a trivial task.

94. Furthermore, we note that Telecom's statement appears itself to be inconsistent with the derivation of the raw benchmarks themselves. Suppose that it was the case that the UBA were predominantly composed of network elements, **all** of which were sourced from international providers. In this scenario, if we benchmarked the UBA increment from two countries that utilised identical assets to provide the service, we might expect that these would give rise to identical benchmarks. But this will only be the case if the benchmark prices are converted using market exchange rates, reflecting the international nature of the equipment that Telecom asserts is the sole source of components for the UBA increment.

95. Given that exchange rates that are 50% weighted towards purchasing power parities are used, we would expect that these services using exactly the same assets would give rise to different benchmarks in New Zealand dollar terms, not the same as claimed by Telecom.

96. Given the importance of these considerations to TSLRIC modelling, implementing an initial pricing principle using unadjusted prices from benchmark jurisdictions will not achieve its purpose of approximating the outcome of a final pricing principle. The importance of the spatial density factors can be shown quantitatively, but there are other qualitative factors (such as the sharing of network assets and the modelled technology) that should be considered in the benchmarking process.

97. In light of these differences, no comfort can be taken from a narrow range of raw benchmark prices. The range of benchmark prices when adjusted for expected differences in underlying cost between the benchmark jurisdictions and New Zealand is what is relevant. This represents an application of the initial pricing principle that is consistent with the objective of approximating the outcome of the final pricing principle.

Appendix A Potential adjustments to exclude areas from regulation

98. We described in our previous cost drivers report how the calculation of spatial density adjustments for Denmark and Sweden are calculated by:

    - estimating econometric models for the relationship between the unit costs of the UBA increment and values of cost drivers in the Danish and Swedish models models; and
    - applying these models to the same cost drivers on Chorus' network.

99. The costs drivers used for this analysis are the average number of lines per DSL location and the average trench length per DSL location measured at the level of the handover point, consistent with the approach used in the benchmark cost models. More detail about the methodology used and the results of this previous analysis can be found in our cost drivers report.[27]

100. We use this framework to assess the effect on the cost of providing the regulated UBA service to remaining areas, if more competitive areas are excluded.[28] Six alternative criteria for a competition test have been modelled, excluding specific exchanges based on:

    - the existence of one or more UCLL competitors at an exchange;
    - the existence of two or more UCLL competitors at an exchange;
    - the existence of three or more UCLL competitors at an exchange;
    - UCLL competitors having at least 20% share of exchange-based lines at an exchange;
    - UCLL competitors having at least 30% of exchange-based lines at an exchange; and
    - UCLL competitors having at least 40% of exchange-based lines at an exchange.

101. Information supplied by Chorus indicates the number of unbundled operators and the number of exchange based lines per exchange. We use this information to analyse which exchanges would be excluded under each criterion. We recalculate the value of cost drivers at each handover point to remove the specific lines and trenching

27 CEG, *Wholesale broadband cost drivers*, January 2013. See in particular sections 3-5.

28 These alternative tests are simplified for modelling purposes and do not represent our view as to the criteria that the Commission should apply if it were to conduct a competition test.

associated with customers served directly through the exempt exchanges (but not the cabinetised customers served at that exchange).

102. The revised adjustments are calculated by applying the econometric relationships estimated from the Danish and Swedish cost models onto the recalculated cost drivers. The results of this analysis are shown in Table 1 in section 3.1.2.