Process and issues paper for determining a TSLRIC price for Chorus' unbundled copper local loop service in accordance with the Final Pricing Principle

Friday 6 December 2013

CONTENTS

Acronyms and abbreviations

2G	Second generation
3G	Third generation
ACCC	Australian Competition and Consumer Commission
Act	The Telecommunications Act 2001
Amendment Act	Telecommunications (TSO, Broadband, and Other Matters) Amendment Act 2011
BEREC	Body of European Regulators for Electronic Communications
BU-LRIC	Bottom up long run incremental cost
CAPM	Capital Asset Pricing Model
CCA	Current Cost Accounting
DAE	Digital Agenda for Europe
DBA	Danish Business Authority
DC	Direct Current
DSLAM	Digital subscriber line access multiplexer
ERG	European regulators group
FPP	Final Pricing Principle
FTTH	Fibre-to-the-home
FTTN	Fibre-to-the-node
FWA	Fixed wireless access
Gbits/sec	Gigabit per second
G-PON	Gigabit Passive Optical Networks
IPP	Initial Pricing Principle
LRAIC	Long run average incremental cost
LRIC	Long run incremental cost
LTBEU	Long term benefit of end-users

Mbits/sec	Megabit per second
MDF	Main distribution frame
MEA	Modern equivalent asset
MSAN	Multi-service access node
NGA	Next generation access
NGN	Next generation network
NRA	National regulatory authority
P2P	Point-to-point
PRD	Price review determination
PSTN	Public switched telephone network
PTS	The Swedish Post and Telecom Authority
RSP	Retail service provider
SLU	Sub-loop unbundling
SMP	Significant market power
STD	Standard terms determination
TD-LRIC	Top-down long run incremental cost
TSLRIC	Total service long run incremental cost
TSO	Telecommunications service obligations
UBA	Unbundled bitstream access
UBA STD	UBA standard terms determination
UCLFS	Unbundled copper low frequency service
UCLL	Unbundled copper local loop
UCLL STD	UCLL standard terms determination
UFB	Ultra-Fast Broadband
WACC	Weighted Average Cost of Capital
VDSL	Very-high-bit-rate digital subscriber line

Purpose

1. The purpose of this process and issues paper is to set out and seek the views of interested parties on:

   1.1 our proposed process for the cost modelling and price review determination (PRD) of Chorus' Unbundled Copper Local Loop (UCLL) Service; and

   1.2 conceptual issues associated with the Total Service Long Run Incremental Cost (TSLRIC) methodology, the cost-modelling process, and our proposed application of it to UCLL.

Background

2. The Telecommunications Act (Act) requires us to determine a price for the UCLL service. In the first instance we benchmark prices against comparable countries under the Initial Pricing Principle (IPP).

3. In 2012 we conducted a UCLL benchmarking review.[1] The purpose of the UCLL benchmarking review was to update the benchmarking data in order to determine UCLL monthly rental and connection charges.[2] Our 3 December 2012 final price determination for the UCLL service:

   3.1 determined the new geographically averaged price for UCLL as $23.52 per line per month, with the new geographically averaged price to come in to effect on 1 December 2014; and

   3.2 updated non-urban and urban UCLL, with monthly rental prices of $35.20 and $19.08 respectively, with the prices coming in to effect immediately (that is, from 3 December 2012).

4. In our final determination for the UCLL IPP re-benchmarking review, we noted:

> A party may apply for a pricing review at the conclusion of the UCLL benchmarking review. The Commission considers that amendments to the UCLL prices resulting from this review still qualify as a determination under section 30M and section 30R of the Telecommunications Act, and therefore, are capable of a pricing review under section 42.[3]

5. Subsequently, we received five applications for a FPP pricing review from Chorus NZ Ltd, Telecom NZ Ltd, CallPlus Ltd, Orcon and Vodafone NZ Ltd.

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1 Under section 30R of the Act and in accordance with the standard terms determination sections of the Act at sections 30K - 30M.

2 Commerce Commission (2012), "Attachment E: Changes made to the UCLL and Sub-loop Services STDs as a result of the section 30R review", 3 December, pp. 106-107.

3 Commerce Commission (2012), "Final determination on the benchmarking review for the unbundled copper local loop service", Decision No. NZCC 37, 3 December, p.12.

We are required to determine a price for the UCLL service in accordance with the FPP

6. Since receipt of the FPP applications we have been working through the key conceptual issues and process options for the FPP. We are required to determine a cost-based price for UCLL in accordance with the FPP. In doing so, we must:

   6.1 follow the process set out in the Act for pricing review applications;[4] and

   6.2 calculate the cost of UCLL in accordance with the FPP using a forward looking cost-based method: TSLRIC by building a cost model tailored for that purpose.[5]

7. We also have the option to request Chorus calculate the UCLL price.[6]

We are interested in your views

8. We would like to know your views on the issues raised in this paper. By providing your views, you will help us decide what approach to take to our TSLRIC cost modelling exercise for the UCLL Service.

9. A workshop will be held at the NZICA Wellington Conference Centre, Level 7, Tower Building, 50 Custom House Quay, Wellington from 08:30am -12:00pm on Thursday 19 December 2013 . The purpose of the workshop is to introduce and discuss some of the key concepts involved with a TSLRIC cost modelling exercise. We will lead a brief presentation that introduces some of the key concepts at the beginning of the workshop. This will be followed by an informal session led by Commission staff. Please provide any questions or matters that you would like to discuss in advance to the email address below for our consideration by Friday 13 December 2013. .

10. Given the venue has a limited capacity, we intend to limit the number of attendees from each organisation to two. Please RSVP with any questions you would like Commission staff to consider to: Keston Ruxton (Chief Adviser, Regulation Branch), c/o telco@comcom.govt.nz.

11. Submissions on this process and issues paper are due on Friday 31 January 2014.

12. Cross submissions are then due on Friday 21 February 2014.

13. Please address responses to: Keston Ruxton (Chief Adviser, Regulation Branch), c/o telco@comcom.govt.nz.

[4] Subpart 4 of Part 2 of the Telecommunications Act (2001).
[5] Subpart 1 of Part 2 of Schedule 1 of the Telecommunications Act (2001).
[6] Section 45 of the Telecommunications Act (2001).

Our proposed process for our UCLL FPP determination

14. In determining a UCLL price using the FPP, we are required to follow the process set out in subpart 4 of Part 2 of the Telecommunications Act. Section 50 requires us to either:

    14.1 consult parties we consider to have a material interest in the matter; or

    14.2 hold conferences in relation to the matter.

15. We consider that there are choices to be made regarding the approach we take to this exercise. Given this is the first time we have used the TSLRIC methodology to price a service of this complexity, we are interested in views on the process we adopt and the time taken to reach a decision.

16. International experience and process suggest that TSLRIC modelling processes can take several years to complete in the extreme. We are interested in views on the appropriate modelling process in this context, including whether there are circumstances unique to current telecommunications developments in New Zealand, such as the UFB rollout, that support a different approach.

17. The question of the appropriate time period for completing a cost exercise necessarily involves consideration of potential trade-offs. In principle a more thorough TSLRIC exercise will take longer to complete but may result in a more accurate estimate of forward looking costs. Conversely, there are uncertainties arising from taking a longer period of time to reach a decision.

18. A TSLRIC cost model is complex, with a multitude of decision-points that feed into its construction. There are, however, some aspects that we consider carry a greater level of materiality in terms of their price impact. Accordingly, we wish to highlight their importance to interested parties to the TSLRIC cost modelling exercise. This paper covers the following material aspects, the details of which are discussed in subsequent sections:

    18.1 The relevant network demand, which determines the number of connections over which total modelled costs will be spread, and informs where the hypothetical network will be deployed;

    18.2 The extent of any performance adjustment, which seeks to normalise performance differences across technology platforms;

    18.3 The degree of network optimisation, which considers how much of the network operator's network infrastructure is retained in the modelled network; and

    18.4 The identification and allocation of common costs, which seeks to establish the relevant pool of common costs and their relationship to the modelled UCLL Service.

19. The materiality of those costs will be impacted by whether or not the price is backdated and if so, the implementation of any mechanisms to mitigate the impact of backdated prices. These matters are discussed in greater detail later in this paper. We are interested in the views of submitters on the interrelation between these matters in order to assist us in our decision about how best to approach the UCLL FPP TSLRIC exercise.

20. On 2 December 2013 we received a request from Chorus to undertake a FPP for the UBA service. We are interested in the views of interested parties on:

    20.1 whether the two FPPs should be undertaken as part of one process;

    20.2 the desirability of taking a consistent approach in terms of TSLRIC and our selection of the Modern Equivalent Asset (MEA);

    20.3 whether the legislative directive that we should use reasonable endeavours to determine a UBA price by December 2014 justifies taking a different or modified approach to either UBA in isolation, or both UCLL and UBA;

    20.4 the desirability of time, quality and approach trade-offs; and

    20.5 how considerations on time, quality and approach should be taken in to account in finalising our approach to the UCLL FPP cost modelling exercise.

21. Below we set out the due dates for submissions and cross submissions on this process and issues paper.

Next steps	**Dates**
Process and Issues Paper released	Friday 6 December 2013
Industry Workshop:	Thursday 19 December 2013
Submissions due	Friday 31 January 2014
Cross-submissions due	Friday 21 February 2014

22. We have not yet settled on the process and timing for undertaking this price review determination beyond this initial consultation phase. We will provide an update on our proposed process and timing following consideration of submissions on this process and issues paper. However, the following steps are provided as an indicative guide on our current thinking on possible steps in the process:

Development of the TSLRIC Model Paper released for consultation Submissions Cross-submissions Conference Final paper published
Draft Determination Draft determination and model published Submissions on our draft determination Cross-Submissions on our draft determination Conference
Final Determination

Framework for making a UCLL pricing determination under a FPP

23. In this section we set out our proposed framework for determining a UCLL FPP price, including consideration of:

    23.1 the service that we are modelling; and

    23.2 specific requirements of the FPP.

24. We then look at conceptual issues associated with TSLRIC cost-modelling, including UCLL's modern equivalent, demand, and common cost allocation issues associated with the choice of how the hypothetical network is modelled.

What is the UCLL Service?

25. Retail telecommunications companies purchase UCLL from Chorus to provide voice and broadband services to end users, once they have added their transmission equipment to the line.

26. UCLL is described in the Act as follows:[7]

Description of service:	A service (and its associated functions, including the associated functions of operational support systems) that enables access to, and interconnection with, Chorus's copper local loop network (including any relevant line in Chorus's local telephone exchange or distribution cabinet)
Conditions:	Nil
Access provider:	Chorus
Access seeker:	A service provider who seeks access to the service, except, until 3 years after separation day, Telecom
Access principles:	The standard access principles set out in clause 5
Limits on access principles:	The limits set out in clause 6
Initial pricing principle:	Benchmarking against prices for similar services in comparable countries that use a forward-looking cost-based pricing method
Final pricing principle:	TSLRIC
Requirement referred to in section 45 *or final pricing principle:*	Nil
Additional matters that must be considered regarding application of section 18:	The Commission must consider relativity between this service and Chorus's unbundled bitstream access service (to the extent that the terms and conditions have been determined for that service)

27. Chorus' local loop network is made up of active cabinet (cabinetised) and non-active cabinet (non-cabinetised) lines. Figure 1 below shows Chorus' local network architecture. Approximately 50% of the copper lines in Chorus' network run through non-active cabinets, the remaining 50% of lines run through active cabinets. The number of lines over which a full UCLL service could be offered was around 620,000 at the end of 2012.

28. The UCLL Service we are setting a price for, as defined in the UCLL STD, is only for those lines that are non-cabinetised. However, the UCLL price flows through to the prices of:

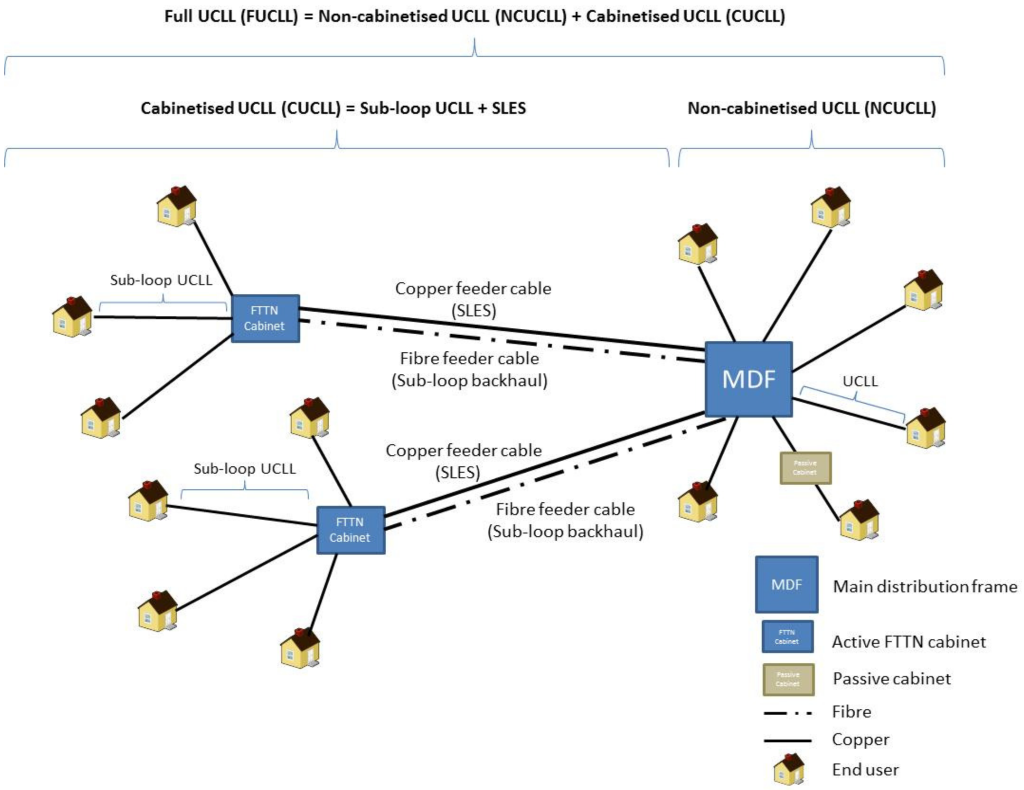
7 Subpart 1 of Part 2 of Schedule 1 of the Act.

28.1 the unbundled bitstream access (UBA) service (for broadband services), available on both cabinetised and non-cabinetised lines;

28.2 the unbundled copper low frequency (UCLF) service (for voice services), available on both cabinetised and non-cabinetised lines; and

28.3 the Sub-loop UCLL service (SLU), available on cabinetised lines.

Figure 1: Chorus' local loop network architecture



29. We have considered whether in developing the model we should restrict ourselves to only a subset of the local loop network (ie, the 'non-cabinetised' local loop network from the home to the exchange as defined in the UCLL STD).

30. However, as the UCLL price flows through to services that run over both cabinetised and non-cabinetised lines, and given that costs are likely to be shared between these services, we consider it more appropriate to model the full UCLL network.

31. Further, it is our understanding that a TSLRIC methodology requires consideration of the full local loop network as the home to the exchange regardless of whether these points are connected directly via active or non-active cabinets. We expand on our understanding of the TSLRIC methodology in the section, *A closer look at the fundamentals of TSLRIC*.

32. If, as a result of our modelling, there are implications for other regulated services, such as sub-loop backhaul, delivered over the local loop network, any pricing decision would need to be considered through a separate process under the Act.

We need to determine how long our UCLL FPP pricing determination will have effect

33. Section 52 of the Act requires us to determine the expiry date of an FPP pricing determination.[8] This means that we are required to determine the length of the regulatory period for the UCLL price we determine.

34. We consider that the length of the regulatory period is likely to be a trade-off between providing regulatory certainty and maintaining flexibility. Market certainty may support an extended regulatory period, while flexibility may favour a shorter timeframe in order to adjust for any relevant market changes.

> Question 1: We are interested in your views on the appropriate length of the regulatory period for a UCLL FPP price.

Ensuring a fair return across price resets

35. A forward looking cost based price based on TSLRIC is expected to allow the hypothetical network operator to recover the sunk capital cost. The price therefore provides the hypothetical network operator with an upfront expectation of a normal return over the lifetime of the asset, or is net present value (NPV) neutral.[9] Therefore, at the time of setting the access price, this price is expected to provide the hypothetical network operator with sufficient revenue to cover the capital cost (including a return on capital) and the operating cost incurred over the lifetime of the modern equivalent asset.

36. *Ex post*, there are many reasons why a network operator may recover an amount of revenue that provides it with a return that differs from a normal return. For example, demand could be different from forecast demand, asset values may turn out to be different to those assumed in the modelling, or the depreciation allowance may not correctly anticipate actual changes in asset prices.

37. When resetting the price at the beginning of the next regulatory period, we must decide which of the components of the TSLRIC modelling to update and reflect in the price for the next regulatory period.[10] In TSLRIC, the modern equivalent asset typically only reflects forward-looking costs and therefore, NPV usually does not

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8 In contrast section 30Q refers to standard terms determinations.

9 A price that provides this expectation is also referred to as expected financial capital maintenance (FCM) or as fulfilling the net present value neutrality (NPV) principle. The name of the NPV neutrality principle reflects that when this principle holds, the net present value of the expected revenues less the expected costs is equal to zero.

10 At the point of the reset, the price again provides the network operator with an expectation of a normal return. However, to the extent that the expected cost differs from that in the previous regulatory period, the network operator may incur losses or gains on its sunk investment.

hold across regulatory periods. In resetting prices, the regulator may also have other objectives, such as avoiding large changes in prices between review periods.

> Question 2: To what extent should the Commission update the assumptions of the cost based prices at each reset?
>
> Question 3: Which considerations are relevant in resetting a TSLRIC based price?
>
> Question 4: What role should NPV neutrality play in price resets?

We also need to determine whether the UCLL price will be backdated

38. The appropriateness of backdating the application of an FPP determination was considered in *Telecom New Zealand v The Commerce Commission and Anor* CA75/05 [25 May 2006]. In that case, Telecom sought a declaration that an FPP price could not be backdated and could only apply from the date of delivery. The application was declined.

39. The Court of Appeal's decision can be read as supporting a general principle that an FPP determination should be backdated to the date that the IPP it replaces first applied. The Court commented that (at [35]):

> In relation to the present matter, if a revised price were not to relate back that would in itself result in inefficiencies. That is because the revised price must be more efficient than the initial price. Just as an initial price is more efficient than a disagreement and should therefore dictate the price for supply, so a revised price is more efficient than an initial price and for that reason should dictate the price of supply.

40. In relation to section 18, the Court noted that (at [44]):

> We consider that the section 18 purpose is better served by substituting the revised price for the initial price *ab initio* rather than only after a period of relatively less efficient pricing. None of the arguments advanced by Telecom has persuaded us to the contrary.

41. However, in the High Court, Harrison J also noted that an alternative starting date could be set by the Commission under section 52 (at [31]).

42. We are interested in the views of submitters on how the Commission should approach the issue of backdating for UCLL FPP, particularly having regard to the Court of Appeal decision referred to above, section 18 and any points of distinction between the UCLL FPP from the section 27 determinations before the Court of Appeal.

43. Given the regulated price is a price cap, this raises the issue of whether it is permissible to backdate prices where the final price determined under the FPP is higher than the price determined under the IPP. This is because the regulated price is a maximum Chorus is entitled to recover (that is, it is open to Chorus to agree a lower price on commercial terms).

44. We are also interested in views on whether we can consider ways to moderate the potential impact of backdating. A backdated price may result in substantial amounts owed to, or owed by, Chorus. To the extent that mitigation is allowable, we are interested in the views of submitters on:

    44.1 whether we should consider ways to mitigate the impacts of backdating; and

    44.2 if so, implementation issues associated with any possible mitigation steps.

45. If permissible, a mitigation of the impact of backdating prices could include consideration of the following:

    45.1 Backdating from some date in between the dates of the IPP and FPP determinations.

    45.2 Spreading the requirement to pay the backdated prices over time. For example the UCLL price going forward could itself be increased (or decreased) in order to spread the recoupment (or payment) of backdated bills over time. This could also apply to only part of the backdated bill.

    45.3 The appropriate time period over which to spread the cost. This may mean rather than a single UCLL monthly charge, a price path is set, which adjusts once any backdated bills are resolved.[11]

46. Related issues include:

    46.1 the difference (if any) in price paid between those access seekers that incurred the charges in the past and those likely to incur the charges in future;

    46.2 determining the appropriate time value of money;

    46.3 how we factor in volumes and demand to our allocation of a backdated lump sum; and

    46.4 changing the price also has implications for future demand.

> Question 5: Does the Commission have discretion to depart from a backdating of the FPP price?
>
> Question 6: If so, are there section 18 factors (or other factors) relevant to the UCLL FPP which tell against backdating?
>
> Question 7: To what extent is the impact of any backdating of prices likely to be limited to downward price revisions given the price determination sets a price cap from which Chorus has the ability to levy charges at a lower level?

[11] This may raise implementation issues such as the potential for over or under-recovery of backdated bills due to changing demand.

> Question 8: : If we backdate the UCLL FPP price, can we consider ways to mitigate the impacts of backdating, and if so, how should we do this and what practical considerations should we take in to account?

Application of section 18

47. Section 19 of the Act requires us to estimate the UCLL price that we consider best gives effect to the purpose set out in section 18 of the Act: to promote competition in telecommunications markets for the long term benefit of end-users (LTBEU). Section 18 sets out relevant considerations in assessing the impacts on promoting competition on our price review determination of UCLL under the FPP. Section 18(2) reminds us to consider the efficiencies (both static and dynamic) that will result, or will be likely to result, from the determination.

48. As the Act is concerned with the promotion of competition over the long term, we typically give greater weight to dynamic efficiencies rather than static efficiencies. Consideration of dynamic efficiency is particularly relevant to decisions that may affect major investment in telecommunications services.

49. This emphasis is reinforced in section 18(2A) of the Act. Section 18(2A) requires us to consider the incentives to innovate that exist for, and the risks faced by, investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services.

50. We discussed section 18 extensively during the recent benchmarking of UBA in accordance with the IPP.[12] We expect that many of the section 18 issues raised in the context of the UBA IPP price determination will be relevant in the context of the UCLL FPP price determination. For instance, potentially a TSLRIC model could provide a relevant range,[13] from within which we would need to select a price, and for section 18 to have a role in that price selection.

51. However, there are differences between benchmarking under an IPP and cost modelling using a TSLRIC methodology which require additional section 18 considerations.

12 Commerce Commission (2013), "Unbundled Bitstream Access Service Price Review: Update on matters relevant to the UBA price review"; Ingo Vogelsang (2013), "What effect would different price point choices have on achieving the objectives mentioned in s 18, the promotion of competition for the long-term benefit of end-users, the efficiencies in the sector, and incentives to innovate that exist for, and the risks faced by investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services?", Paper Prepared for the New Zealand Commerce Commission, Boston University; Commerce Commission (2013), "Unbundled Bitstream Access Service Price Review, Final determination to amend the price payable for the regulated service Chorus' unbundled bitstream access made under s 30R of the Telecommunications Act 2001", Decision No. NZCC 20, 5 November.

13 A TSLRIC model may provide a point estimate of cost. A plausible range for the true TSLRIC value could also be derived, for example using a sensitivity analysis or other statistical techniques.

52. We consider that section 18 may have a role to play in the UCLL FPP cost modelling exercise in:

    52.1 model design and approach (discussed in greater detail in the following section);

    52.2 the determination or selection of individual parameters in the cost modelling exercise (discussed throughout this paper); and

    52.3 selecting a price within any relevant range provided by the modelling (discussed above).

53. Given that section 18 will influence a number of aspects of the UCLL FPP cost modelling process, we will need to consider the cumulative effect of applying section 18 considerations at different stages.

54. We also consider that differences in the UCLL and the UBA services may mean section 18 requires different considerations in the context of a UCLL FPP price. For instance, we would not expect the UCLL price to be as important to incentives to unbundle as the UBA price.

> Question 9: What role should section 18 play in an FPP TSLRIC modelling exercise?
>
> Question 10: What section 18 considerations should we take into account in the following respects: model design and approach; the determination or selection of individual parameters in the TSLRIC cost model; and in selecting a UCLL FPP price?
>
> Question 11: What differences in the UCLL and UBA services support different section 18 considerations?

The outcomes a TSLRIC price may promote

55. We must determine a UCLL price in accordance with the FPP, which stipulates we use a TSLRIC cost modelling methodology. TSLRIC is defined in the Act as:

> **TSLRIC**, in relation to a telecommunications service,—
>
> (a) means the forward-looking costs over the long run of the total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, the service, taking into account the service provider's provision of other telecommunications services; and
>
> (b) includes a reasonable allocation of forward-looking common costs.[14]

56. The definition of TSLRIC in the Act is broad and provides limited practical guidance on the various choices that need to be made when undertaking a cost modelling

[14] Subpart 1 of Part 1 of Schedule 1 of the Act.

exercise. Section 19 directs us to be guided by the purpose set out in section 18 in making such choices. This means that TSLRIC model design is guided by section 18 and informed by considering the outcomes that a TSLRIC price may promote.

57. We have previously considered TSLRIC applied in the New Zealand context.[15]

58. We have also considered an international body of literature on the various outcomes that a TSLRIC based price may promote. An ACCC paper published in 1997 usefully sets out the possible outcomes of a TSLRIC-based access price which the ACCC considered under its (then) new telecommunications regulatory regime.[16]

> **First**, TSLRIC encourages competition in telecommunications markets by promoting efficient entry and exit in dependent markets. […]
>
> **Second**, TSLRIC encourages economically efficient investment in infrastructure. As TSLRIC provides for a normal commercial return on efficient investment in infrastructure (in the long term) it provides the appropriate incentives for future investment. It also promotes efficient 'build or buy' decisions. […]
>
> **Third**, in the long term TSLRIC provides for the efficient use of the existing infrastructure. […]
>
> **Fourth**, TSLRIC provides incentives to access providers to minimise the cost of providing services. […]
>
> **Fifth**, TSLRIC by allowing efficient access providers to fully recover the costs of producing the service promotes the legitimate business interests of the carrier or carriage service provider providing access. […]
>
> **Finally**, TSLRIC protects the interests of persons who have rights to use the declared service. […]. [this was given as an outcome in a context where the incumbent network operator was vertically integrated]

59. We consider these outcomes are a useful starting point for our own consideration of TSLRIC, and are interested in the views of interested parties on the relative weight we should place on these factors in building a UCLL FPP cost model.

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15 See Commerce Commission (2002), "Application of a TSLRIC Pricing Methodology - Discussion paper", July; Frontier Economics (2002), "Interconnection Pricing Methodology: Report prepared for the Commerce Commission", April; Commerce Commission (2004), "Principles Paper: Implementation of TSLRIC Pricing Methodology for Access Determinations under the Telecommunications Act 2001", February; Commerce Commission (2011), "Standard Terms Determination for the designated services of the mobile termination access services (MTAS) fixed-to-mobile voice (FTM), mobile-to-mobile voice (MTM) and short messaging services (SMS))", Decision 724, May; Commerce Commission (2010), "MTAS Schedule 3 Investigation: Final Report, February; Commerce Commission (2003), "Determination for TSO Instrument for Local Residential Service for Period Between 20 December 2001 and 30 June 2002", December; Commerce Commission (2007), "Final Determination for TSO Instrument for Local Residential Service for period between 1 July 2003 and 30 June 2004", J5270, March; Commerce Commission (2012), "Final determination on the benchmarking review for the unbundled copper local loop service", Decision No. NZCC 37, 3 December, Attachment A, pp. 78-79.

16 ACCC, (1997), "Access Pricing Principles —Telecommunications, a guide", pp.29-30.

60. We consider that TSLRIC may involve weighting these objectives and making trade-offs. For example, there are likely to be trade-offs between promoting cost efficiency (i.e. minimising costs) and encouraging investment.

61. We are interested in your views on TSLRIC, and which, if any, of the above possible outcomes that have been attributed to a TSLRIC model selection exercise by the ACCC are most important in the context of the New Zealand UCLL FPP cost modelling exercise.

62. Giving significant weight to the promotion of an efficient build or buy approach appears to be supported by the decision of the majority in *Vodafone v Telecom*, in which the Supreme Court favoured a scorched earth approach to the cost modelling of the TSO service. However, international regulators appear to strongly favour a scorched node TSLRIC model (or modified scorched node approach), which suggests that international regulators have not adopted the promotion of efficient build or buy decisions as the exclusive purpose for TSLRIC.

> Question 12: Having considered section 18 and international approaches to TSLRIC cost modelling, what outcomes should a TSLRIC model selection for UCLL promote in the New Zealand context and why?
>
> Question 13: Should any of these outcomes be afforded a greater weight and, if so, why?

A closer look at the fundamentals of TSLRIC

63. As highlighted above[17], the definition of TSLRIC in the Act is broad. In this section we explore TSLRIC in more depth.

TSLRIC definition

64. TSLRIC has many variants so the purpose of this section is to explain our understanding of the methodology in general, applicable to the current context. The TSLRIC definition has several aspects. These are discussed below.[18]

Total service

65. The term ‘total service’ refers to the total amount of the service provided by the network operator. The total amount includes the quantity supplied to the various access seekers and the quantity the network operator supplies to itself. This means that the TSLRIC is different from the incremental cost the network operator incurs in supplying the last unit of the service, or the incremental cost of providing the service to one particular access seeker.

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[17] See paragraph 26

[18] See also ACCC (1997), *“Access Pricing Principles – Telecommunications”,* at http://www.accc.gov.au/system/files/Access%20pricing%20principles.pdf

Long run

66. The term 'long run' means that costs should be considered over a long time horizon. Over this timeframe, all factors of production including capital equipment are variable in response to changing demand. All investments are considered as variable costs.

Incremental costs

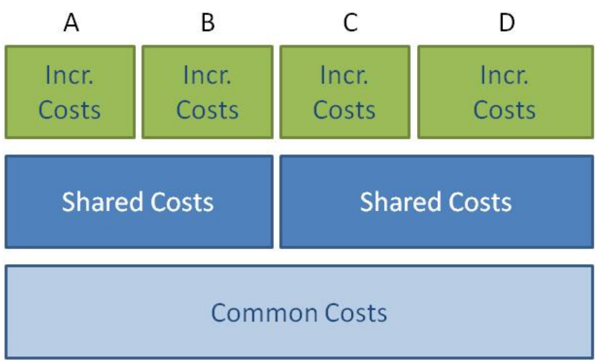
67. Incremental costs are those costs that are incurred for the increment of demand for the service. Incremental costs can also be considered as the avoidable costs of not providing the service. In this case the increment is the total output of the service. The costs included in the analysis are the efficient set of costs required to supply the service.

Forward-looking costs

68. Forward-looking costs reflect the costs that a network operator would incur if it built a new network today using assets collectively referred to as the modern equivalent asset, which we discuss further below. The costs of these assets are the costs of currently available equipment as opposed to the costs of older equipment that may actually still be in use.

Common costs

69. Telecommunications networks are characterised by economies of scope; assets are used to deliver a range of services. In the following diagram we lay out a set of incremental costs that are specific to each individual service[19] (a strict LRIC analysis would consider only these costs). However, the delivery of each service in telecommunications networks (and many other types of network) also involves costs that are common to some or all services. In the example below there are cost elements shared between A and B and between C and D as well as various common costs (for example, corporate overheads) that are shared by all of the services.



19 The Act defines these specific costs as being directly attributable or reasonably identifiable as incremental to a service.

70. The definition of TSLRIC in the Act includes a 'reasonable allocation' of common costs to the regulated service under review. We have interpreted this definition as capturing both shared and common cost categories.

71. Additionally, our interpretation of the requirement to take other telecommunications services into account is that this is an element of shared cost, but not the only element. In other words, where assets owned by parties other than the service provider form part of the hypothetical network (e.g. power poles or ducts), the cost of these shared assets is also taken into account.

72. There are various approaches to cost allocation that are discussed under the proceeding *Common cost allocation* section.

> Question 14: Do you agree with our interpretation of the components that make up the TSLRIC definition in the Act and if not, what interpretation is more appropriate?
>
> Question 15: Is it reasonable for us to account for costs shared with other utilities such as electricity poles?

Relevance of TSLRIC-based copper prices in a fibre transition

73. There is international debate about the appropriateness of TSLRIC in the context of investment in next generation access for broadband.[20] The Act specifies TSLRIC as the cost standard we must use to determine the price. However, the issues raised in the international context provide some useful material to consider.

74. TSLRIC-based prices tend to be used in a market environment that is stable or expanding, where firms are continuing to invest to meet demand and the build or buy consideration is relevant. TSLRIC derived prices are then associated with the appropriate level of revenue required to cover an efficient, forward-looking cost structure, including capital replacement or expansion costs, as well as a normal rate of return.

20 See Plum (2012), "The Copper Fibre Transition – A Guide for the Perplexed: A Report for ETNO"; WIK Consult. (2011), "Wholesale pricing, NGA take-up and competition: Study for ECTA", Bad Honnef 7 April; Martin Cave, Antoine Fournier and Natalia Shutova (2012), "The Price of Copper and the Transition to Fibre", *Digiworld Economic Journal*, no. 85, 1st Q; Warwick Davis (2011), "From Futility To Utility – Recent Developments in Fixed Line Access pricing", *Telecommunications Journal of Australia*, (61:2); Marc Bourreau, Carlo Cambini, Pinar Doğan (2012), "Access pricing, competition, and incentives to migrate from "old" to "new" technology" *International Journal of Industrial Organization*, Vol. 30. See also Australian Competition Tribunal (2010), Application by Telstra Corporation Limited ABN 33 051 775 556 [2010] ACompT1 (10 May 2010), at http://www.austlii.edu.au/au/cases/cth/ACompT/2010/1.html

75. TSLRIC prices are less reflective of market-based prices in markets that are contracting,[21] where on-going capital investment is likely to be much lower and over-capacities may develop.

76. The migration from copper to fibre is occurring internationally and is expected to occur in New Zealand. The European Commission has considered copper to fibre migration in its recommendations on costing methodologies for copper and next generation access (NGA) networks. It notes that the costing methodology for copper networks should *"… deal appropriately and consistently with the impact of declining volumes caused by the transition from copper to NGA networks…"*[22]

77. The European Commission has established its policy position on copper price regulation during the transition to fibre. It notes as follows:

> Active copper lines are decreasing due to customers migrating to cable, fibre and/or mobile networks. Modelling a single efficient NGA network for copper and NGA access products neutralises the inflationary volume effect that arises when modelling a copper network, where fixed network costs are distributed over a decreasing number of active copper lines. It allows for progressively transferring the traffic volume from copper to NGA with deployment of and switching to NGA.[23]

78. When discussing what the transition to fibre means for the application of the TSLRIC approach to setting prices, Vogelsang notes that:

> …the TSLRIC approach can be saved if the old technology disappears because there is a new technology that replaces the old one. In that case, the new technology may provide a modern equivalent asset (MEA) to the old access product and then TSLRIC may be applied using the MEA approach.[24]

79. Substantial debate has taken place in Europe leading to the European Commission's recommendation to model a single efficient next generation access network. We consider this position a useful starting point for a price set under the UCLL FPP. Therefore, the relevant demand for this UCLL TSLRIC analysis is the end-users of Chorus at a given point in time, including end-users that may subsequently migrate to Chorus' fibre network. We recognise that the New Zealand specific factors relevant to this modelling choice may differ from those in Europe. However, as we are modelling a hypothetical entrant, Chorus' mix of copper and fibre connections is not a relevant consideration.

Question 16: Is it appropriate to model demand for a single efficient next generation access network which includes end-users that may migrate to Chorus' fibre network?

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21 See Neumann, K.-H. and Vogelsang, I (2013), "How to price the unbundled local loop in the transition from copper to fibre access networks?", *Telecommunications Policy*, at http://dx.doi.org/10.1016/j.telpol.2013.05.011

22 European Commission (2013), *"Commission Recommendation of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment",* C(2013) 5761, p7.

23 European Commission (2013), op.cit., p.8.

24 Ingo Vogelsang (2013), op.cit.

Question 17: Are there any circumstances specific to New Zealand that we should have regard to when deciding whether this modelling choice is appropriate?

The LFC UFB networks as possible sources of capital and operating cost data or as the modern equivalent asset (MEA)

80. We are required to model and establish the cost of a hypothetical MEA network that is capable of competing with Chorus' UCLL Service. However, we are aware that there are new fibre networks currently being deployed across New Zealand that may provide useful information or assist this process in some way.

81. We understand that LFCs are in the process of deploying G-PON FTTH networks, a technology that, under the sub-section '*Possible MEA Options*', we have not ruled out as a possible MEA option.

82. Accordingly, we are considering LFC network information for the following uses:

 82.1 *Raw cost data*. The LFCs' UFB network construction projects could potentially be a source of data for estimation of the capital (and even the operating) cost of the MEA[25]; and

 82.2 *Network topology*. In principle, the LFC networks have been optimised (on a scorched node basis) relative to Chorus' copper network. Therefore, a more ambitious use of the data could be to adopt the non-Chorus LFC networks as the MEA in their particular geographies.

83. However, the UFB tender price is unlikely to align with the TSLRIC methodology.

84. A TSLRIC price for UCLL should set the level an efficient market entrant would charge in competition with Chorus' UCLL Service – based on a variety of requirements, such as best-in-use technology, cost and coverage. Accordingly, the appropriateness of the UFB tender pricing may be questionable. Factors to consider include:

 84.1 *Coverage*. UFB covers the 75% of New Zealand with the highest population density (and therefore lowest cost to serve);

 84.2 *Service handover points*. There are far less service handover points in the UFB network, compared to UCLL handover points.

 84.3 *Penetration rate assumptions*. UFB pricing has been set on the assumption that take-up is gradual, whereas TSLRIC analysis assumes the hypothetical network is deployed and fully utilised from day one.

[25] For example the trenching costs and the overhead costs at which different LFCs can contract for trenches and other components of network construction could provide unit cost estimates (eg, per meter) for that element of MEA capital costs.

What are the different approaches to TSLRIC modelling?

Choosing the form of TSLRIC model

85. In the previous sections we outlined our understanding of the primary purpose of using TSLRIC for the price review before us and, secondly, to outline our understanding of the methodology in general. We now move to the particularities of applying the methodology in the context of the UCLL service. There are three broad forms of TSLRIC model under consideration:

    85.1 *Bottom-up LRIC (BU-LRIC).*[26] BU-LRIC models calculate the efficient costs that a hypothetical service provider would incur to deliver the various services provided by the regulated operator. The hypothetical provider is assumed to supply the same scale and scope of services provided by the regulated operator. The technology used in calculating the costs is the best in-use technology.

    85.2 *Top-down LRIC (TD-LRIC).* Top-down models use the network operator's accounting records as the main source of cost and asset quantity information for estimating the forward looking cost of a hypothetical network operator. To ensure that the costs are forward looking, the costs from the records usually need to be adjusted to take into account any differences in the price of assets and other inputs, and adjusted for possible cost inefficiencies. When considering the degree of optimisation, the accounting data may also have to be adjusted or supplemented to reflect differences in demand, asset types and asset quantities.[27]

    85.3 *Hybrid TSLRIC.* A hybrid TSLRIC combines features of both TD-LRIC and BU-LRIC. A hybrid TSRIC may be identified by reconciling the costs from a bottom-up model (e.g. as developed by the regulator) to those from a top-down model (e.g. as developed by the network operator) to ensure the TSLRIC appropriately reflects the network operator's costs. Another approach to identify a hybrid TSLIRC may involve asset quantities from the network operator's asset register, and unit costs derived from independent sources.

86. All three approaches to TSLRIC are used in jurisdictions around the world. For example, Sweden and Denmark use a BU-LRIC approach. Italy and Spain have used a TD-LRIC approach in the past, but have now shifted to a BU-LRIC methodology. France uses a hybrid TSLRIC approach.

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[26] In practice, most BU-LRIC models incorporate data from the operators' accounts. In this sense BU-LRIC models, while centred firmly on the concept of a hypothetical, efficient operator, may be considered a type of hybrid model. For instance, assumptions regarding operating expenditure and common costs in a BU-LRIC analysis are usually informed by the operator's actual cost structures.

[27] Depending on the technology of the MEA, the modelling may require a different quantity of assets or different assets to those currently comprising the network.

87. A BU-LRIC-based approach (i.e. a BU-LRIC or a hybrid approach as described above) is more time intensive and costly, but more likely to yield cost estimates that reflect an efficient operator.

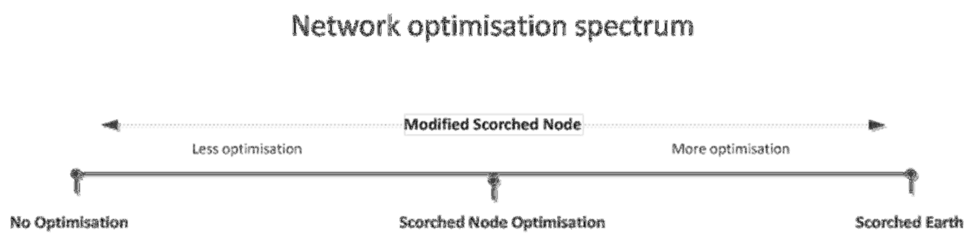
88. BU-LRIC models overcome some of the information asymmetries that may exist between the regulator and the regulated entity as by constructing a bottom-up model; the regulator is less reliant on data provided by the regulated entity. The model is developed from the perspective of a hypothetical operator on the basis of expected demand and a network design rather than starting with the existing network.

89. Conversely, TD-LRIC approaches may be quicker and cheaper, but less likely to lead to cost estimates that reflect an efficient cost structure. It may be difficult to construct a TD-LRIC with a MEA that reflects the technology choices and network optimisation a competing hypothetical entrant would deploy. This is because more of the network and operator's cost structures are used as a starting point.

Optimising the network in a bottom up TSLRIC approach

90. A TSLRIC analysis is concerned with calculating the efficient set of network costs that a hypothetical new entrant network operator would incur. This efficiency objective is met partly by the appropriate choice of the MEA. A related issue of considerable importance is the optimisation of the existing network structure, particularly nodes that need to be modelled in order to reflect efficient costs. The key nodes in a copper distribution network are the local exchanges (MDFs) and the distribution cabinets.

91. There are various degrees of node optimisation that can be applied in a TSLRIC analysis, as illustrated by the following figure



92. The level of optimisation that is adopted is a trade-off between efficiency and the fact that the model should reflect the 'real world' trade-offs and (sunk) investment decisions that have been made in building the actual network.

93. The four broad options are:

    93.1 *No optimisation* (which occur in a top-down or bottom-up approach). Under this option, the number, location, topology and function of exchanges and cabinets in the current network are retained in the analysis. Additionally, the existing network infrastructure (for instance ducts and poles) is also retained and the network is not optimised to reflect projected demand.

93.2 *Complete optimisation ('scorched earth').* Under this option, the network is fully optimised). This scorched earth approach allows complete redesign of the network, without considering any past investment and existing node locations/numbers. This approach removes all of the inefficiencies that may have arisen due to the historical development of the network. However, this approach may not reflect a number of 'real world' issues such as the sunk, irreversible nature of some of the investments that the regulated operator has made, such as the number and the location of local exchanges.

93.3 *Scorched node optimisation*. This approach lies midway between the previous two options. Under this option, the number, locations and functions of major network nodes (eg, exchanges) are left as they are. The access network is then optimised with respect to the number, location and function of the minor nodes (eg, cabinets) and the efficient routing and dimensioning of the local access network between these points and end-users' premises. This is therefore, a trade-off between efficient and 'real world'/historic investment considerations.

93.4 *Modified scorched node optimisation*. This option is a variant of the scorched node approach. Under this approach, there is a greater degree of flexibility on the level of network scorching that occurs.

94. Regulators in other countries typically adopt either the scorched node or modified scorched node approach for optimising the network. For instance, the Swedish regulator uses a 'slightly modified' scorched node assumption in its LRIC model of the fixed network. The Danish regulator adopts scorched node optimisation in its analysis. The German regulator adopts a scorched node approach where MDFs are treated as fixed and the cabinet nodes are treated as re-optimised.

95. We understand that a modified scorched node approach is widely used internationally by regulators. The approach has significant practical advantages as it corresponds to a more realistic efficiency standard and acknowledges (to a degree) real-world investment decisions made by the network operator, while allowing for optimisation where efficiencies can be identified. It also allows for a greater degree of flexibility in approach.

Question 18: Should we use a modified scorched node approach in the TSRLIC model for UCLL? What are the advantages and disadvantages of this approach compared to alternative approaches?

Question 19: What forms of modification should be adopted? What are the advantages and disadvantages of your modification suggestions?

Question 20: Please explain the trade-offs between efficiency and 'real-world' considerations in your assessment of the most appropriate approach to modelling the network?

Question 21: If parties develop top-down models independently, how should we audit and reconcile the different models?

Key features and functionality of Chorus' UCLL service

96. TSLRIC requires us to model a hypothetical access network, which as a minimum, should provide the same functionality as the existing UCLL service. It is therefore necessary to build up a list of the important characteristics of Chorus' UCLL service that we can then use to assess candidates for the modern equivalent asset.

97. A list of possible characteristics would include:

    97.1 *Copper*. The UCLL Service is delivered over a copper distribution network. The copper carries electrical-based transmissions and interfaces with connected equipment on the same basis;

    97.2 *Layer 2 Input*. The UCLL Service enables access seekers to provide layer 2 (and higher) services to end users;

    97.3 *Point to Point*. The UCLL Service provides access seekers with a point-to-point path from the node to the end-user.

    97.4 *Passivity*. The UCLL Service provides passive transmission paths connecting the external termination point at the end users' premises to the distribution frame at the local exchange[28];

    97.5 *Services*. There are no restrictions on the type of services or applications Access Seekers may offer over the passive transmission path within the physical limits of the line (providing compliance with the Interference Management Plan).[29] Traditional voice (POTS), other voice (VoIP), broadband, and low speed data (fax and dial-up internet) services are widely deployed on UCLL lines; and

    97.6 *Power*. Capable of providing a DC power path.

Question 22: What, in your view, are the important characteristics of Chorus' copper local loop network that must be also available from the MEA? Please outline the reasoning for your view.

Choosing the modern equivalent asset

MEA definition

98. The TSLRIC approach involves the calculation of forward-looking costs. These costs reflect the costs that an efficient operator investing in a new fixed

28 Passive connections do not require electronics. Active connections include electronics.
29 See paragraph 2.4, Schedule 1, UCLL Service Description, November 2007 and http://www.comcom.govt.nz/regulated-industries/telecommunications/standard-terms-determinations/interferencemanagementplan/

telecommunications network would face. The forward-looking capital costs are set using the MEA concept.

99. BEREC (the Body of European Regulators for Electronic Communications, previously ERG) has defined MEA as follows:

> Gross MEA value is what it would cost to replace an old asset with a technically up to date new one with the same service capability, allowing for any differences both in the quality of output and in operating costs. For the replacement cost valuation to be appropriate it is not necessary to expect that the asset will actually be replaced.
>
> The new technologies are usually superior in many aspects to the older technologies in terms of functionality and efficiency. However, since MEA values are required to reflect assets of equivalent capacity and functionality, it may be necessary to make adjustments to the current purchase price and also the related operating costs - for example, the new asset may require less maintenance, less energy and less space. Other adjustments may also be required in the calculation of current costs, e.g. surplus capacity.[30]

100. BEREC defines 'equivalent' as an asset with a similar service capability. A 'modern' asset is defined to be a technically up-to-date or current asset, consistent with the forward-looking concept outlined in the earlier TSLRIC definition discussion.

MEA selection

101. The selection of technology for the MEA is a complex decision influenced by a number of factors. We consider the following features and capabilities of the existing UCLL service suitable for selecting the MEA:

101.1 *Copper*. Accepting copper as a MEA criterion would lead to the exclusion of modern access technologies, such as fibre and fixed wireless. Our preferred option, in this instance, is to place greater weight on 'modern' (at the expense of 'equivalence') to consider a wider range of technologies. However, there is still a question as to whether the MEA should interface with electrical-based equipment i.e. optical-based MEA must convert transmissions to 'look' like an equivalent copper transmission – media conversion is likely to have cost implications.

101.2 *Layer 2 input*. The ability for access seekers to provide a layer 2 (or higher) service is fundamental to the UCLL Service, and should therefore form part of the MEA selection criteria. Importantly, this leaves open the possibility of a layer 1 or layer 2 MEA.

101.3 *Point-to-Point*. Similar to the *Layer 2 input* criterion, point-to-point is a relevant feature of the MEA as it enables access seekers to scale and customise end user connections.

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30 ERG COMMON POSITION: "Guidelines for implementing the Commission Recommendation C (2005) 3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications".

101.4 *Passivity*. In our view, passivity should not be a determinative feature of the MEA. However, this assessment does not rule out passive technologies. It allows for both passive and active technologies.

101.5 *Services*. The delivery of services is to a large extent determined by the transmission capacity of the given link. Our view is that services and transmission capacity is a relevant consideration for determining the MEA. However, we note that there may be some services currently provided over UCLL lines that may not be able to be provided over other technology platforms e.g. fax over a fixed wireless connection.

101.6 *Power*. Our preliminary view is that a DC path should not be a necessary requirement of a MEA, as this capability is a historical aspect of copper networks, rather than an important feature of the UCLL Service for access seekers.

102. Further considerations that inform the MEA selection include:

102.1 *Cost.* The MEA technology should be more cost-efficient than the current technology in producing the services of the current technology. Efficiency here includes both quality and quantity considerations.

102.2 *Best-in-use technology.* The MEA should be of a sufficiently modern technology and architecture to optimise, over the long term, investments made in civil infrastructure, while being a readily available, best-in-use, technology.

102.3 *Alternate infrastructure.* The MEA technology may involve the use of layer 0 infrastructure (such as ducts and poles) owned by other network operators (telecommunications or otherwise) so that investment costs are minimised.

103. It is likely that the various MEA options will fit some selection criteria better than others. Some level of judgement may be required to establish which options are suitable MEA candidates.

Question 23: Do you consider that the criteria we have identified will enable us to make the most appropriate MEA selection?

Question 24: What additional criteria, if any, should we consider for determining the MEA for UCLL?

Question 25: What criteria do you consider to be of most importance in the selection of the MEA for UCLL?

Possible MEA options

104. Our initial assessment is that the UCLL MEA candidates that meet the above criteria include:

104.1 Point-to-Point Fibre-to-the-Home (P2P FTTH); or

104.2 G-PON Fibre to the Home (G-PON FTTH); or

104.3 Fibre-to-the-Node (FTTN); or

104.4 A combination of P2P FTTH and fixed wireless access (FWA), with the technology used in a particular geographic region e.g. being the minimum of the cost of FTTH and FWA.

105. The candidate MEA options are discussed below.

P2P FTTH

106. P2P FTTH's physical topology uses point-to-point fibre, where a physical connection is permanently provided between the node and end user's premise.

107. A P2P FTTH network can provide a point-to-point input that enables a layer 2 (or higher) service. Our current assessment is that P2P FTTH will not constrain services, as the transmission capability is significantly higher than what is available over UCLL lines.

108. The main issue with FTTH as the MEA is that it is an expensive technology solution in sparsely populated areas. Although New Zealand has a very high urbanisation rate, the rural population is relatively sparse. Two percent of the population live in a land area that covers over half of New Zealand.[31] In these areas, the cost of trenches and ducting per dwelling passed is very high.

109. Overseas, the Danish regulator has concluded that FTTH is the MEA for the copper access network. The Swiss regulator is currently considering if FTTH is the appropriate MEA technology in its jurisdiction. Several other regulators are also using TSLRIC models based on FTTH. The European Commission has released a recommendation that suggests that regulatory authorities should consider a next generation access (NGA) network to be the MEA in TSLRIC analyses. The NGA network is defined as a network that meets the European Commission's Digital Agenda for Europe (DAE) targets, which is at least FTTN (fibre-to-the-node) and possibly FTTH.[32]

G-PON FTTH

110. G-PON's physical topology uses point-to-multipoint fibre, where an unpowered optical splitter sits between the node and end user connection, allowing a single optical fibre to serve multiple premises.

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[31] Statistics New Zealand. *"New Zealand: An Urban/Rural Profile"*, http://www.stats.govt.nz/browse_for_stats/people_and_communities/Geographic-areas/urban-rural-profile.aspx.

[32] European Commission (2013), op.cit., at (31), p.8.

111. Our assessment of G-PON FTTH is very similar to P2P FTTH (above), in that it satisfies the criteria requiring a suitable point-to-point[33] layer 2 input, as well as offering significantly higher transmission capability than what is available over UCLL lines.[34]

112. As with P2P FTTH, the main issue with G-PON FTTH as the MEA is its deployment costs in sparsely populated areas.

FTTN

113. The European Commission's recommendations on costing methodologies for copper and next generation access networks[35] includes FTTN as a candidate next generation access technology because it potentially delivers the bandwidth, coverage and take-up targets of the Digital Agenda for Europe.[36]

114. The network topologies (and therefore, the deployment costs) of G-PON FTTH and FTTN can be similar i.e. both have point-to-multi-point elements. Our current thinking is that given the choice of deploying from scratch either FTTN (copper access) or G-PON FTTH (fibre access), a network operator would be likely to select a G-PON network due to the increased capabilities of fibre. Like all previously discussed fixed networks FTTN has high deployment cost in sparsely populated areas.

Combination of P2P FTTH and FWA

115. FWA can provide a point-to-point[37] input that enables a layer 2 (or higher) service, as well as the transmission capacity to deliver broadband and voice services.

116. This MEA option recognises that FWA may be a more cost effective technology for delivering telecommunications access services to sparsely populated areas. Under this option, the technology used in a particular geographic area is either P2P FTTH or FWA depending on which technology has the lowest cost.

117. The Swedish regulator, PTS,[38] has adopted a composite fibre and FWA MEA in its TSLRIC model for the fixed network. PTS has determined that (compared with FTTH) FWA is a more cost effective access technology in sparsely populated areas. In its 2013 fixed network TSLRIC model, PTS conducts a fibre versus FWA cost comparison for the 50 zones (equating to five defined 'geotypes') it samples in its cost model. PTS concludes that geotype 5 (equating to 10 of the 50 sampled

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33 G-PON technology can provide point-to-point connectivity where layer 2 electronics are included in the deployment

34 GPON FTTH is inferior to P2P FTTH with regards to performance and ability to unbundle.

35 European Commission (2013), op.cit., pp.9-10.

36 See http://ec.europa.eu/digital-agenda/.

37 FWA technology can provide point-to-point connectivity where layer 2 electronics are included in the deployment

38 Post-och telestyrelsen (2013), *"Dokumentation av utkast till hybridmodell v.10.0"*, 13-1949, http://www.pts.se/upload/Ovrigt/Tele/Bransch/HY10/Modelldokumentation_HY_100_samrad.pdf.

areas) is best served by FWA, with the remaining four geotypes served by a fibre access network.[39]

> Question 26: Are there other MEA options that should also be considered?
>
> Question 27: What are the pros and cons of the options that we have identified and any further options that you may have identified?

Should we adjust for performance?

118. The objective of applying a performance adjustment is to achieve competitive neutrality across technology platforms. The MEA technologies are different and superior in the sense that they are providing a different quality of service and higher capacities and are capable of providing different services. Thus, there is a performance difference between copper and fibre access services for example. Quality of service differences suggest that adjustments should most likely be made for the observed performance differences.

119. Any appropriate MEA approach has to deal with the performance differences between the copper access and the MEA access technology. In particular, FTTH bandwidths tend to be (sometimes large) multiples of copper bandwidths, while the value differences are much smaller. Also, bandwidth is not the only relevant component of quality differences between the two technologies so that various quality indicators would need to be aggregated into a single performance measurement.

120. BEREC's MEA definition notes that adjustments to the MEA values may be required because the MEA technology is likely to be superior to the current, in-the-ground, technology. For example, in comparison to copper access, fibre optic cable may incur lower maintenance and operating costs while enabling significantly greater bandwidth and higher transmission quality to be delivered to end-users.

121. In the context of fibre as the MEA for copper access, BEREC notes:

> Whether fibre is the MEA for copper depends on whether the value of fibre assets replacing copper assets results in lower costs. If not, then fibre, by definition would not be the MEA because it would not be the least cost technology available for the service in question. As fibre allows new services (or higher speeds) to also be delivered, then if fibre assets cost more than the copper assets they dis-place, this additional value needs to be abated.[40]

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[39] There are around 56,000 users in geotype 5, compared with 9,116,000 users over all areas. It appears that PTS deals with the FWA MEA for this geotype by pricing a FWA access product that is separate from fixed network access prices. The implication of this approach is to effectively reduce the coverage area for the fixed access network.

[40] BEREC (2011), *"BEREC's answer to the Commission's questionnaire on Costing methodologies for key wholesale access prices in electronic communications",* BoR (11) 65, http://ec.europa.eu/information_society/policy/ecomm/doc/library/public_consult/cost_accounting/2_BEREC.pdf.

122. Neumann and Vogelsang (2013) conclude that a performance adjustment is required if fibre-based technology is used as the MEA for copper access:

> To become competitively and technologically neutral, copper access should be based on the cost of fiber access corrected by the performance delta between copper and fiber access. The performance delta should be derived from the market valuation of services provided over copper and fiber access represented by the end-user prices of services and corrected by cost differences down stream of the access provision.[41]

123. The European Commission recommends the following approach:

> An FttH [fibre to the home] network, an FttC [fibre to the cabinet] network or a combination of both can be considered a modern efficient NGA network. Under this approach the cost calculated for the NGA network should be adjusted to reflect the different features of a copper network. This requires estimating the cost difference between an access product based on NGA and an access product based entirely on copper by making the relevant network engineering adjustments to the NGA model to determine the wholesale copper access price.[42]

124. The treatment of MEA performance differences varies across jurisdictions. For example, during the development of the Danish LRAIC fixed network model, TERA Consultants (on behalf of the Danish regulator, the Danish Business Authority,(DBA) considered the following adjustments:[43]

124.1 *Adjustment based on willingness to pay.* Under this approach, costs are adjusted using an estimate of relative consumer willingness to pay. For example, if FTTH is selected as the MEA for the copper access network and end-users are found to be willing to pay relatively more for fibre, then a downward adjustment would be applied to the fibre-based cost to calculate the copper price. Neumann and Vogelsang (2013) propose this form of adjustment approach. [44] The Swiss regulator is considering this approach; it is currently consulting on a modified Ordinance for Telecommunications Services that includes this form of performance adjustment.[45]

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41 Karl-Heinz Neumann, and Ingo Vogelsang, (2013),"How to price the unbundled local loop in the transition to fibre access networks?" *Telecommunications Policy*, at http://dx.doi.org/10.1016/j.telpol.2013.05.011.

42 European Commission (2013), op.cit., at (41) p.9.

43 TERA Consultants (2013), Section 3, "Modification and development of the LRAIC model for fixed networks 2012-2014 in Denmark – MEA Assessment", ref: 2012-55-DB-DBA-V2 February.

44 Karl-Heinz Neumann, and Ingo Vogelsang, (2013), op.cit., at http://dx.doi.org/10.1016/j.telpol.2013.05.011.

45 Under the proposed modifications, if the calculation of the cost of the copper access network is to be based on a MEA, for example fibre, then the cost differential between the two technologies is to be determined according to a performance delta. This delta is to be based on the difference between the earnings that on the market for end users are currently being realised with either of the two technologies. Schweizerischer Bundesrat, Entwurf einer Änderung der Verordnung über Fernmeldedienste (FDV), 17.04.2013; see also Bundesamt für Kommunikation BAKOM, Entwurf eines Erläuternden Berichts zur Änderung der Verordnung über Fernmeldedienste (FDV), 17. April 2013.

124.2 *Adjustment based on technologies and performance.* Under this option, a cost adjustment between the MEA and the 'technology-in-the-ground' is made based on the different technical capabilities of the technologies, e.g. relative capacity of copper vs. FTTH (e.g. 50 Mbits/sec vs. 1 Gbits/sec). The main drawback of this approach is that the performance difference is completely unrelated to economic assessment by end users; it would lead to very low copper access prices. We understand that this approach has not been used by any regulator.

124.3 *Adjustment based on costs.* Under this approach, the difference in cost between the current and MEA technologies is applied to the cost structure of the MEA technology. Effectively, the lowest technology cost is used, irrespective of the MEA. The Danish Business Authority is currently considering this option.

125. There is also the option to make no adjustment at all. Sweden has adopted this approach; in its latest LRAIC analysis, the Swedish regulator makes no adjustment for the performance differences between copper and fibre-based access network MEAs.[46]

> Question 28: Should performance adjustments on the MEA value be made to reflect the differing performance attributes of the MEA technology relative to the current UCLL technology?
>
> Question 29: What are the potential adjustment options that we should consider? What are the advantages and disadvantages of these options i.e. willingness to pay, technologies and performance, and costs?

Should we take into account the TSO when considering the MEA?

126. Telecom's TSO requires that it deliver fax and low speed data services (at 9k6 and 14k4) to TSO customers. There has been some difficulty experienced in delivering such services over IP based voice services of the type that would be offered over an optical fibre network.

> Question 30: Should a technology's inability to deliver TSO services disqualify it from consideration as an MEA? Or is it more important to have a forward-looking MEA than to preserve the ability to carry legacy services?

Demand: determining the size of the network to be modelled

127. As discussed in the *Relevance of TSLRIC-based copper prices in a fibre transition* section, the relevant demand for this UCLL TSLRIC analysis is the Chorus end-users at a given point in time, including end-users that may subsequently migrate to Chorus' fibre network during the regulatory period.

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46 Post-och telestyrelsen (2013), op.cit.

128. Demand is an important consideration in a TSLRIC exercise as it affects our choice of MEA, is an important characteristic when considering connection volumes and is ultimately used to determine the unit cost of the service. The model will be sensitive to this assumption.

129. There are two key aspects of this end-user demand:

129.1 Spatial – how demand is dispersed geographically; and

129.2 Temporal – how network demand changes over time.

Spatial

130. Equipment deployed in a telecommunications network is designed to serve a certain number of connections. What equipment is deployed in any particular location is informed by cost drivers, such as density, distance, topography, geological conditions and local government regulations.

131. In order to select the MEA, it is vital to understand the geography that the UCLL network covers. Linking capability and demand to geographic areas will enable efficient MEA selection choices.

Question 31: What geographical aspects drive equipment/technology choices for network owners?

Temporal

132. Demand in a fixed access network is typically the number of connections required between end users and the first aggregation node in a given geographic area.

133. The starting point for the demand profile in the access network is the current connection volume of Chorus lines. The network is dimensioned for total connections with cost allocation occurring across only active lines. Assumptions are made on changes in demand over the regulatory period. These assumptions could be based on the network provider's forecasts, but might also include forecasts from non-Chorus LFCs and mobile operators to help estimate changes in connections.

134. At a minimum, the demand forecast period should be the same as the regulatory period. However, if an economic depreciation methodology is adopted, the forecast period should equal the economic life of the longest-lived asset.

Question 32: What forecasts of demand currently exist that may be relevant?
Question 33: How would we establish an accurate forecast of the network provider's connection volumes over time?

Should we take into account the TSO when considering demand?

135. As we explain above, an important attribute of the network to be modelled is its extent; what is the required coverage of the network geographically, and should

all of it be modelled in the UCLL cost? One approach to answering this question could be to take the boundaries defined by the network TSO. The provision of service to those customers inside this boundary, apart from those provisioned via active cabinets, would be modelled and the costs included in the network cost. Provision of service to customers outside that boundary would be excluded from the model. The benefits of this approach include:

135.1 Chorus is entitled to ask end-users to contribute to the capital costs of connections outside this area; and

135.2 Chorus is obliged to provide service to end-users' premises inside the TSO boundary.

136. The UCLL footprint (areas where Chorus currently offers UCLL) and the TSO footprint will be different. There will be areas inside the TSO footprint where service is not provided over copper (except those served from active cabinets), for example, customers served by customer multi-access radio systems.

Question 34: Do you agree that the TSO area is an appropriate area to consider when calculating the cost of UCLL? If not, what would you consider to be a better alternative?

Common cost allocation

Common costs

137. As discussed under the section *A closer look at* the *Fundamentals of TSLRIC*, there are costs that are not directly attributable, but that are still applicable to the delivery of the UCLL service. These costs are common costs.

Allocating common costs

138. The allocation of common costs is an important regulatory challenge. The relevance of a particular method of allocating common costs depends on the particular context of the industry in which the approach is intended to be applied, and on the regulator's objectives and duties.

139. The Act requires us to include a reasonable allocation of forward-looking common costs to the UCLL Service. We have interpreted 'reasonable' to be a level of cost between stand-alone cost[47] and incremental cost.[48]

140. We consider that a causal approach to allocating common costs is preferable, and expect that in many instances it will be possible to establish such a relationship by carefully examining the direct and indirect cost drivers of services.[49] However, where this is not possible, a mark-up approach should be used.

Cost allocation methodologies

141. Three types of cost driver can be used to allocate common costs:

    141.1 *Input-based.* Costs can be allocated to a service based on known inputs employed in the production of that service, such as labour, floor/duct space used;

    141.2 *Output-based.* Costs can be allocated using output indicators, such as production volumes (i.e. the number of lines); and

    141.3 *Value-based.* Costs can be allocated based on demand factors, such as revenues or consumers' willingness to pay. A variant includes allocating costs using the Ramsey principle, which states that it is economically efficient to recover a relatively larger part of common costs from those customers whose demand is relatively more inelastic. The theoretical merit of Ramsey pricing is normally outweighed by real-world practicalities, and is therefore rarely used in practice.

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47 The stand-alone cost of deploying all of the elements that deliver the UCLL Service e.g. ducts, poles, exchange buildings, provisioning systems etc.

48 The incremental cost is the additional cost to provide UCLL over and above other existing service(s) provided over the UCLL network e.g. UCLFS bears the common cost of ducts, poles, exchange buildings, provisioning systems etc.

49 Exchange buildings, for example, might at first sight be considered a common cost. It would however, be inappropriate to allocate the total costs of exchange buildings to the access network, as the building will probably house core network equipment. The costs of exchange buildings are to a large degree driven by the number of square meters required by the equipment installed in the buildings.

142. Where causal cost drivers cannot be identified, a mark-up approach is appropriate. Equi-proportional mark-up (EPMU) is the methodology that is commonly adopted in relation to LRIC cost-modelling. Utilising this method, costs are spread across all relevant services by the same percentage. The percentage is calculated as the ratio of total common costs to total incremental costs.

143. We have observed that common costs are sometimes categorised into the following broad groups:

143.1 *Shared costs.* Costs that cannot be directly attributed to a particular service, but that can be attributed to a group of services. For example, full-loop and sub-loop access lines sharing a duct would fall into the shared cost category;

143.2 *Non-network costs*. Costs that are comprised of corporate overheads, such as finance, HR and the Chief Executive's salary; and

143.3 *Network costs*. Costs that encompass common network elements, such as exchange buildings.

144. Categorisation of common costs in the manner set above may be beneficial if different allocation methods are applied to the various categories. For example, network costs are allocated based on input cost drivers, whereas non-network costs are allocated based on a mark-up methodology.

145. We will look into what cost drivers can be identified and their appropriateness as cost allocators. It is likely that we will employ several approaches to allocate common costs, but the precise methodologies cannot be determined at this stage of the process.

Question 35: Is there benefit in segmenting common costs in this way i.e. as it allows for different allocation methodologies to be applied to different cost pools?

Question 36: Is the distinction between shared and common costs necessary? Does the allocation methodology need to differ between shared and common costs?

Depreciation

146. Most capital goods are used up in the process of producing output. Through physical deterioration and obsolescence capital goods, with a few exceptions, eventually reach the end of their useful life. As assets deteriorate and are finally retired their productive capacity declines to zero. At the same time their market value declines.[50] This depreciation of value is a cost that needs to be recovered as

[50] Charles R.Hulten and Frank C. Wykoff, (1996), "Issues in the measurement of economic depreciation: introductory remarks", *Economic Inquiry*, 34, pp. 10–23.

part of a forward-looking cost-based price. Accordingly, depreciation needs to be reflected in the prices charged for the service(s) that use the capital goods.

147. There are two broad forms of depreciation – economic and accounting.

147.1 *Economic-based depreciation* captures the change in factors that determine the value of an asset from one period to the next. Whereas;

147.2 *Accounting-based depreciation* is focussed on allocating costs across time periods.

Economic-based depreciation

Economic depreciation

148. Economic depreciation incorporates the various factors that affect the value of assets. There are a wide range of factors that determine the economic value of an asset, including expected revenue, asset prices, technological change and demand.[51]

149. Estimating economic depreciation is information intensive and requires forecasts of how the various factors that affect the value of an asset are expected to change over a long time period. Due to the inherent shortcomings of forecasting over long periods, it is unclear whether economic depreciation provides a more accurate depreciation allowance than accounting-based approaches to depreciation.

150. There is also a risk of creating a circular argument, as the calculation of economic depreciation depends on the expected development in revenue, which in turn depends on the calculated depreciation charge included in the regulated prices.

Accounting-based depreciation

Straight-line depreciation

151. Straight-line depreciation distributes an asset's value equally across the assumed life of the asset to produce an annualised depreciation charge.

152. The straight-line depreciation formula provides some limited flexibility to take into account factors that are expected to affect asset values. For example, the regulator can modify the assumed lifetime of the asset.

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51 Regulators in Belgium, The Netherlands and Norway apply forms of economic depreciation. Analysys Mason (2011), "Report for BIPT: BIPT's NGN/NGA Model version v1.0 documentation for industry players", 23 December; Analysys Mason (2012), "Report for the Norwegian Post and Telecommunications Authority (NPT): Fixed Long Run Incremental Cost (LRIC), Model for Market 4 Response to operator consultation", 28 September; Analysys Mason (2010),"Report for OPTA: Conceptual approach for the fixed and mobile BULRIC models", 20 April; Analysys Mason (2012), "Report for Ofcom: Study of approaches to fixed call origination and termination charge controls", 15 May.

153. Straight-line depreciation is often used in economic regulation, particularly outside telecommunications, because (relative to other forms of depreciation) it is well understood, transparent and simple to calculate.

Annuities

154. An annuity incorporates an allowance for depreciation and the return on capital.[52]

155. A standard annuity calculates the charge that recovers the asset's total purchase price and financing costs in annual sums that are constant over time.

156. If the price of the asset is expected to change over time, a tilted annuity would be more appropriate. A tilted annuity calculates an annuity charge that changes between years at the same rate as the expected change of the asset value. This results in declining annualisation charges if prices are expected to fall over time, or vice versa when prices are expected to rise. Because of this feature, the tilted annuity approach is an approximation to economic depreciation as annual charges are brought in line with the expected value of the asset at each time of its economic life. As with a standard annuity, the tilted annuity should still result in charges that, after discounting, recover the asset's purchase price and financing costs.

Depreciation considerations

157. In order to determine which of the above depreciation approaches will best provide adequate cost recovery, it is useful to understand the factors that will impact the economic value of the asset(s) over its assumed economic life.

158. We have identified the following factors as the most important:

158.1 asset prices;

158.2 technological change; and

158.3 demand.

Expected changes in asset prices

159. Taking expected changes in asset prices into account in the depreciation allowances helps to promote efficient investment incentives. An expected change in asset prices is likely to influence an access seeker's choice of either purchasing the UCLL Service or building their own access network. For example, where asset prices are expected to fall, the depreciation charge should reflect this change in value. This is achieved by shifting depreciation costs from later periods to earlier periods, such that its flow through into the price of the service will provide efficient investment incentives.

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52 The return on capital is calculated by multiplying the value of assets by the cost of capital (i.e. the financial return investors require from an investment given its risk).

160. We do not have a settled view on expected changes in asset prices and what this might mean for the depreciation assumptions. However, we note that a large proportion of the cost of building a modern fixed access network is in trenching and ducts, involving labour and specialised machinery.

Expected technological change

161. As with the expected change in asset prices, if technological change is expected to make the MEA technologically obsolete it would be rational for the access seeker to build its own network using the new technology, when it becomes efficient to do so.

162. Our current view on the MEA (set out in paragraphs 104 to 117) results in fibre comprising the majority of the hypothetical network. We therefore consider that the risk of technical obsolescence in the medium-term is low. Accordingly, our initial assessment is that expected technological change is unlikely to provide a reason for selecting one depreciation method over another.

Expected changes in demand

163. The revenue (price x quantity) generated from services using the asset should, amongst other things, recover the depreciation costs of the asset. The expected demand (or quantity) for the services over time is therefore a crucial component in determining the correct depreciation charge in the service price. If demand is higher than expected, this will result in an over-recovery of depreciation costs – and vice versa.

164. Our initial assessment (set out in the *Demand* section above) is that the TSLRIC modelling exercise should include demand from Chorus connections that will migrate to fibre. Given this view on demand, we expect some growth in the number of connections over the lifetime of the assets. To the extent that it is efficient for the network to accommodate the connection growth, the value of the MEA will reflect this expected growth.

165. Accordingly, our preliminary assessment is that expected changes in demand do not provide a reason for selecting one depreciation method over another.

Depreciation selection

166. The depreciation methods listed above can take into account (in varying degrees)[53] expected changes in the factors that impact the economic value of the asset(s) over their assumed economic lives.

167. On practicality and transparency grounds, our preliminary assessment is that it is better to use a less information intensive accounting-based approach to depreciation.

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53 Noting when the return on capital is added to the straight line deprecation, depending on timing assumptions, can lead to capital cost recovery profiles that are similar to a tilted annuity: constant capital recovery or a greater proportion can be allowed to be recovered early or later in the assumed lifetime of the asset.

168. In selecting one accounting-based approach over another, our current preference is that a tilted annuity approach should be used. A tilted annuity provides greater flexibility than a straight-line approach, as expected changes in asset values can be more explicitly incorporated. Where no changes are expected, a tilted annuity will deliver a similar result to straight-line depreciation.

> Question 37: Should we use an alternative depreciation approach to tilted annuity and if so, why is this preferable?
>
> Question 38: If we adopt a tilted annuity approach, what factors reflect how the tilt should be set?

Cost of capital

The cost of capital reflects the cost of funding investment

169. The cost of capital reflects the expected return investors require to provide the funding for building the infrastructure to providing UCLL services. The cost of capital is used to calculate the return on capital used in setting the cost based price.[54]

170. The cost of capital is one of the most important parameters in a TSLRIC exercise. However, for the purpose of this paper, we only seek parties' views on our overall approach. The cost of capital is one of the few parameters that can be more or less isolated as a stand-alone piece of work. In that sense, despite its importance, there is ample time within the FPP exercise to determine the most appropriate way of applying the weighted average cost of capital (WACC) to the UCLL price review. Therefore, the purpose of this section is to set out at a high level our initial assessment on the approach to the cost of capital, without specifying actual estimates of parameter values. Such estimates will be considered in the context of the specifics of the model building exercise and the price review determination.

171. The cost of capital is the financial return investors require from an investment given its risk. Investors have choices, and will not invest in an asset unless the expected return is at least as good as that they would expect to get from a different investment of similar risk. The cost of capital is an estimate of that expected rate of return.

172. There are two main types of capital: debt and equity capital. Both have a cost. For debt, it is the future interest payments. For equity, it is the expectation of dividend payments by the firm, and where profits are retained and reinvested, the expectation of larger dividend payments by the firm sometime in the future.

173. The WACC reflects the cost of debt and the cost of equity, and the proportion of each that is used by the firm to fund the investment.

[54] The return on capital is calculated by multiplying the value of assets used to provide the UCLL service by the cost of capital.

The cost of capital compensates investors for systematic risk

174. The cost of equity capital to a firm is primarily related to the exposure to risk that an investor cannot avoid by spreading investment across a variety of firms. The risk that cannot be reduced by diversification is called the systematic risk. The risks specific to just one investment (called the unsystematic risks) can be expected to offset one another in an investor's portfolio since they can be diversified away at minimal cost.[55] Unsystematic risks are therefore not generally rewarded in workably competitive capital markets.[56]

175. Cost of capital measurement recognises that the higher a firm's level of exposure to systematic risk, the higher its cost of capital. This reflects a risk-reward trade-off, insofar as investing in firms where returns are likely to be more correlated with market returns, (i.e. investments exposed to more risk), will require higher expected returns.[57]

The cost of capital input methodologies as a starting point for consultation

176. We propose to use the cost of capital input methodologies as a starting point for consulting on the estimation of the WACC to be used in setting the TSLRIC-based price.[58]

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55 Cost of capital discussions usually distinguish between systematic risk and unsystematic risk. Systematic risk reflects the extent to which an asset (or stock) participates in the fluctuations or movements in the overall market. Systematic risk of an asset (or stock) is therefore sometimes described as that component of risk that is 'correlated' with the overall market. Examples of systematic risks are the impact that changes in real GDP, inflation, currency movement, major technological advances and a recession have on the returns earned on an individual asset (or stock). The correlation of the returns on an asset with the value weighted return on all assets in the market is the asset's beta.
Unsystematic risk (or idiosyncratic specific asset risk) is the risk unique to a specific asset (or stock), and this component of the risk of an asset (or stock) is uncorrelated with general movements in the overall market. It includes the risks associated with an asset (or stock) that arise through increasing competition, changes to antitrust legislation, technological innovations, and geographic location. Empirical studies have generally found that the unsystematic or idiosyncratic risk will be eliminated (or diversified out of) through investors holding a sufficiently large portfolio of stocks. The unsystematic risk associated with an asset (or stock) is therefore also referred to as the 'diversifiable risk'. The risk that remains after diversification is the systematic risk, also referred to as the 'non-diversifiable' risk.

56 A key analytical basis of the pre-eminent cost of capital model, the CAPM, is that provided capital markets are competitive and efficient, equity investors will only expect to be compensated for bearing systematic risk. Rational investors could and would diversify away firm-specific risk, so such risk should not be priced by the market. (This result would hold to a first approximation provided capital markets are workably competitive.) The implication for regulators is that, when setting allowed rates of return, compensation should only be awarded to investors for bearing systematic risk.

57 An often used approach to estimating the cost of capital that makes this assumption of risk-reward trade-off is the capital asset pricing model (CAPM). In New Zealand, the input methodology for cost of capital used in regulation under Part 4 of the Commerce Act uses the simplified Brennan-Lally CAPM model.

58 For further details see Commerce Commission, *Input methodologies (electricity distribution and gas pipeline services): reasons paper*, December 2010, chapter 6 and appendix H; and Commerce Commission, *Input methodologies (airport services): Reasons paper*, December 2010, chapter 6 and appendix E. The determinations of the cost of capital are posted at www.comcom.govt.nz/regulated-industries/input-methodologies-2/cost-of-capital/

177. The capital asset pricing model (CAPM) used in the cost of capital input methodologies describes the returns expected for individual equity investors relative to the universe of investment opportunities, including opportunities to invest in the telecommunication sector. The input methodologies represent the practical exposition of the Commission's application of the capital asset pricing model across a range of sectors.

178. The cost of capital input methodologies establish the upfront rules that we have to apply when estimating the cost of capital for services that are regulated under Part 4 of the Commerce Act.[59] We set the input methodologies upfront (for up to seven years) to provide regulatory certainty.

179. The approach set out in the input methodologies has been developed through a thorough consultation process involving a range of sectors (electricity and gas distribution and transmission, airports) and has involved a range of stakeholders, including Telecom.[60]

180. The consultation process for the cost of capital guidelines started in October 2005 and was intended to inform final guidelines that would "outline a consistent framework employed by the Commission in estimating the cost of capital." We proposed to "use them as a starting point, and adapt them when necessary to accommodate variations in industry-and firm-specific circumstances." We did not finalise the guidelines as the Commission focussed its resources on developing the input methodologies that apply under Part 4 of the Commerce Act.[61]

181. We have consulted on the cost of capital in the telecommunications sector in various contexts before.[62] We expect that the consultation on the cost of capital for the UCLL FPP will be of interest to a wide range of stakeholders.

182. The input methodologies were determined in December 2010. There is currently a merits review of the cost of capital input methodology before the High Court.

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59 Currently electricity and gas distribution and transmission services, and the aeronautical services provided by the three international airports are subject to price-quality and/or information disclosure regulation.

60 For the cost of capital determinations that currently apply refer to our website at www.comcom.govt.nz/cost-of-capital.

61 Commerce Commission, Draft guidelines: The Commerce Commission's approach to estimating the cost of capital, October 2005, para 9. www.comcom.govt.nz/dmsdocument/5952.

62 Telecom contributed a number of submissions to the cost of capital guidelines and the input methodologies consultation process and we considered these in the paper that sets out the reasons for the Commission's determination: Commerce Commission, Input Methodologies (electricity distribution and gas pipeline services) Reasons Paper, December 2010, chapter 6 and appendix G. www.comcom.govt.nz/dmsdocument/6499. An example of where a wider set of parties from the telecommunications sector submitted on the cost of capital was the standard terms determination for certain sub-loop services. Commerce Commission, Standard Terms Determination for the designated services of Telecom's unbundled copper local loop network service (Sub-loop UCLL), Telecom's unbundled copper local loop network co-location service (Sub-loop Co-location) and Telecom's unbundled copper local loop network backhaul service (Sub-loop Backhaul), 18 June 2008. www.comcom.govt.nz/dmsdocument/5526.

We will have to tailor our approach to cost of capital estimation

183. Many of the components that make up a WACC estimate are generic to any sector or service (such as an estimate of the risk free rate). However, if we use the cost of capital input methodologies as the starting point for developing a WACC estimate for setting the UCLL price, some of the components would need to be tailored to the context of the forward-looking cost based price for the UCLL.[63]

184. Our proposed approach is that we should use the simplified Brennan-Lally version of CAPM for estimating the cost of equity. This is consistent with previous determinations we have made in other industries regulated under Part 4 and the draft cost of capital guidelines, and is widely used in practice in New Zealand.

185. We expect a fuller discussion on the cost of capital to be carried out in future consultations and the industry workshop that we have scheduled for later in the project. As such, we are interested at this stage on the questions set out below.

Question 39: Do you agree that it is appropriate to use the cost of capital input methodologies as the starting point for estimating the cost of capital for the UCLL TSLRIC model?

Question 40: If the cost of capital input methodologies are used as the starting point, which (if any) parameters should be updated to reflect the specific circumstances of the UCLL TSLRIC model?

Question 41: Do you agree that it is appropriate to use the simplified Brennan-Lally capital asset pricing model as the basis for estimating the cost of equity for the UCLL service?

Question 42: Which comparator firms should be used to estimate the beta for the UCLL service?

Operating expenditure

186. A forward-looking cost-based price needs to allow for the expected on-going operating cost of providing the unbundled copper loop service. These operating costs include costs relating to the network (such as property maintenance costs and fault repairs) and costs that do not relate to the network but are needed to provide the service (such as corporate overheads).[64]

187. There are different approaches to developing operating expenditure assumptions for a TSLRIC modelling exercise, including:

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63 Among the components that would need to be estimate are the beta, the term assumption (to match the term of the risk free rate and of the debt premium), credit rating assumptions, and the leverage assumption.

64 Some operating costs (such as corporate overheads) are likely to involve common costs. To determine an appropriate allowance for operating costs we would need to apply the approach to common cost allocation (discussed in the *Common Cost Allocation* section).

187.1 Top-down assessments using the network operator’s actual costs. Solely relying on the network operators may result in inefficient costs being included in the modelling. In addition, Chorus’ cost-base is likely to include certain transitional items resulting from its separation in 2011. To ensure that only efficient operating cost, adjustments for inefficiencies and transitional costs may need to be undertaken.

187.2 Bottom-up assessments that relate detailed individual cost categories to cost drivers. This requires estimates of the operating expenditure per unit of relevant cost driver (e.g., operating expenditure per unit of capital expenditure, or operating expenditure per full time employee) and the expected level of cost drivers over the lifetime of the asset. The unit costs can be derived from the network operator and/or through benchmarking.

187.3 Benchmarking assessments of costs of comparable network operators in other jurisdictions or assumptions used by regulators in other jurisdictions.

188. The various approaches differ in their information and other resource requirements. Top-down and benchmarking assessments of operating costs may have lower resource requirements than bottom-up assessments but they may be relatively less accurate.

189. It may be appropriate to use different approaches for different categories of operating expenditure. For example, operating expenditure on the network may change with certain characteristics of the network, such as age, so a bottom-up approach to reflect the changing nature of the relationships over time may be most appropriate. Non-network expenditure on corporate overheads may be unrelated to the characteristics of the network, so a top-down assessment relying on assumptions used by other regulators may be appropriate. [65]

190. Our preliminary position is that we would not rely on a top-down approach relying only on the network operator’s data. We consider that this would be inconsistent with the TSLRIC definition in the Act which requires that the “costs included in the analysis are the efficient set of costs involved in supplying the service.”[66] All of the other approaches (including a top-down approach with adjustments for efficiency and transitional costs) aim to estimate the efficient operating cost. We have no preference for the other approaches at this stage and welcome your views.

[65] The distinction between capital and operating expenditure relies on accounting rules. Depending on which accounting rules are adopted some types of expenditure can be treated as operating expenditure (for example, some types of maintenance) or as capital expenditure. Depending on the rules adopted the costs can be recovered through the price in the year in which they are incurred, or over time through the depreciation charge.

[66] For example, using the operator’s actual operating expenditure would result in an inefficient allowance if the operating expenditure of the network operator’s existing assets is different to the expenditure associated with the modern equivalent asset used in the TSLRIC model.

Question 43: Which approaches to estimating operating expenditure are most appropriate in the UCLL TSLRIC modelling exercise?

DATED at Wellington this 6th day of December 2013.