COMPETITION ECONOMISTS GROUP

# Uplift asymmetries in the TSLRIC price

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# Table of Contents

# 1 Overview

1. We have been asked by Chorus to consider the Commerce Commission's (Commission's) draft determination to not apply an uplift to the cost of capital for the unbundled local loop (UCLL) and unbundled bitstream access (UBA) services. In its draft determination the Commission has also solicited views on whether an uplift in the TSLRIC price estimate is appropriate.[1]

2. We agree with the Commission's view that it *"should give weight to erring on the high side to avoid the negative consequences of setting a price that is too low"* and its reasons for reaching this conclusion.[2] The analysis in this report supports the Commission's view that there are asymmetric consequences stemming from setting UCLL and UBA prices too low, relative to setting them too high. Our view is that the Commission should apply an uplift to minimise the expected costs to society of misestimating the costs of providing these services.

3. These asymmetric consequences (or asymmetric costs) stem from the fact that low prices for UCLL and UBA would:

   - provide weaker incentives for Chorus to continue to maintain and invest in its copper network in the long run; and
   - send signals that are likely to:
     - impede the migration of customers from copper based services to fibre based services; and
     - reduce the incentives for Chorus and LFCs to invest in their UFB networks.

4. These effects could in turn affect the welfare benefits stemming from investment in fibre. We also note that the circumstances of the telecommunications industry, in which there is the potential for inter-modal competition, mean that it is not just the effect on Chorus' incentives to invest that must be considered in setting prices, but also the incentives of its competitors (or potential competitors) to invest.

5. We consider that there are also cash flow asymmetries (or asymmetric risks) that motivate an uplift. In particular, we note that:

   - the compensation allowed by the Commission for catastrophic risk is not complete and Chorus will not be compensated in expectation for these residual risks;

[1] Commerce Commission, Draft pricing review determination for Chorus' unbundled copper local loop service: Draft determination (hereafter "*Draft Determination*"), 2 December 2014, para 425-428.

[2] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: Draft decision*, 2 December 2014, p. 47

- the Commission proposes not to provide compensation for potential regulatory stranding due to regular revaluations of the asset to the assumed changes in the modern equivalent asset; and
- technological and competitive standing risks are not effectively compensated in the Commission's draft decision. The use of accounting lives will not reflect the future expectations of stranding, and moreover, the use of annuity compensation means that expected compensation will be axiomatically below the required level if the expected life is used.

6. We disagree with the conclusions drawn by Vogelsang (2014), that an uplift is not warranted since the modelling adopted by the Commission has elements that already favour a higher price.[3] Specifically, Vogelsang (2014) raises the possibility that the Commission at its discretion could have modelled either the re-use of existing assets or a performance adjustment. We understand that the Commission's modelling choices:

   - were driven by the need to implement TSLRIC within the New Zealand legal framework; and
   - are not 'generous' in their implementation and would not be expected to provide compensation that would otherwise be taken into account when considering an uplift.

7. We do not consider that the method of TSLRIC implemented by the Commission gives rise to a rationale not to apply an uplift. We consider that the case for an uplift is strong due primarily to (i) the consumer welfare benefits from migration to fibre; (ii) the less than fair aspects of the Commission's modelling, in particular the absence of compensation for asymmetric risks and 'all copper and fibre' demand assumption; and (iii) the inability of the classical TSLRIC approach to capture the forward-looking costs of transitioning between technologies. We do not consider that modelling the re-use of assets on a forward-looking basis would or should in any material way offset these effects.

8. In this report we set out our rationale for an uplift to address both asymmetric costs and asymmetric risk (if they are not addressed directly in the cash flows). As we discuss further below, we note uncertainty around the best estimate applies to a number of key parameters in the modelling including the cost of capital, asset lives and asset price trends and this could also be addressed in an uplift to the estimate of the TSLRIC price. We describe a methodology the Commission could implement to quantify the effect of this uncertainty in a range in prices of the regulated service (i.e.,

3 Vogelsang (2014) *Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand*, November 25, 2014.

Monte Carlo simulation). This could be used to establish a range in the price of the regulated service around the central estimate.

# 2 Framework for analysis

9. In this section we outline two key features of the framework that we use for analysis of uplift in this report.

   - First, we consider the need for an uplift in light of the existence of asymmetric consequences that exist in the real world, as opposed to the alternative reality occupied by the Commission's hypothetical efficient operator (HEO).
   - Second, we consider whether an uplift is required in the cost of capital (or WACC) in the Commission's modelling. However, in light of the Commission's broader discussion of an uplift in the prices of UCLL and UBA we focus on this approach.[4]

10. We outline the basis for these conclusions below.

## 2.1 Assessing asymmetric consequences in the real world

11. We consider that analysis of whether an uplift is required must be grounded in real world outcomes and not the world of the Commission's HEO. This has important consequences for how the Commission should consider the effect of the cost of capital and, more generally, the prices set for UCLL and UBA.

12. In relation to asymmetric consequences, we are concerned about the asymmetric effects on society's welfare from setting prices higher or lower than the long run efficient costs of providing the UCLL and UBA services. This analysis can only consider the effects of the Commission's pricing decisions in reality – one in which Chorus is the provider of UCLL and UBA.

13. The purpose of applying an uplift is to minimise the expected costs to society of misestimating the costs of providing UCLL and UBA in setting their prices. Our interest in performing this exercise is the effect of real pricing outcomes on overall welfare in New Zealand in which Chorus provides UCLL and UBA services and attempting to maximise benefits for that society. There is less obvious purpose in attempting to maximise benefits in a hypothetical scenario where the HEO provides UCLL and UBA services.

14. We do not consider that the need to focus on real world outcomes in considering the need for an uplift is internally inconsistent with the Commission's framework for estimating TSLRIC through the prism of the HEO. The HEO framework does not negate the absolute requirement for welfare analysis to be undertaken in the real world. As we discuss below, when the costs of the HEO are being used to determine

[4] Refer to Commerce Commission *Draft Determination* at paras 425-428 and to similar effect, Commerce Commission *Draft Pricing Review Determination for Chorus' Unbundled Bitstream Access*, December 2014 at para 358.

the value of Chorus' actual network, the analysis of asymmetry may yield the same outcomes in the hypothetical and real worlds.

## 2.2 Assessing asymmetric consequences in the hypothetical world

15. Many of the assumptions that the Commission uses to determine TSLRIC reflect hypothetical circumstances that are not grounded in reality (e.g., instantaneous build of a single vintage of technology). An analysis of welfare outcomes based on an assumption that the HEO exists would itself be a hypothetical exercise. For example, the Commission's HEO:

- operates a nationwide FTTH network when no such network currently exists – in effect building it instantaneously;
- captures all copper and fibre demand, abstracting from the reality that demand must transition between these networks; and
- has access to environmental and legal approvals to build its network.

16. Nevertheless, if the Commission adopts the HEO as its framework for analysis of whether an uplift is required, we consider that the case for an uplift is compelling. If the price set for the TSLRIC is below the level of costs that would be incurred by the HEO the HEO would not invest at all.[5] This would be expected to be the case 50% of the time if the TSLRIC price was based on the median of the WACC and the expected level of input costs. The welfare consequences of this would be significantly detrimental to end-users of telecommunications services in New Zealand.

## 2.3 An uplift to the WACC and the price

17. In this report we focus on the rationale for an uplift to the price for the UCLL and UBA services, rather than an uplift to the WACC that has been applied by the Commission in the context of its regulation of electricity and gas networks.

18. An uplift to WACC may be motivated by the asymmetric consequences that can result from setting the WACC too high or too low. This was a natural point of focus in the context of building block regulation of electricity distribution and gas pipeline businesses under Part 4 of the Commerce Act because in this framework the regulatory WACC sends an immediate signal about the value of incremental investments to regulated businesses through the addition of capital expenditure to the regulated asset base. In the context of uncertainty in the WACC and the

5 Assuming the HEO did not have the flexibility to invest in some areas and not in others, or undertake investment in lower quality. If this was possible, the HEO may be able to attract some investors due to the heterogeneous assessment of risk.

asymmetric consequences of investment in electricity and gas networks, allowing for an uplift to the WACC provides a direct way of ensuring that the expected costs of under- or overinvestment are minimised.

19. In the context of TSLRIC regulation of the UCLL and UBA services, the asymmetric consequences of setting the WACC too high or too low remain important. However, there exists a wider set of asymmetric consequences resulting from setting the prices of UCLL and UBA too high or too low which are independent of how the WACC is determined. While uncertainty in the WACC is a contributor to uncertainty in the price, it is by no means the only contributor, given that the price calculated in TERA's TSLRIC model also takes into account of other inputs such as:

    - the costs of building the modelled network;
    - the costs of operating and maintaining the modelled network;
    - demand for services provided by the modelled network; and
    - the asset lives and price trends of the network assets.

20. Uncertainty in each of these factors around the best estimate also feeds through to variation in the modelled TSLRIC for the UCLL and UBA services.

21. Since it is the prices for the UCLL and UBA services that determine the asymmetric consequences that we discuss at sections 3 and 4 below, it is uncertainty in these prices that gives rise to the need for an uplift. Providing for an uplift that allowed for only the uncertainty in the estimation of WACC would likely materially underestimate the uplift needed to allow for uncertainty in the price.

22. Even if one were to disagree that other aspects of the TSLRIC modelling other than the WACC contribute to uncertainty in the price, an uplift in price is a reasonable way of capturing this uncertainty. Through the operation of the TSLRIC model, uncertainty in the WACC gives rise to uncertainty in the price, and similarly an uplift applied to WACC gives rise to an uplift in price.

23. However, the reverse is not obviously true. If uncertainty in other aspects of TSLRIC modelling gives rise to uncertainty in the price, this will not be captured by having regard only to uncertainty in the WACC. While it would be possible to capture the uncertainty in these other aspects and reflect their importance to the uncertainty in price through an uplift purely to the WACC, this would involve reverse engineering of the TSLRIC model.

24. In light of these conclusions, in this report we focus our discussion in relation to uplift on an uplift in price, rather than an uplift in WACC, though as we indicate above it is possible, albeit indirectly, to express the uncertainty in various parameters in a WACC uplift if that is preferred by the Commission.

# 3 Asymmetric cost

25. Asymmetric cost refers to the differing welfare effects from setting a price too high as against those resulting from setting it too low. In this context, "too high" and "too low" refer to a comparison against the firm's long run efficient costs, which can only be imperfectly observed by the regulator. If the Commission misestimates cost and therefore sets a price that either over-recovers or under-recovers true cost, this may result in a range of consequences to consumer welfare and total welfare. The type of consequences that may be caused can depend upon the environment in which prices are set.

26. In the context of regulation of UCLL and UBA under the Commission's proposed implementation of TSLRIC, these asymmetric costs stem from the fact that low prices for UCLL and UBA would:

    - provide weaker incentives for the provider of UCLL and UBA to continue to maintain and invest in its copper network in the long run; and
    - send signals that are likely to:
        - impede the migration of customers from copper based services to fibre based services; and
        - reduce the incentives for Chorus and LFCs to invest in their UFB networks.

27. These issues are also raised by the Commission and by Vogelsang (2014). We are largely in agreement with the Commission on the categories of asymmetric cost and with the Commission's conclusion that it *"should give weight to erring on the high side to avoid the negative consequences of setting a price that is too low"* and its reasons for reaching this conclusion.[6] We discuss the asymmetric effects on incentives to invest and incentives to migrate in more detail below.

## 3.1 Effect on investment in services

28. Prices serve an important function in determining incentives to invest, both for Chorus and for other businesses.

29. A price above midpoint for UCLL and UBA services signals both to Chorus and other businesses increased value in their past investments and a higher likelihood of earning a return on new investment.

[6] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: Draft decision*, 2 December 2014, p. 47

### 3.1.1 Impacts on investment in copper networks

30. There are two potential ways in which erroneously estimating the price of UCLL and UBA might provide Chorus itself with an incentive to act in ways that might have asymmetric consequences for consumers. These are the following:

    - Chorus may be *more likely* to under-invest if the prices for its copper services are set too low than it is to over-invest if the prices are set too high; and
    - the *net social cost* of under-investment may be greater than the net social loss of the same amount of over-investment.

31. The first scenario may well be met in Chorus' circumstances. If the prices for UCLL and UBA are over-estimated, any additional investment that Chorus undertakes does not simply get added to a RAB and recovered from its customers. Such investments will only be profitable if they lead to a significant up-lift in demand – which may not be a "given". In other words, the incentive to over-invest appears not to be as strong under a TSLRIC framework.[7]

32. However, there is still likely to be an incentive for Chorus to under-invest if the prices for its UCLL and UBA services are set too low. If it is to continue to maintain and invest in its copper network, Chorus has to expect to cover its long run average costs of providing its copper services.[8] As Vogelsang (2014) observes, the ability for the regulated firm to expect to cover its forward looking costs is important:[9]

    > *TSLRIC is an average cost concept, as it should be in order to be compatible with cost coverage for the regulated firm.*

33. If the Commission, by not accounting for uncertainty, sets a price below the long run measure of efficient costs that is feasible for the regulated firm to recover, incentives to invest will be eroded in the long run. In particular, if the method of setting prices consistently sets them at a level where costs cannot be recovered, over time existing investors will have the value of their sunk investments eroded in a systematic way, and the knowledge of this means that new investors are unlikely to be attracted to the sector.

34. In the short term, if these prices are materially under-estimated relative to cost, Chorus would have an incentive to spend as little as possible providing existing services to its current customers. It is also likely to have little if any incentive to invest

7 The same observation is made by the Commission and by Vogelsang (2014).

8 Whilst much of the investment in the copper network is irreversibly sunk, investors in Chorus and more generally, would be deterred from making new investment if the definition of average cost did not recognise this sunk investment and the regime of periodic asset revaluations at replacement cost was not adhered to.

9 Vogelsang (2014), p. 1

so as to try and obtain new customers, including by making investments in new regulated products (e.g., to expand coverage of the UBA service in rural areas), since it will not expect to cover its costs in doing so. These consequences are very similar to those caused by asymmetric risk (discussed in section 4 below).

35. The fact that a new product might be unregulated may also not quarantine it from the effects of incentives determined by the level of regulated prices. Suppose that Chorus is considering investing in a new unregulated service that is a "new and improved" version of an existing regulated product. It may be disinclined to do so if the price that it can charge is effectively "anchored" by the regulated price for the existing product.

36. Furthermore, the Commission's statement that it would prefer to incentivise new "economic" investments through specific, targeted incentive regimes rather than a general uplift is not an option in this context. The TSLRIC framework arguably does not permit the Commission to implement the targeted incentive schemes – the likes of which it had applied to Transpower – to Chorus, i.e., it is simply not a "tool in its bag". Therefore under a TSLRIC framework, the probability of under-investment – particularly in the long-run, and in new services – if prices are erroneously and systematically set too low, is significantly higher than the probability of over-investment if prices are set too high.

37. This leads to the related issue of the potential *costs* of over- and under-investment. The magnitude of the former is not altogether clear since, as noted above, it will only occur when Chorus expects to be able to increase demand (presumably from willing buyers) and therefore its revenue will increase along with consumer welfare. That is, the nature of the regulatory regime suggests that overinvestment attributable to the design of the regime is not likely.

38. The magnitude and nature of the latter (costs of under-investment) depends upon the form that the under-investment takes, for example:

    - under-investment in existing services may manifest in a deterioration in the quality of service, which may give rise to costs; and
    - under-investment in new services manifests in the form of welfare foregone on investments that are deferred or cancelled.

39. In respect of the first category of costs, we consider that the Commission has not given adequate consideration to the potential cost to consumers of underinvestment in the networks providing regulated services. Network outages can cause significant disruption to customers and economic activity. These have recently been estimated to be as much as 50 euros per household per day in Ireland, though estimates are

lower for local exchange outages.[10] The incentive to invest in measures to reduce faults and outages is reduced with a lower price for the regulated services, both:

- in the long term because of potential concerns over expected cost recovery; and
- in the short term if the revenue foregone due to network faults and outages is less due to lower prices.

40. We note that whilst the standard terms for the regulated services are prescriptive in terms of timing and penalties for ordering and provisioning, they appear to allow Chorus flexibility in determining fault restoration times.[11] This is not to say that Chorus does not have strong incentives for rectifying faults, however the business case for investing in fault prevention would be improved with higher prices for the regulated service.

### 3.1.2 Impacts on investment in other networks

41. One of the most obvious differences between Chorus and energy transport businesses is that it faces clear inter-modal competition (e.g., from mobile) and the prospect of unbundling – on both its copper and its fibre networks. This means that the prices determined for the UCLL and UBA services have the potential not only to affect Chorus' incentives and conduct (as described above), but also its competitors'. On balance, the existence of actual and potential competitors would tend to favour the Commission *"erring on the high side"* when setting prices for UCLL and UBA.

42. This is because, if actual or potential competition exists, this may constrain Chorus to pricing despite regulated prices being set "too high". In contrast, the costs of setting prices "too low" may not be limited to those described above – it may also reduce the incentives for new firms to enter the market, resulting in a diminished level of competition. For this reason, regulators will sometimes provide some "headroom" within which competition can occur when setting regulated prices, opting to set them relatively high, rather than risk stifling future competition by setting them at a level that is too low to encourage entry.

43. These issues have been recognised by a number of regulators of potentially competitive electricity retail services. For example, the Essential Services Commission of Victoria acknowledged the importance of avoiding excessively low regulated prices when setting maximum prices for potentially competitive retail electricity default contract tariffs (these were regulated tariffs that suppliers were

[10] http://www.sciencedirect.com/science/article/pii/S1567422312000452

[11] Commerce Commission, Standard Terms Determination for Chorus' unbundled copper local loop network service, Schedule 4: UCLL Operations Manual: Public Versions, 7 November 2007, Section 10.3.

obligated to offer at a regulated rate, and firms were then free to offer customers alternative tariffs in competition, e.g., with different price levels/structures):[12]

> *"The tension involved in determining the appropriate level for safety net price cap, is to ensure that the regulated prices are not so high that retailers are able to exercise market power by charging prices substantially above supply costs, but are not so low that competitive price offers are not feasible and/or efficient supply costs cannot be recovered."*

44. The need for appropriate signals for competing infrastructure is also reflected in the Commission's considerations of the balance of build/buy signals in its draft decision for the UCLL, where it states that:[13]

> *…incentivising efficient build or buy choices is consistent with the section 18 purpose statement, by promoting investment in alternative infrastructure, and in turn promoting competition for the long-term benefit of end-users.*

45. In particular, the Commission states that its approach to TSLRIC:[14]

> *…emphasises the use of forward-looking costs, resulting in a price that reflects the efficient costs of building an equivalent service today. The intention is that an access seeker will build an alternative rather than purchase the regulated access only where building is more efficient and therefore is in the long-term best interest of end-users.*

46. As the Commission has determined the UCLL price based on fibre technology using the MEA approach, which results in lower costs compared to the UCLL price based on the existing Chorus legacy copper infrastructure, it appears that the build or buy decision is skewed towards the buy choice, i.e. a too low UCLL price is likely to incentivise an access seeker to purchase the regulated access instead of investing in alternative infrastructure, which in turn would not promote competition for the long-term benefit of end-users. In sum, if the incentives for investment in services and infrastructure that substitute for or compete with the copper network are undermined due to the Commission setting the WACC too low to benefit consumers in the short-term this could lead to a marked reduction in quality of service, narrower product offerings, a reduction in the level of competition and the potential foreclosure of rivals. These outcomes may have a greater detrimental impact on consumers in the long run than higher prices. In this respect, it must be remembered that section 18 of the *Telecommunications Act 2001* refers to the *long-term* benefit of end-users.

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12 ESC (2002), *Special Investigation: Review of the Effectiveness of Full Retail Competition for Electricity - Final Report,* September, p.69.

13 Commerce Commission, *Draft Determination*, p. 41

14 Ibid, p. 40

## 3.2 Effect on migration

47. There are likely to be significant welfare benefits from encouraging the migration of customers and services from copper to fibre. These benefits arise from a number of factors, including that:

    - fibre infrastructure is capable of offering a higher quality of service than copper. Migration of customers from copper to fibre can achieve:
        - private benefits to each customer in terms of better internet quality and the potential for enhanced services; and
        - network benefits to each customer that is already connected by increasing the pool of customers with fibre connectivity and opening up more opportunities for investment in innovative products and services that rely upon high quality internet speeds.
    - maintaining two parallel fixed line access networks is costly, not just for Chorus, but for society. Migration of customers from copper to fibre could be expected to bring forward the date at which the copper network can be "shut down" in areas where the UFB will bypass copper. This will eliminate continued expenditure on maintaining and operating the copper network that could be more efficiently channelled into alternative infrastructure or services.[15]

48. The existence of significant private and public benefits available from migration from copper to fibre mean that the net costs of setting a price that overestimates the long run efficient costs of providing UCLL and UBA are likely to be low. High copper prices will contribute to increased migration which will spur significant benefits. There will also be costs for those consumers that remain on the copper network – and for some there will be no opportunity to migrate to fibre. However the net cost of an overestimate may be zero, or even negative, since it is not obvious that the costs of increasing the copper price above its true TSLRIC (whatever that might be) even exceed the benefits, let alone exceed them by much.

49. Conversely, the costs of setting UCLL and UBA prices too low could be severe since it is likely to disincentivise migration to fibre and/or other competing infrastructure alternatives. This, together with the signals to investment from low prices for UCLL and UBA discussed at section 3.1.2 above, could delay the benefits of these alternative services reaching consumers.

50. We note that in its draft determination, the Commission states that it agrees that the benefits of migration from copper to fibre provide a rationale for an uplift in the

[15] Including discouraging socially wasteful and duplicative investment in unbundling exchanges and cabinets.

TSLRIC price of UCLL and UBA. However, the Commission sets out an important caveat to this opinion:[16]

> *We also note that our estimated TSLRIC price for UCLL and UBA is, in combination, greater than the current entry level wholesale price for UFB. Where we are concerned about the potential welfare costs of lower migration to alternative networks, most notably the UFB, we would expect the level of those welfare costs to relate to the relative price of UCLL (and UBA) and the UFB price. In the situation that the price of an existing service is already higher than the alternative (higher quality) service, the extent of potential welfare losses associated with a lower level of migration is expected to diminish. We see a strong distinction to be made here with any consideration that a specific level of relative prices should be established between the combined price of UCLL and UBA and the UFB prices, which we reject as inconsistent with s.18 and the promotion of competition.*

51. We agree substantively with the Commission's reasoning in the passage above. That is we agree that it is the relative price of fibre and copper that drives incentives for migration which will affect welfare when we consider setting TSLRIC prices for UCLL and UBA. The Commission does not appear to draw a conclusion from this, but the quote suggests an inference that there may be less reason to be concerned about potential welfare losses if prices for copper services are higher than prices for fibre services. We consider that:

    - that there would be less reason to be concerned about potential welfare losses in this scenario *relative* to a worse scenario in which prices for copper services were lower than prices for fibre services; but
    - even in the state of the world where the prices for copper services are higher than prices for fibre services, this does not establish that the relative prices are set in a way that would maximise welfare[17] or provide appropriate incentives for migration given the weight of private and public benefits associated with migrating customers to fibre services.

52. Absent a concrete proposal as to how fibre prices will be set in the future, the Commission may not be able to rely on the current relativities to temper its assessment of the effect on migration. As such, our view is that it would be appropriate for the Commission to consider the absolute level of copper prices on migration in lieu of such a proposal.

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16 Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: Draft decision*, 2 December 2014, p. 50

17 For example, the current relativity between copper and fibre prices may have been set in expectation of a particular migration of customers from copper to fibre that may be accelerated by the Commission through higher copper prices to the benefit of consumers.

# 4 Asymmetric risks

53. Asymmetric risk is a term used by the Commission to refer to the effects caused by truncating one end of the distribution of returns to a firm. More generally, we consider that asymmetric risks occur where the basis for determining the price of the UCLL and UBA services under- or over-compensates the regulated business in expected terms. Asymmetric risks provide a rationale for setting the price higher or lower so as to align the price allowed with the expected costs of the business.

54. While asymmetric risks necessarily focus on the costs of the regulated business (in contrast to the analysis of asymmetric costs) the focus nonetheless remains on the welfare of society overall and the long term benefit of end users. This reflects the fact that in the long run dynamic efficiency is achieved where the regulated business, acting efficiently, can expect to recover its costs. As Vogelsang (2014) puts it, the ability for the regulated firm to expect to cover its forward looking costs is important:[18]

> *TSLRIC is an average cost concept, as it should be in order to be compatible with cost coverage for the regulated firm.*

55. It is widely understood that, in the long run, providing compensation to a regulated business that is less than its expected average costs may have negative welfare consequences. That is, in the long run, concerns over asymmetric risks may actually be concerns over asymmetric costs. However, in this report we continue to address these as separate areas of analysis, reflecting the treatment given to them by the Commission in its draft decision.

56. We note that there are a number of sources for asymmetric risk to the provider of UCLL and UBA created by the Commission's draft decision. The Commission has not adequately accounted for the asymmetric cash flows arising from risks CEG identified in its previous report. In particular:

    i. Chorus' insurance for catastrophic events is based on a declared asset value of around $1.8 billion and does not include coverage for cables, poles and ducts outside of CBD areas;

    ii. The Commission has not recognised that re-optimisation risk must be accounted for to ensure the hypothetical operator is NPV neutral and that not accounting for anticipated technology change will guarantee asymmetries;

[18] Vogelsang (2014), p. 1

iii. The Commission has not appropriately accounted for the risk of competitive developments and technology change that could truncate the recovery of assets before the end of their useful lives.

## 4.1 Catastrophic risks

57. In our earlier report we stated that the risk of catastrophic events should be factored into consideration of whether an uplift is required to UCLL and UBA prices.[19] The Commission has agreed but considers that its draft decision does provide compensation for catastrophic risk:[20]

> *We have included compensation for catastrophic risk in our model as follows:*
>
> > *We have included costs for seismic bracing and backup generators; and*
> >
> > *We consider it is appropriate to use Chorus' insurance costs, which provide cover for catastrophic events.*

58. In our view, the Commission's allowance provides compensation for some of the catastrophic risks faced by Chorus, but not all of them.

59. First, the costs incurred by Chorus are more varied than the two identified in the quote above. Aside from seismic bracing and backup generators, Chorus' capital expenditure on risk management also includes other measures such as protection from fire and lightning.[21] **[CI]** While many of these risks can be insured, Chorus nevertheless incurs substantial capital expenditure to mitigate these risks, and this expenditure needs to be taken into account.

60. Secondly, we consider that it is not reasonable to use Chorus' insurance costs alone as an indicator of the costs associated with catastrophic risks. This is because the insurance options available to Chorus are incomplete in the sense that not all of Chorus' catastrophic risks can be insured against, or in any case are not insured against. Any such residual risks are borne internally by Chorus, and will not be reflected in its insurance costs. Chorus' actual expected risk management costs are thus higher than its insurance costs since Chorus will have to bear the expected costs of those uninsured risks.

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19 CEG, *Response to Commerce Commission UCLL/UBA WACC consultation paper*, March 2014, pp. 81-85

20 Commerce Commission, *Draft Determination*, p. 157

21 **[CI:** [redacted] **]**

### 4.1.1 Chorus' insurance

61. The structure of Chorus' insurance policy does not completely insure Chorus against all forms of damage that may arise from catastrophic risks. This is the case because:

    - Chorus is not insured against all events. In particular, it is not insured at all against:[22] **[CI]**
        - damage to its distribution and transmission lines outside the CBDs of the five major cities; and
        - events arising from riots, acts of terrorism or war.
    - in common with almost all insurance policies, Chorus' features:
        - a 'deductible' (or excess) that provides a lower limit of damage below which Chorus (and not the insurance company) will meet the cost of claims; and
        - a upper limit above which the insurance company is not responsible for claims against damage.

62. Therefore, it is not correct to claim that compensation based on the premiums for Chorus' insurance policies provides compensation for the expected costs of catastrophic events. By extension, an HEO holding the same insurance policy would also not be fully protected against all catastrophic risks.

63. While the likelihood of many of these adverse events is fairly small, the losses that could be incurred should they be realised is relatively large. These asymmetric risks once again should be considered in assessing the scale of the uplift that is appropriate for the UCLL and UBA prices.

### 4.1.2 Chorus' capital expenditure on risk management

64. In addition to paying for insurance coverage, Chorus also incurs capital expenditure on risk management in areas such as seismic/structural, fire, security, lightning protection and risk mitigation elements of major projects.[23] **[CI]**

65. These expenditures reduce the probability and likely magnitude of damage to Chorus' assets and infrastructure resulting from catastrophic events. In turn, their purposes are twofold. First, incurring capital expenditure on risk management can reduce the insurance premiums that Chorus is subject to. It would therefore be efficient for Chorus (and the HEO) to carry out this capital expenditure if the cost of doing so is exceeded by the corresponding reduction in premiums.

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22 **[CI: [redacted]]**

23 **[CI: [redacted]]**

66. Secondly, the cost to society resulting from damage to Chorus' infrastructure is likely to be greater than the cost to Chorus itself, due to the public benefits generated by its telecommunications networks. It may therefore still be socially efficient for Chorus to incur capital expenditure on risk management even in cases where this expenditure exceeds the consequential reduction in insurance premiums.

67. To the extent that the Commission's model does not allow for expenditure on risk management categories beyond *"seismic bracing and backup generators"* cited in its draft decision, this is a further category of efficiently incurred expected costs that are not provided for in the Commission's determination. If this is not addressed directly in cash flows, perhaps due to difficulty in quantification, this could be taken into account by the Commission in considering an uplift in the price.

## 4.2 Regulatory stranding

68. The TSLRIC framework proposed by the Commission, due to selecting FTTH as the MEA of the copper network, may have the potential to strand a large proportion (and possibly almost all of) Chorus's investment in its copper network. Furthermore, applied consistently over time, it would be expected to similarly strand the assumed investment of the HEO that the Commission models as the TSLRIC exercise is repeated in the future. This form of asymmetric risk could potentially be addressed by the use of a price uplift for copper services.

69. That stranding will occur under the Commission's proposed TSLRIC framework is clear from its draft decision and the Commission's conception of the HEO:[24]

> *Our conceptual framework for TSLRIC is that the hypothetical efficient operator would operate a newly built network providing the relevant regulated services. The implication of this is that the hypothetical efficient operator is not constrained by the legacy decisions of the incumbent in respect of, for example, network technology, network design, the nature of the assets used and cost structure.*

70. The Commission's HEO is not constrained to operate a network that reflects the legacy decisions that Chorus has made. Similarly, when the Commission comes to reassess TSLRIC price in the future and posits a new HEO, that HEO will not be constrained to reflect the decisions that the Commission and its modellers have made in respect of this HEO. This means that over time one would expect that the HEO would not be able to cover its average costs, as new lower cost technologies emerge (or could be expected to emerge) which lowers the TSLRIC price determined under the Commission's methodology.

[24] Commerce Commission, *Draft Determination*, p. 42

71. Seen in this light, the Commission's implementation of TSLRIC through the prism of the HEO can be seen as a commitment to periodically cost an efficient network *at the time of the assessment* without regard to whether either:

- the costs that it models are achievable by the incumbent operator that it will use its model to set prices for; or
- the costs that it models are achievable over time by the operators that it has previously hypothesised as efficient for this purpose.

72. The Commission states that it is not required to solely have regard to what an HEO might do. For instance, it reserves to itself the discretion to take into account *"incumbent network and any legacy inefficiencies"*.[25] However, this appears to be also tempered by its view that it may *"also include information based on the existing operator's actual cost structures where these are likely to be broadly efficient."*[26] This second statement appears to leave open the prospect that the Commission would consider it reasonable to not just:

- capture 'efficient' costs that are achievable by the HEO, but not the incumbent; but also
- capture 'efficient' costs that are achievable by the incumbent, but not the HEO.

73. Examples of both can be seen in the Commission's draft decision where:

- it hypothesises an FTTH network that captures both copper and fibre demand at an average cost that is lower than could be achieved by operating two separate networks. Similarly, this FTTH network is assumed to be built instantly and it costlessly acquires this demand; whereas
- it assumes that the HEO could easily access environmental approvals to build its networks and that it would be able to strike pole sharing deals with electricity network businesses that could not be negotiated today.

74. The net result of these positions contributes to asymmetric risk through regulatory stranding, where the Commission's proposed pricing framework measures a level of costs over time that is not achievable by Chorus (and indeed is unachievable by the Commission's HEO or any hypothetical business).

75. In addition, applying the Commission's approach means continually identifying and compensating for the least-cost means of supplying the regulated service assuming that the entire network must be rebuilt afresh at the start of each regulatory period (and valued on an optimised replacement cost basis). To account for the fact that prices will be periodically reset in the future (on the basis of the future replacement

25 Commerce Commission, *Draft Determination*, p. 43

26 Commerce Commission, *Draft Determination*, p. 42

cost for today's network design or, more likely, a different network design), this means setting a path of prices now that anticipates movements in future replacement costs *and* network design.[27]

76. Under this approach, it will be the norm for new technologies to displace old technologies as the most efficient because old technologies will have no special advantage in the cost model associated with already being in place. That is, compensation above the simple 'single technology' annuity is required for the expected future cost of shifting to a lower annuity level of compensation based on the latest technology.

77. Therefore, we disagree with the Commission's statement that regulatory stranding relates to actual costs rather than the HEO's costs:

> *In our view, CEG's argument relates to actual costs rather than the hypothetical efficient operators costs. We also do not consider it is appropriate to provide an allowance for future regulatory decisions that may strand assets because a TSLRIC model explicitly includes expected asset price trends. Such windfall gains may occur in either direction and consequently we have no evidence of any material asymmetry. We would also be concerned about potential double-counting where any write down in asset value reflects the introduction of new technology.*

78. We disagree because even if the efficient technology is correctly identified today, the Commission's approach would have prices for the regulated service based on the current efficient technology (i.e., asset price trends for that technology) despite the fact that the efficient technology might be updated before the end of the current asset's life to reflect the cost of the next efficient technology. This means that if it is open to future Commissions to switch between technologies, the Commission will need to develop a 'time consistent' approach to the recovery of forward-looking costs. To do otherwise will lead to prices below forward-looking costs of the HEO. To see this, it is helpful to use the mathematical concept of a tilted annuity and its role in achieving expected present value neutrality for the HEO over the life of its investment.

79. The central assumption of a tilted annuity is that the price of an asset or technology is changing at *a constant proportional rate* over its life. Where this is not the case, or is not expected to be the case, then application of a tilted annuity that assumes it is will not provide for expected present value neutrality.

80. A classic example demonstrating this is a case of two alternative technologies of equal economic life that could be used to provide a service. Each has different costs and price tilts, such that while technology A is currently least cost, it is expected that

[27] This requires the adoption of a tilted annuity that accounts for expected changes in replacement cost plus a specific allowance for the expected costs of stranding associated with future technologies.

technology B will be least cost at some point during the economic life of technology A.

81. It would be a fallacy to calculate the current cost of providing the service on the basis of a tilted annuity calculated purely on the parameters of technology A, even if technology A is currently the most efficient means of providing the service (in NPV terms). This is because the price tilt for the service itself is expected to follow the path of technology A before changing slope once technology B becomes lower cost. Applying this knowledge requires that:

- once technology B is the most efficient, then revenue should be determined on the basis of a tilted annuity for technology B;
- prior to technology B becoming efficient, revenue is determined based on the current cost of replacing technology A less the expected revenues earned in future years, to provide for expected present value neutrality.[28]

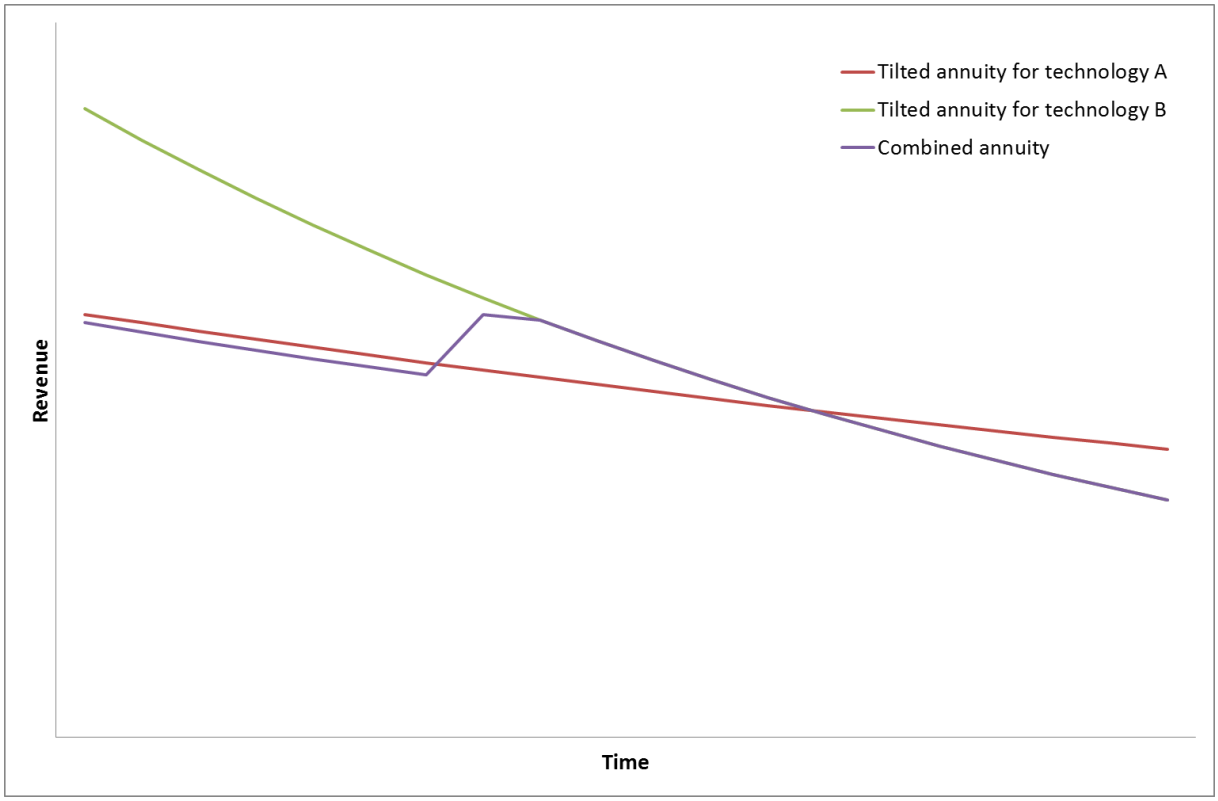
82. This generates some important results, illustrated in Figure 1 below. The key observations are that:

- when technology B becomes cheaper, it does not have the lower tilted annuity because this is calculated based on assumed lower revenues in future. Paradoxically, this causes the revenue to rise at switchover;[29] and
- the year immediately prior to B becoming cheaper, the calculated revenue for the service rises because it is conditioned on receiving lower revenue over the remaining life of the asset and must make up for this to achieve expected present value neutrality; but
- in all prior years, calculated revenue for the service is slightly lower than the titled annuity for technology A because the effect of the near term higher revenues caused by the switchover to B more than offsets the lower revenues in the future (at least, calculated from these earlier years).

[28] It is this element of the present value neutral compensation that is apparently missed by Commission.

[29] This is the correction for the error discussed in the previous section.

**Figure 1: Tilted annuities applied with changing technologies**




83. The previous analysis identifies a fundamental principle when pricing based on forward-looking costs. That is that prices must provide revenues that equal the investment cost of efficient investments. The implication of this principle is that if alternative technologies are expected to be selected in future years (even outside the current regulatory period) that current prices are increased to, in expectation, fully compensate for any investment in the technologies that were previously determined to be efficient (i.e., the costs of the HEO).

84. Therefore, if the Commission's modelling shows that in NPV terms an FTTH P2P network is the least-cost means of providing the regulated service, it needs to think carefully about how technology may change in the future, say to FWA (e.g., through LTE) or FTTH GPON, and the effect that will have on the future revenue path. To the extent that FTTH P2P is of similar cost to FTTH GPON, this may make little difference. However, for FWA those difference may be significant, particularly if FWA is broadened to areas beyond the rural broadband initiative (now or in the future).

85. The problem of stranding due to regulatory optimisation raises the issue of how to resolve the stranding. Three options to overcome stranding are:

- cease optimisation entirely;

- conduct rigorous modelling designed to quantitatively anticipate and account for the arrival of new technologies and their effect upon the allowed price in the future in setting prices today; or
- compensating for these risks by considering their magnitude and provide compensation for them in the form of an uplift to the price for copper services.

86. We recognise that ceasing optimisation entirely may not be the Commission's preferred option. It may also be that the rigorous modelling required to anticipate technological change in the future is challenging for the Commission, not least because it requires it to anticipate decisions of future Commissions. Nevertheless, the potential for asset stranding is a material element of the forward-looking costs of the choice of MEA. It is of course open to the Commission to consider this as a factor in deciding on whether there should be an uplift and the implementation of this option is what we discuss in this report.

## 4.3 Technological and competitive stranding

87. We consider that the Commission's draft decision gives rise to the potential for uncompensated stranding of assets due to technology changes and competitive entry. These concepts are clearly related:

- technology changes over time may be expected to cause Chorus' existing asset stock to become obsolete or require Chorus to replace it earlier than the expiry of the working life of the asset. Generally the need to make such investments may be driven by the *threat* of competition; whereas
- if actual new entry is triggered then the potential stranding costs are much more significant, since Chorus may be faced with a declining market share over which to recover its costs. This may lead to a situation in which Chorus would be simply unable to recover its costs, even with absolute pricing flexibility.

88. The Commission's draft decision states that it provides compensation for technological stranding through shortened asset lives provided by Chorus. However, the Commission does not consider that further compensation should be provided for the expectation of lower demand due to new entry triggered by technology changes.[30]

89. We discuss these issues in more detail below.

### 4.3.1 Technological stranding

90. The Commission considers that it has taken into account the prospect of the technological stranding of Chorus' assets because it has used, to a significant extent,

[30] Commerce Commission, *Draft Determination*, pp. 158-160

the asset lives provided by Chorus in its TSLRIC model. The Commission quotes Chorus' 2014 Financial Statements, which state:[31]

> *The determination of the appropriate useful life for a particular asset requires management to make judgements about, amongst other factors, the expected period of service potential of the asset, the likelihood of the asset becoming obsolete as a result of technological advances, the likelihood of Chorus ceasing to use the asset in its business operations and the effect of government regulation.*

91. We consider that the Commission's reliance on the above statement by Chorus' auditors is not a reasonable basis upon which to support a proposition that Chorus' assets lives already reflect the probability of stranding due to the advent of future technologies. The reasoning underpinning the Commission's use of this statement assumes that the task that accountants set out to achieve in determining asset lives for the purpose of estimating depreciation is the same as the task that the Commission sets out to achieve in estimating TSLRIC for the UCLL and UBA services. We do not consider that this assumption is well-founded. Rather we consider that it is reasonable to expect and believe that the statement of Chorus' auditors is made in the context of the requirements of accounting standards and not with a view about how the Commission would come to model TSLRIC as a tool for estimating forward looking costs.

92. The framework and guidelines that accountants work within in respect of asset impairments are set out in the New Zealand Equivalent to International Accounting Standard 36 (NZ IAS 36).[32] This standard sets out the key criterion for when an asset is impaired:[33]

> *An asset is impaired when its carrying amount exceeds its recoverable amount.*

93. The standard goes on to explain that it:[34]

> *… defines recoverable amount as the higher of an asset's or cash generating unit's fair value less costs to sell and its value in use.*

94. The estimation of fair value less costs is based upon an estimate of what the asset would sell for in an arm's length transaction. However, since Chorus' assets are mostly sunk and not separable from its business, it seems reasonable to assume that

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31 Chorus, *Financial Statements for the year ended 30 June 2014*, August 2014, p. 10

32 Available online here.

33 NZ IAS, para. 8

34 Ibid, para. 18

the value in use methodology would be the methodology used to determine impairment for Chorus' assets.

95. While in theory the calculation of "value in use" could capture all probability weighted future outcomes, the guidelines for its determination make it clear that in ordinary practice it is not likely to be. The basis of cash flow projections appears to be very much focussed on recent returns. It is also, clearly, based on the 'best estimate' of future conditions rather than a probabilistic weighting of possible future conditions to produce an expected future condition. For example, the standard states:[35]

> *In measuring value in use an entity shall:*
>
> *(a) base cash flow projections on reasonable and supportable assumptions that represent management's **best estimate** of the range of economic conditions that will exist over the remaining useful life of the asset. Greater weight shall be given to external evidence.*
>
> *(b) base cash flow projections on the most recent financial budgets/forecasts approved by management, but shall exclude any estimated future cash inflows or outflows expected to arise from future restructurings or from improving or enhancing the asset's performance. Projections based on these budgets/forecasts shall cover **a maximum period of five years**, unless a longer period can be justified.*
>
> *(c) estimate cash flow projections beyond the period covered by the most **recent budgets/forecasts by extrapolating the projections** based on the budgets/forecasts using a steady or declining growth rate for subsequent years, unless an increasing rate can be justified. This growth rate shall not exceed the long-term average growth rate for the products, industries, or country or countries in which the entity operates, or for the market in which the asset is used, unless a higher rate can be justified.*

96. Based on this guidance, it does not appear to be the case that an accounting practitioner would necessarily need to consider the probability of an asset utilised by Chorus, or its entire network, being supplanted by an alternative technology if that impairment were to happen beyond the range of management forecasts or was not the most likely future outcome (i.e., the best estimate). The standard appears to be consistent with the practice of accountants in providing for impairment when a certain threshold of certainty is achieved that an asset will become obsolete.

97. On the other hand, the Commission has been set the task of determining the extent to which the asset lives of the HEO should be impaired given the *risk* of potential

35 Ibid, para. 33

technological stranding. Relying on the confirmation of Chorus' auditors that its asset lives have been adjusted for obsolescence is not reasonable for this purpose because:

- the Commission must take into account now the fact that technological stranding *may* occur over the life of a new asset in order to provide for present value neutral compensation over time. The task of accountants is not to provide for present value neutral compensation based on possible future outcomes, but to set a depreciation schedule for the purpose of estimating a firm's financial position and profitability. For example, obsolescence may take place outside the range of management forecasts or have only moderate probability; also

98. the assets of Chorus are not the same as the assets of the HEO. Chorus' assets consist of aged assets of a copper network. The HEO's are new assets of a fibre network.In summary, the asset lives in the accounts are only impaired if there is technological stranding within the financial projections and if it is the best estimate of the future, whereas the Commission must impair asset lives based on the probability of stranding into the future.[36] Therefore, we do not consider that the Commission's reliance on the statements of Chorus' auditors provides a reasonable basis upon which to conclude that Chorus' assets have been impaired for the type of stranding risks that Chorus (or the HEO) would require expected compensation for under the Commission's proposed implementation of TSLRIC. We consider that this continues to represent an uncompensated asymmetric risk to Chorus.

### 4.3.2 Competitive stranding

99. The risk of competitive stranding can be distinguished from technological stranding to the extent that competitive stranding may also capture the stranding risks created by new entry and the demand base (and therefore average cost) of the provider of UCLL and UBA being adversely affected.

100. The Commission disagrees that it is reasonable to take into account the potential for competition to create stranding risks. It states:[37]

> *In principle we agree that new entry could reduce demand and leave assets stranded. However, we do not consider that it is appropriate to provide an additional allowance for the potential loss of scale due to competition. In this respect technological change and the risk of asset stranding through competitive developments cannot be easily separated. It is primarily*

[36] Indeed, for the reasons discussed in the previous section, the use of a tilted annuity means that the risk of stranding must be assessed beyond the current regulatory cycle.

[37] Commerce Commission, *Draft Determination*, pp. 160

*competition which promotes the use of new, better technology that may strand assets in a competitive market.*

101. We agree with the Commission that competition promotes the use of new and better technologies. However, the Commission's reasoning does not explain how it proposes to provide for a present value neutral regulatory framework if it does not have regard to the potential for competitive stranding.

102. That is, it is possible to believe that competition is a good thing and provides benefits to consumers whilst also believing that the possibility of competition will bias downwards Chorus' expected returns and give rise to a source of asymmetric risk (which is associated with its own welfare costs in the long run). Asserting the benefits of competition does not provide a reasonable basis for the Commission to ignore the effects of potential competition on Chorus.

103. Our opinion remains that the expectation of competition remains a source of asymmetric cost that the Commission does not compensate for in its draft decision.

### 4.3.3 Uncertain asset lives and annuities

104. It should also be recognised that even if we accept that the asset lives used by the Commission represent the 'expected life' of the asset rather than the most likely life as indicated by the accounting standard, their use in the annuity form of revenue calculation will systematically undercompensate Chorus or the HEO. That is, it will not create a revenue stream that in NPV terms will be expected to return the optimised replacement cost of the asset. This is because the annuity formula assumes that asset lives are known with certainty, which the Commission recognises they are not. If there is uncertainty, the correct level of compensation is equal to the expected value of the annuity revenues for different probable asset lives, which is above the revenue stream created by using the expected life in the annuity compensation.

105. This point is well recognised in economic texts. For example, Salinger states that:[38]

*The annuity formula requires not only that capital have constant usage over its expected life, but also that the life be known with certainty at the time the asset is purchased. The forward-looking cost must be based on the time shape of the expected units sold, where the term "expected" is used in the mathematical sense. As of the date that an asset is purchased, the expected usage at some point in the future is the product of its usage conditional on survival multiplied by the probability of survival. Since the probability of survival necessarily decreases as the time horizon lengthens,*

[38] Salinger (1999) "Lowering Prices with Tougher Regulation: Forward-Looking Costs, Depreciation, and the Telecommunications Act of 1996" in *Regulation Under Increasing Competition*, edited by Michael A Crew, page 53.

*constant usage during an asset's expected life implies declining expected usage over time.*

*An example serves to illustrate this point. Consider an asset that costs $100 to purchase and that yields a single unit of output during its actual life. If, at the time the asset is acquired, it is known that the asset will last exactly 10 years and if it is expected that the forward-looking price will remain constant, then it is straightforward to use an annuity formula to calculate a forward-looking cost of $16.27. Note that the present value of 10 successive annual receipts of $16.27 starting one year after the purchase price are discounted at a 10% rate is $100.*

*Now, suppose that the 10-year life is not a known life but, rather, an expected life. To keep matters simple, assume that the asset has a 50% chance of lasting only 5 years and a 50% chance of living 15 years. If the asset lasts only five years, then the present value (as of the time the asset is purchased) of the actual payments, assuming a price of $16.27, is $62. If the asset lasts 15 years, then the present value of the cash flows is $124. As of the time the asset is purchased, the expected value of the cash flows is $93, which is the average of the two. The important feature of this estimate is that it is less than $100. Thus, the $16.27 provides an adequate return when the ten-year life is known with certainty. In the example with uncertainty about the asset life, the $16.27 does not provide an adequate return.*

*Although illustrated with a single example, this point is completely general.*

106. Therefore, notwithstanding the issues raised above in terms of whether the asset lives used by the Commission reflect a forward-looking expectation of stranding due to technological and competitive forces, their use in the annuity formula creates a bias downward in the price of the regulated service. This bias could be removed by formulating expectations of asset lives and determining annuity compensation to deliver expected recovery of the optimised replacement cost determined by the Commission (using the MEA). Otherwise, the Commission needs to take the asset stranding risk into account in an uplift.

# 5 Classical TSLRIC does not offset need to favour a higher price

107. The Commission has indicated in its draft determination that in so far as there are uncertainties in the estimated TSLRIC price, it would favour a higher price due to the negative welfare consequences of setting a price that is too low. However, the Commission has not decided to set a price above the mid-point estimate (or uplift the WACC from its mid-point estimate) on the basis of advice from Vogelsang (2014). The Commission states:[39]

> *Our view remains that, in principle, we should give weight to erring on the high side to avoid the negative consequences of setting a price that is too low. However, for the reasons described in paragraphs 212 to 220 below, our draft decision is that a WACC uplift is not required to address the asymmetric consequences of estimation error. In particular, we accept Professor Vogelsang's advice that an uplift is not warranted, due to our TSLRIC approach and decisions (ie, not taking into account asset re-use, and not making a performance adjustment for the FTTH modern equivalent asset (MEA)).*

108. The advice of Vogelsang (2014) was that the Commission's decision not to modify the TSLRIC method to take into account the re-use of existing assets or a performance adjustment was sufficient to offset the decision to favour a higher price to deal with asymmetric costs and to offset efficiency arguments and investment risks associated with the classical TSLRIC approach.

109. Vogelsang (2014) states:[40]

> *If the Commission sticks to its preliminary decisions to stay with the classical TSLRIC approach and therefore not to consider re-use of civil works and not to make a performance adjustment for the FTTH MEA, then as compared to application of the modified TSLRiC* [sic] *methodology being advocated by the EU the NZCC classical application results in a higher price. This would likely offset any efficiency argument (Alfred Kahn), investment risk or lumpiness that would go against the classical TSLRIC. It would also take care of any net positive externalities from incentivizing migration to UFB. Thus, there would, in my view, be no case to be made for*

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39 Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: Draft decision*, 2 December 2014, pp. 47-48

40 Vogelsang (2014), p. 35

*an uplift to the WACC or for a generous approach to any other cost components.*

110. In this statement Vogelsang (2014) identifies a number of reasons why a classical TSLRIC approach would understate the correct price. These include the efficiency arguments attributed to Professor Kahn that highlight the unrealistically low cost estimate by classical TSLRIC because it assumes an 'instantaneous build', investment risks and lumpy investments, as discussed further at section 5.2 below. It is not apparent from the Commission's draft determination that it has taken into account these factors. Rather the Commission appears to have construed Vogelsang (2014) as saying that network externality arguments in favour of a higher price would be offset by the asset re-use and performance adjustment modelling implementation. Whereas Vogelsang (2014) is saying that this modelling implementation not only offsets these externality arguments but also other factors pointing toward an uplift (e.g., the unrealistic efficiency benchmark of TSLRIC).

111. We note that the Commission's choice of its modelling methodology was based on what it considered to be a reasonable application of TSLRIC in the New Zealand regulatory context *and not* on the basis that the decisions were generous and offset the requirement for a price uplift. As the Commission itself concedes:[41]

> *As explained within the UCLL pricing review draft determination, in respect of our draft decision to not apply a performance adjustment when modelling a FTTH MEA and to not apply an alternative asset valuation to optimised replacement costs (ORCs) for re-usable assets, the basis of these draft decisions was not specifically to err on the high side.*
>
> *Nonetheless, we recognise that Professor Vogelsang has assessed that the outcome of our decisions is, in his view, enough response to the asymmetry in the cost of under or over-estimating the price. We agree with his conclusions.*

112. We disagree with Vogelsang (2014) on three key points. We consider that the Commission's implementation of TSLRIC cannot reasonably be described as 'generous' and does not provide a rationale to not implement a pricing uplift. Specifically:

- adoption of a greenfields optimisation approach to TSLRIC could be expected to be far less generous than an approach that considered the re-use of existing assets (which we would describe as brownfields optimisation);
- the adoption of a performance adjustment might only apply in the context of modelling a contestable market price for the regulated service. It is not obvious

[41] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: Draft decision*, 2 December 2014, p. 50

to us that this is consistent with the forward-looking cost standard and, even if it were, it would require a quid pro quo of modelling the very high entry costs of a real world new entrant constraining market prices (for example, low scale and ramp up costs). It appears the Commission has rejected this approach; and

- other modelling choices adopted by the Commission such as assuming that its HEO can capture all New Zealand copper and fibre demand, even that of LFCs, and some of the features that we comment upon in our discussion of asymmetric risks above cannot reasonably be described as 'generous'.

## 5.1 Basis for Commission's modelling choices

113. The Commission has made modelling choices to not assume a re-use of existing assets and not apply a performance adjustment. In both cases this is because to do so would have been inconsistent with setting a price based on 'forward-looking costs'. We agree. It is for these reasons that Vogelsang's (2014) advice is based on a false premise that the Commission should offset arguments in favour of a higher price with those modelling choices.

### 5.1.1 Re-use of existing assets

114. We note that Vogelsang (2014) identifies the re-use of assets approach as being advocated by the European Commission.

115. However, in making its decision to not re-use existing assets, the Commission states:[42]

> *We agree with CEG. We think it is incorrect to exclude assets that are unlikely to be replicated, but still in use. If an asset is still in use, it should be included.*
>
> *Professor Vogelsang noted that using the dual asset valuation methodology would mean that fully depreciated assets would no longer be valued. This dual methodology does not recognise the opportunity costs of such assets. Professor Vogelsang advised that if we were to allow for re-use in a TSLRIC context we would have to calculate the remaining lifetime of such facilities and calculate the forward looking costs based on a later replacement.*

116. In our view, if an asset is in use, it has a forward-looking value. The value of an existing asset is, in part, the savings to its owner from delaying expenditure in replacing the asset. Accounting values and concepts of depreciation are removed from forward-looking costing and therefore, to exclude fully depreciated assets from a forward-looking costing would be inappropriate.

42 Commerce Commission, *Draft Determination*, pp. 140

117. A reasonable way to determine a forward-looking cost of existing assets that are fully depreciated is by the present value stream of costs of using the existing asset relative to the present value stream of costs of a new asset (a method sometimes termed NPV DORC). As we have noted previously, applying this approach should yield the same regulated revenue stream as calculating a tilted annuity form of depreciation to an optimised replacement cost.[43]

118. Nevertheless, to the extent that the Commission accepts the advice of Vogelsang (2014) that incorporating the re-use of assets in a TSLRIC model would involve the exclusion of fully depreciated costs, our view is that this is inconsistent with a forward-looking cost standard. And, in the event that existing assets were re-used in the TSLRIC modelled and valued on a forward-looking cost basis (as described above), this should not yield a lower price that would offset arguments in favour of an uplift to the price of the regulated service (e.g., due to externalities).

### 5.1.2 Performance adjustment

119. In making its decision to not apply a performance adjustment, the Commission states:[44]

> *We consider that a MEA adjustment on the basis of consumer preference or technological performance would be very difficult to estimate in practice and is likely to introduce a degree of unpredictability, and is therefore not supported in this draft decision.*

120. We agree with these statements. Applying a performance adjustment would introduce significant unpredictability into the regulatory regime since it would require expected future changes in consumer preferences to be incorporated into the depreciation of existing assets. We note that the Commission has made no such allowances in the past.

## 5.2 Efficiency factors, investment risks and lumpiness

121. It is important, in our view, to recognise that Vogelsang (2014) has, correctly, identified a number of considerations that would lead to a higher regulated price. These are not obviously taken into account by the Commission. In particular, Vogelsang (2014) has recognised the arguments of Professor Alfred Kahn in relation to the unrealistic efficiency standard imposed by a classical adaption of TSLRIC.

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43 CEG (2014) *Non-replicable assets and forward-looking cost*, August 2014

44 Commerce Commission, *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, p. 126

122. The classical adaption of TSLRIC assumes that the operator can instantly deploy a single vintage of the latest technology at the level of capacity required to meet the current demand for the regulated service. In reality this standard is physically and economically unachievable. Assuming the hypothetical firm adopts the latest technology assumes that a replacement network can be built almost instantaneously and capture all of the economies and scope that could only realistically be achieved over time. In reality, efficient operators deploy new technologies over time, using existing technologies where they are productive and deploying new technologies where the willingness to pay of end-users exceeds the incremental costs. This inevitably means that efficient operators in reality have a mix of technologies in their networks rather than the single vintage assumed by a classical TSLRIC.

123. Assuming that the network is built to capacity using the latest technology also ignores the efficiently incurred costs an operator deploying its network over time to reflect current and uncertain future demand. A classical TSLRIC would therefore exclude costs associated with efficiently delaying expansions of the network which, ex post, will appear to be duplicated investments (e.g., double trenching). It would also exclude efficiently incurred costs in meeting demand that subsequently migrates to alternative (unregulated) platforms.[45]

124. This unrealistic efficiency standard has been recognised and accepted by regulators in international jurisdictions, including most significantly by the Federal Communications Commission (FCC). In its 2003 review, the FCC noted its concern over the inconsistency between assuming a competitive market at the same time as assuming a carrier that has a ubiquitous network and a large market share:[46]

> *One of the central internal tensions in the application of the TELRIC methodology is that it purports to replicate the conditions of a competitive market by assuming that the latest technology is deployed through the hypothetical network, while at the same time assuming that this hypothetical network benefits from the economies of scale associated with service all of the lines in a study area. In the real world, however, even in extremely competitive markets, firms do not instantaneously replace all of their facilities with every improvement in technology. Thus, even the most efficient carrier's network will reflect a mix of new and older technology at any given time.*

45 In addition, a classical TSLRIC that is based on a bottom-up model may not include the efficient costs incurred by incumbent operators in generating know-how to design, deploy and operate networks. This know-how is costly to attain as it develops over time through people interaction, investment errors and build experience.

46 Triennial Review Order, paragraph 50. The FCC refers to TELRIC which is an element-based implementation of TSLRIC which in practice is used by most regulators to estimate TSLRIC, including the Commission.

125. The concern was that this combination of assumptions would result in a cost below competitive market costs, creating improper investment incentives to competitive and incumbent carriers. Whilst the FCC affirmed the use of forward-looking costs, it tentatively concluded that the TELRIC rules should reflect the real world rather than a total hypothetical cost of a most-efficient provider building a network from scratch, by accounting for the carrier's actual network topography. The FCC further stated that "[e]ven if the objective is to replicate the results of a competitive market, an approach that reconstructs the network over time seems to be more appropriate than one that assumes instantaneous deployment of 100 percent new technology".

126. The FCC considered that taking greater account of the higher-cost realities of transitioning between technologies would be more appropriate than the classical application of TSLRIC. That is, an approach that took into account the real world costs of transitioning between networks and the fact the forward-looking costs of providing the regulated services will likely mean multi-technology networks operating in parallel for extended periods.

127. In our view this is a relevant factor the Commission should consider in deciding in favour of applying an uplift to the price from its 'classical' implementation of TSLRIC.

## 5.3 Demand modelling assumption are not generous

128. We consider that there are a number of other facets of the Commission's modelling that are not at all generous to the UCLL and UBA provider (or even in some cases the HEO modelled by the Commission). In particular, we note that the Commission considers that it can assume that the modelled UCLL and UBA operator captures demand from both the copper network and the four separate fibre builds that are occurring around New Zealand.

129. This cannot be described as a generous assumption. In reality and in theory, no UCLL and UBA service provider would be able to maintain this level of demand on its network in the context of a general migration towards a parallel fibre network build. Indeed, this assumption is made by the Commission precisely because it believes that its HEO is not constrained by reality, or even to be realistic.

130. If the Commission continues with its 100% demand assumption over time, it means that even if Chorus could be as efficient as the Commission expects of the HEO (an unrealistic assumption for the reason discussed in the previous section) it would expect to earn less than 100 cents back in the dollar for its investment. This is because it will inevitably lose demand to competing network including mobile, HFC and subsidised UFB networks. This is particularly acute because of the requirements of the regulatory regime for Chorus to have a geographically averaged price for its regulated services.

131. The inability, in expectation, for a fair return on investment is an issue for the regulatory regime proposed by the Commission. It is not consistent with the

principles of reasonable regulatory practice. For instance, Ofcom defines its "fair bet principle" as:[47]

> *An investment is a 'fair bet' if, at the time of investment, expected return is equal to the cost of capital. This means that, in order to ensure that an investment is a fair bet, the firm should be allowed to enjoy some of the upside risk when demand turns out to be high (i.e. allow returns higher than the cost of capital) to balance the fact that the firm will earn returns below the cost of capital if demand turns out to be low. This issue is particularly important where there is significant uncertainty around demand (or other factors that affect returns).*

132. We think the "fair bet principle" is reasonable and is inconsistent with the Commission's proposed demand assumptions. In their present form, we do not consider these assumptions provide an expectation of cost recovery for the estimated long-run cost and as such will deter investment, contrary to the interests of end-users.

47 Ofcom, *Proposals for WBA Charge Control – Consultation*, 20 January 2011, Annex 8, paragraph A8.27

# 6 Empirical analysis

133. Asymmetric costs and asymmetric risks are different concepts and must be approached differently. However, they originate from the same source, which is uncertainty. Both asymmetric costs and asymmetric risks require uncertainty to exist.

    - asymmetric costs require some probability that the estimated TSLRIC does not reflect the long run efficient costs of the firm. This is only possible where there is uncertainty.
    - asymmetric risks require that the estimated TSLRIC is, in expectation, lower than the long run efficient costs of the firm. This again requires that there is a distribution of returns, which in turn is driven by uncertainty in parameters such as costs or demand.

134. The fact that the source of asymmetric costs and asymmetric risks is uncertain means that any attempt to estimate the effect of these must take into account uncertainty. That is, some understanding or assumption about the distribution from which key parameters are drawn is necessary to begin to draw conclusions about the magnitude of the effects resulting from asymmetric costs and asymmetric risks.

135. By way of example, in the context of the electricity and gas businesses regulated with building block models under Part 4 of the Commerce Act, the Commission's focus in assessing asymmetric costs was on uncertainty in estimation of the WACC. In order to facilitate estimation of a WACC that addressed concerns about asymmetric costs, the Commission assumed that the WACC was drawn from a normal distribution, with a mean and standard deviation calculated based on the point estimates and estimated standard deviations for the various WACC parameters and assuming statistical independence between them.

136. The function linking input parameters and the final WACC estimate is relatively simple and with some assumptions permits the standard deviation of the WACC to be derived as a mathematical expression. The relationship between the component parameters of a TSLRIC model and the estimated price is considerably more complex. This makes numerical simulation of the distribution necessary. Monte Carlo analysis provides a tool with which to achieve this.

137. In this section we describe how Monte Carlo analysis could be used to simulate the uncertainty in key TSLRIC modelling parameters and how this information could be used to estimate uncertainty in the resulting TSLRICs for UCLL and UBA. However, it is not within the scope of this report to perform the analysis described below.

## 6.1 Parameters subject to uncertainty

138. To perform Monte Carlo analysis it is necessary to identify parameters that are subject to uncertainty, and to estimate the form of that uncertainty. These assumptions form the inputs to the Monte Carlo analysis. The output of the analysis is the distribution of the variable that is a function of these input parameters – in this exercise the TSLRICs of the UCLL and the UBA.

139. In theory, almost every input parameter into TERA's TSLRIC model is subject to uncertainty. However, it is reasonable to assume the existence of uncertainty in four key areas:

- the WACC, including market risk premium, asset beta, debt risk premium and the risk free rate (which is only imperfectly observed);
- unit costs, including unit opex and unit capex;
- asset parameters, including asset lives and price trends; and
- demand, including forecasts of future demand.

140. The form of the uncertainty in each of these parameters is inherently unobservable. For some parameters, such as the WACC parameters, there may be access to a time series of observations that will provide some information about the distribution from which they are drawn. However this information cannot be complete.

141. It is therefore necessary to make assumptions about the distribution from which each of these parameters is drawn, and extent to which the parameters are correlated. For example, in the context of the WACC uplift for electricity distribution and gas pipeline businesses under Part 4 of the Commerce Act, the Commission assumed that each of the market risk premium, debt risk premium and asset beta were:

- independently drawn from normal distributions; with
- means equal to its point estimate for each value; and
- standard deviations estimated based on empirical measures of uncertainty in the point estimates.

142. Similar assumptions can be drawn in the context of other key inputs for TSLRIC modelling.

## 6.2 Performing Monte Carlo simulations

143. Monte Carlo simulation seeks to simulate the distribution of a random variable using information about the variability of parameters that determine its value. Simulations assist in understanding how the variability of a model's inputs determine variability of its outputs. Typically a large number of simulations are conducted using randomly drawn numbers to generate simulated values for input variables.

144. In the context of the Commission's TSLRIC model, we seek to understand the uncertainty associated with its estimate of the costs for UCLL and UBA. This is informed by the information that we have about the uncertainty of key parameters, such as those discussed above.

145. In this way, Monte Carlo simulations allow simulation of the distribution of costs estimated by the model. This in turn provides a basis upon which to determine an allowance (or uplift) that takes into account the uncertainty associated with estimating the true costs.

146. We note that Monte Carlo analysis is a commonly used statistical tool that is a generalisation of the same approach that the Commission uses to determine the distribution of the WACC when it applies an uplift for electricity distribution and gas pipeline businesses.

147. The essential difference between the two is that Monte Carlo analysis estimates the distribution for an output based upon the assumed distributions of its inputs. However, the Commission assumes a distribution for the WACC without considering what the distribution of its component parameters might be.

148. The Commission's formula for the standard error of the vanilla WACC, as set out in 2.4.6(2) of its Input Methodologies for electricity distribution businesses, is:

$$\sqrt{0.00003 + 0.0169E^2\left(\widehat{TAMRP}\right) + 0.1936Var(\hat{p})}$$

149. In this equation:

- $E^2\left(\widehat{TAMRP}\right)$ is the square of the tax-adjusted market risk premium; and
- $Var(\hat{p})$ is the square of the standard error of the debt premium.

150. The derivation of this formula follows from the Commission's definition of the vanilla WACC as:

$$r_d L + r_e(1 - L)$$

151. Where:

- $r_d$ is the cost of debt;
- $r_e$ is the cost of equity; and
- L is the leverage.

152. The remainder of the Commission's formula for the standard error of the WACC follows from its formula for the post-tax WACC and the further assumptions that:

- the only uncertainty in the WACC is derived from variation in the TAMRP, the debt premium and the equity beta. That is, other WACC parameters such as the risk free rate and leverage are not subject to uncertainty;
- leverage is 44%, the estimate for the equity beta is 0.61, the standard error of asset beta is 0.13 and the standard error of market risk premium is 0.015; and
- the variation in each of the three uncertain WACC parameters is independent of variation in the others.

153. The Commission assumes that the WACC is drawn from a normal distribution. On this basis, it calculates that:

- the 75th percentile WACC is located 0.674 standard errors above the mean; and
- the 67th percentile WACC is located 0.440 standard errors above the mean.

154. The Commission's most recent application of this methodology for electricity businesses was applied to the electricity distribution businesses and Transpower in October 2014.[48] In that document, the Commission calculated the 67th percentile WACC of 7.19% as against a mid-point estimate of 6.72%. That is, it calculated an uplift for the WACC of 0.47%.

155. This estimate of uplift was reached through the use of the formula shown above. The Commission's decision shows that it assumes an estimate of TAMRP of 7.0% and a standard error for the debt premium of 0.0015. Substituting these into the formula above, the Commission estimates a standard error for the nominal WACC of 0.011.[49]

156. Exactly the same conclusion could be achieved by Monte Carlo simulation. Consistent with the Commission's assumptions in its calculation of the standard error, we assume that:

- the TAMRP is normally distributed with a mean of 0.07 and a standard deviation of 0.015;
- the equity beta is normally distributed with a mean of 0.61 and a standard deviation of 0.23[50]; and
- the debt premium is normally distributed with a mean of 0.0165 and a standard deviation of 0.0015.

48 Commerce Commission, *Cost of capital determination for electricity distribution businesses' default price-quality paths and Transpower's individual price-quality path*, 31 October 2014

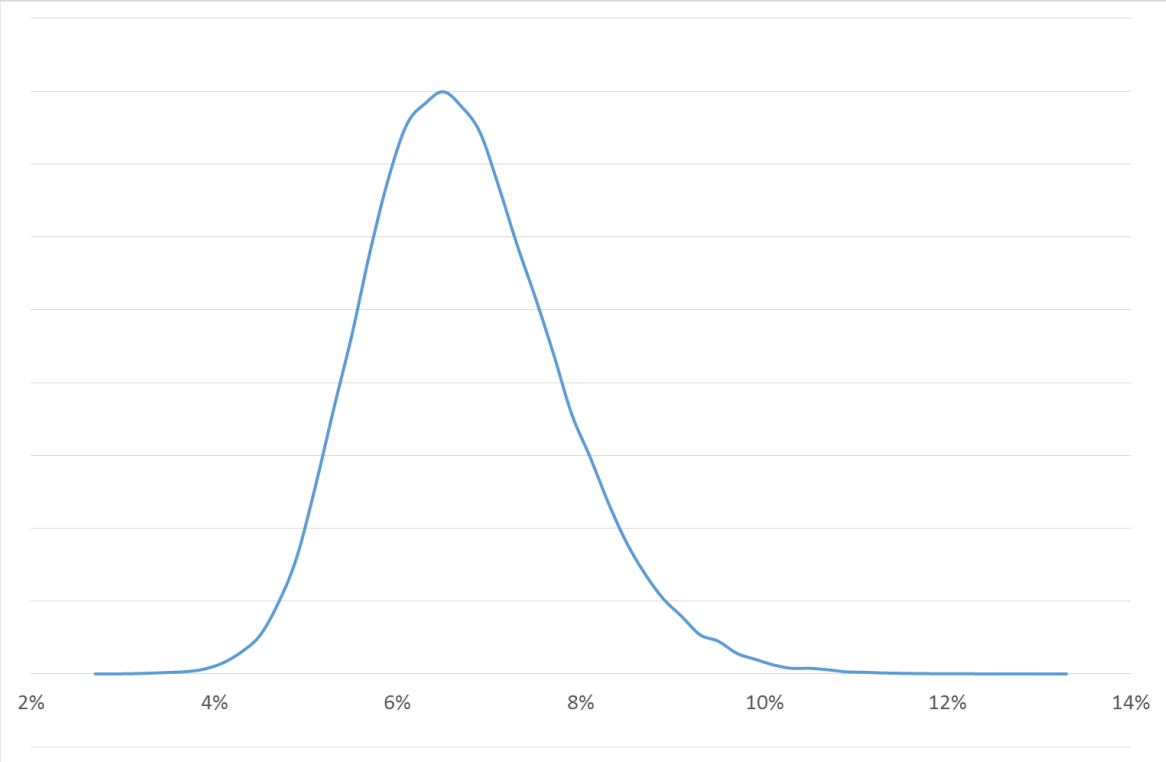
49 Ibid, p. 6

50 Equal to the standard error of the asset beta (0.13) divided by one less leverage of 44%.

157. The remaining components of the WACC are set out in the Commission's decision at page 6.

158. With these assumptions, we can form a distribution of WACC by generating random draws for each of these variables satisfying the above assumptions. This process can be repeated many times to generate many estimates of the WACC. A distribution that was generated by 100,000 repetitions of this approach is shown below

**Figure 2: Distribution of the WACC estimated using Monte Carlo analysis**




*Source: CEG analysis*

159. The figure above identifies that the mean and the standard deviation of the modelled WACC distribution are identical to those calculated by the Commission.

160. However, we note that the distribution above is skewed and not normal. This arises because:

- we assume that each component parameter is normally distributed. However, under this assumption the WACC is not normally distributed;[51] however

[51] While the result of any linear function of normally distributed random variables it itself normally distributed, the WACC function is not linear since the equity premium is generated as the product of two random variables drawn from normal distributions.

- the Commission does not make explicit assumptions about the form of the distribution of its parameters and merely assumes that the resulting WACC is normally distributed.

161. Despite these differences, we continue to find that the difference between the 50th percentile of the distribution (ie, the median) and the 75th percentile is 0.47%, consistent with uplift calculated by the Commission for the WACC using its formula.