Report for Spark New Zealand and Vodafone New Zealand

Cross-Submission

In response to the Commerce Commission's "Draft pricing review determination for Chorus' unbundled bitstream access service"

and

"Draft pricing review determination for Chorus' unbundled copper local loop service"

including the cost model and its reference documents

Non-Confidential version

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Contents

Executive Summary

1. WIK-Consult has been appointed by Spark and Vodafone New Zealand to provide independent expert analysis of the Commission's TSLRIC cost modelling of UCLL and UBA. This cross-submission provides our feedback to submissions made in response to the Commission's December 2014 Draft Determinations.

2. This cross-submission provides a more detailed focus on pricing policy aspects and responds to detailed comments made on these aspects in some of the stakeholder submissions. Our comments on modelling selectively concentrate on items where we believe the comments and proposals of some stakeholders are inappropriate or incorrect.

3. TSLRIC represents a powerful and meaningful regulatory concept, because TSLRIC-based wholesale prices balance several potentially conflicting interests of economic agents. TSLRIC efficiently balances the interests of the access providers and access seekers, and of investors and consumers. The concept of TSLRIC loses these credentials and economic distortions will occur if deviations are introduced. All aspects of the "uplift" proposals therefore lead to economic distortions. The Commission is well advised not to follow these proposals, as to do so will relinquish the important merits of the TSLRIC pricing concept.

4. An (undistorted and uninflated) TSLRIC price level is already more than is required to secure the necessary investment incentives to maintain the copper access network. Thus we must ask whether there are other investment incentives at stake which need to be taken care of within the TSLRIC exercise? The most significant current network investment project in New Zealand is the deployment of an ultra-fast fibre network covering most of the country. The investment incentives for this network build are, however, not managed via a market-based incentive scheme but instead, via capital contributions from central government. Given the reality of the New Zealand UFB (and RBI) deployment arrangements, there is no reason to distort (or uplift) the wholesale pricing system in New Zealand to artificially generate additional investment incentives.

5. Wholesale pricing remains important. Its main importance, however, is not to incentivise investment in fibre networks (or copper access networks). This is conducted by other means in New Zealand. Wholesale prices have to incentivise the *use* of broadband and broadband network infrastructure. Usage is where the economic benefits for the New Zealand economy are generated. Optimal network use is not incentivised by distorting wholesale prices upwardly.

6. New Zealand faces the problems associated with too high broadband access prices. Wholesale access prices are the basic building block for end-customer broadband prices. Given the consequences for access to broadband services, the

Commission should not increase current wholesale prices, but instead should continue to refine its TSLRIC modelling exercise towards the true TSLRIC level, which in turn would result in more affordable broadband for New Zealanders. This outcome will be in the long-term interest of end-users *and* in the interest of growth and dynamic efficiency in the New Zealand economy.

7. If UCLL prices are set at the level calculated by the Commission in the UCLL Draft Determination there will not be efficient use of telecommunications networks in New Zealand. Broadband access provided over the legacy copper access infrastructure would be over-priced, at an inflated estimate of the full replacement cost of a brand new fibre network (a cost that ignores the cost reducing strategies Chorus is using in the deployment of its fibre network). And yet, the fibre network provides a significantly higher level of performance than the copper access network, as Chorus rightly points out in its submission.

8. Chorus' advisor Hausman totally ignores the reality that wholesale prices and derived retail prices have a major impact on the welfare of residential and business users. If the policy approach is to incentivise and direct demand to advanced telecommunications services by distorting the underlying wholesale prices, then welfare losses caused by inflated high prices for legacy services can far outweigh any welfare gains from the introduction of new and improved telecommunications services.

9. Chorus has one of the highest EBITDA margins of any telecommunications carrier around the world. This high degree of profitability by definition enables Chorus to conduct the relatively low amount of re-investment required by the copper access network and to meet its investment targets for UFB and RBI. There is no need at all to artificially inflate UCLL and UBA prices to increase Chorus' investment capability.

10. Despite the high importance of the principle of predictability in general, it has to be clearly stated that the application of predictability as a concept is less obvious for the Commission's current TSLRIC determination than for a regularly repeating regulatory process. The changing in the method of setting wholesale access prices from the IPP's international benchmarking to the FPP's cost modelling approach is a system change which can have *a priori* a significant impact on the pricing outcome. Given this is a system change in approach there is by definition no predictability of the outcome. The stakeholders who applied for the Commission to carry out the FPP exercise are aware of this. Moreover, it is not solely the system change which (inevitably) generates unpredictability, it is also the model architecture, the level of efficiency modelled and the selected input parameters that have an impact on results, as demonstrated clearly by the stakeholders' submissions.

11. Chorus requests that the Commission does not exclude the capital cost incurred when capital contributions flow from third parties deploying the HEO's network. If the Commission follows this request the HEO would be paid twice for certain parts of its network deployment costs. Similarly, when the Government makes capital contributions to network deployment and end-users are also directly covering the cost of certain network elements (or provide elements themselves), or if the HEO receives TSO compensation for providing service in uneconomic areas, such contributions and payments must be taken into account to avoid double-recovery of costs.

12. Chorus fundamentally misunderstands how the mechanism of considering (external) capital contributions in TERA's model works. The network modelled by TERA covers the whole country. Chorus' statement that there are unconnected TSO islands or unconnected customers is wrong. Only the capital cost of street segments outside the TSO polygons are not part of the cost base used to calculate the UCLL cost. These capital costs are a (correct or incorrect) proxy for the capital contributions which the HEO receives from third parties. Thus, contrary to Chorus' claim, there are no costs caused by '10,000 km of route length excluded' from the cost model. The assumption of the model is that such costs are contributed by third parties, not more and not less.

13. Analysys Mason and Chorus both demonstrate a basic misunderstanding regarding the nature of the LFI adjustment in the TERA model. The LFI adjustment is intended to adjust the OPEX identified from Chorus' accounts, and so represents the OPEX of an old copper access network adjusted to the OPEX of the new copper access network modelled for the HEO. The benchmarking figures which L1 Capital provides to compare operating expenditure of Chorus and BT OpenReach with the OPEX in TERA's model nicely support the appropriateness of, and the need for, adjustment. According to L1 Capital's numbers, Chorus' OPEX per line is slightly higher than those of BT OpenReach, but 59% higher than in the TERA model (on a per line basis). Chorus seems to be as efficient (or inefficient) as BT OpenReach regarding operating expenditure per line. This is not a surprise but rather is logical because, similarly to Chorus, the OPEX of BT OpenReach represents the OPEX of managing an old copper access network.

14. Our February Submission criticised the limited benchmark approach which TERA conducted to derive the OPEX for the fibre network from the cost of the (old) copper network. To achieve a better basis for assessing the level of OPEX in the TERA model (after making the adjustments) we benchmarked the share of OPEX in the Commission's model with the share of OPEX in other access cost models based on the TSLRIC approach. We compared the OPEX cost share of the TERA model with the OPEX cost shares in the cost models of Spain and Denmark. These OPEX cost shares are significantly lower than the fibre OPEX share calculated by TERA in New Zealand, which amounts from 12.22% to 12.99% (depending on the year of

calculation). These numbers indicate that the Commission's model (after the adjustments) did not underestimate OPEX.

15. The development of the Virtual Unbundled Local Loop service in Europe proves that the core functionality of FWA is fully in line with this type of fixed line access service. The arguments of Chorus against the functional equivalence of UCLL/UBA provided over FWA are therefore incorrect.

16. Trenching cost per metre used in the model should represent all the necessary costs to construct and build the trench so that it is ready for service. Such costs include all relevant overheads for organisation and management of construction work. That is the usual ("orthodox") approach in cost modelling and it is the approach which the Commission has taken. The trenching cost used in the TERA model therefore must be interpreted as representing all relevant costs including the overheads which Chorus claims are omitted. Itemising certain overheads in addition to the trenching costs already considered would result in double-counting of costs and so should clearly be rejected by the Commission.

17. The Commission should exclude all the cost of the vertical lead-in and all the cost of non-standard lead-ins from the modelled costs. These costs are covered either by a different service or by the end-users directly. Our proposed approach is more coherent than firstly including the costs and then deducting corresponding revenues.

18. Chorus claims a variety of technical and design requirements to the model which we regard as not justified. All of Chorus claims would result in cost increases:

- No justification for any mark-up to the UCLL price due to the change from copper to fibre access lines (or to FWA);
- No longer lead-ins due to the consideration of berm and sidewalk;
- State-of-the-art lead-in implementations have to be taken into account instead of expensive outdated deployment forms;
- No consideration of ETP and inhouse wiring;
- Urban trenching cost already include additional implementation complexity of the urban environment, no further uplifts justified;
- [[redacted]][**CNZCI**] NZD/m trenching cost claimed for Auckland are excessive for average urban trenching cost and by a factor of four above comparable most expensive trenching cost in Europe;

- Access network resilience can be achieved by simple design rules without remarkable additional cost;
- The already existing power access network poles can also be used for the telecommunication fibre access lines without any pole enforcement or height increase;
- Network sharing shall also be taken into account for underground deployment and all lead-in deployment forms;
- The traffic volume growth rate requested by Chorus overestimates future development and leads to overcapacity.

1 Introduction

19. WIK-Consult has been appointed by Spark New Zealand ("Spark") and Vodafone New Zealand ("Vodafone") to support both companies in the course of the cost modelling and FPP process of the Commission. Nevertheless, this cross-submission is brought to the attention of the Commission as an independent expert report.

20. This cross-submission provides a more detailed focus on pricing policy aspects and responds to detailed comments made on these aspects in some of the stakeholder submissions. Our comments on modelling selectively concentrate on items where we believe the comments and proposals of some stakeholders are inappropriate or incorrect.

21. There is a confidential and a non-confidential version of this cross-submission.

22. To make citation a bit easier we use a few abbreviations:

    a) **Analysys Mason, February Submission** stands for: UCLL and UBA FPP draft determination submission, Report for Chorus, 20 February 2015

    b) **Chorus, February Submission** stands for: Submission for Chorus in response to Draft Pricing Review Determinations for Chorus' Unbundled Copper Local Loop and Unbundled Bitstream Access Services (2 December 2014) and Process and Issues Update Paper for the UCLL and UBA Pricing Review Determinations (19 December 2014), 20 February 2015

    c) **WIK-Consult, February Submission** stands for: Submission in response to the Commerce Commission's "Draft pricing review determination for Chorus' unbundled bitstream access service" and "Draft pricing review determination for Chorus' unbundled copper local loop service" including the cost model and its reference documents, 20 February 2015

2 Pricing policy aspects of UCLL and UBA pricing

2.1 The "Uplift" proposals

23. TSLRIC represents a powerful and meaningful regulatory concept, because TSLRIC-based wholesale prices balance several potentially conflicting interests of economic agents. TSLRIC efficiently balances the interests of the access providers and access seekers, and of investors and consumers. It is, as Vogelsang points out, "*compatible with cost coverage of the regulated firm. At the same time it represents efficient costs, thus assuring that consumers get the best possible deal among all average cost concepts.*"[1] Furthermore "*TSLRIC are consistent with competition in the market and for the market and ... provide sufficient investment incentives for incumbents, for potential access seekers (both downstream and for make or buy) and for intermodal competitors.*"[2] The concept of TSLRIC loses these credentials and economic distortions will occur if deviations are introduced. All aspects and suggestions of the "uplift" proposals lead to such economic distortions. The Commission is well advised not to follow the proposals as to do so relinquishes the important merits of the TSLRIC pricing concept.

24. There are weak arguments in comments made on the Commission's draft determination regarding an "uplift" on TSLRIC. One such argument is CEG's statement that an uplift is needed to provide *"... incentives for Chorus to continue to maintain and invest in its copper network in the long run."*[3] Rather, one must recognise that TSLRIC provides Chorus with the financial resources to fully fund the most advanced fibre network. The value of Chorus assets invested in its copper network - over which it produces the UCLL and UBA services - represent only about one third of the value of the network for which it receives economic compensation. This also means that the actual cost for Chorus of providing the UCLL service are around 50% or probably even less than the calculated cost for the fibre MEA network. This means that the calculated TSLRIC prices include significant investment premiums to invest in the new fibre network. Chorus financial reports indicate that in contrast, it actually conducts only 11% of its investment in the copper access network and 84% into the fibre network.[4] Moreover, it is realistic to assume that the investment in the copper access network will (further) decrease in the near future, and not increase. Therefore CEG's argument is totally without foundation.

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1 Ingo Vogelsang, Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand, 25 November 2014, para. 2.

2 Ingo Vogelsang, Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand, 25 November 2014, para. 2.

3 CEG, Competition Economists Group, Uplift asymmetries in the TSLRIC price, Confidential Version, February 2015, para. 3.

4 See para. 56 of this Submission.

25. If, as explained above, an (undistorted and uninflated) TSLRIC price level is already more than is required to secure the necessary investment incentives to maintain the copper access network, we must ask whether there are other investment incentives at stake which need to be taken care of? The most significant current network investment project in New Zealand is the deployment of an ultra-fast fibre network covering a major part of the country. The investment incentives for this network build are not managed by a market-based incentive scheme but instead, by a governmentally managed and incentivised process. To meet its policy objectives the New Zealand Government has created incentives to invest in New Zealand-wide fibre networks through major public capital contributions. Firstly, the Government has incentivised private operators to invest in fibre networks beyond a market-driven level via capital contributions. Secondly, the Government is ensuring the realisation of these investments by holding operators that receive capital subsidies to specific obligations regarding deployment of and connection to new fibre networks. Strongly speaking, the investment incentives for Next Generation Access (NGA) are settled in New Zealand. In that respect New Zealand differs markedly to many European countries in which there is a significant lack of NGA investments and incentives are not sufficient to close the gap. Given the reality of the New Zealand UFB (and RBI) deployment arrangements, there is no reason to distort (or uplift) the wholesale pricing system in New Zealand to artificially generate additional investment incentives.

26. Not to be misunderstood. Wholesale pricing remains important. Its main importance, however, is not to incentivise investment in fibre networks (or copper access networks). This is conducted by other means in New Zealand. Wholesale prices have to incentivise the use of broadband and broadband network infrastructure. That is where the economic benefits for the New Zealand economy are generated. The best use of networks is not incentivised by distorting wholesale prices upwardly.

27. Several submissions criticise that the Commission has not applied an “uplift” to its mid-point WACC estimate of 6.47%.[5] The same submitters argue in favour of an “orthodox” approach to apply TSLRIC to secure “predictability” of the modelling outcome. This is a rather opportunistic combination of arguments: it is the “orthodox” approach of regulators around the world to use the mid-point WACC estimate and not to apply any “uplifts”.

28. For these reasons we fully support the Commission’s conceptual view not to consider a section 18 uplift. The Commission itself states that “... *the cumulative impact of a number of our TSLRIC modelling decisions have provided a central estimate*

5 For instance Chorus, February Submission, para. 263ff and para. 75ff, L1 Capital, Submission of 20 February 2015, p. 11.

which naturally mitigates asymmetric cost concerns."[6] As we have shown in our February Submission a variety of modelling choices have already led to an unjustified inflation of the calculated cost from the "true" TSLRIC. Among these factors are the general use of ORC, the choice of many parameter values and some network dimensioning and modelling design decisions.

2.2 Price level in New Zealand

29. Setting the right prices and the right price level is a key responsibility for the Commission. We agree with the principle that Chorus has noted as a basis for price determination: "*... setting an appropriate price now opens up the potential for better broadband and more competitive and innovative retail offerings for all New Zealanders ...*"[7]

30. Besides getting the principles right, it is most important to get a clear view on the appropriate price level. Most international benchmarks prove that the problem with the broadband price level in New Zealand is not that the price level is too low. Rather, New Zealand has a problem with too high a level of broadband access prices. Wholesale prices are the basic building block for broadband access prices. The Commission should not increase current prices, with the resulting consequences for access to broadband services, but instead should carry out a more appropriate TSLRIC modelling exercise, which in turn would result in more affordable broadband for New Zealanders. That is in the long-term interest of end-users *and* in the interest of growth and dynamic efficiency of the New Zealand economy. The economic benefits of broadband and superfast broadband do not arise from the pure existence of advanced broadband networks and services. It is only the *use* of these networks that actually generates the economic benefits in terms of consumer welfare, macroeconomic growth and employment. Rather than *over* compensating infrastructure owners, the pricing system should incentivise and foster penetration and use of broadband networks via efficient pricing. It is economic common sense that high prices will not encourage penetration and use of networks.

31. Spark highlighted in its February Submission where New Zealand would stand in an international comparison if the UCLL price which the Commission has calculated in its FPP Draft Determination would become reality.[8] The price proposed in the UCLL FPP Draft Determination is 80% higher than the median price of the countries which the Commission considered as potential benchmarks for determining UCLL prices in the context of its IPP pricing review process. It is 60% higher than the next

6 Commerce Commission, Draft pricing review determination for Chorus' unbundled copper local loop service, 2 December 2014,para. 426.
7 Chorus, February Submission, para. 6.
8 See Spark New Zealand, UBA and UCLL FPP pricing review draft decision, Confidential Version, Submission to Commerce Commission, 20 February 2015, para. 7ff.

most expensive country. Prices have not tended to go up in these comparison countries in the meantime. There is therefore no credible economic reason for increasing the pricing gap between UCLL and services in comparable countries. Conversely, there are compelling reasons in favour of decreasing this gap.

32. Not all external experts agree that the risk of setting too low a price outweighs the risks of erring in the opposite direction. We disagree strongly with Chorus' suggestion that there is agreement among experts on this point.[9] Rather, we warn that there is a significant risk to the New Zealand economy of losing dynamic efficiency if UCLL and UBA prices are set above efficient TSLRIC levels.

2.3 Pricing and competition

33. There are a lot of benefits of having a structurally separated operator environment for fostering competition. There are, however, also some collateral problems related to structural separation. One of these collateral problems is that the separated network operator lacks connection with and understanding of the retail side of the business. Chorus' submissions demonstrate clearly the existence and relevance of this problem. All of Chorus' arguments, proposals and critique on the Commission's modelling is related to investment requirements and investment incentives. Chorus is ignoring the impacts of price structures and price levels on the retail side of the business. That is reasonable from its own company policy perspective. But it contains a dangerous bias of arguments when forming an overall economic perspective. Put simply, Chorus' position represents only one side of the coin of the whole economic impact chain. The Commission's mandate, however, requires it to consider and properly balance both sides of the coin.

34. Structural separation has fostered competition at the retail level in New Zealand. RSPs compete on a level playing field. The resulting high degree of competition also means that retail service providers have to pass through wholesale price changes to their retail customers. Even the draft UCLL price increase announced by the Commission in December 2014 has been already passed through to a significant degree to end-users. The structure of competition in New Zealand therefore directly impacts the affordability of broadband in New Zealand. The Commission cannot assume that wholesale price changes are simply absorbed at the RSP level. Instead they directly affect end-users.

35. Hausman's arguments on the need for an "uplift" of the WACC and the calculated TSLRIC are based on the economic illusion that "*access seekers will find it in their economic interests to purchase the regulated access to legacy copper-based UCLL*

9 See Chorus, February Submission, para. 5.

service instead of building an alternative fiber-based network."[10] This economic illusion of competing fibre networks goes beyond any economic logic and in any case beyond the institutional and policy environment in New Zealand. As described in Section 2.1 above, the investment incentives in superfast broadband are managed in New Zealand by the central Government, and so are not at all accurately represented in Hausman's paradigm.

36. The Commission must consider the implications that its pricing decisions on UCLL and UBA will also have on inter-platform competition. In our August submission we made the following statement with regard to platform competition which still is valid:

> *"Level and structure of the UBA and UCLL prices are also an important baseline for the platform competition of the fixed network platform against cable and mobile. If the Commission artificially increases UCLL and UBA prices, it will distort the platform competition in favour of cable and mobile at the expense of the fixed network platform. This will hurt in particular Chorus as the dominant provider of the fixed network infrastructure in New Zealand but also the RSPs. One may argue that the effects towards cable are small because of the limited footprint of cable networks in New Zealand. Nevertheless, where cable is present in New Zealand, it is highly competitive and successful. Even small price increases above the level of relevant TSLRIC will then have competitive effects. Given the universal availability of mobile broadband in New Zealand these effects will be stronger here and will strengthen the path of fixed-mobile migration."*[11]

37. Chorus[12] and its advisor CEG argue that *"... 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."*[13] This argument might have an abstract appropriate economic meaning in a world in which a competing fibre network was economically viable (which would however lead to the question of why the existing access is regulated). However, CEG's statement is divorced from the operator, competitive and institutional environment in New Zealand (and in many other countries). There is no realistic expectation in New Zealand that a competing second (or even third) NGA fibre access infrastructure will be built at a relevant scale to compete against the fibre infrastructure currently being constructed by the LFCs and Chorus. The economies of scale and scope inherent in NGA networks do not allow for replication

10 Professor Hausman, Response to the Commerce Commission's Draft Determination on Uplift, Report, para. VI.

11 See WIK-Consult, Submission in response to the Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)", 5 August 2014, para. 41.

12 See Chorus, February Submission, para. 270, 628.2.

13 CEG, Competition Economists Group, Uplift asymmetries in the TSLRIC price, Confidential Version, February 2015, para. 46.

of this infrastructure in an economically viable form.[14] It is also for this reason that we do not observe an expansion of the footprint of cable networks. Additionally, and especially in the New Zealand context, the new fibre infrastructure is built with significant capital contributions from the Government. This fact - and the pure economics of fibre networks - makes it unviable to duplicate fibre networks in New Zealand. Therefore, any argument that UCLL prices have to be high to incentivize the deployment of a competing access infrastructure is baseless in the New Zealand environment.

38. Given the set and established framework for NGA investments and the effective inability for RSPs to invest in duplicative fibre infrastructure, the comments which Hausman makes on the “free option” and the “free ride” of access seekers lack foundation and do not reflect reality in New Zealand. They are therefore irrelevant.

39. Nevertheless, in conceptual terms there should be a concern on wholesale pricing and efficient entry. If Chorus (and the Commission) do have a concern it should be related to the effects if wholesale prices are set too high rather than too low, as Chorus expresses in its submission.[15] Inefficiently high wholesale prices would encourage entry by companies less efficient than Chorus. This would not be in Chorus favour.

2.4 Pricing and broadband penetration

40. The prices calculated by the Commission in its Draft Determination would increase the wholesale price by $ 4.70. This would imply, under a pass through assumption, a retail price increase of $ 5.40 ($ 4.70 + GST). This will negatively impact broadband penetration in New Zealand. At a retail price level of for example $ 77.39[16] this implies a retail price increase of 6.07%. On the basis of an own price elasticity of demand of -0.951 (as Spark refers to in its February Submission)[17] the total number of 1,221,510 DSL broadband internet subscribers in 2013 would be reduced by 70,500 subscribers. In reality the effects would even be larger, because

14 Elixmann, D; Ilic, Dragan; Neumann, K.-H.; Plückebaum, T.
The Economics of Next Generation Access; Report published by ECTA, Brussels, 16 September 2008, www.ectaportal.com/en/news_item860.html,
www.wik.org/content_e/ecta/Ecta20%NGA_masterfile_2008:09_15_V1.pdf
Plückebaum, T.: Profitability and Coverage of NGAN, Florence School of Regulation Communications and Media Workshop on “Regulated Access to NGAN”, Florence, 20.11.2009
Hoernig, S.; Ilic, D.; Neumann, K.-H.; Peitz, M.: Plückebaum, T.; Vogelsang, I.: Architectures and competitive models in fibre networks, Bad Honnef, December 2010,
http://www.wik.org/uploads/media/Vodafone_Report_Final_WIKConsult_2011-01-10.pdf

15 See Chorus, February Submission, para. 299.

16 As a midrange value for broadband access prices in New Zealand we took the Vodafone offer „Broadband with a home phone including 80 GB data, $89 per month including GST, http://www.vodafone.co.nz/broadband-phone-bundles/, 03/19/2015.

17 Spark New Zealand, UBA and UCLL FPP pricing review draft decision, Confidential Version, Submission to Commerce Commission, 20 February 2015, Attachment D.

the price elasticities of the marginal subscriber groups are higher than the overall elasticity signals.

41. There are further structural effects on broadband user demand which cannot be ignored. It is realistic to assume that price elasticities are higher for user groups which exhibit a relatively low penetration rate of broadband access. The 2013 Census data compiled by Statistics New Zealand furthermore show that broadband access in New Zealand (as in most other countries) correlates with household income.

2.5 Welfare implications of pricing

42. Chorus is arguing in favour of a rebalancing between UCLL and UBA prices.[18] Insofar as rebalancing, compared to the interim prices set by the Commission, is the result of a proper implementation and application of TSLRIC there is no reason against rebalancing to occur from our perspective. Chorus, however, argues in favour of rebalancing beyond that point and nebulously argues for the generation of broader incentives to unlock the benefits of better broadband. We find this argument strange and intransparent, and cannot see any need or justification for rebalancing beyond the outcome of a proper TSLRIC implementation.

43. In contrast to any request for an artificial rebalancing between UBA and UCLL prices, we strongly support the principle of competitive neutrality in respect of business models - which the Commission also has committed to in its July 2014 consultation document.[19] In our Submission to this consultation document we stated:

> "*38. ... Efficient outcomes in a competitive market require that the relevant business models will be the result of strategic business decisions in a competitive market environment based on efficient wholesale prices determined by the regulator. If the regulator would artificially incentivize certain business models e.g. unbundling or the use of UBA services, he would distort such business decisions and would not support or even hinder efficient market outcomes which are in the long-term interests of end-users.*
>
> *39. Competitive neutrality at this level is best served by wholesale access prices which reflect the TSLRIC of the respective services. If the TSLRIC prices are derived from a uniform modelling structure which is applied in a coherent and consistent way, then the resulting pricing structure of the UCLL and the UBA services are in an efficient balance to each other. The price difference generates the sufficient economic*

18 See Chorus, February Submission, para. 10.
19 Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014), para. 88.

space which allows efficient operators to use the unbundling model where that is more appropriate not only from a firm's strategic perspective but also from the perspective of the economy at large and the long-term interests of end-users. There is no need and no room for artificially incentivising any business model.

40. The same considerations are relevant with regard to relativity between the UCLL and UBA prices, the Commission is referring to in ***para. 66 ff****. As long as TSLRIC prices are developed under the same model structure, cost model-based TSLRIC prices generate the sufficient economic space to make the efficient business decisions such that those business models can be chosen which best fit with efficiency and the long-term interest of end-users. Properly developed cost models calculate the cost of those network elements which are needed for efficient operator to produce the next rung of the value chain from one wholesale service to the next. Those cost differentials generate the relevant economic space for an efficient operator to produce one wholesale service (e.g. UBA) by using another wholesale service (e.g. UCLL) as an input.'*[20]

This statement still holds without any reservation.

44. If UCLL prices are set at the level calculated by the Commission in the UCLL Draft Determination there will be no efficient use of telecommunications networks in New Zealand. Broadband access provided over the legacy copper access infrastructure would the priced at the replacement cost of a brand new fibre network. The calculation of these fibre cost furthermore are significantly inflated compared to an efficient level of fibre access costs as we have shown in our February Submission. At the same time, the fibre network provides a significantly higher level of performance than the copper access network, as Chorus rightly points out in its submission. Hausman points out in his report on behalf of Chorus that the incremental willingness to pay for fibre access compared to copper access amounts to $ 17.60 per month in the US. This incremental willingness to pay is an indicator of a performance delta between copper and fibre access attributable to the new infrastructure. This performance delta provides the relevant information to determine the "true" economic cost of copper access in a competitive environment that would allow for efficient use of the legacy infrastructure. The "true" economic cost of the legacy access infrastructure in the MEA context is determined by the cost of the MEA access infrastructure minus the performance delta between the legacy infrastructure

20 WIK-Consult, Submission in response to the Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)", 5 August 2014.

and the MEA infrastructure[21]. Only this type of legacy infrastructure pricing allows for an efficient use of the legacy infrastructure and efficient competition between the legacy and the fibre infrastructure.

45. The Commission will be distorting this efficient outcome in two senses if it retains its draft TSLRIC price determination: firstly by inflating the cost of the MEA infrastructure; and secondly by disregarding the performance delta adjustment. This can only be explained within the context of a forced migration approach to the new fibre network. The Commission neither has a mandate for such a pricing policy approach, nor does it reflect broader Government policy which anticipated copper access remaining in competition with fibre access. Nor is the approach compatible with an economically viable approach towards broadband deployment, broadband penetration and dynamic efficiency of the New Zealand economy. The Commission's current approach is detrimental to these policy targets.

46. Hausman is totally ignoring in his analysis the reality that wholesale prices and derived retail prices have a major impact on the welfare of residential and business users. Welfare gains from the introduction of new and improved telecommunications services can be overcompensated by welfare losses of inflated high prices for legacy services if the policy approach is to incentivise and direct demand to advanced telecommunications services by distorting the underlying wholesale prices.

47. Hausman also abstracts from or perhaps even ignores one important aspect of the telecommunications environment in New Zealand. It is not Chorus (or the HEO) that provides "new telecommunications service and improved quality to consumers". Rather, in the structurally separated operator model in New Zealand, telecommunications services are provided by access seekers. It is their decision to use a particular infrastructure, be it the legacy copper access or the new fibre access infrastructure. Similarly, it is their decision to invest in service differentiation, quality of service and new services. Furthermore, Hausman totally ignores that the incentives of RSPs to invest downstream are distorted by his recommendation to "uplift" WACC and TSLRIC prices and so effectively distort upstream prices.

48. Reading Hausman's report one might get the impression that the major task of the Commission in determining TSLRIC prices for UCLL and UBA is to increase incentives for investments in "improved quality (speed) internet", "new services or higher quality services" or even in other infrastructures than the legacy copper infrastructures. These considerations ignore the main task of the Commission's price determination, which is to make sure that wholesale prices provide efficient incentives to

21 For a deeper economic analysis we refer to Neumann, K.-H. and I. Vogelsang, How to price the unbundled local loop in the transition from copper to fibre access networks?, Telecommunications Policy 37(10), 2013, pp. 893-909.

use the existing infrastructure in the long term interest of users for some well-defined services. This goal is ignored, or at least totally underestimated by Hausman.

49. There are many arguments submitted on the potential welfare gains if customers move to more superfast broadband. The major arguments of Hausman in favour of an "uplift" on TSLRIC are based on such arguments. We do not question the potential of such welfare gains in principle. We argue however in favour of a thorough quantitative analysis of the costs and benefits of superfast broadband before a decision is made for the pricing system to be distorted to capture such supposed externalities. Such a comprehensive cost benefit analysis has been conducted just recently in Australia. The results of the Vertigan report are important and to some extent surprising. The cost benefit analysis of different roll-out and deployment scenarios in Australia provides the following high level results:[22]

- An unsubsidised roll-out of high-speed broadband has net benefits relative to no further roll-out of AUD 24 billion, which is AUD 2,430 per Australian household.
- The multi-technology-mix scenario has a net cost relative to an unsubsidised roll-out of AUD 6 billion or AUD 620 per household.
- The FTTP scenario (FTTH for 93% of households) has net costs of AUD 22 billion (or AUD 2,220 per household) compared to the unsubsidised roll-out.
- The multi-technology-mix scenario has net benefits relative to the FTTP scenario of AUD 16 billion. These benefits are comprised of lower costs (around AUD 10 billion) and higher benefits (around AUD 6 billion).

These cost benefit results for Australia show that the net economic benefits can be higher if the existing copper access network is still used to provide superfast broadband to a certain degree compared to the deployment and use of a nationwide fibre network.

50. Given these unexpected results for Australia we can only repeat the warning which we already expressed in our August Submission.[23] Biasing the UBA and the UCLL prices upwardly to attempt to realise expected positive externalities of the UFB requires, as a prerequisite, empirical proof that the welfare losses due to artificially "uplifting" prices will be outweighed by spill-over externalities. The abstract proof which Hausman provides is in no way empirical proof of this point, especially in the New Zealand context.

22 Independent cost-benefit analysis of broadband and review of regulation, Volume II – The costs and benefits of high-speed broadband, August 2014, p. 84f.

23 WIK-Consult, Submission in response to the Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)", 5 August 2014, para. 44ff.

51. Spark has calculated in its February Submission that end-users will have to pay (in the end) Chorus over $ 400 million more than they would have if draft FPP prices rather than IPP prices are confirmed.[24] We stress that the costs to the New Zealand economy would significantly exceed the income transfer gained by Chorus. The decrease in broadband penetration following from the price increase would cause, under conservative assumptions, a loss in GDP to the New Zealand economy between $ 600 million and more than $ 1 billion over the regulatory period.[25] We have assessed and support these calculations. We warn again that following the path of unjustifiably inflating UCLL and UBA prices would create serious welfare losses in the New Zealand economy, with the losses far outweighing any perceived gains to Chorus.

2.6 Pricing and Chorus' profitability

2.6.1 The reality of profitability

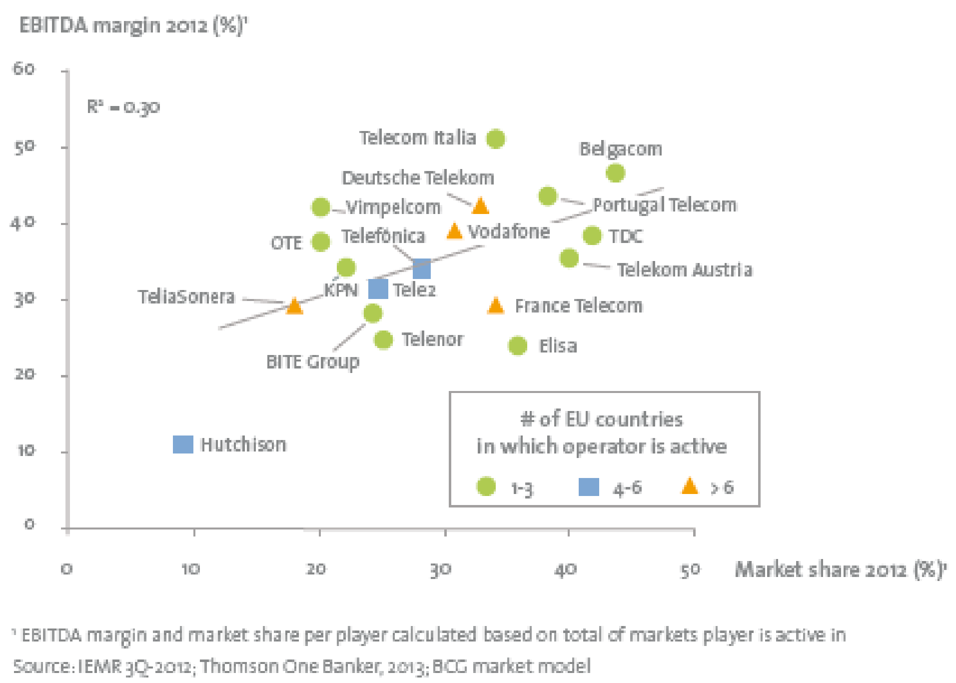
52. Chorus' recently published interim FY2015 results[26] show that it is a highly profitable company. For the six month ending 31 December 2014 Chorus reports operating revenues of $ 527 million and operating expenses of $ 206 million. These figures generate earnings before interest, tax, depreciation and amortisation (EBITDA) of $ 321 million or an EBITDA margin of 60.9%. It is notable that this is one of the highest EBITDA margins of any telecommunications carrier around the world – for example, European incumbent operators trade at EBITDA margins between 30% and 50% (see Figure 2-1). Moreover, these European EBITDA margins include the mobile business of incumbents which is often more profitable than the fixed line business.

24 Spark New Zealand, UBA and UCLL FPP pricing review draft decision, Confidential Version, Submission to Commerce Commission, 20 February 2015, para. 10.

25 See Spark New Zealand, UBA and UCLL FPP pricing review draft decision, Confidential Version, Submission to Commerce Commission, 20 February 2015, Attachment D.

26 See Chorus media release, dated 23 February 2015.

Figure 2-1 EBITDA margins of European operators



Source: Boston Consulting Group, Reforming Europe's Telecoms Regulation To Enable the Digital Single Market, Report for ETNO, p. 28. [https://www.etno.eu/datas/publications/studies/BCG_ETNO_REPORT_2013

53. Chorus would rather perfectly fit into the market share/EBITDA margin relationship of Figure 2-1. Chorus has a market share of around 95%. So its 60.9% EBITDA margin is rather close to the extrapolated line in Figure 2-1. From that perspective the high profit margin of Chorus seems to be more explained by its dominant market position than by its status as a wholesale-only utility operator. European incumbents have to finance their NGA investments with much lower EBITDA margins as Chorus has to.

54. Even Chorus' high level of depreciation and amortisation leaves earnings before interest and tax (EBIT) of $ 162 million for the second half of 2014. The resulting EBIT margin of 30.7% also is one of the highest of telecommunications carriers around the world.

55. This high degree of profitability enables Chorus definitively to conduct the relatively low amount of re-investment needed for the copper access network and to meet its investment targets for UFB and RBI. There is no need at all to artificially inflate UCLL and UBA prices to increase Chorus' investment capability.

2.6.2 The general use of ORC

56. Chorus is no longer investing in the infrastructure for which the Commission is currently determining prices. In its reporting on interim results Chorus reveals that the company will be spending only between $ 60 to $ 75 million of capital expenditure on its copper network in FY2015.[27] In comparison, Chorus intends to invest $ 530 to $ 550 million into its fibre network. Therefore Chorus' arguments on investment incentives regarding UCLL and UBA are premised on a position that is totally different to the reality reflected by Chorus' actual investment behaviour.

57. There is no doubt that a general application of an ORC asset valuation for a MEA network granted for the provision of services over a mostly depreciated infrastructure represents a regulatory generosity to the owner of the legacy infrastructure. Requesting a further "uplift" to the cost/price level generated from such regulatory approach will unavoidably lead to an inflated and distorted price level.

58. We continue to state that the application of TSLRIC does not require a general use of ORC of all relevant assets. If it is the general practice of operators to re-use assets, then a brownfield approach is consistent with the general TSLRIC approach. This view is (at least partially) supported by the Commission's advisor Ingo Vogelsang who states: "*Using a brownfield approach could clearly be a possible adaptation of the classical TSLRIC concept ...*"[28]

2.6.3 Re-use of assets

59. There seems to be a fundamental misunderstanding by CEG, Chorus and others on what the decision-relevant cost is for an owner of a legacy infrastructure facing technological change and migration to a new infrastructure. The cost that informs the decision to maintain (and to make the necessary investment for using) the legacy infrastructure is not the TSLRIC of that infrastructure. Instead, the decision-relevant cost is the sum of the short-run incremental cost plus the opportunity cost of the legacy infrastructure. Depending on the level of opportunity cost, the decision-relevant cost may represent only the operating expenditure to run the infrastructure. In any event, it is definitively below the level of the TSLRIC of the MEA infrastructure. This does not necessarily mean that the decision-relevant cost should inform the outcome of the TSLRIC price determination. Retaining incentives for necessary investment into the legacy infrastructure does not require the price level for the legacy infrastructure to be set at the level of TSLRIC of the MEA infrastructure. The price level for UCLL and UBA could be lower if the purpose of price

27 See Chorus media release, dated 23 February 2015.

28 Ingo Vogelsang, Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand, 25 November 2014, para. 12.

determination is only to set the proper investment incentivise for investing into the legacy infrastructure.

60. Chorus rejects the consideration of the re-use of assets in the cost calculation of the Commission but nevertheless also confirms that it is making intensive use of its existing asset to build the fibre networks,[29] as any profit seeking operator would. The Commission cannot ignore an efficient behavioural trait of a regulated firm and instead rely on cost calculations which do not reflect the same regulated firm's reality in New Zealand. The Commission's advisor Ingo Vogelsang has confirmed the efficiency implications of asset re-use when he states: "*Rather than starting from scratch the re-use of those civil works facilities for the new set of cables is usually the most efficient way to go forward. It also reduces the probability that the regulated firm is over-collecting.*"[30]

2.7 Pricing and predictability

61. We reaffirm the analysis on regulatory predictability presented in our February Submission. Indeed, our earlier arguments can be made more strongly given the overestimation which this principle has received in some submissions. Firstly and not to be misunderstood: regulatory predictability is highly important as an objective for good governance of regulation. If regulatory behaviour and decision making is unpredictable, uncertainty for operators, investors and users increases. A higher degree of uncertainty represents a higher risk, increases the cost of capital and has a negative impact on investment incentives.

62. Despite the high importance of the principle of predictability, it has to be clearly stated that predictability as a concept is meaningless for the Commission's current TSLRIC determination. Changing the regulatory price determination approach from the IPP's international benchmarking to the FPP's cost modelling approach is a system change which can have *a priori* a significant impact on the pricing outcome. Given this is a system change in approach there is by definition no predictability of the outcome. The stakeholders who applied for the Commission to carry out the FPP exercise are aware of this. Moreover, it is not solely the system change which (inevitably) generates unpredictability, it is also the model architecture, the level of efficiency modelled and the selected input parameters that have an impact on results, as demonstrated clearly by the stakeholders' submissions.

63. Regulatory certainty and predictability regain relevance once the FPP process (including the cost modelling process) has come to an end. For the next regulatory

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29 See Chorus, February Submission, para. 91.2 and https://www.chorus.co.nz/file/48837/InvestordayFINALslides.pdf, slide 31.

30 Ingo Vogelsang, Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand, 25 November 2014, para. 12.

price determinations to be predictable, it will be essential that the Commission apply consistent modelling principles and design criteria and uses a transparent process of model parameterisation. The principle of predictability does not discriminate between current decisions to be taken on modelling details that may have a major impact on the results. To illustrate, the principle of predictability provides no guidance on the choice of the appropriate level and structure of trenching cost, although this element of cost clearly has a significant effect on pricing results.

64. Hausman suggests that there is a policy shift in Europe regarding the principles of wholesale pricing.[31] We do not agree. In contrast to Hausman's argument, the European Commission has set up a common framework for European NRAs guiding the calculation of access prices provided over the legacy copper infrastructure. The stated intention of this 2013 Recommendation[32] is to harmonise the approaches for wholesale access cost and pricing that NRAs apply across member states. Furthermore, regulated operators and investors should have clarity and predictability on the outcome of the regulatory cost determination procedures in a phase of technological change and migration towards NGA. For that purpose, the European Commission has set a price band within which it expects the cost calculations of the various NRAs to be positioned. The conceptual baseline for the pricing approach in the EU remains the TSLRIC approach. We have extensively dealt with the costing details of that Recommendation in our August Submission[33] and the Commission is aware of that. Additionally, there is a legally required review process of the common European regulatory framework for electronic communications. The European Commission will start the next review process within this year. Such reviews usually result in some changes to the framework, which would be likely to be implemented within two years at the earliest.

2.8 UCLL and UBA prices compared to initial UFB prices

65. Chorus and its advisors argue in favour of an uplift to TSLRIC-based prices for UCLL and UBA to incentivise the transition to fibre networks.[34] There is no doubt that the relative prices of using the legacy infrastructure and of using the fibre network have an impact on migration. By applying a general ORC asset valuation approach and by setting the price of using the legacy infrastructure at the level of the cost of the fibre access network, the Commission has conceptually done everything

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31 See Professor Hausman, Response to the Commerce Commission's Draft Determination on Uplift, Report, para. 13-15.

32 See European Commission, Recommendation of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2013/c_2013_5761_en.pdf.

33 WIK-Consult, Submission in response to the Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)", 5 August 2014, Section 2.1.

34 See Chorus, February Submission, para. 4.

to maximise the incentives to migrate to fibre. This holds in particular when the performance of the fibre networks is much higher than the performance of the legacy infrastructure. Additionally, there is a significant higher willingness to pay for the use of fibre networks as Hausman highlights.[35]

66. We share the Commission's view that it is not consistent with section 18 of the Telecommunications Act 2001 to target a specific level of relative prices. The Commission states: "*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 section 18 and the promotion of competition.*"[36]

67. The Commission should not forget that migration at *any* price is not optimal to the New Zealand economy. There are relevant trade-offs that must be taken into consideration. The Commission should be aware, in particular, of the following trade-off: broadband access over the copper access network generates the entry level products and prices that attract new broadband users. New broadband users are less likely to be attracted to the high end, high quality services provided over the fibre network. It is therefore the services provided over the copper access infrastructure which determine the level of broadband penetration in New Zealand and not the services provided over the fibre networks. Keeping wholesale access pricing cost reflective (allowing attractive retail pricing) therefore is essential to increase broadband penetration in New Zealand. This outcome also is in the long-term interest of the operators that own and operate the fibre network.

68. Chorus argues that the results of the Commission's cost model fails the sense check that its outcome for nationwide P2P fibre network results in lower cost than the entry level UFB fibre price for services in the UFB areas which are mostly urban.[37] This argument is faulty in several respects. Firstly, the Commission's model does not represent a nationwide fibre network but a hybrid network which relies on the cost saving features of FWA at the edge of the network. Secondly, the entry level UFB fibre price is a negotiated price between the group of LFC operators and the Government. This price is not derived from TSLRIC-based principles and calculations. Therefore, there is no conceptual basis to compare both prices or even to assess the appropriateness of the modelled TSLRIC cost's relative level to the initial UFB fibre price. Additionally, as the Commission itself stated, it "*would not*

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35 See Professor Hausman, Response to the Commerce Commission's Draft Determination on Uplift, Report, p. 11.

36 See Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014), para. 432, Footnote 214.

37 See Chorus, February Submission, para. 11.

support any adjustment of the price from our modelled central estimate of the TSLRIC price on the basis of the section 18 purpose statement" in order to prevent 'not cost-orientated' dumping strategies by Chorus.[38]

2.9 Pricing and asymmetry

69. There is a fundamental problem with Chorus' request of an "uplift" to TSLRIC prices because of asymmetric risk. The Commission has taken a variety of "conservative" assumptions on modelling design, degree of efficiency modelled and parameter choice. We have criticised some of these conservative assumptions in our February Submission. Conservative assumptions in this context lead to higher cost than potential (and more straightforward) other assumptions. Choosing conservative assumptions is a methodologically accepted approach to properly deal with asymmetric risk. Uplifting a TSLRIC calculation which is already inflated by the use of conservative assumptions would lead to a double-counting of the same risk. The Commission should therefore reject those requests on methodological grounds.

70. Some submitters like L1 Capital[39] and Chorus[40] seem to ignore that the Commission explicitly accounts for asymmetric catastrophic risk. The Commission considers allowances for insurance for catastrophic risk as a relevant cost, as well as costs related to seismic bracing and backup generators. We have supported this approach in our February Submission.[41] Any request from these submitters to an additional uplift on the WACC would lead to double-recovery of the same risk-related costs and should therefore be rejected by the Commission. The capital markets are well aware of this risk in New Zealand and will reflect this awareness in the general WACC parameter. Therefore the WACC parameters compensate the HEO for any residual risk which cannot be insured.

71. The Commission has decided in favour of an *ex ante* allowance for asset stranding due to technological change by accepting Chorus asset lifetimes which are relatively short for many assets. L1 Capital[42] is challenging this approach by questioning Chorus' auditors' competence to properly assess the impact of technological change. This is an unacceptable argument. It is a fair assumption that Chorus management has made its prudent choice of asset lifetimes. L1 Capital is also questioning the 50 year asset life of duct and trenches.[43] Duct and trenching are not a good example of technological change and asset stranding in telecommunications.

38 Commerce Commission, Draft pricing review determination for Chorus' unbundled copper local loop service, 2 December 2014 , para. 442 – 445.
39 See L1 Capital, Submission of 20 February 2015, p. 12.
40 See Chorus, February Submission, para. 670.
41 See WIK-Consult, February Submission, para. 77.
42 See L1 Capital, Submission of 20 February 2015, p. 12.
43 TERA took Chorus' stated asset life value of ducts without adjustment, see Excel-map "CI_ComCom-UBA Inputs v1.0.xlsx, sheet " Q6 19 6 a Asset lifes" cells F81 and 82 and TERA- Model Specification - CI version final version for release.pdf, p. 63.

The degree of (re-)using the existing duct infrastructure for deploying its fibre network[44] proves that this asset life is not overestimated at all.

72. Most of the arguments raised by Chorus and its advisors on asymmetries caused by stranded investment are totally beyond the point. A stranded asset is no longer in use, not fully depreciated and cannot be sold at a positive price (or only at a price below its remaining book value). The New Zealand network reality that Chorus argues the Commission must account for is not characterised by stranded assets. Instead, the opposite holds in New Zealand: major parts of the infrastructure which Chorus uses to produce the UCLL service are fully depreciated but still in use. These assets are generating returns based on their ORC value without causing capital costs at all. That is the opposite of a stranded asset. Therefore, to apply short(er) asset lives to these assets serve no efficient purpose.

73. Also, in trying to transpose the risk premium approach which the European Commission has recommended in its NGA Recommendation[45] Hausman again ignores the reality of the New Zealand context. The risk premium approach in the EU context is recommended in the context of wholesale pricing for FTTH access services which compete against legacy services and explicitly not in the context of pricing for legacy infrastructure. Moreover, the European Commission's 2013 Recommendation explicitly states that a risk premium should not be applied to provide VDSL services. Transposed to the New Zealand environment the concept of the EU Recommendation implies that a risk premium on the WACC might be considered for the determination of wholesale services provided over the new UFB fibre networks but would not be appropriate for services which are provided over the legacy copper infrastructure. This holds regardless of the fact that the Commission intends to calculate the relevant cost of the legacy infrastructure on the basis of an FTTH MEA.

2.10 TSLRIC and performance adjustment

74. The relevance of the performance adjustment is best demonstrated by the results of the Nevo et al. (2013) study which Hausman presents in his report.[46] According to this study, relating to the US market, the consumer's willingness to pay for a 10 Mbps increase in internet speed averages US $17.60 per month. The major difference between fibre access networks and legacy copper access networks is fibre's provision of higher speeds. Although consumers' incremental willingness to pay for

44 See WIK-Consult, February Submission, Section 1.1.2.5.

45 European Commission, Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA), p. L 251/46. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010H0572&from=EN.

46 See Professor Hausman, Response to the Commerce Commission's Draft Determination on Uplift, Report, para. 11.

higher speeds looks lower in other countries[47], the direction is obvious. As a result there is a performance delta with regard to willingness to pay which has a major impact on the ability of RSPs which use the legacy network platform to compete against the fibre network platform if they have to pay wholesale prices for both platforms which are (roughly) the same.

75. Hausman is not directly opposing the approach of a performance adjustment between fibre and copper access conceptually. He is, however, arguing against its consideration because the performance adjustment approach "*involves consumer valuation of different services and thus is based on demand factors.*"[48] Those, however, are misplaced in a TSLRIC study which is based on cost. There is some (but only some) logic in this argument. However the arguments which Hausman advances in requesting an "uplift" on WACC and TSLRIC are based on demand considerations and supposed welfare effects from the migration of customers to more advanced telecommunications services.

47 See for example Germany, NGA-Forum, 7th meeting, 3. November 2010, http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Breitband/NGA_NGN/NGA-Forum/sitzungen/7teSitzung/Hoffmann_NGAForum_20101103.pdf?__blob=publicationFile&v=2

48 See Professor Hausman, Response to the Commerce Commission's Draft Determination on Uplift, Report, p. 21. footnote 22.

3 Overall aspects of modelling

3.1 Exclusion of certain capital costs

76. Not surprisingly, Chorus is opposing the consideration of any type of capital contribution by third parties in the cost determination for UCLL and UBA.[49] Chorus claims that "*the Commission should not exclude capital costs from the TSLRIC model on the basis that those costs will be notionally recovered through a hypothetical capital charge which does not actually form part of the price for the service*".[50]

77. Chorus argues that costs are under-estimated if certain capital costs are excluded from the model and that those costs are required to maintain the existing network footprint.[51] This is a unique approach which essentially argues that double-recovery of costs is required to maintain the network footprint. However, the Commission has a clear obligation to avoid double-recovery of costs. Therefore capital contributions which the HEO realistically achieves from third parties must be accounted for when calculating the wholesale prices. If not, the HEO will receive windfall profits and there will be no user benefits from capital contributions made by the Government (or other operators in a TSO context). In addition, if capital contributions from end-users (for example for a long lead-in or a new build's trenching) are not taken into consideration then, assuming pass-through to retail prices, the end-users themselves will be paying twice.

78. In addition, Chorus even questions whether users would agree to a 100% capital contribution to fund network deployment.[52] A reading of Chorus' own Copper Service Lead-in[53] documentation would show to Chorus that whether users agree is irrelevant: Chorus already requires that users pay a lump sum fee of $ 195 for (standard) lead-ins and 100% of costs (or even more) for non-standard lead-ins.[54]

79. The counter-argument that Chorus might have or even has an obligation to provide service upon request does not deal with this point.[55] The various forms of capital contributions are the economic compensation to provide service in areas where it cannot be provided economically.

80. Chorus requests that the Commission does not exclude the capital cost incurred when capital contributions flow from third parties deploying the HEO's network.[56] If

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49 See Chorus, February Submission, para. 95ff.
50 See Chorus, February Submission, para. 95.
51 See Chorus, February Submission, para. 97.
52 See Chorus, February Submission, para. 98.
53 See Chorus: Copper Service Lead-In, printed from http://customer.chorus.co.nz/copperserviceleadin on December 05 2014.
54 See WIK-Consult, February Submission, para. 254.
55 See Chorus, February Submission, para. 99.
56 See Chorus, February Submission, para. 95-105.

the Commission follows this request the HEO would be paid twice for certain parts of its network deployment costs. Similarly, if when the Government makes capital contributions to network deployment, if users also directly cover the cost of certain network elements (or provide elements themselves), and if the HEO receives TSO compensation for providing service in uneconomic areas, such payments must be taken into account to avoid double-recovery of costs.

81. Chorus incorrectly argues that excluding capital costs "*will result in an under-estimate of the costs required to maintain the existing network footprint.*"[57] The model excludes the capital cost of providing service in non-TSO areas but the cost of maintaining the network in non-TSO areas are already included in the model and are part of the cost base informing the UCLL costs.[58] Therefore the Commission's modelling approach is full in line with a statutory obligation of the HEO to maintain all existing connections. In contrast to Chorus' argumentation[59] the Commission's approach of excluding certain capital cost fully meets the statutory test.

82. Chorus seems to question whether users would agree to a 100% capital contribution to fund network deployment. This is not always an issue open to negotiation. For example, Chorus requires users to provide an open trench on their estate to install the lead-in and to cover 100% of those deployment costs themselves[60] as a condition of receiving service. For non-standard lead-ins, Chorus requests from users that they make a lump-sum connection fee for the first 100 metres and have to pay for time and material for any additional distance.[61] This also implies that Chorus requests from users a 100% (or even higher) capital (and other) cost contribution for deploying this network element.

83. Chorus claims that the Commission's model excludes the capital costs for significant volumes of DSLAMs due to funding for these assets from the RBI.[62] However, the actual implicit capital contribution to UBA in the model amounts to $ 15.8 million in 2015 and to $ 13.7 million in 2019. This contrasts with the total subsidy to Chorus under its RBI contract of $ 236 million.[63] Chorus might be right that the RBI capital contributions are not paid for DSLAMs (only). We have shown in our February Submission that the RBI subsidies are actually paid for more network elements than just DSLAMs.[64] Therefore, Chorus' argument is not relevant.

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57 See Chorus, February Submission, para. 97.
58 Commerce Commission, Draft pricing review determination for Chorus' unbundled copper local loop service, 2 December 2014 para. 321, and TERA, TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services Model Reference Paper, criterion 17.
59 See Chorus, February Submission, para. 102f.
60 See WIK-Consult, February Submission, para. 252.
61 See WIK-Consult, February Submission, para. 254.
62 See Chorus, February Submission, para. 50.
63 See Network Strategies, Commerce Commission Draft Determination for UCLL and UBA, A review of key issues. Report for Spark New Zealand and Vodafone New Zealand, February 2015, Section 3.1.
64 See WIK-Consult, February Submission, para. 108.

84. Chorus is requesting that "*any capital contributions are treated as a true "one off" payment by the end-user, as is the case in practice. It should not be assumed that the end-user will continue indefinitely to contribute the cost of replacement assets outside TSO areas.*"[65] This is first of all an important statement insofar as Chorus admits that there are capital contributions from users outside the TSO areas. Nevertheless, Chorus' request is not consistent with its own lead-in policy and its own requirement for user contributions. In the relevant document (that we cited at length in our February Submission)[66] there is no limitation on the requirement that users must provide an open trench and cover (at least) the full cost of non-standard lead-ins. Therefore, the Commission should not follow Chorus' recommendation.

85. For the same reason the Commission should not follow Analysys Mason's proposal to treat capital contributions as an asset with a negative capital cost and its own lifetime. TSO payments are one reason that capital contributions flow permanently. As we have shown in para. 84 there is also no restriction on end-user contributions. Therefore, it would be inconsistent for the Commission to depart from its current approach of modelling capital contributions in the model. This holds regardless of our view that the capital contributions considered in the model are incomplete.[67]

86. It is important to realise that Chorus fundamentally misunderstands how the mechanism of considering (external) capital contributions in TERA's model works. The network modelled by TERA covers the whole country. There are no unconnected TSO islands or unconnected customers as Chorus assumes.[68] It is only the capital cost of the street segments outside the TSO polygons that are not part of the cost base used to calculate the UCLL cost. TERA's Model Documentation states:[69]

> "*The network is modelled for all areas, inside and outside the TSO-derived boundary, as FWA and core infrastructures are incurred by Chorus in any case. However, the access network assets are not taken into account in the areas outside the TSO-derived boundary.*"

These capital costs are a (correct or incorrect) proxy for the capital contributions which the HEO receives from third parties. Thus, there are no costs caused by '10,000 km of route length excluded' from the cost model. The assumption of the model is that such costs are contributed by third parties, not more and not less. Nevertheless, the cost to maintain the network for those segments (and users) for which the capital costs are excluded does already form part of the relevant cost base for UCLL.

65 See Chorus, February Submission, para. 24.
66 See WIK-Consult, February Submission, para. 251ff.
67 See WIK-Consult, February Submission, Sections 1.4, 2.7 and 3.5..
68 See Chorus, February Submission, para. 17, para. 22 and paras. 110 and 111.
69 See TERA, Model Documentation, p. 78.

3.2 Consideration of demand

87. In criticizing the Commission's concept of demand Chorus again conflates the position of an HEO with its own position.[70] Therefore Chorus' arguments are misleading and faulty. The demand which the HEO serves represents the demand for fixed line access in New Zealand. That is not (totally) identical with Chorus' demand. A test of whether the level of efficiency is attainable for a HEO serving Chorus' demand is irrelevant. What matters for the Commission's modelling is the level of efficiency that the HEO can be assumed to achieve in serving its demand. Therefore, the level of efficiency modelled is attainable to the HEO by definition. If Chorus compared its actual cost with the modelled cost it would become apparent that the former are significantly lower.

3.3 OPEX and OPEX adjustments

88. Analysys Mason and Chorus both demonstrate a basic misunderstanding of the nature of the LFI adjustment in the TERA model. The LFI adjustment is intended to adjust the OPEX identified from Chorus' accounts, and so represents the OPEX of an old copper access network adjusted to the OPEX of the new copper access network modelled for the HEO. Chorus' copper access network is mostly depreciated and will therefore require higher OPEX to maintain the network and for fault repair. Chorus' actual OPEX is therefore significantly above the relevant OPEX of a new copper access network. TERA just uses the LFI as a proxy for the different level of OPEX required for networks of a different vintage. This proxy correlates with the relevant differences in LFI but does not directly represent them. Therefore, Analysys Mason's proposal to exempt individual OPEX items from the adjustment, on the grounds that they seem to be less correlated to the fault rate than other OPEX items, is methodologically incorrect

89. The same misunderstanding icharacterises L1 Capital's Submission.[71] Firstly, L1 Capital incorrectly argues that the LFI adjustment corrects *"... maintenance costs for lower line faults that may arise in a fibre network."*[72] To the contrary, the LFI adjustment is made with regards to the lower maintenance cost of a new copper network compared to an old copper network.

90. The benchmarking figures which L1 Capital provides to compare operating expenditure of Chorus and BT OpenReach with the OPEX in TERA's model nicely support the appropriateness of, and the need for, adjustment. According to L1 Capital's numbers, Chorus' OPEX per line is slightly higher than those of BT OpenReach, but 59% higher than in the TERA model (on a per line basis). Chorus seems

70 See Chorus, February Submission, para. 297.
71 See L1 Capital, Submission of 20 February 2015.
72 See L1 Capital, Submission of 20 February 2015, p. 4.

to be as efficient (or inefficient) as BT OpenReach regarding operating expenditure per line. This is not a surprise but only logical because, similarly to Chorus, the OPEX of BT OpenReach represents the OPEX of managing an old copper access network.

91. The LFI OPEX adjustment which TERA conducted does not necessarily imply that Chorus is operating as highly inefficient today as L1 Capital claims. It is simply needed because the OPEX associated with operating a new fibre network is significantly lower than with operating an old copper access network.

92. Chorus[73] and Analysys Mason[74] mention a risk of double-counting if the 50% OPEX fibre adjustment is applied after the LFI adjustment. This is a further misinterpretation of TERA's adjustment approach. Both adjustments are proxy approaches. The LFI adjustment adjusts for the OPEX of an "old" copper network that basic data is derived from, while the fibre adjustment adjusts from the OPEX of a new copper to the OPEX of a new fibre network. From this high level perspective, TERA's adjustment approach is methodologically correct. Therefore, Analysys Mason's proposal just to apply the fibre adjustment in the fibre network scenario is incorrect. Double-counting in the OPEX adjustment is not a relevant issue, however what does matter is whether or not TERA arrives at the appropriate level of OPEX or not.

93. Before making any adjustments to OPEX for conceptual reasons, it is essential to start from the appropriate basis. We have presented in our February Submission that TERA's starting base for OPEX is already inflated. TERA did not, for instance, check Chorus' process efficiency. Other efficiency aspects such as process design and related costs have not been regarded. OPEX related processes do not consider solely fault repair but also include many other maintenance activities. We could not observe this exercise in TERA's model. This is probably due to the model's design: in that most OPEX accounts are considered in a top-down approach without an assessment of whether the cost-driving processes are in fact efficient processes. This also holds for LFI-related OPEX: the reduction of OPEX due to the LFI adjustment simply reflects a volume effect, resulting in less fault repair activities corresponding to lower LFI. We cannot observe that the fault repair activities themselves have been analysed by TERA or the Commission for efficiency. The consequence of the absence of efficiency assessments is that the costs for the basis to calculate FTTH related costs are already overestimated.

94. Our February Submission criticised the limited benchmark approach which TERA conducted to derive the OPEX for the fibre network from the cost of the (old) copper network.[75] The examples of the OPEX savings of fibre networks which Analysys

73 See Chorus, February Submission, para. 170.1, 171 to 175.
74 See Analysys Mason, February Submission, Section 5.3.2.
75 See WIK-Consult, February Submission, para. 140.

Mason quotes,[76] however, are either outdated or methodologically as unclear as the evidence that TERA contributed. We only see two approaches that may verify whether the level of OPEX that the Commission derives in its model is appropriate or not. The first best approach is to apply relevant mark-ups for OPEX on the CAPEX of the fibre network. From our own modelling[77] of fibre networks we can confirm that the relative levels of OPEX (compared to CAPEX) in the TERA model is appropriate. A second approach would be to benchmark the share of OPEX in the Commission's model with the share of OPEX in other access cost models based on the TSLRIC approach.

95. We compared the OPEX cost share of the TERA model with the OPEX cost shares in the cost models of Spain and Denmark:

a. In Spain, the share of fibre OPEX in relation to total costs per line amounts from 9.28% to 9.41% (depending on the year of calculation).[78]

b. In Denmark, the share of fibre OPEX in relation to total costs per line amounts from 7.79% (GPON) to 8.04% (P2P).[79]

These OPEX cost shares are significantly lower than the fibre OPEX share calculated by TERA in New Zealand, which amounts from 12.22% to 12.99% (depending on the year of calculation).[80] These numbers indicate that the Commission's model (after the adjustments) did not underestimate OPEX.

96. The Australian NBN Co, a government business enterprise to design, build and operate a wholesale-only superfast broadband network, estimates OPEX savings for the superfast broadband network of around 35%. These savings represent, according to the NBN Co, a conservative estimate as real experiences and estimations of the carriers Verizon and BT calculated OPEX savings of 70% to 80%[81] Taking this into account, the 50% OPEX fibre adjustment by TERA represent a reasonable approach.

97. The critical remarks made by Chorus and others on the adjustment approach supports our view that the Commission should have applied a conceptually more appealing approach. A mark-up for OPEX on CAPEX is more coherent in a bottom-up modelling context[82] than the approach applied by the Commission and it would

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76 See Analysys Mason, February Submission, Section 5.3.1.
77 Switzerland, Germany, Austria, Italy.
78 See http://ftp.cmt.es/201305_ModeloBU-LRIC+_Red_acceso_cobre_fibra.zip, Excel-map "Module3_cost_calculation_v2.09.xlsm", Sheet "fi_Summary", lines 24, 35.
79 See http://erhvervsstyrelsen.dk/udkastlaicafgoerelse2015, Excel-Map "2012-55-DB-DBA-Fixed LRAIC-Access Cost Model - v4.07 DBA - Public.xlsb, ", Sheet "Dashboard", lines 16 to 24.
80 See WIK-Consult, February Submission, para. 325.
81 http://savethenbn.com/economic.php
82 See WIK-Consult, February Submission, para. 145.

be much more robust than the arbitrarily defined adjustment approach as applied by TERA.

3.4 Non-network cost

98. We understand that TERA did not have the relevant data to apply the EPMU allocation rule consistently for common costs between regulated and non-regulated services. We do not, however, subscribe to Analysys Mason's argument that retaining consistency requires the allocation of common cost between UCLL and UBA in the same way that TERA does between regulated and non-regulated services.[83] The closest proxy for a general application of the EPMU rule would be to allocate common costs to UCLL and UBA on the basis of the attributable costs of these services.[84]

83 See Analysys Mason, February Submission, Section 5.4.
84 See WIK-Consult, February Submission, para. 402f.

4 UCLL modelling aspects

4.1 Core functionality aspects of UCLL and SLU

99. Chorus argues against FWA as part of the MEA approach chosen by the Commission, that the bandwidth planned per customer would be restricted to 250 kbps and thus not be of sufficient capacity already today compared to the UBA service. Furthermore it cannot fulfil the UCLL core functionality to be unbundled at layer 1[85].

100. The bandwidth constraints mentioned by Chorus are no defining feature of FWA. They can be overcome by simply using state-of-the-art modern LTE equipment, as it was already announced by the Commission, but not implemented to an sufficient extent in the TERA model yet. We have already described how these deficits may be overcome by using a more state-of-the-art technology in the cost model[86].

101. Chorus describes the core functionality of UCLL and SLU as including unbundling at layer 1[87]. For this it is referring to international precedences which all are dated between the years 2003 and 2007, but leaving out more recent developments in Europe regarding the Virtual Unbundled Local Loop (VULA)[88] [89]. In case that a Next Generation Access network cannot be physically unbundled due to technical or economic reasons a VULA coming as close to the essential characteristics of physical unbundling as possible shall be provided at least. These are:

    - Local
    - Service agnostic
    - Uncontended product
    - Sufficient control of the access connection
    - Control of customer premise equipment.

    The VULA service shall enable the utmost degree of freedom regarding product differentiation as possible to the wholesale seekers. Thus at least in Europe a VULA is defined within the new Market 3a “Wholesale local access provided at a fixed

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85 See Chorus, February Submission, para. 17, p. 7, para. 78, p. 26 and para 82.1, p. 29.
86 See WIK-Consult, February Submission, Section 4.2.6.1.
87 See Chorus, February Submission, para. 83 and Appendix A.
88 Plückebaum, Jay, Neumann: Benefits and regulatory challenges of VDSL Vectoring (and VULA), RSCAS 2014/69, http://fsr.eui.eu/Publications/WORKINGPAPERS/ComsnMedia/2014/WP201469.aspx
89 European Commission, Recommendation on relevant product and service market … C(2014) 7174 final and the annex and appropriate Commission Staff Working Document SWD(2014) 298 of 9. October 2014

location" as alternative under circumstances comparable to the FWA conditions in New Zealand as a substitute for UCLL.

102. This VULA is very close to the core functionality of UCLL/ SLU defined by Chorus: *"The core functionality of the service is therefore best described as a* physical *connection providing a point-to-point transmission* medium *between the end-user and a hand-over point which enables RSPs to utilise their own equipment to provide a voice and data communications service to end-users."*[90]

103. We do not agree to Chorus description that "GPON cannot be unbundled to dedicated resources on an end-user basis"[91] because GPON can be deployed using a P2P FTTH network topology, as we have already explained in our August 2014 submission[92]. Thus not the GPON technology is hindering the physical unbundling, but the underlying fibre point-to-multipoint topology with splitters in the field. Nevertheless, VULA was developed as a concept to overcome such NGA network constraints.

104. Chorus once again repeats its argumentation regarding *"supporting aspects of the full functionality of the UCLL and SLU services" ("support for fax, alarm, EFTPOS terminals"*) and "*the missing of the necessary "fibre fixes" "*[93]*,* which have been stated already in its August 2014 Submission. While we responded already in the appropriate cross-submission[94] and have shown that Chorus arguments are not valid, Chorus did not use the opportunity to respond to or debate these arguments now, but simply repeats it once again.

105. We therefore summarize our view once again[95]: Nobody (no HEO) would deploy a new copper network in order to support some old (analogue) services for the future, for which alternative digital solutions either already exist or can be developed easily. A fibre based network is the technological innovation sometimes requiring changes in outdated old solutions also, which then have to be updated. The UCLL service first of all is a passive connection service changing its characteristic from transmitting electrical to optical signals, but in both modes allowing for transmitting messages. The significant improvement is the transmission capacity, for the benefit of the end-customers. The upgrade of services using the UCLL service is due to the end-users using these services, as it is an even more orthodox approach as the

90 See Chorus, February Submission, para. 370.
91 See Chorus, February Submission, para. 82.2.
92 See WIK-Consult, Submission in response to the Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)", 5 August 2014, Section 2.1.
93 See Chorus, February Submission, para, 82.1, footnote 9, and para, 85.
94 See WIK-Consult, Submission in response to the Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)", 5 August 2014, Section 2.
95 For more details see WIK-Consult,Cross-Submission in response to the submissions to Commerce Commission's "Consultation paper outlining our proposed view on regulatory framework and modelling approach for UBA and UCLL services, 06 August 2014", Section 2.

single Swedish contrary example of Analysys Mason. They cannot be due to all users at all. We have referred to many more historic examples of technology improvements in our previous cross-submission. An inclusion of additional cost for service adaption, which are not born by the new UCLL service, would distort a make or buy decision of an efficient operator. Therefore we further on strongly recommend to exclude any mark-ups caused by services being not part of the UCLL service for all users.

4.2 Trenching costs

106. We have shown in our February Submission that the trenching costs used in the TERA model are too high for a variety of reasons.[96] Therefore, the trenching costs assumed by Chorus and Analysys Mason significantly overstate the relevant costs even further[97] and should not be used in the Commission's model as per Chorus' submission.[98]

107. Chorus claims that the Commission has omitted service company overheads from the modelled trenching costs. It is up to Chorus (or any other operator in the market) whether it handles the organisational management of network deployment including the management of work of the construction companies itself, or whether it employs service companies to conduct this management and organisational work. It is not the task of a cost model to reconstruct the production process of a particular firm in detail. Trenching cost per metre used in the model should represent all the necessary costs to construct and build the trench so that it is ready for service. Such costs include all relevant overheads for organisation and management of construction work. That is the usual (the "orthodox") approach in cost modelling and it is the approach which the Commission has taken. The trenching cost used in the model therefore has to be interpreted as representing all relevant costs including the overheads which Chorus claims to be omitted. Itemising certain overheads in addition to the trenching costs already considered would result in double-counting of costs and so should be clearly rejected by the Commission.

108. We agree with Beca's approach to use a sixth class of trenching – urban – in order to reflect that urban trenching is not only driven by the soil classification but by other circumstances as well. This includes different forms of surface, corridor restrictions due to existing infrastructure of other utilities, more complex traffic management, more complex crossings of streets and some tram tracks, taking care of trees, dewatering and reinstatement.[99] If the Commission were to ask suppliers for average trenching cost in urban areas all these additional cost drivers shall be reflected in

96 See WIK-Consult, February Submission, Section 5.8.6.
97 See WIK-Consult, February Submission, para. 482.
98 See Chorus, February Submission, para. 121.
99 See also the aurecon Submission of 20. February 2015 on behalf of Chorus, p. 3, Analysys Mason, February Submission, Section 3.2, Figure 3.3.

its response and thus reflected in the average cost of trenching in urban areas. We believe that it is not even possible to determine “clean” trenching cost without all the given additional difficulties. That is our and the Commission’s understanding of the trenching cost calculated by Beca and that is the appropriate understanding.

109. Underground soil classes also have to be taken into account. But while aurecon in its submission is talking about basalt[100], a soft form of rock, Chorus[101] mentions scoria as the prevailing underground of Auckland. According to our experience scoria is much easier to dig than basalt, but basalt is much easier to dig than hard rock. In this way aurecon and Chorus are contradicting to each other.

110. The denser an urban environment the more expensive trenching may become, but we assume that Auckland (and its trenching cost) are not representative for the cost of all urban trenching areas as Chorus argues. Thus, the trenching cost for urban areas chosen by Beca may be more representative than just looking at Auckland. The model requires average trench cost per meter, and for averaging the urban cost the total trench length in Auckland has be taken into account, beside all other trenches in (other) urban environments. Auckland as the largest city in New Zealand has the most homes to be served, but typically the average cost per home are lower due to a lower trench length per home. Thus the large number of homes served is not the decisive factor for determining the average trenching cost because the average trench length per home is significantly lower in less populated area. The average trenching cost in urban areas is only determined by the different cost per metre and the total urban trench length, independent of population density.

111. Chorus claims in its February Submission that trenching cost in the Auckland Central Business District (CBD) is [[redacted]][**CNZCI**] NZD/m plus some additional costs.[102] We have compared this cost level with the average cost of the most expensive trenching class (densest urban population and most expensive soil/ surface class) of cost models for some European and Mediterranean countries. The results are shown in Table 4-1.

100 See aurecon Submission of 20. February 2015 on behalf of Chorus, p. 1.
101 See Chorus, February Submission, para. 28.
102 See Chorus, February Submission, para. 26 and 417.2.

Table 4-1: Highest trenching cost in other cost models

Country	Nominal cost [NZD/ km]	Exchange rate	PPP Relation to NZ[103]	PPP adjusted cost [NZD/ km]
Denmark	92,212	1.00 € = 1.59 NZD	0.786	72,452
Germany	190,800	see €	1.100	209,880
Israel	59,434	1.00 NIS = 0.334 NZD	1.000	59,434
Luxembourg	190,800	see €	0.917	174,900
Norway	207,209	1 NOK = 0.191 NZD	0.733	151,953
Spain (6 ducts)	186,030	see €	1.222	227,370
Sweden	206,579	see €	0.846	174,798
U.K.	203,000	1 GBP = 2.03 NZD	1.000	203,000

Sources: Denmark: https://erhvervsstyrelsen.dk/gaeldende-prisafgoerelse-2015
Germany: Implikationen eines flächendeckenden Glasfaserausbaus und sein Subventionsbedarf, WIK Discussion paper No. 359, October 2011, www.wik.org,
Israel: Analysis of the Israeli Wholesale Bitstream Access cost model, WIK-Consult Report, 28.3.2014, pages 24/25
Luxemburg: http://www.ilr.public.lu/communications_electroniques/en-cadrement_tarifaire/modele_couts_fixe/3_ILR-Model-results-and-input-data_20140303.pdf
Norway: http://www.npt.no/marked/markedsregulering-smp/kostnadsmodeller/lric-fastnett-aksess
Sweden: http://www.pts.se/sv/Bransch/Telefoni/Konkurrensreglering-SMP/SMP---Prisreglering/Kalkylarbete-fasta-natet/Gallande-prisreglering/
Spain: http://telecos.cnmc.es/consultas-publicas/-/asset_publisher/f9RdqmDOXuDP/content/20130528_modeloscostes?redirect=http%3A%2F%2Ftelecos.cnmc.es%2Fconsultas-publicas%3Fp_p_id%3D101_INSTANCE_f9RdqmDOXuDP%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-3%26p_p_col_count%3D1
U.K.: https://www.google.de/search?client=opera&q=ofcom+trenching+costs&sourceid=opera&ie=UTF-8&oe=UTF-8#q=mason+analysys+BSG+2008, page A-3

112. The PPP consideration takes into account that there are different purchasing powers in the economies compared, which can be normalised by purchase power parities as resulting in the right hand column of Table 4-1. This does not take into

103 The Purchase Power Parity (PPP) adjusted cost have been calculated from the PPP relation to the US $ per country taken from http://data.worldbank.org/indicator/PA.NUS.PPPC.RF, published by the Worldbank. multiplying the column 2 values per country with the PPP relation of each country for New Zealand. The PPP relation of each country has been determined by the PPP relation of each country to the US $ and the PPP relation of New Zealand to the US $ by dividing the latter by the first (NZ PPP value (which is 1.1)/ Country nn PPP value).

account that there might be special circumstances for specific business segments like road or underground construction, which experience an increased demand and cost level due to the increased repair demand of the recent large earthquake in New Zealand. Hence the PPP adjusted cost shall be some percent higher due to these specific reason than presented in the right hand column, but not higher by magnitudes. The values in Table 4-1 already include all additional cost claimed by Chorus and mentioned in para. 108 above and are far below the [[redacted]] [**CNZCI**] NZD Chorus is claiming for. Chorus trenching cost is about four times higher than the highest comparable per km trenching costs in benchmarking cost models. Something must be significantly wrong with Chorus' numbers or Chorus' way of deploying networks.

113. Analysys Mason states that the Beca workbook should be updated when considering the TSO area only, because otherwise the Commission would consider rural trench cost for a heavily urbanized trench network.[104] We do not agree. We assume that the trenching costs of the non-TSO areas are typically taken from the non-urban soil classes. Thus, the urban trenching cost are not influenced by considering the non-TSO areas or not. Outside the urban areas the Beca classification still holds in any case, inside TSO areas as well as outside TSO areas. We would expect that the share of urban trenches in relation to the total trench length would increase, because considering the TSO areas only would exclude many non-urban trenches from the total length of trenches.

114. While Analysys Mason claims that the blended trenching cost determined by Beca are taken from regional suppliers[105] and consists of samples of trench construction of a minimal length of 50m[106], implicitly claiming for higher trenching cost[107], we once again want to point out that we expect that larger suppliers and larger projects (such as a HEO's New Zealand-wide deployment) would result in even lower trenching cost than those reflected by Beca.

115. The Commission informed us that the public and the confidential Beca models in fact are identical despite different representations of the pre-calculation.

116. The duct installation rates for directional drilling and chain trenching of $ 12/m for a 50 mm duct and $ 15/m for a 100 mm duct derived by Beca and used in the TERA model are too high.[108] According to Spark and its subsidiary connect8 appropriate rates should be $ [[redacted]] CNRZI. So the corresponding costs in the model are overestimated by more than 25%.

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104 Analysys Mason, February Submission, Section 3.2, p. 31.
105 Analysys Mason, February Submission, Section 3.2, p. 35.
106 Analysys Mason, February Submission, Section 3.2, p. 32.
107 Analysys Mason, February Submission, Section 3.2, Figure 3.2.
108 See sheet „Dir.Drilling" cells G4 and G49 and sheet „Chain Trench " cells H4 and H49

117. For the other deployment forms Beca increases duct material and duct installation by 10% for rural and 20% urban deployment.[109] These mark-ups remain unexplained by Beca. TERA does not use Beca's mark-ups but applies a uniform mark-up of 20% in all geotypes,[110] but referring to Beca. Also in these deployment forms unexplained cost increases of 20% occur.

4.3 Aerial deployment

118. We disagree with Analysys Mason's view that large fibre cables (with 312 fibre pairs) cannot be deployed aerially. If the Swedish cost model is only deploying cables with 144 or fewer fibre pairs aerially that does not prove the deployment of larger cables is impossible. The probable reason in Sweden is that demand in areas where fibre is deployed aerially is limited such that there is no need for large fibre cables in those areas. We are aware of operators' practice also to use aerial deployment for 312 fibre cables.

119. Chorus[111] and Analysys Mason[112] seem to assume that sharing of infrastructure between two networks efficiently always requires that the costs of the shared network elements are distributed equally. Other (and more economic) sharing rules allocate the shared infrastructure according to and in proportion to their respective standalone cost. If, for instance, the standalone cost of an electricity pole is higher than the standalone cost of a telecommunications pole, then electricity should bear a higher share of the cost of a pole (to support both networks) than telecommunications.

120. The TERA cost model uses Chorus' input prices for poles. These poles are in line with the street clearance requirements in New Zealand. Therefore it is irrelevant if TERA describes the pole height by 4.5 m street clearance, although it might be actually 5.5 m, since the cost model in fact uses poles of the appropriate height and at the relevant price.

121. If power utility poles are used in a shared manner, these already are designed according to the required street clearance, so no additional investment has to be taken into account to increase the height once again. Thus, no additional costs have to be considered for adapting the nominal street clearance of TERA (4.5 m) to the required one (5.5 m).

109 See cells T13 respectively V10.
110 See cells K35 and K36 respectively L35 and L36 on sheet „ Unit costs calculation".
111 See Chorus, February Submission, para. 493..
112 See Analysys Mason, February Submission, Section. 3.2.

4.4 ETP costs

122. Chorus states and recommends in its February Submission, that "*The ETP forms part of a lead-in and is included in the UCLL service*" and that "*All wiring before the ETP should be included.*" [113] Chorus demands to "*Include the costs of ETP, and all wiring to the ETP. The ETP forms part of the UCLL service.*"[114] Furthermore, Chorus states, that "*The Commission is not correct to assume that the ETP costs are recovered as a component of a different service.*"

123. Chorus is incorrect. The provision of the ETP is part of the "Copper Service Lead-In Service".[115] Therefore, the Commission is correct in not considering the ETP cost as part of the modelled UCLL cost. Chorus is charging $ 195 for the lead-in service. Considering the ETP costs as part of the UCLL cost would result in a double-recovery of the same cost.

124. Chorus is incorrect in requiring the cost of any in-house wiring to be part of the UCLL cost. As Chorus clearly states on its website it is the responsibility of the homeowner to supply the home distribution box and the in-house wiring. In its own words Chorus states:

> "*Who does the work?*
>
> *Your electrician can work with you to design a wiring plan to meet your needs. As home wiring requirements become more complex, you can also choose to use a specialist cabling company.*"[116]
>
> and
>
> "*Setting up the home distributor box*
>
> *It is the homeowner's or builder's responsibility to supply the home distributor box, patch panel and patch cables.*"[117]

125. Vodafone has confirmed to us that companies like Teltrack[118], Cablecraft[119], Aotea Electric[120] and Independent Lines[121] offer in-house wiring services to house owners.

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113 Chorus, February Submission, para. 17, page 7.
114 Chorus, February Submission, para. 78, page 29.
115 See Chorus: Copper Service Lead-In, printed from http://customer.chorus.co.nz/copperserviceleadin on December 05 2014.
116 https://www.chorus.co.nz/wiring-for-broadband/for-homeowners/wiring-your-home-for-broadband-new.
117 https://www.chorus.co.nz/wiring-for-broadband/contractors/wiring-homes-for-ultra-fast-broadband.
118 http://www.teltrac.co.nz/products-and-services/cabling/.
119 http://www.cablecraft.co.nz/Menu/Cabling-Systems.php.
120 http://www.aoteaelectric.co.nz/structured-cabling-xidc46623.html.
121 http://www.independentlines.com/pages.php?id=17.

126. We assume that Chorus charges a separate price to the house-owner if it would provide a similar service.

127. The lead-in service as described in para. 124 and in more detail in para. 252f. in our February Submission not only includes the provision of the ETP. It also includes the installation of the ETP, the cost of the pipe in the open trench, the copper cable of the vertical lead-in and the respective installation.

128. The various elements of the lead-in are covered by the lead-in service and directly charged to the user as a separate service. The only missing element for a lead-in service from the estate boundary to the ETP is the open trench. This has to be provided by the user itself. This means that all costs of the vertical lead-in (including the ETP) are covered either by the lead-in payment or by the user directly. We would therefore like to make a recommendation in our February Submission more precise in the following way: the Commission should exclude all the cost of the vertical lead-in and all the cost of non-standard lead-ins from the modelled costs. These costs are covered by a different service or by the users directly. This approach is more coherent than including the costs in the first place and then deducting corresponding revenues.

129. The proposal developed here is fully in line with a responsibility of Chorus "*to repair or replace faults up to and including the ETP as part of its provision of the UCLL service*".[122] This responsibility is met by corresponding maintenance activities which are part of operating expenditure and included in the model.

4.5 Lead-in considerations

4.5.1 Road width and lead-ins' length

130. Analysys Mason claims that the width between the metallic surface of the road and the private ground border of the end-customer building, the space for berm, sidewalk or pavement[123], is missing in the lead-in length determination. This may have an impact if the width of this area has a significant share of the total lead-in length. The width of footpaths and berm can vary significantly according to council standards, i.e. from no footpath on mixed use roads to 1.5 m for suburban footpaths. Nevertheless, simply adding this missing length to the lead-in length calculated so far (from the building to the private ground border) would definitively overestimate the cost. Such a deployment would not be efficient, at least in the case of underground deployment. A trench deployment at the sidewalk space's edge just in front of the private ground would be more efficient, since the street is crossed much less

122 Chorus, February Submission, para. 445.
123 See Analysys Mason, February Submission, Section 2.3, Figure 2.3.

often than such longer lead-ins would be required (per single building or per building pair, as we proposed in our February Submission). Such deployment is also recommended in New Zealand's standard for new subdivision infrastructure (NZS 4404:2010)[124] For this reason the Commission should not follow Analysys Mason's recommendation.

131. The costs caused by segments of the street crossings in the berms have to be valued at a lower berm digging cost compared to the cost of crossing a metalled surface of a road.

132. Furthermore, Analysys Mason is claiming that the vertical lead-in, which is used for underground installations, is an underestimation as obstacles between the building and the roads edge requiring deviations are not considered.[125] This is not true. The underground lead-in construction assumes a rectangular triangle of the horizontal line, the vertical line and the straight line. A lead-in cannot be longer than the sum of horizontal and vertical line, otherwise it is inefficient[126]. In the case of aerial lead-ins there may be some deviations from the straight line required (i.e. may be caused by a tree), which we believe would, overall, be minor.

133. For both cases of deployment, aerial and underground, we see a significant overestimation of lead-in cost in cases of buildings behind buildings directly neighbouring the roads, as they are depicted in Figure 2.2 of the Analysys Mason, February Submission, Section 2.3, p. 11, and the Figures 3-5 of the Chorus, February Submission, para. 41. The lead-ins should not be considered as constructed individually per building, but in a shared manner commonly using the lead-in trenches (and ducts) of the buildings closer to the road, thus reducing cost significantly. So, if debating lead-in deployment in more detail, all aspects have to be taken into account, in total significantly reducing the cost compared to individual lead-ins. Therefore, the Commission should reject Analysys Mason's proposal.

134. One additional network element related to the lead-ins is the CCT. While Analysys Mason is claiming for an error in the calculation[127] we want to point out that the number of CCT, especially in aerial deployment, can be increased to 8 lead-in per CCT in order to be more efficient, thus also reducing the number of poles for CCT deployment and thus reducing lead-in cost.

135. Another additional element of the lead-ins are the poles in the case of aerial lead-in deployment. We already explained above that there are lead-in saving options if buildings are located behind each other. Analysys Mason[128] claims additional poles

124 See http://content.asce.org/files/pdf/Hall.pdf , p. 58
125 See Analysys Mason, February Submission, Section 2.3, p. 12.
126 That is a deviation mark-up of 1.4142 applied to the straight line. Typically such mark-ups are in the range of 1.25.
127 See Analysys Mason, February Submission, Section 2.6.
128 See Analysys Mason, February Submission, Section 2.8.

should to be deployed for lead-ins at the minor side of a road in order to keep the road clearance for high vehicles passing underneath. We reject this requirement. In many cases the buildings are close to the road edge and the ETPs installed at the upper level of the building should be sufficiently high. Furthermore, we observe rooftop ETP and poles to carry the lead-in cables for buildings behind another building, which sometimes are even higher than required in order to cross the first building. Even in cases where there is no first building to support passing a longer initial segment, the lead-in poles are of normal height and distance allowing for regular installation. Therefore there is no need for additional poles. Even if there might be circumstances where an additional pole on the opposite site of the street may allow for better or more efficient installation we do not agree that such installation, which typically increases cost, should be modelled in general. One could of course model the lead-ins, including its pole requirement, in more detail, but this is not a generalized efficient solution with deviations for single cases. The result of modelling should be efficient cost on average. We are convinced this goal will be better met without overestimation of the modelled lead-ins by assuming a requirement for additional poles.

136. The TERA model only distinguishes between aerial and ducted deployment for the lead-in construction, but neglects new state-of-the-art technologies used also by Chorus in practice[129]. These are micro trenching, shallow trenching and surface mounting of cables, so that classical deep underground ducting only is a last resort of deployment. Thus, the cost for this most expensive deployment method should not be used as the standard deployment technique for non-aerial deployment, but the average cost for state-of-the-art modern deployment.

137. Furthermore, new FTTdp[130] technologies like G.fast are emerging and will be available for market use soon. Still in the beginning of the next regulatory period. G.fast enables the re-use of the existing copper lead-ins for an up- and downstream sum bandwidth of 1 Gbps (i.e. 500 Mbps symmetrical bandwidth). The Crown already has indicated that - for UFB extension - G.fast could be considered for deployment[131]. These aspects are neither debated nor reflected in the submissions (or in the Commission's Draft Determination) so far nor is its cost decreasing effect reflected yet in lower lead-in cost as it should be in the relevant long-term perspective of the model.

129 See Chorus: https://www.chorus.co.nz/installing-fibre/from-the-street-to-your-house#from-the-street-to-your-house/from-the-street-ot-your-home?&_suid=1426656922868006591678996245387
130 FTTdp: Fibre to the distribution point, a location comparable to those for the CCT/ FAT.
131 See: http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/pdf-and-documents-library/new-initiatives/roi-supply.pdf , p. 8.

4.6 Engineering and dimensioning rules

4.6.1 Cable spare capacity

138. In our February Submission we also have pointed out that there is no spare capacity deployed in copper feeder cables. We agree with Analysys Mason[132] that this needs to be corrected in the model for the reason that the percentage of (efficiently determined) spare capacity needs to be less in the feeder segment than in the distribution network.

139. We disagree with Analysys Mason that the spare capacity assumption is (too) low for the distribution network. Their reference to higher values in other cost models is misleading. The Commission is modelling a network for constant demand and not a growing demand as other models do. Spare capacity therefore is only needed to cope with the operational requirement of efficiently dealing with a moving customer base and not for meeting a growing demand. Therefore, we also do not share the opinion of Analysis Mason, that the 11% spare capacity is too low. The stated 25% and 30% spare capacity of Denmark ignores, that the spare capacity in the copper feeder network is lower than in the copper distribution networks. These values are also much too high and do not reflect the stable demand assumption of the Commission. Therefore the spare parameters in the context of New Zealand do not need to reflect increasing demand if the Commission retains its assumption of constant demand. Therefore 11% spare in the copper distribution network is sufficient.

140. Additionally, Analysis Mason recommends a spare capacity parameter for cables in the fibre network.[133] While we identified this inconsistency and generally agree with this finding[134], we do not share Analysis Mason's statement, that a fibre spare capacity parameter should be set to the same value as the copper spare capacity parameter "CuSparePairsDistribution" in the distribution network.[135] The copper access network is divided into a distribution and a feeder segment due to the installed SDF and so allows for different spare capacity parameters in these segments.[136]

141. For example the German regulator, BNetzA, foresees in its latest decision a technical reserve of 5.72% in the feeder cable and 10.28% in the distribution cable[137]. These values represent already conservative values. In Spain, the regulator CMT

132 See Analysys Mason, February Submission, Section 2.9.
133 Analysis Mason, February Submission, Section 2.9, p. 22.
134 WIK-Consult, February Submission, para. 335.
135 Analysis Mason, February Submission, Section 2.9, p. 22.
136 See our recommendation under para. 407 in our February Submission.
137 See also the latest copper LLU price decision of the German regulator, BNetzA, BK 3/13-002, p. 48

considered just 1-2% technical reserve.[138] Taking the Commission's assumption of constant demand into account, the 11% assumption of TERA for the feeder cable represents a more than sufficient spare while in the feeder cable a reduction to a maximum of 6% should be processed by the Commission.

142. Regarding fibre networks, we see the spare capacity needed in the same range as copper networks which means between 6% and 11%, as both models, copper and fibre, work with the same stable demand assumption and the technical reserve is comparable for copper and fibre networks.

4.6.2 Network protection and resilience

143. Telecommunications network architects of course have to consider network resilience and the fault penetration rates of single network failures. We have addressed these aspects in our February Submission to some extent.[139] Resilience becomes an ever more important consideration in higher levels of network architecture. Thus, we proposed to consider these aspects by using a physical ring network topology for connecting the local exchanges to the FDS locations and by distributing the fibre from the DSLAMs to two different FDS locations. We recommended an appropriate higher level network redesign instead of reusing the existing inter local exchange links, as the TERA model does. Network resilience against single failures can be implemented and this is state of the art of network planning, but this design exercise typically starts at levels above the local exchange.

144. Following the network architecture given by the local exchange locations as scorched nodes these scorched nodes are the single points of failure with the largest fault penetration rate. This cannot be prevented, since the local exchanges are the star-points of the point-to-point access network. If a location failure occurs, e.g. caused by a fire, all end-customers concentrated in this local exchange can be disconnected. Thus, one may doubt whether the proposal which Analysys Mason made[140], concerning redundant access network trenching in case of trench lines combining more than 5,000 customer access lines, is to be taken seriously at all:

   a) Active end-customer line aggregation of this size can occur only in local exchange areas having even more active end-customers, thus the fault penetration rate of the local exchange for these exchanges is in any case larger than a single trench fault combining less active customers.

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138 WIK-Consult, Bottom-up cost model for the fixed access network in Spain, Reference document, p. 65. http://www.cmt.es/searchbroker/services/open?q=wik&l=es&page=1&p=Buscador%20Horizontal&title=%20Documento%20de%20referencia%20sobre%20el%20modelo%20de%20costes%20%20&url=http%3A//www.cmt.es/c/document_library/get_file%3Fuuid%3D0de86a85-ba72-4294-a9b0-e397cd77a7d6%26groupId%3D10138

139 See WIK-Consult, February Submission, Section 5.6.15.

140 See Analysys Mason, February Submission, Section 2.14.

b) A single trench fault can easily be prevented by routing the feeder (for fibre the distribution) access lines on both sides of a street, thus increasing the minor side trench size a little bit and decreasing the major trench size accordingly. Because such high concentration only will occur in (very) dense populated areas one can assume these changes can be performed by a negligible increase of cost.

c) The two-sided deployment should not be tolerated typically. A deviation of trenches by less than 1 km can be required in addition in order to increase resilience. This additional length is negligible in comparison to the whole trench length.

d) We estimate that a concentration of more than 5,000 active customers in a feeder segment could occur only in local exchanges with more than 10,000 active customers, taking into account, that not all access lines will approach the local exchange from the same direction. According to New Zealand carrier sources there are less than around 30 local exchange locations above this size. Thus a modelling abstraction from such detail can be admitted, as the failure rate would be below one per million.

e) In a scorched earth approach, or even in an approach with optimized local access areas such high active access line concentrations typically do not occur because the local access node would be located more in the middle of the access area, so that the location will be approached by access lines from different directions.

145. We agree that burying cables may better protect them against attacks, storm or accidents than deploying aerial cables. But there is no evidence given by Analysys Mason that these high loaded trenches are not buried in the model.[141] In any event, we do not see any criterion describing which segments are buried and which are not. So this definition is disappearing in the averages of underground and overhead deployment used in the model. Therefore we do not see any need for detailed differentiated modelling if the average cost values for trenching are set appropriately, particularly where there are only very few kilometres which might have slightly increased cost if modelled in the very detail.

146. Although not mentioned by Analysys Mason we once again repeat that there already is a significant fibre cost overestimation due to the use of the shortest path approach chosen by TERA, taking shortest paths for each of the customer buildings to the local exchanges instead of optimizing the trench cost. Before any steps are taken to increase cost by negligible amounts (as addressed in preceding paragraphs), the overestimation of trenching costs should first be corrected by using

141 See Analysys Mason, February Submission, Section 2.12.

appropriate optimizing algorithms instead of elaborating modelling details with minor (if any) effects.

4.7 Network sharing

147. While Chorus and Analysys Mason claim that TERA's modelling represents an unrealistically high degree of sharing in aerial deployment, we are instead convinced that sharing has not been considered to an appropriate extent. The TERA model for the Commission does not consider sharing of underground trenches with other utilities, as we know to be appropriate, but considers infrastructure sharing with power utilities in case of aerial trenching only.

148. Where trenches are shared between different users the cost typically will be allocated according to the amount used by each party. This applies not only for underground trenching but also for aerial infrastructure for electrical power access networks and telecommunication access networks. The approach should apply to all cost elements, thus operational expenditures for maintaining and surveying the trenches also.

149. The TERA model for the Commission applies a simple sharing rule of 50% between the electrical power and the telecommunication access network infrastructure. This allows for simple cost allocation, however is inappropriate for the deployment of a HEO in a 'reality' where electricity distribution networks already exist. An electrical power network requires more enforced poles than a telecommunication access network, so the higher share of the pole cost must be allocated to the utility network than to the telecommunication network, thus deviating from the 50% sharing approach[142].

150. We assume that:

a) there is no difference for pole height regarding street clearance between electrical and telecommunication aerial networks;

b) typically, the electrical power copper cables have a larger weight than the telecommunication fibre cables, hence poles for an aerial electrical distribution network have to be stronger than for fibre lines;

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142 The German NRA defines the sharing rule between electrical power and telecommunication access networks to be the cost share resulting from the cost relation of the stand alone cost for both installations individually (see BNetzA Mitverlegungsleitlinie http://www.bundesnetzagentur.de/DE/Service-Funktionen/Beschlusskammern/Beschlusskammer8/BK8_93_Leitfaeden_und_fSV/BK_Energie-Leitfaden_2012_download.pdf?__blob=publicationFile&v=1).

c) fibre aerial cables may be simply added to existing electrical power aerial infrastructure without enforcing the poles.

If so, there will not be any additional cost for trenching except of installing the additional fibre cables. The Chorus February Submission, para 498, demonstrates in the photo of p. 136 the existence such parallel installations in the case of lead-ins.

151. We therefore cannot follow the arguments on this point in Analysys Mason's Submission[143]. Pole survey fees and trench maintenance cost have to be shared between the parties. Traffic management for pole construction only occurs once and has to be shared also. The height shall be the same, and sharing the cost of poles between both parties by 50% is an acceptable approach of not too detailed cost modelling. If electrical power network access networks require more expensive poles than telecommunication fibre networks, the cost can be allocated in an asymmetric manner according to cost causation.

4.8 FWA modelling

152. We agree with Chorus' assessment that Vodafone's RBI network is not an efficient proxy for the HEO's FWA network.

> "*The Commission's FWA model has utilised the Vodafone RBI network as a proxy for the network that would be deployed by an HEO. However, that RBI service is a specific service built to achieve particular parameters that are different from the UCLL and UBA services provided by Chorus.*"[144]

As Networks Strategies shows in its FWA study[145] an optimisation modelling approach would significantly expand the efficient scope and coverage area of FWA to deliver the access services.

153. Chorus[146] reveals the same misunderstanding and misinterpretation of the FWA capacity in the model as the Commission itself.[147] The model assumes a capacity to serve 67 users per sector and not per site. Instead, each site contains equipment for three sectors. Thus, the model should assume at least a capacity of 3 x 67 = 200 users per site.

154. It may be the case, as Analysys Mason points out[148] that individual premises within the coverage areas of the model and the way in which FWA is modelled can actually

143 See Analysys Mason, February Submission, Section 3.2.
144 See Chorus, February Submission, para. 503.
145 See Network Strategies, Modelling Fixed Wireless Access, UCLL and UBA Final Pricing Principle, Report for Vodafone and Spark, February 2015.
146 See Chorus, February Submission, para. 511.
147 See WIK-Consult, February Submission, para. 193.
148 See Analysys Mason, February Submission, Section 6.2.

not be servable by FWA. However, as we have pointed out in our February Submission the TERA model significantly underestimates the potential of FWA due to model deficiencies and the parameter choice. If TERA had modelled state-of-the-art LTE advanced technology it would have found that FWA could reach more customers (including more than 67 customers per sector) and would reduce the potential issue of non-servable premises significantly.

155. Analysys Mason claims[149] that the HEO should cover the FWA-specific CPE so that these cost would become part of the UCLL cost base. We disagree. The service which FWA will provide is comparable to the virtual unbundled local access (VULA) service as it is provided in several European member states over the fixed network. As the European Commission[150] and several NRAs[151] emphasise it is a constitutional and definitional element of a VULA service that RSPs have control over customer premises equipment. To provide the flexibility and innovation potential of CPE, CPE is not part of the VULA service but is in the responsibility of the RSP. These considerations also hold in the UCLL context. CPE should for competitive reasons be in the responsibility of the RSP and can therefore not be part of the cost base of the HEO.

156. We have shown in our February Submission[152] that the appropriate assumption regarding spectrum fee is that the HEO will not have to pay spectrum fees. Paying spectrum fees would be a zero sum subsidy game for the Government at a higher level. Therefore, we regard any reference to a potential auction result and the consideration of specific auction scenarios for the HEO, as Analysys Mason did[153], as totally misleading.

157. We share Analysys Mason's view[154] that the determination of FWA OPEX is not transparent and is vague in the Commission's model. We do not, however, share Analysys Mason's view that OPEX for 550 sites would be in a range between $ 10 million and $ 14 million p.a. if based on mobile network cost models from EU regulators. According to our reading of such models the relevant OPEX for 550 sites are

149 See Analysys Mason, February Submission, Section 6.3.

150 See European Commission, Explanatory note accompanying the document Commission Recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, p. 44.: *"Access seekers need to have sufficient control over the transmission network to consider such a product to be a functional substitute to LLU and to allow for product differentiation and innovation similar to LLU. In this regard, the access seekers' control of the core network elements, network functionalities, operational and business process as well as the ancillary services and systems (e.g. customer premises equipment) should allow for a sufficient control over the end user product specification and the quality of service provided (e.g. varying QoS parameters)"* http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=7056.

151 See, for instance, the decision of the Austrian regulator Telecom-Control-Kommission, Bescheid vom 16.12.2013, M1.1/12-106.

152 See WIK-Consult, February Submission, Section 4.2.6.4.

153 See Analysys Mason, February Submission, Section 6.4.

154 See Analysys Mason, February Submission, Section 6.5.

below $ 10 million. An OPEX value of $ [[redacted]] CNZRI million p.a. as assumed by TERA therefore is in the relevant range.

4.9 Fibre and copper cable costs

158. Analysis Mason states that the unit costs of fibre cables are too low based on the reduction of the values which Chorus provided in the Section 98 request [155] We already illustrated that only taking information from the incumbent into account is not an appropriate approach to identify costs of an HEO.[156]

159. We assume that the data used by TERA for the unit costs of fibre cables do not include installation costs of the fibre cables. Furthermore, we assume that TERA did not forget the installation costs and included them in a different part of the model. On the basis of supplier data in New Zealand received we conclude that the fibre cable costs of the HEO in the model are overestimated. [[redacted]

] CNZRI

Additionally, it has to be taken into account, that the carrier's data which we used represent the operation at a lower scale than the HEO represents. The HEO should be able to receive even lower cable prices than we showed in the table above.

155 Analysys Mason, February Submission, Section 3.1, p. 23.
156 WIK-Consult, February Submission, para. 211-220.

5 UBA modelling aspects

5.1 Backhaul links

160. Chorus extrapolates in its February Submission, Annex G, the traffic per end-customer over the next 5 years with an increase of 50% per annum. We discuss this growth rate in paragraph 165 below. Overall we would expect a slowing rate of traffic increase at least towards the end of the new regulatory period. Following Chorus' extrapolation[157] the exhaustion of the 1 Gbps backhaul link will occur *"at the end of the fifth year"*. Given the estimation uncertainty and our different growth assumption there will be no need for a backhaul line upgrade for any of the DSLAMs.

161. In our February Submission (Section 5.4.1) we have pointed out that a significant number of DSLAMs, most of those installed in the cabinets, cannot be fully loaded with end-customer access lines due to the end-customer distribution. We estimated that *"85% of the DSLAMs serve less or equal 192 UBA customers"*. Thus, for all these customers the consideration Chorus is making in its Annex G is without any relevance, since the exhaustion of backhaul line capacity is restricted to *"any fully provisioned DSLAM serving 384 customers"*[158] (or a few less), which is the minority of the DSLAMs.

162. Of course one can deal with traffic growth over time in an adequate network capacity modelling year per year, considering the investment increments required over time due to demand increase. This adds some modelling complexity. From our point of view the DSLAM backhaul capacity modelling does not require such adaption under the circumstances described in the paragraphs above.

5.2 FDS interlinking dimensioning

163. The TERA UBA model for the Commission accounts for switch capacity just according to the interfaces connected to the switch. We stated in our February Submission that the traffic being transmitted over the access links also has to be taken into account,[159] at least in the context of dimensioning the upwards links directed into the higher network levels and for the handover interfaces. Also the switching engine should be capable of handling the traffic at peak hours. The TERA model cannot currently deal with these aspects and should be amended accordingly.

164. Switch and uplink traffic dimensioning in a real network environment can be dealt with over time, according to traffic growth. When defining the average cost for a five

157 Chorus, February Submission, para. 542.
158 Chorus, February Submission, para. 542.
159 See WIK-Consult, February Submission, Sections 2.4 and 5.4.3.

year period, thus deriving an average cost over time, one can also take an average traffic over time in order to reflect the average switch dimensioning required in the period considered. We recommend following this approach instead of using the method Analysys Mason describes in its February Submission (Section 4.2). Otherwise, dimensioning the network for the traffic at the end of the five year period would overestimate the network cost, because with growing traffic demand the network will be filled and will make full use of its scale just at the end of the considered period. Much capacity will be unused until the end of the period.

165. In terms of traffic growth, it is possible to speculate whether an internet traffic growth of 50% per year is appropriate, since it is extrapolating the past development into the future. Alternatively, a decrease of the growth rate may be reasonable due to the assumption of a saturation effect coming up in the future. In addition, it is relevant that traffic volume growth is counted in Mbyte per year and is not directly related to the busy hour peak capacity (Mbit/s) used for proper network dimensioning. Here the kind of traffic, e.g. permanent video streams or short term communication, plays a significant role. TERA has not documented any investigation in this regard. We recommend a growth rate for the busy hour peak capacity of below 40% as more appropriate to the future reality.

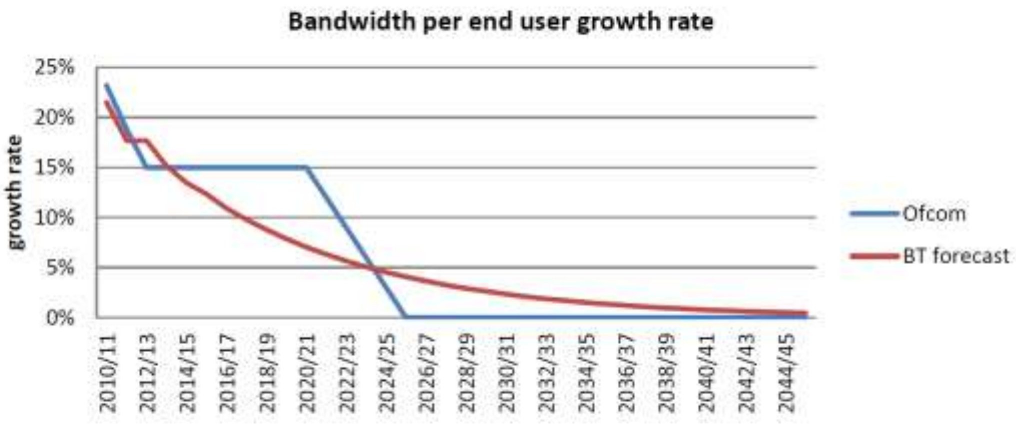
166. Reasonable sources demonstrate growth rates for the busy peak hour bandwidth per line significantly below 40%. For example, the recent Luxembourg UBA model uses a GAGR growth rate of 14% per year (see Table 5-1). BT responded to a market consultation of Ofcom with a degressive busy peak hour capacity growth rate per line, starting at approximately 22% in 2010 and passing 2020 with a growth rate of approximately 7% (Figure 5-1).

Table 5-1: Broadband bandwidth per line (bhkbps*) in Luxembourg

	2013	2014	2015	2016	2017	GAGR
Standard Broadband (<24 Mbps)	171	195	222	253	289	14%
Superfast Broadband (30 Mbps)	228	260	296	338	385	14%
Ultrafast Broadband (50+ Mbps)	285	325	370	422	481	14%
Weighted average**	186	220	261	303	354	17%

Source: Frontier Economics, Input data and intermediate calculations, A report prepared for ILR, 3rd March 2014

Figure 5-1: Forecast for peak kbps per line in the UK



Source: BT response to Ofcom Consultation – Narrowband Market Review – Consultation on possible approaches to cost modelling for the Network Charge Control for the period 2013-16, BT Response 9 November 2012

167. Chorus addresses the FDS interlinking dimensioning in its February Submission, Annex G, para. 547-556. It proposes to adapt the TERA model to the latest FDS technology, thus increasing the switch capacity. By this one can reduce the interswitch capacity in case of several switches required in one FDS location. Using the lower capacity switches of the TERA model results in more parallel switches and thus more interlinks between them. While we agree in principle, we want to point out that the switch size described by Chorus (para. 547) is not the technological and capacity end of modern switches. Therefore even larger switches may be considered in those locations where also this proposed increased switch size is not sufficient for serving the local traffic by one switch. Thus a larger switch overcomes the need of interlinks to the utmost extent and avoids the unnecessary cost driving effects of Chorus interlink dimensioning proposal.

168. If there remains the need for parallel switches in some locations there are additional options to reduce or even prevent interswitch traffic. First, any RSP can be connected to each of the remaining switches for handing over the traffic as described in para. 551[160]. Thus there is no interswitch traffic occurring. In addition, for minor interswitch traffic of small RSPs there is an option to route the traffic through higher level network nodes instead of installing complex any-to-any interswitch connections. If applying these rules, we are convinced that the interswitch connection demand is negligible and has neither impact on cost nor has to be modelled at all.

160 Chorus, February Submission, Annex G.

5.3 SFP dimensioning

169. Analysys Mason states, that a second SFP would have to be considered, that means "one at each end".[161] As Analysys Mason speaks in this context of DSLAM-FDS ports, we assume that Analysys Mason means here the DSLAM at one end and the FDS at the other end. We took a look in the data room and the Section 98 responses of Chorus. Here we found the file [[redacted]] CNZRI. This indicates, that TERA already considered the second SFP requested additionally by Analysys Mason by calculating the costs of the DSLAMs as integrated part of the DSLAM.

170. We have shown in our February Submission that the input parameters of DSLAMs overestimate significantly the cost of an HEO. [162] Hereby costs have been calculated for the status RFO. SFP functionality of DSLAMs are already included in our calculation. That means, even if TERA omitted to include costs for a second SFP, our finding on the overestimation of costs of DSLAMs, carries even more weight because we assumed that costs for a 2nd SFP are already included in the input parameters of DSLAMs used by TERA.

5.4 Installation and indirect capital costs

171. Analysys Mason states that different indirect capital costs such as installation costs appear to be underestimated or excluded.[163] We think this statement is unsubstantiated. The statement argues unspecifically regarding documentation and the model without describing in detail what is missing exactly. Moreover, there is no model analysis on whether such cost positions are included in other parts of the model. The statement itself is rather careful in its wording ("appears") and sounds more like a vague guess than evidence based analysis. Additionally, the statement sounds self-contradicting because in the same section Analysys Mason states that:

> "*indirect costs are bundled with other assets in Chorus' UBA model, namely:*
>
> - *indirect costs for DSLAM chassis, which include indirect costs for DSLAM line cards and SFP links, and*
> - *indirect costs for Ethernet aggregation switch, which include indirect costs for switch line cards.*"

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161 Analysis Mason, February Submission, Section 4.4, p. 40.
162 WIK-Consult, February Submission, para. 363-368.
163 Analysis Mason, February Submission, Section 4.1, p. 38.

These remarks themselves show that indirect costs have been considered by TERA because DSLAM and switches represent those assets for which Analysys Mason claim missing indirect costs.

172. Analysys Mason states that the cost for fibre reservation are missing in TERA's cost model.[164] That is actually not true. The costs for fibre reservation in Net Map have been considered. We took a deeper look into the Excel map "CI_ComCom-UBA Inputs v1.0.xlsx" and found on the sheet "Q 6.17.12 (d) Install Costs" costs for fibre reservation in Net Map (marked in yellow):

[

[redacted]

] CNZRI

These fibre costs flow as parts of the cost position "subtotal" via the calculations in sheet "Equipment per year", cell AB 49, to the central input result sheet "Input – Assets", cell I19.

173. We have shown in our February Submission that the input parameters of active equipment overestimate significantly the cost of an HEO because relevant benchmarks lead to lower equipment cost.[165] In that Submission costs have been calculated for the status RFO. Indirect capital costs are already included in that calculation. That means, even if TERA underestimated some related costs, our finding on the overestimation of costs of active equipment, carries even more weight, because we assumed that these costs are already included in the input parameters of active equipment by TERA[166]. TERA itself stated in the corresponding Excel map, that installation costs are included in the input parameters.

164 See Analysys Mason, February Submission, Section 4.1, p. 38.
165 WIK-Consult, February Submission, para. 363-374.
166 Excel map "CI_ComCom-UBA Inputs v1.0.xlsx", Sheet "Input – Assets", Column I.

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