WIK-Consult • Report

Report for Spark New Zealand and Vodafone New Zealand

Submission

On the Commerce Commission's analytical frameworks for considering an uplift to the TSLRIC price and/or WACC

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Executive summary

1. This submission provides a more detailed analysis of the Commission's framework for uplifting the TSLRIC price. Our analysis and comments regarding a potential uplift of the WACC are more general at this stage because this concept seems to be less clearly specified by the Commission than it should be to give a final assessment. Nevertheless, because in the end both uplifting concepts are reflected in a wholesale price increase, major parts of the arguments related to an TSLRIC price uplift are also valid in the WACC context. In our March Cross-Submission we expressed already a rather sceptical view against any uplifting approach. These arguments are still valid without reservation and have to be considered alongside this submission.

2. Despite our general sceptical view regarding any justification of an TSLRIC uplift, we regard the Commission's framework as a useful and appropriate tool to analyse the welfare implications of an TSLRIC uplift. We will, nevertheless, remind the Commission of some missing elements in its framework and propose to change certain parameters.

3. Our general reservation on an uplift approach follows from the fact that it leaves the orthodox understanding of implementing TSLRIC and goes beyond that. Regulators usually do not use TSLRIC pricing to follow public policy objectives other than efficient pricing. The Commission also has to ask itself whether its (potential) price uplift approach with the intention to foster migration to fibre is coherent with consumer sovereignty. What brings the Commission to the judgement that a faster track to fibre networks is more to the long-term benefit of end-users than the path which users decide by their day-to-day subscription decisions themselves? Which indications does the Commission have that the principle of consumer sovereignty fails in this particular case?

Framework for uplifting the WACC

4. The Commission does not demonstrate in its framework which investments should be further incentivised by uplifting the WACC and therefore by artificially increasing UCLL and UBA wholesale prices. The potentially relevant investments to be impacted which might generate innovation potential are the following ones:

    - Further investment in the legacy copper access network.
    - Investment in Chorus' UFB network.
    - Investments of the other LFCs in UFB.
    - Investment in UFB 2.

- Bypass investment in duplicative fibre infrastructure.
- Investments by cable TV networks.
- Investments in LTE networks.
- Investments of RSPs in innovative services and applications.

We show in our submission that fostering innovation in the legacy copper network will be counter-productive for fostering fibre migration. There is no need to incentivise UFB 1 investments because they are committed and contracted already. The decision for UFB 2 investment will mainly be driven by the subsidy scheme and not by the UCLL WACC. Incentivising bypass investment will not be coherent with prevailing economics of scale in New Zealand and Governmental subsidies and would in the end be inefficient.

5. In the structurally separated market structure of New Zealand most of the service innovations making the use of fibre networks attractive to users are not conducted by Chorus or the LFCs but by the RSPs and OTT players. Any Section 18 consideration has to take this New Zealand reality into account. Increasing UCLL prices does not improve the ability of RSPs to invest in innovative services. Quite the opposite. Margins of the RSPs may be negatively affected furthermore, if increased retail prices due to a UCLL price uplift lead to lower broadband penetration. The investments of RSPs in ADSL and VDSL are sunk. If demand decreases due to artificial price increases they directly face a compression of margins. The Commission's approach runs the risk that the investments in innovative services may be negatively affected. Those services are, however, one of the major factors which incentivise users to migrate to superfast broadband.

6. The discussion of investment incentives in New Zealand so far has neglected a major asymmetry between Chorus and the RSPs. Chorus is lucky to face a quasi-monopolistic market position in more than 80% of its business. Any uplift of the WACC and the resulting wholesale price increase will increase profits of the company. Increased profits may increase investment incentives. There is, however, no control by market forces that this will actually be the outcome. There is also no regulatory control mechanism in place which guarantees or controls that the market behaviour intended by the regulatory intervention actually occurs. The monopolistic market position of Chorus enables Chorus' management to decide how to spend additional profits from increased wholesale prices with complete discretion. The management can foster investment – as the regulator intends. The management can also foster the investment in the copper network in those areas where other LFCs than Chorus are active, thus enforcing the copper versus fibre competition to the detriment of the other LFCs. The management may, however, also decide to pay such windfall profits as dividends (or other benefits) to its share-

holders. In that case any uplift only becomes a redistribution of wealth from end-user to Chorus' shareholders with no positive efficiency implications. RSPs are in a different position compared to Chorus. They operate in a competitive market environment. If RSPs receive more financial flexibility from regulatory decisions than they had before, competition guarantees users to receive the benefits of this financial flexibility. This can be in the form of lower retail prices. Or it can be in the form of investments in innovative services and applications. The competitive process decides in which form such benefits are passed-through to end-users. The competitive process also guarantees that increased financial flexibility of RSPs cannot be simply passed-through to their shareholders as in the case of Chorus.

7. The TSLRIC concept is consistent with determining the cost of services for which there is a manifest demand and for which the corresponding infrastructure has to be put in place. Here it would be the question of allowing operators to invest in innovative networks, technologies or services which are not needed by the service for which this demand exists. It would actually be investment into the *creation* of new services for which users of the existing regulated services would be required to pay, a clear case of cross-subsidisation. It is obviously the task of investors to provide the funding for such innovations and not of users which do not demand that service.

Framework for uplifting the TSLRIC price

8. The Commission's own demand study shows, consistent with demand studies in other jurisdictions, that there is an impact of price on fibre take-up, but other factors like service availability and content seem to be more important. Most of the differentiating demand factors for superfast broadband are, however, already provided by VDSL or even ADSL. The incremental benefit of fibre remains small in New Zealand.

9. According to our interpretation of available demand studies, a cross-price elasticity of demand for fibre of 1.2 as assumed by the Commission is too high. Half that value seems to be more appropriate.

10. The Commission does not provide any evidence to which services network externalities for fibre are related. Downloading, the most important broadband application, is not related to communications or network externalities. If the analogy to the mobile network externality surcharge in the context of termination rates holds (which we doubt), then the Commission in its own logic could only use a fraction of a 2% value as the proper proxy for externalities in broadband access and not a multiple of it.

11. The Commission's framework is missing certain aspects and elements which have an impact on the result and which have to be included in a comprehensive analysis:

    - There is reason to assume that an increase of copper-based retail prices will also induce an increase of fibre retail prices. This effect will jeopardise at least partially any welfare gain from an increased fibre up-take.
    - There are supply-side constraints due to the coverage deployment of fibre. We propose to take this constraint into consideration by weighting the cross-elasticity of demand by the degree of UFB coverage.
    - Switching costs of customers need to be taken into consideration.
    - Artificially fostering fibre migration will cause negative externalities for subscribers remaining on copper-based services.
    - Introducing a migration tax to copper-based services will negatively impact penetration which has a negative welfare effect and which needs to be taken into consideration.
    - Given the uncertainty of the parameters of the welfare model, the Commission can only draw conclusions from its welfare analysis, if it applies a relevant confidence interval to its calculated values.

A broader framework

12. Although the Commission can directly only influence the UCLL and UBA wholesale prices to foster migration, it has to bring this measure into perspective to other measures which might be more effective to pursue this public policy objective and cause less welfare losses.

13. First of all, the Commission has to be aware of the fact that the reference point for a migration neutral UCLL price is not the TSLRIC price as calculated by the Commission's model. As Ingo Vogelsang has already pointed out, a migration neutral reference point for UCLL would be a price which is based on a TSLRIC calculation which allows for the re-use of assets and which is then reduced by the performance delta between UFB-based and copper-based services. On the basis of a rough and indicative calculation of the impact of re-use of asset and the performance delta between copper and fibre we conclude that on the basis of current cost calculations of the Commission (which are according to our February Submission much too high) a proper migration neutral reference UCLL price point would be $ 18.55. About $ 10 of a UCLL price of $ 28.22 would have in other terms already to be regarded as a contribution to incentivising migration to UFB.

14. According to the Commission's concept the proceeds of the migration tax would automatically flow to Chorus. It is neither obvious nor efficient that the proceeds of a tax which should incentivise users to move to a higher quality level product should flow to the owner of the legacy infrastructure. Besides building the fibre network Chorus can do nothing to motivate users to use the fibre network instead of using the copper access network. This is basically the job of the RSPs. Handing over the proceeds to Chorus therefore is just a transfer of wealth from end-users to Chorus but does not generate any incentive effect with regard to enhancing the uptake of fibre. If the migration tax is introduced, proceeds should therefore be used to positively influence migration.

15. According to the Commission's framework all fixed line users which use the legacy copper access network shall be subject to a migration tax. This includes broadband users and users of the PSTN (only). It includes users in the UFB coverage areas and those outside the UFB coverage areas. This is not justified and not efficient.

16. The migration concept of the Commission has negative distributional effects. This is critical with regard to its digital divide implications. Given the high relevance of avoiding a digital divide in New Zealand as a public policy concern and goal, the Commission cannot (totally) ignore distributional impacts in its welfare analysis.

17. There are more targeted, more effective and more welfare enhancing alternatives to a migration tax when it comes to fostering fibre migration. Such measures include:

    - Lowering fibre prices,
    - Incentivising RSPs to migrate customers,
    - Subsidising users,
    - Switching-off the copper network.

18. The intended migration tax does not only seem to be an ineffective measure. The welfare framework provided by the Commission also indicates that the TSLRIC uplift will also generate a net welfare loss because of its collateral damages. Even the parameter set of the Commission indicates that it is rather difficult to generate a positive net welfare gain. Our analysis of these parameters clearly indicates that they have to be modified with the result of definitively achieving negative welfare effects. The results would even become more negative if certain missing elements of the Commission's framework would be included in the analysis such as induced higher fibre prices, negative effects on broadband penetration and supply-side constraints just to mention the most obvious examples.

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. In this context we have been asked to provide an opinion on the Commission's framework for considering an uplift to the TSLRIC price and/or the WACC which is described in the Commission's document of 2 April 2015. Nevertheless, this submission is brought to the attention of the Commission as an independent expert report.

20. This submission provides a more detailed analysis of the Commission's framework for uplifting the TSLRIC price. Our analysis and comments regarding a potential uplift of the WACC are more general at this stage because this concept seems to be less clearly specified by the Commission than it should be to give a final assessment. Nevertheless, because in the end both uplifting concepts are reflected in a wholesale price increase, major parts of the arguments related to an TSLRIC price uplift are also valid in the WACC context.

21. In our March Cross-Submission we already expressed a rather sceptical view against any uplifting approach. These arguments are still valid without reservation and have to be considered alongside this submission.

22. This submission does not deal with the CEG modelling approach to reflect welfare effects.[1]

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

    a) **Chorus, February Submission** stands for: Submission of 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.

    b) **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.

    c) **WIK-Consult, March Cross-Submission** stands for: Cross-Submission in response to the Commerce Commission's "Draft pricing review determination for Chorus' unbundled bitstream access service" and "Draft pricing re-

1 CEG, Welfare effects of UCLL and UBA uplift, March 2015.

view determination for Chorus' unbundled copper local loop service" including the cost model and its reference documents, 19 March 2015.

d) **Commission, Uplift paper** stands for Commerce Commission, Agenda and topics for the conference on the UCLL and UBA pricing reviews, 2 April 2015.

2 General aspects of the Commission's framework for considering an uplift to the TSLRIC price and/or to the WACC

2.1 Intention of the Commission

24. The Commission has developed and presented analytical frameworks for considering an uplift to the TSLRIC price and/or the WACC in its agenda paper from 2 April 2015. More precisely, the Commission is considering whether or not an adjustment would be justified to its central estimate of the TSLRIC-based price for UCLL and/or its central estimate of the WACC for UCLL and UBA to give best effect to section 18. Should a departure be made to promote competition for the long-term benefit of end-users (LTBEU)?

25. The potential uplift to the TSLRIC-based UCLL price would be intended to speed migration of customers from copper-based broadband services to fibre-based services. The framework provides a (rather) rough cost benefit analysis which examines potential benefits that might arise from faster migration of customers and the increased costs which are associated to higher prices for those customers which do not migrate.

26. A potential uplift of the WACC relates primarily to investment effects. The Commission expects potential benefits to reducing the risk of delaying investment in new innovative technologies. It remains unclear which investments and investments in which areas of the telecommunications market the Commission intends to incentivise additionally. Some wording in the framework paper suggests that it is not a specific investment which should be incentivised but the Commission seems to send *"... the potential signal ... to investors in telecommunications services more generally*."[2] We will analyse this aspect in more depth in Section 3.2.

2.2 Differences and commonalities

27. The Commission states that it recognises the need to avoid double-counting the same effects.[3] Analytically the Commission's framework identifies the migration and the investment effects separately. The Commission records that it ensures that any relevant linkages are recognised. Effectively, we could not observe in the framework that the Commission actually satisfies this intention and requirement.

28. The Commission may pursue different intentions with a potential uplift of the WACC and a potential uplift of the TSLRIC-based UCLL price. The approach and concept which the Commission seems to have in mind, mostly does not make the

2 See Commission, Uplift paper, para. 33.
3 See Commission, Uplift paper, para. 32.

implementation of each distinguishable. Any increase of the WACC leads to an increase in the "TSLRIC" price for UCLL and UBA. The only difference to uplifting the UCLL price is that this approach does not impact the (incremental) UBA price. Because of the combination of both prices to generate the wholesale bitstream access price effectively the result remains the same. It remains a parameter question on the two uplift concepts to what extent they are in the end quantitatively balanced.

29. We will show in Section 4.3.2 that there are very good reasons to make the two uplift concepts much more distinguishable. The migration target intends to incentivise a certain behaviour of users. The investment target aims at incentivising a certain investment behaviour of operators. These major conceptual differences can and for efficiency reasons should require different implementation frameworks to become effective and efficient.

2.3 Public policy objectives and user sovereignty

30. In its revised draft UCLL Benchmarking Decision of 4 May 2012 the Commission stated:

> "*The purpose of the Act is to promote competition in telecommunications markets, not to promote take-up of a particular technology over another.*"

If this statement describes a relevant policy position of the Commission, this would not be consistent with any uplift approach. It is of course up to the Commission to change its interpretation of the statutory provisions which inform and guide its decision framework. Regulatory predictability, however, remains an important principle for making efficient forward looking decisions of market participants. Nevertheless, fostering a particular technology by regulatory means raises some general issues and implications the Commission should be aware of.

31. First of all, it has to be stated that spillover effects on other markets and the economy at large and externality effects are definitely not part of a correctly measured TSLRIC. Ingo Vogelsang expresses concerns whether such considerations are being in the LTBEU for benefits that not directly accrue to consumers when he argues: "*It becomes somewhat of a stretch for spillovers to the economy in general such as productivity effects from the internet. Such spillovers should therefore be the concern of explicit subsidies or other policies than the TSLRIC determination.*"[4] One may argue that the governmental interventions in New Zealand in favour of the UFB including the public capital contributions reflect the value of these

4 I. 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. 18.

macroeconomic spillover effects. This would at least represent rational political choice and justification of the (relatively strong) intervention. From that perspective Ingo Vogelsang concludes: "*A decision not to consider such spillover effects therefore has good justification.*"[5] We fully share this view.

32. It is in the end a legal question whether or not the Commission is entitled to follow and include in its regulatory pricing decisions public policy objectives which go beyond its statutory mandate. From our economic perspective we cannot contribute much to the legal part of this question. Nevertheless, we have to state that the Commission's uplift framework in any case leaves the orthodox understanding of implementing TSLRIC and goes beyond that. Regulators usually do not use TSLRIC pricing to follow public policy objectives other than efficient pricing.

33. The Commission also has to ask itself whether its (potential) price uplift approach with the intention to foster migration to fibre is coherent with consumer sovereignty. What brings the Commission to the judgement that a faster track to fibre networks is more to the long-term benefit of end-users than the path which users decide by their day-to-day subscription decisions themselves? Which indications does the Commission have that the principle of consumer sovereignty fails in this particular case? Normally a market failure has to be identified before intervention and deviations from basic economic principles is justified. If consumers are not informed enough to make the right choices than the intervention first of all should be to provide appropriate information to improve the quality of consumers' decision making before more far reaching interventions might be envisioned or even justified.

5 I. Vogelsang, What effect would different price point choices have on achieving the objectives mentioned in s.18, the promotion of competition for the long-term benefit of end-users, the efficiencies in the sector, and incentives to innovate that exist for, and the risks faced by investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services?, 5 July 2013, para. 46.

3 Framework for uplifting the WACC

3.1 The Commission's formal approach of the framework

34. For presenting its framework for considering an uplift to the mid-point of the WACC estimate, the Commission starts out stating that "(t)his paper does not analyse whether we should depart from the mid-point WACC estimate. Rather, a possible quantitative framework is developed to inform our thinking regarding the extent of any WACC uplift, in case we ultimately decide that an uplift is appropriate".[6] In Attachment C the Commission then proceeds to formulating a mathematical model that is supposed to give expression to this quantitative approach. Given this emphasis, it is clearly important to make sure that this quantitative model properly states what a WACC uplift Is expected to bring about in terms of benefits and costs. This is being verified in what follows. The result is that the Commission's model is quite abstract and even at this level of abstraction fails to express the proper relationships. We develop here an approach in which the relevant relationships are clearly presented.

35. Using again the words of the Commission, the model seeks "to minimize the direct cost to consumers of an uplift to the mid-point WACC plus the probability-weighted annualised cost to consumers resulting from under-investment (if the allowed WACC is too low)".[7]. For this the following equation is formulated:

$$Min \rightarrow f(w) = RAB * (w - w_0) + c * \left(1 - CDF(w)\right) \qquad \text{(A1)}$$

where

RAB	=	the value of the regulatory asset base
w	=	the allowed WACC, which is required to be greater than or equal to the mid-point WACC estimate to ensure a reasonable expectation of a normal return
w_0	=	the mid-point WACC estimate, which is treated as a constant
c	=	the annualised net cost to consumers resulting from under-investment if the allowed WACC is below the 'true' WACC
CDF(*W*)	=	the cumulative distribution function of the WACC, which is the probability that the 'true' WACC is less than the allowed WACC

6 See Commission Uplift paper, para. 80.
7 See Commission Uplift paper, para. 106.

(We give this equation and the following one a number preceded by "A" to indicate that it is an equation from the Attachment and to set them apart from those of our own analytical approach farther down).

36. Equation (A1) is then minimized by differentiating it with respect to *w*, the resulting equation is set to zero and from this the following solution is obtained:

$$PDF(w) = \frac{RAB}{c} \qquad \text{(A3)}$$

where

PDF(*w*) = the probability density function of the WACC

Note that the *PDF*(*w*) is obtained when the *CDF*(*w*), the cumulative density function of the WACC, appearing in equation (A1), is differentiated with respect to *w*.

37. In respect of equations (A1) and (A3), several observations are in order, of which in particular the last one highlights a rather fundamental flaw in the Commission's model:

- Formulating the problem as that of the minimisation of a cost function is a bit unusual. Normally, one would have expected that a surplus function be formulated in which the annualised net surplus to consumers resulting from a reduction of under-investment is maximised. As said, this is a bit unusual but not objectionable per se.

- The problem is formulated in a very reduced and stylised way. All costs except the capital cost caused by the WACC uplift are disregarded. Further, it is implicitly assumed that the extra cost brought about by the WACC uplift is transformed one-to-one into the prices for services. In other words, it is assumed that, if there is a WACC uplift, the prices that users pay for services are increased in such a way that the total increase of users' expenses exactly equals the total increase in cost due to the WACC uplift, and consumers are prepared to pay these higher prices because of the benefits due to the innovation. With this assumption, a formulation in terms of an explicit market model of demand for and supply of these innovative services is avoided. For beginning to establishing a relationships between a WACC uplift and its effects, this may be sufficient, but for any uplift that might possibly be instituted, a demonstration of such effects in terms of a market model concretely deriving the surplus created thereby would be necessary.

- Under this bullet we discuss the objectionable features of the model: In equation (A1), the cost *c* to consumers due to under-investment is multiplied by the term (1-*CDF*(*w*)). Why this is done completely unintelligible. According to the description of the problem in plain English (as opposed to in the

equation), the probability-weighted annualised cost to consumers of under-investment is due to a regulatory asset base, *RAB*, that is too low because of too low a WACC. If this is to be transformed into a mathematical expression, then *RAB* must be made to depend positively on (w-w_0) – positively, because with higher w, *RAB* would supposedly increase – and c to depend negatively on *RAB* – negatively, because with higher *RAB*, under-investment would decrease and with it its cost to consumers. If one wanted to bring in a probability that there is a major innovative new technology in prospect, this could be included by multiplying the additional *RAB* that would be necessary to bring forward the corresponding services, by a parameter p that expresses that probability. Perhaps, the terms (1-*CDF*(w)) in equation (A1) and *PDF*(w) in equation (A3) are meant to express this probability. But that cannot be, since the density functions *CDF*(w) and *PDF*(w) represent the uncertainty due to measurement errors when determining w_0, the original mid-point WACC value. The corresponding probability that due measurement errors w lies at a certain distance from w_0, is completely different from the probability that a major new innovation may occur.

Given the assessment of the Commission's model in the last bullet, we refrain from considering its further developments in the remainder of Attachment C. Instead we proceed to a reformulation of the model and the corresponding solution.

38. For this we write instead of equation (A1) the new equation

$$Min \rightarrow f(w) = RAB(w - w_0) * (w - w_0) + c(RAB) \qquad (1)$$

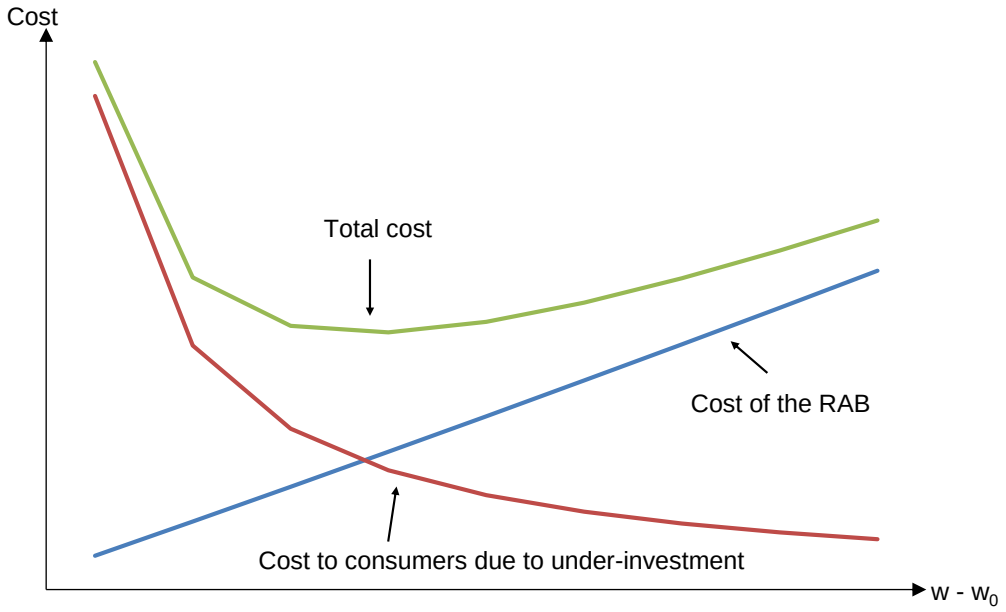
where the term (1-*CDF*(w)) is omitted, *RAB* is made a function of (w-w_0) and c is made a function of *RAB*. Note that it is assumed that c decrease with increasing RAB, i.e. that dc/d*RAB* < 0, since the cost of underinvestment is reduced through an investment caused by new innovations which leads to additional *RAB*. Written this way, equation (1) reflects the description in the Commission's text.

For minimizing equation (1), we rewrite it a bit further to make it more amenable to an interpretable solution. The variable c is now defined as the cost in terms of utility forgone due to under-investment, not as the latter's net cost, and the investment for reducing the under-investment, leading to additions to the regulatory asset base, i.e. RAB_a, and the corresponding cost, are shown as separate items. Further the extra cost of the WACC uplift is applied to the original regulatory asset base, RAB_0. Finally, c is functionally shown to be dependent on the additional RAB_a, since its reduction obviously requires a higher level of investment (a higher RAB_a), and RAB_a is shown to be dependent on w-w_0. So instead of equation (1) we get

$$Min \rightarrow f(w) = RAB_0 * (w - w_0) + w * RAB_a(w - w_0) + c[RAB_a(w - w_0)] \qquad (1')$$

39. We will derive the mathematical expression for the solution to equation (1') farther below. Here we present the solution in Figure 3-1 in graphical form, which is equivalent but easier to understand by the mathematically uninitiated. We also provide the interpretation of the results using Figure 3-1.

Figure 3-1: Graphical description of the solution to the cost minimisation problem in equation (1')



Source: WIK-Consult

There are three curves in the figure, each of which represents one of the terms in equation (1'), i.e. the total cost, $f(w)$, the cost due to the regulatory asset base needed to produce the relevant services, w^*RAB_a plus the cost due the uplift being applied to the old asset base, $(w-w_0)^*RAB_0$, and the cost to consumers due to under-investment if the WACC is too low, $c[RAB(w-w_0)]$.

40. It is clear that the cost of the regulatory asset base will steadily increase when w gets larger and larger, as then both the old and the additional *RAB* are causing additional cost. The cost to consumers resulting from under-investment, however, will decrease when w gets larger, as then this very under-investment is diminished. In the graph, it is assumed that the decrease in this cost is first quite strong and then peters out as the prospects of new innovations become fewer. Adding the two costs gives the total cost curve that first decreases due to the impact of

diminishing under-investment and then increases as the benefits from more investment become less and the cost of the regulatory asset base becomes larger.

Obviously the solution to the problem is found at the lowest point of the total cost function *f*(*w*). The derivation leading to this result is provided for a given probability that a major investment occurs (not explicitly shown in the model). For higher or lower probability, the set of the three curves would move upwards or downwards but their shapes would remain the same and the location of the optimum would not move very much.

41. As stated at the beginning of this section, the Commission seeks to minimize the direct cost to consumers of the WACC uplift plus the cost to consumers resulting from under-invest. Above derivation shows what proponents of such an uplift need to demonstrate. They must not only show that there are prospects for innovations that would be brought about by a WACC uplift, but also that the resulting benefits to consumers are higher than the cost caused by them, in particular the additional cost due to the WACC uplift also being imposed on the legacy regulatory asset base.

As mentioned before, this would have to involve the demonstration of such effects in terms of a market model, showing the expected demand for services due to innovations, the concrete conditions of their supply and the consumer surplus created by them. We have grave doubts that the information and data for such a demonstration are available and would presume that any corresponding estimate would be ridden by great uncertainty. In this respect we would second the comments by Professor Vogelsang cited by the Commission to the effect that there is no empirical analysis to draw on and that any such analysis would be difficult and subject to considerable uncertainty.[8] We present a more detailed discussion of this point the following sections.

42. To complete the analysis, we turn now to the mathematical derivation of the solution. Differentiation of equation (1') with respect to *w* leads to

$$\frac{df(w)}{dw} = RAB_0 + RAB_a + w * \frac{dRAB_a}{d(w-w_0)} + \frac{dc}{dRAB_a} * \frac{dRAB_a}{d(w-w_0)} = 0 \qquad (2)$$

After a few rearrangements, equation (2) can be shown to be equivalent to the following conditions:

$$RAB_0 + RAB_a + \left[\left(\frac{w-w_0}{RAB_a}\right) * \left(\frac{dRAB_a}{d(w-w_0)}\right)\right] * \frac{w}{w-w_0} * RAB_a = \qquad (3)$$

$$-\left[\left(\frac{RAB_a}{c}\right) * \left(\frac{dc}{dRAB_a}\right)\right] * \left[\left(\frac{w-w_0}{RAB_a}\right) * \left(\frac{dRAB_0}{d(w-w_0)}\right)\right] * \frac{1}{w-w_0} * c$$

8 See Commission, Uplift paper, para. 44.

In equation (3) we recognize two elasticities which are easier to interpret than the derivatives in equation (2). These are $\varepsilon_{RAB,w\text{-}w0}$, the elasticity with which *RAB* reacts to *w*, shown in the square brackets on the left side and in the second square brackets on the right side, and $\varepsilon_{c,RAB}$, the elasticity with which *c*, the cost to consumers of under-investment decreases with an increase in *RAB*, shown in the first square backets on the right side. Making these replacements and rearranging, we obtain

$$w * RAB_a * \left[\left(1 + \frac{RAB_0}{RAB_a}\right) * \frac{w - w_0}{w} + \varepsilon_{RAB,w}\right] = -\varepsilon_{RAB,w} * \varepsilon_{RAB,w-w_0} * c \qquad (4)$$

which in turn can be rearranged to yield

$$\frac{-\varepsilon_{RAB,w} * \varepsilon_{RAB,w-w_0}}{\left[\left(1+\frac{RAB_0}{RAB_a}\right) * \frac{w-w_0}{w} + \varepsilon_{RAB,w}\right]} = \frac{w * RAB_a}{c} \qquad (5)$$

Equation (5) has some superficial similarity with equation (A3) in Attachment C, but of course the terms in the ratio on its left side are completely different. Instead of the ratio *RAB/c* being equated to some point on the probability density function of the original WACC, the ratio *w*RAB/c* is here equated to the ratio of terms representing the reactions of market participants to an uplift of the WACC in terms of the cost of additional investment and additional consumer benefits resulting therefrom.

43. It is equation (4) that lends itself readily to an interpretation. It shows the condition that is reached when further investment would not bring about any further net benefit but a net cost. The right side of (4) shows the increase in consumer benefit when the WACC is increased by one percent (note: not one percentage point) and the left side shows the increase in cost due to the same increase in the WACC, which includes that portion of the cost due to the WACC uplift also being applied to the old regulatory asset base. At the solution point these two expressions must be equal, in mathematical jargon, that is where the marginal benefit equals the marginal cost. The point corresponds to the lowest point on the total cost curve shown in Figure 3-1.

3.2 Which investments should be incentivised?

44. The Commission does not demonstrate in its framework which investments should be further incentivised by uplifting the WACC and therefore by artificially increasing UCLL and UBA wholesale prices. The potentially relevant investments to be impacted which might generate innovation potential are the following ones:

- Further investment in the legacy copper access network.
- Investment in Chorus' UFB network.
- Investments of the other LFCs in UFB.
- Investment in UFB 2.
- Bypass investment in duplicative fibre infrastructure.
- Investments by cable TV networks.
- Investments in LTE networks.
- Investments of RSPs in innovative services and applications.

We will discuss the rational and implications for each of these directions for sector investments with regard to innovation in the telecommunications sector.

45. The Commission[9] puts its WACC uplift framework in the context of CEG's arguments[10] that setting UCLL prices too low would weaken incentives for Chorus to maintain and invest in its copper network.

46. Major innovation trends are currently being implemented in the copper access network. Chorus also is arguing in favour of an WACC uplift to incentivise further investment into the copper access network. Two major innovation trends are at stake. Upgrading VDSL to VDSL/Vectoring will significantly increase the capability of VDSL both in speed and in quality. Download speeds can be upgraded up to 100 Mbps and upload speeds up to 40 Mbps. The avoidance of crosstalk significantly increases the utilisation and productivity of VDSL.[11] It increases bandwidth and coverage area due to increased line length for high bandwidth transmission, allows to fully load a cable up to 100% of copper pairs with broadband signals, significantly increases the minimum bandwidth per cable and at the same time significantly reduces the spread of maximum and minimum bandwidth between different customers, thus increasing bandwidth predictability. The incremental investment to introduce vectoring technology is rather limited in areas where cabinetised VDSL is already in place. It only requires an additional Vectoring processor per DSLAM, if the line cards and the CPE are already prepared for it, which might be quite likely because such equipment is already sold for some years now. The environment of introducing vectoring are rather favourable in New Zealand

9 Commission, Uplift paper, para. 17.
10 CEG, February Submission, para. 26.
11 Plückebaum, Jay, Neumann: Benefits and regulatory challenges of VDSL Vectoring (and VULA), EUI Working papers, RSCAS 2014/69, http://fsr.eui.eu/Publications/WORKINGPAPERS/ComsnMedia/2014/WP201469.aspx
Plückebaum, Jay, Neumann: Investment requirements for VDSL vectoring in Germany, Communications and Strategies, no. 93, 1st Q. 2014, pp. 141ff.

because of the quasi-monopolistic position of Chorus in running the access infrastructure. In New Zealand the potential impediment to introduce vectoring, namely the mutually exclusive interference of vectoring between two operators, does not exist in New Zealand so far. But subloop unbundling and using the subloops with VDSL2 by alternative operators also is no realistic perspective for the future.

47. The next upcoming innovation in the copper access network becomes the G.fast technology which will be commercially available later in 2015. G.fast will increase speeds to up to 1 Gbps (sum bandwidth for up- and download) for distances of up to 250 m remaining length of the copper cable. G.fast requires more investment than VDSL/Vectoring because fibre has to be deployed deeper into the network. On the other hand the performance increase is even more significant and comes close to that of fibre networks[12].

48. If Chorus would invest in these innovative upgrades of the copper network incentivised by the Commission it would jeopardise its own UFB investments. Upgrading the copper access network would make it less distinguishable from a fibre network. Services and qualities which can only be provided over the fibre network – and there are not too many of them – will then also be provided over the copper network. Demand studies show that the quality difference to copper services has a relevant impact on the decision to migrate to fibre. Investments to innovate within the copper network would be counterproductive for fostering migration to fibre. The incentives to migrate for users would even be discouraged and reduced. Investment incentives for the copper network can therefore not be intended by the Commission's framework.

49. A major dimension of investment incentive concern is the impact of the UCLL price of the legacy copper network on the incentives to invest in fibre networks. A bulk of literature starts from the typical European scenario of an integrated downstream and retail incumbent operator.[13] Some of these papers generate the result – without going into details – that under certain conditions increasing copper access prices may generate positive investment incentives for fibre networks.

50. The typical scenario of incumbent operators' incentives to invest in fibre as representative for Europe is not relevant in New Zealand for two reasons. Chorus is a structurally separated wholesale-only entity. Secondly, the fibre network invest-

12 It is above the GPION bandwidth per customer and at the lower edge of FTTH Point-to-Point bandwidth.

13 See for instance: Nitsche, R. and L. Wiethaus, Regulation and investment in Next Generation Networks: a ranking of regulatory regimes, International Journal of Industrial Organization 29, 2011, pp. 263-272; Cambini, C. and Y. Jiang, Broadband investment and regulation: A literature review, Telecommunications Policy 33, 2009, pp. 559-574; Briglauer, W., G. Ecker and K. Gugler, The impact of infrastructure and service-based competition on the deployment of next generation access networks: Recent evidence from the European member states, Information Economics and Policy, 2012; Bourreau, M., Cambini, C. and R. Dogan, Access pricing, competition, and incentives to migrate from "old" to "new" Technology, International Journal of Industrial Organization 30, 2012, pp. 713-723.

ments are settled in New Zealand. The Governmental UFB program has incentivised the fibre investments by financial capital contributions. The necessary investment to implement the 75% fibre coverage are contractually agreed and committed. Fulfilment up to 2020 is incentivised by a financial penalty system. Therefore there remains no economic function of wholesale copper access prices anymore to incentivise fibre investments. The corresponding investment gap as observed in many European countries does not exist in New Zealand.[14]

51. We have pointed out in our March Cross-Submission that Chorus' UFB investments are contractually committed and fixed. In the view of Ingo Vogelsang[15], which we fully share, those investments should not materially depend on the UCLL and UBA prices. By uplifting the WACC and the UCLL and UBA wholesale prices no further investments can be induced and expected.

52. Similar to Chorus UFB fibre investment the investments of the LFCs in their licence areas are committed and contractually settled. A WACC uplift has no impact on those decisions anymore.

53. The Government has announced to expand fibre coverage in New Zealand from 75% to 80% (UFB 2). Will a WACC uplift incentivise fibre investments in UFB 2? It is realistic to assume that the coverage areas of UFB 2 will be higher cost areas than the UFB 1 areas. Fibre investment in UFB 2 will therefore not be profitable for Chorus or its potential competitors in such investment.[16] Already to incentivise UFB 1 investments the Government had to provide a relevant amount of capital contribution. This will also be required to generate private investors' UFB 2 investments at all. This means that bidders for UFB 2 will make their decision to invest in UFB 2 dependent on the amount of subsidies received and not on the WACC calculation for the legacy infrastructure. If the Government follows a reversed auction approach for UFB 2 licences, this process will than generate the amount of subsidies required to incentivise (private) investments in UFB 2. A WACC uplift would bring a discriminatory element into the competitive bidding process, because Chorus is the only bidder who would benefit from price increases in the legacy infrastructure.

54. The economic peculiarities of New Zealand also do not cry for incentives to artificially engage in bypass investments to the UFB networks. If the ladder of investment concept has any meaning in New Zealand it might be relevant for alternative operators potentially moving from a Layer 2 bitstream access-based business

14 Carlo Cambini has also developed and supported this view in his paper for the Commission. See C. Cambini, Economics aspects of migration to fibre and potential welfare gains and losses from an uplift to copper prices, Paper prepared for the New Zealand Commerce Commission, 16 March 2015.

15 See I. 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. 25.

16 We refer to the fibre network profitability analysis of Network Strategies in their February Submission, Section 3.

model to a Layer 1 unbundling-based business model. Economies of scale and Governmental subsidies for UFB do not allow for efficiently replicating a fibre network in New Zealand. Incentives to invest in bypass infrastructure are therefore irrelevant in the New Zealand context or even inefficient.

55. Vodafone's cable networks are geographically limited to Wellington, Christchurch and Kapiti. If there were no UFB fibre networks in New Zealand an increase of the UCLL price above the corresponding TSLRIC would incentivise Vodafone to invest in its cable networks and to expand the footprint of the cable networks. Such a potential incentive is, however, totally dominated by available or upcoming UFB networks. As a consequence, any uplift of the UCLL price would not generate additional investment in cable networks.

56. In New Zealand as in many other countries mobile broadband access only seems to be a limited substitute to fixed line broadband access. Therefore, the cross-elasticity of demand for LTE products will be small in case of retail price increases of ADSL/VDSL-based broadband products. Mobile networks will be affected by a UCLL price increase only to a small extent. At the margin, nevertheless, there is some ability of mobile operators to increase LTE prices. Innovation, investment and prices in mobile markets will mainly be driven by competition in the mobile market. A potential effect of incentivising further investment due to UCLL price increases will be rather limited and small. And even if such incentive increases LTE demand, it also increases fixed network demand due to the typical mobile data WiFi offload in home and office environments.

57. It is important to note that Section 18 (2A) specifies that the considerations of Section 18 apply to incentives to innovate in new telecommunications services that involve significant investment and that offer capabilities which are not available from established services. This statutory language does not only consider investment in network infrastructure. It seems even more focussed on investment in innovative services. The network infrastructure may be regarded as a prerequisite for innovation in services, but innovation is definitively not limited to or even concentrated in the network infrastructure. Services which make the use of superfast broadband access attractive to users require complementary investment in layers of the network not provided by the Layer 1 or Layer 2 level of the network, but in Layer 3 equipment and traffic control systems (i.e. IMS) and in service creation and deployment.

58. In the structurally separated market structure of New Zealand most of the service innovation making the use of fibre networks attractive to users are not conducted by Chorus or the LFCs but by the RSPs and OTT players. Any Section 18 consideration has to take this New Zealand reality into account. Increasing UCLL prices does not improve the ability of RSPs to invest in innovative services. Quite the opposite. Insofar as RSPs are unable to pass-through the wholesale price in-

crease in total to their retail prices, their margins will be negatively affected and as a consequence their ability to invest in innovative services and applications. The welfare analysis of the Commission assumes a 100% pass-through of wholesale price changes to the retail price level. This assumption is not supported by market developments in New Zealand in all respects. The market reactions following the publication of the Commission's Draft Determination in December 2014 indicate that at least not all RSPs had been able to pass-through the wholesale price increase to their end-users. Margins of the RSPs may be negatively affected furthermore, if increased retail prices due to a UCLL price uplift lead to lower broadband penetration. The investments of RSPs in ADSL and VDSL are sunk. If demand decreases due to artificial price increases they directly face a compression of margins.

59. The Commission's approach runs the risk that the investments in innovative services may be negatively affected. Those services are, however, one of the major factors which incentivise users to migrate to superfast broadband.

3.3 Whose investment to be incentivised?

60. We have shown in the previous section that the Commission's WACC uplift approach may affect various types of investments in the complex system of telecommunications networks and services. Furthermore, an uplift might generate positive incentives for some type of investments and negative incentives for other types of investments. Therefore, the analysis of investment incentives is complex and the results are not as easy and obvious as often assumed. Some investment incentives might even be counterproductive in fostering migration to fibre networks. It can also not be excluded that uplifting the WACC does not induce further investments at all because the drivers of the relevant investment decisions are others than the WACC. On the other hand, the negative consumer welfare effects occur anyhow in the same way as in the case of the migration tax of uplifting the TSLRIC price as we will discuss in Section 4 of this submission. This complex system of effects does not exclude the scenario that a WACC uplift will generate negative consumer welfare effects. We draw from such collateral implications of regulatory interventions the very clear message which we recommend to regulators as a general philosophy: It is not the job of regulators to promote certain investments, certain market players, certain business strategies and business models. Such discretionary interventions distort competitive market outcomes and are usually not consistent with and do not support economic efficiency. Regulators should be neutral with regard to type of investments in the sector and business models.

61. To demonstrate the collateral problems and distortions of artificial interventions we want to bring to the attention of the Commission an asymmetry between Cho-

rus and the RSPs (and eventually further market players) which has been (totally) neglected in the New Zealand discussion on investment incentives so far.

62. The Commission analysis – as well as Chorus' arguments in this context – seem to suggest that increasing the financial capability of an operator by increasing regulated wholesale prices will automatically increase the investment level of that operator. Why should that be the case? Chorus is lucky to face a quasi-monopolistic market position in more than 80% of its business. Any uplift of the WACC and the resulting wholesale price increase will increase profits of the company. Increased profits may increase investment incentives. There is, however, no control by market forces that this will actually be the outcome. There is also no regulatory control mechanism in place which guarantees or controls that the market behaviour intended by the regulatory intervention actually occurs. The monopolistic market position of Chorus enables Chorus' management to discretionary decide how to spend additional profits from increased wholesale prices. The management can foster investment – as the regulator intends. The management can also foster the investment in the copper network in those areas where other LFCs than Chorus are active, thus enforcing the copper versus fibre competition to the detriment of the other LFCs. The management may, however, also decide to pay such windfall profits as dividends (or other benefits) to its shareholders. In that case any uplift only becomes a redistribution of wealth from end-users to Chorus' shareholders with no positive efficiency implications.

63. Chorus itself highlights that the regulatory process so far has motivated the management to suspend payment of dividends to shareholders.[17] This is unusual for a company generating a level of profitability as high as Chorus and which we have described in detail in our March Cross-Submission.[18] It may well be the case that Chorus might return to a dividend payment plan once final prices have been established for UCLL and UBA.

64. RSPs are in a different position compared to Chorus. They operate in a competitive market environment. If RSPs receive more financial flexibility from regulatory decisions than they had before, competition guarantees users to receive the benefits of this financial flexibility. This can be in the form of lower retail prices. Or it can be in the form of investments in innovative services and applications. The competitive process decides in which form such benefits are passed-through to end-users. The competitive process also guarantees that increased financial flexibility of RSPs cannot be simply passed-through to their shareholders as in the case of Chorus.

65. The Commission should be aware of this asymmetry between Chorus and the RSPs when it decides on its parameters to determine TSLRIC and on any uplift. If

17 See Chorus, March Cross-Submission, para. 33 and Chorus, February Submission, para. 69.
18 WIK-Consult, March Cross-Submission, Section 2.6.1.

RSPs get more financial flexibility competition assures that such benefits are used in the LTBEU. If the Commission provides more financial flexibility to Chorus, the Commission has no such guarantee. It fully depends on whether or not Chorus' management itself acts in the LTBEU or in the interest of its shareholders.

3.4 Who should bear the cost of investment?

66. The Commission's approach of intending to incentivise investment in innovative new telecommunications services raises some more principal and conceptual issues and concerns. The orthodox approach of TSLRIC – which the Commission intends to follow and apply – requires to set a price for a particular regulated service. A TSLRIC price guarantees that the necessary investment of producing that particular service are economically awarded appropriately. Users of that particular services are requested to pay the "true" economic cost of producing that service. It is part of the definition of TSLRIC that only users of the regulated service ("the relevant demand") should pay for producing the relevant quality and quantities of the regulated service and nobody else. Another definitional aspect of TSLRIC is that users of the regulated service should pay for the production of that service and not for other services. Application of the MEA concept guarantees that TSLRIC is not a static but also a dynamic concept which appropriately takes into consideration the innovative change of the regulated service and the corresponding technological progress.

67. If the regulated firm decides to build its network such that it is capable of producing not only the regulated service but also unregulated services which are demanded today or tomorrow the TSLRIC concept does not allow for users of the regulated service to pay for the additional investment to generate the capabilities of the unregulated services, even if that would be a "innovative service". The regulated firm has to allocate these incremental invest to the unregulated service(s) even if these services will only represent demand in the future. Otherwise, users of regulated services would subsidise users of unregulated services. Some regulators in that case even no longer allocate the costs of the regulated service on a stand-alone cost basis. By following the "total service" aspect of TSLRIC they allocate the shared and joint cost of certain network elements between the regulated and the unregulated service. Whether or not that is justified depends in our view on whether or not it can efficiently be expected that the HEO produces other services than the regulated service on a stand-alone basis.

68. The TSLRIC concept is consistent with determining the cost of services for which there is a manifest demand and for which the corresponding infrastructure has to be put in place. Here it would be the question of allowing operators to invest in innovative networks, technologies or services which are not needed by the service for which this demand exists. It would actually be investment into the *creation* of

new services for which users of the existing regulated services would be required to pay, a clear case of cross-subsidisation. It is obviously the task of investors to provide the funding for such innovations and not of users which do not demand that service.

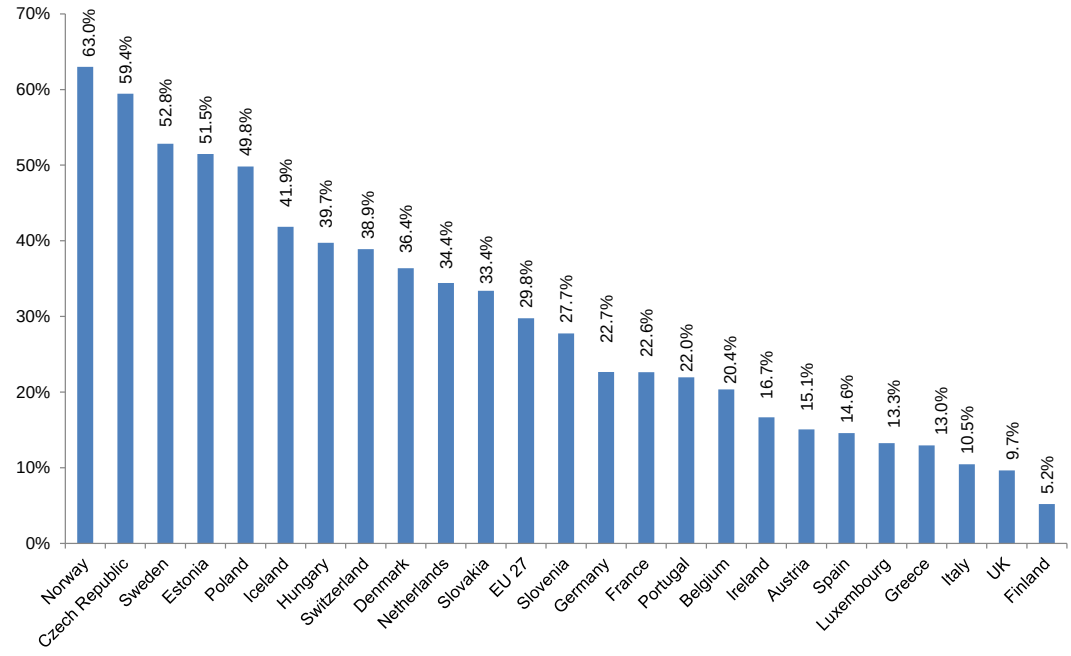
4 Framework for uplifting the TSLRIC price

4.1 What drives fibre take-up?

4.1.1 Some study results

69. It is a worldwide reality that not only FTTP penetration rates vary significantly from 0% to more than 25%. It is even more astonishing that the FTTP take-up rates spread even more. In a WIK study focussing on Europe the WIK researchers identified FTTP take-up rates which ranged from 5.2% at the low end (in Finland) and 63.0% at the high end (in Norway).[19] Figure 4-1 shows these take-up rates for a variety of countries between these extreme values with an average rate of 29.8%. The current take-up rate in New Zealand of 13.8%[20] falls below this European average uptake rate.

Figure 4-1: FTTP take-up rates in selected European countries



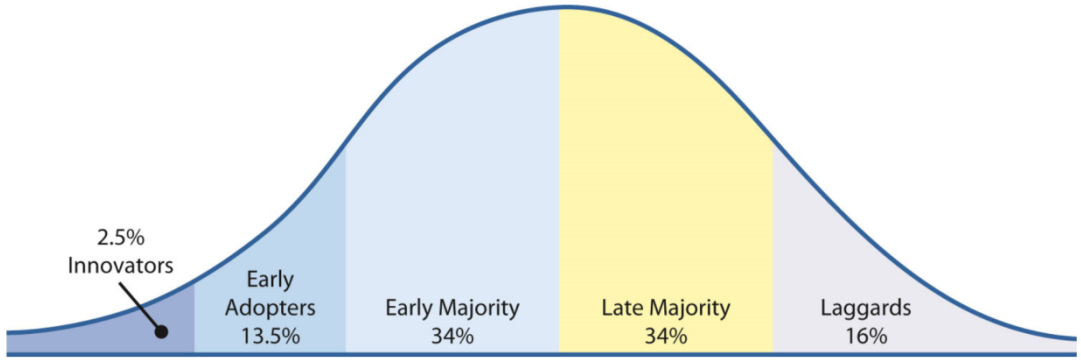
Source: Arnold/Tenbrock (2014)

19 See Arnold, R. and S. Tenbrock, Bestimmungsgründe der FTTP-Nachfrage, WIK Diskussionsbeitrag Nr. 387, August 2014.

20 See Ministry of Business, Innovation & Employment, Broadband deployment update, March 2015.

70. On the basis of quantitative analysis and case studies the aforementioned study shows that there is an impact of relative DSL and FTTP retail prices on FTTP take-up, but the impact is limited. The impact of relative prices becomes more important in case of intermodal competition between FTTP and cable. The study also shows that time is one of the most important factors to explain take-up. FTTP take-up reveals the typical pattern of diffusion curves as presented in Figure 4-2. There is some management of that cycle possible but only to a limited degree.

Figure 4-2: Phases of a typical diffusion process

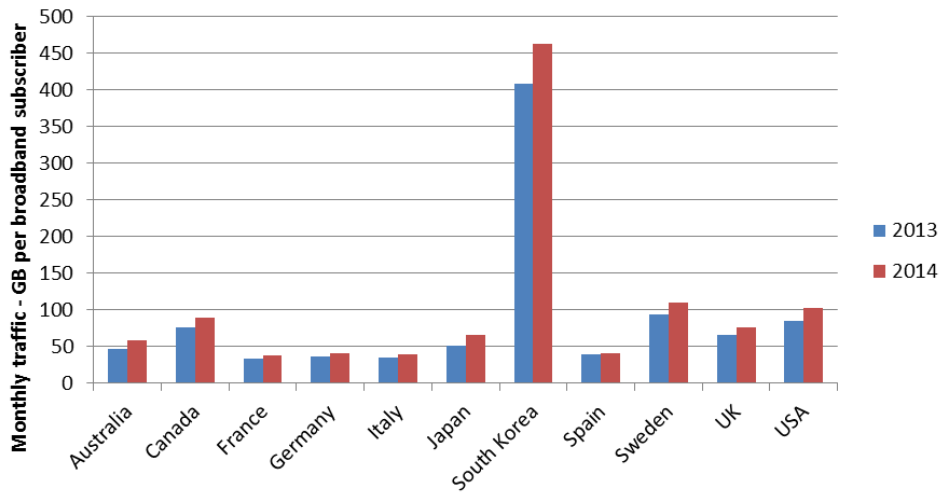


Source: According to Rogers, Diffusion of innovations, 1962

71. In a study for the European Parliament in 2013 WIK made the important observation that speed does not necessarily equate to usage.[21] Figure 4-3 shows those findings on fixed data usage including an update for 2014. Japanese consumers use less bandwidth than those in the UK and in the US despite having apparently higher broadband speeds. Data usage in France, Germany and Spain has been consistently low despite reasonable speeds, while Australian usage is higher than would be expected given relatively low speeds and NGA diffusion (yet). Only in the case of South Korea high speed availability goes hand in hand with a high usage rate. As a consequence, increasing demand for higher usage and services which induce higher usage will not necessarily increase demand for higher broadband access speeds or not to the same extent.

21 See WIK-Consult, How to Build a Ubiquitous EU Digital Society, Study for Directorate General for Internal Policies of the European Parliament, IP/A/ITRE/ST/2012-09, November 2013.

Figure 4-3: Fixed data usage per broadband subscriber



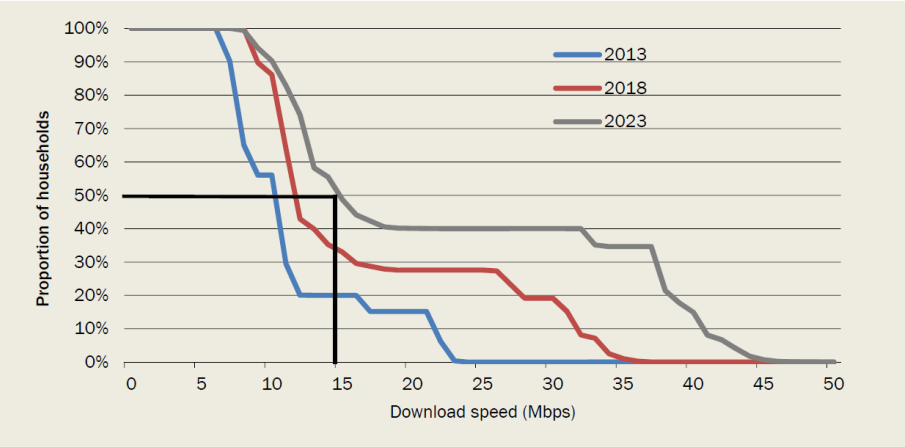
Source: WIK-Consult, based on CISCO, VNI Forecast Widget

4.1.2 Some examples

72. The cost benefit analysis (CBA) of the Vertigan report in Australia[22] also reveals a demand pattern for broadband speeds which has relevance for New Zealand. Figure 4-4 shows the "technical" demand projections underlying the CBA of the Vertigan report. According to this report the median household (the 50% proportion of households) will require bandwidth of 15 Mbps in 2023. The top 5% of households have demand of 43 Mbps or more. These numbers look rather low compared to other approaches and studies.

22 See Vertigan Commission, Independent cost-benefit analysis of broadband and review of regulation, Volume II – The costs and benefits of high-speed broadband, August 2014.

Figure 4-4: Technical household demand for speed



Note: these results are presented on a '4 minute excluded' basis: that is the bandwidth required to service all but the 4 busiest minutes in the month. The Communications Chambers report provides significant sensitivity analysis around this assumption.

Source: Vertigan Report, Volume II, p. 34.

4.1.3 The New Zealand environment

73. The studies mentioned in Sections 4.1.1 and 4.1.2 indicate a broad range of diverse effects of fibre uptake and a broad range of demand reactions. This indicates that it is of limited benefit and reliability to deduce price and cross-price demand elasticities from trying to adopt findings in other jurisdictions to the New Zealand environment. The findings are simply not coherent, sharp and stable enough. There is no other way than to derive a clear view on demand reactions with New Zealand specific data. In its cross-submission on behalf of Chorus, Houston Kemp highly stress the limited data available on the switching behaviour of users to the UFB.[23]

74. In its own demand study on the factors which influence the uptake of high speed broadband services the Commission does not even mention the impact of price.[24] Instead, the Commission mentions the following key points that have emerged in the course of the study which may affect the uptake of high speed broadband services in New Zealand:

- The cost related to connecting to the network where the connection costs might not be covered by Chorus or the LFCs, and using high speed broad-

23 See Houston Kemp, Response to Spark New Zealand's Attachment D: Illustrative estimate of social cost of high price, A Report for Chorus, 12 March 2015, p. 14.

24 See Commerce Commission: High speed broadband services demand side study, final report, 29 June 2012, p. 4.

band services. These costs include non standard connections, re-wiring, upgrading equipment and subscribing to the services.

- Video content is likely to be the primary driver of consumers' uptake.
- Potential issues relating to data caps, backhaul capacity and IP interconnection are likely to be resolved by operators.

75. In the context of this study the Commission also conducted a survey on the consumer willingness to pay for high speed broadband services. "*The survey found that while 4% of consumers said that they were willing to pay more than $ 20 extra per month, 37% said that they were willing to pay between $ 5 and $ 10 extra per month. A further 40% of consumers (640,000 households) said that they were willing to pay up to $ 5 extra per month.*"[25] Although those results are only indicative they provide some range of the limited incremental willingness to pay.

76. For SMEs the Commission's survey found that the majority of SMEs were satisfied with their current broadband services.[26] SMEs seemed to be even more price sensitive than consumers. 35% of SMEs say that they would pay no more than their current charges.

77. In its demand study the Commission highlights that getting high-definition video is the most important benefit of superfast broadband. This may be true. But is it also a reason to migrate to fibre? Most copper-based broadband customers in New Zealand get high-definition video today either over ADSL or over VDSL. This means the most important benefit of superfast broadband does not provide a reason to migrate. It is already provided over the copper network products.

4.2 The elements of the cost benefit analysis

4.2.1 Demand for UFB services

78. One reference point of the Commission's welfare analysis is the development of the UFB demand in the absence of any UCLL uplift.[27] The starting point of 100,000 UFB subscriptions in 2015 seems realistic. For the following years the Commission then assumes an increase by 100,000 new fibre connections per annum. This demand estimate remains unexplained. The Commission only provides reference to a forecast by Deutsche Bank which indicates UFB subscriptions of approximately 1 million by 2024 which corresponds to the Commission's estimate

25 See Commerce Commission, High speed broadband services demand side study, final report, 29 June 2012, para. 149.
26 See Commerce Commission, High speed broadband services demand side study, final report, 29 June 2012, p. 37f.
27 See Commission, Uplift paper, para. 56.ff.

for 2024. For the year 2016 the Commission assumes a jump in UFB demand by 240,00 connections which deviates significantly from its forecast path and remains unexplained.

79. We cannot provide our own estimate of the UFB demand profile over time. We want, however, to bring to the attention of the Commission another forecast of fibre demand which shows more cautions expectations than Deutsche Bank and the Commission. The market research company IDC[28] expects in its forecasts for 2018 around 330,000 fibre connections which compares to about 500,000 of the Commission's estimate.

80. Another market development should indicate that the Commission's fibre connection estimates might be a bit too optimistic. There seems to be a significant growth in superfast broadband in the New Zealand market. But most of this growth currently is absorbed by VDSL and less by fibre. Fibre connections grew by a factor of two while VDSL connections grew by a factor of 13. In the year ending June 30, 2014 VDSL connections grew from 5,000 to 65,000 while fibre connections grew (only) from 27,000 to 58,000.[29] According to a recent publication of the Ministry of Business, Innovation & Employment UFB connections increased to 85,544 connections by the end of the first quarter 2015.[30]

4.2.2 Cross-elasticity of demand for fibre

81. The Commission assumes for purpose of its welfare analysis a cross-price elasticity of demand of 1.2. According to this assumption an increase of copper retail prices by 1% would increase fibre access demand by 1.2%. This is by all standards in other contexts a relatively high value.

82. The cross-elasticity of demand value adopted by the Commission is not based on a New Zealand specific demand analysis or New Zealand specific data. It is just adopted from results of a study which Shinohara et al.[31] have estimated on the basis of 19 OECD countries for the period 2000 - 2008. The Commission's advisor Ingo Vogelsang expresses serious doubts whether these model results from the 2000 - 2008 OECD countries can travel to 2016 - 2024 New Zealand. Shinohara et al.'s data relate to a period of generally low penetration levels. These are coming close to saturation soon in New Zealand. This means that total broadband subscription demand may become inelastic with regard to price. For this reason

28 IDC, New Zealand Telecommunications 2014-2018 Forecast and Analysis: Running to Stand Still, January 2015 [Study provided by Vodafone New Zealand].

29 IDC, New Zealand Telecommunications 2014-2018 Forecast and Analysis: Running to Stand Still, January 2015 [Study provided by Vodafone New Zealand], p. 2.

30 See Ministry of Business, Innovation & Employment, Broadband deployment update, March 2015.

31 Shinohara S., Akebatsu, Y. and M. Tsuji, Analysis of broadband services diffusion in OECD 30 countries: Focusing on open access obligations, paper given at 8th ITS Asia-Pacific Regional Conference, Taiwan, June 26-28, 2011, Available at http://hdl.handle.net/10419/52312.

Ingo Vogelsang concludes that *"... the Shinohara et al. study does suggest a fairly robust sensitivity of migration w.r.t the price difference between DSL and UFB, but the quantitative magnitude for New Zealand cannot be derived from the study."*[32]

83. Despite these arguments and warnings the Commission has used this relative high value of the cross-elasticity. This is astonishing also insofar as another advisor of the Commission, Professor Cambini, also argues in favour of a much lower cross-price elasticity. Cambini refers to his own estimates using data from EU 27 over the period 2004 - 2013. From this work and the preliminary results of it he concludes that the cross-substitution between a change in the DSL price and the adoption of fibre connections range between 0.6 - 0.64. From that perspective Cambini's conclusion *"... that a cross-price effect in the range of 1.2 is a fair and reasonable average of the values in recent economic literature ..."*[33] is a bit surprising and not conclusive to us.

84. Many demand studies signal that higher prices for copper-based services induce end-users to switch to fibre-based services. These studies also indicate that the price effect is only one of several factors which influence consumer behaviour. Quality of services, applications and services as well as other factors are important and often more important than price. This relativity of price as a factor to motivate migration to fibre also translates into lower values of the cross-price elasticity of demand.

4.2.3 Externality effects

85. The Commission does not take into consideration in its quantitative welfare analysis the potential benefits from fibre-based services on economic growth, productivity or other macroeconomic indicators. The Commission focusses on potential benefits to end-users of telecommunications services. Potential welfare gains emerge from externality effects from faster migration to the UFB. Such externalities reflect the increase in utility generated for other UFB subscribers from having additional subscribers joining the UFB. Such positive externalities follow from the ability to communicate with a wider customer base by for example using high-definition video-based services or to the extent that the higher penetration of fibre stimulates more innovative applications and content over fibre.

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32 I. Vogelsang, What effect would different price point choices have on achieving the objectives mentioned in s.18, the promotion of competition for the long-term benefit of end-users, the efficiencies in the sector, and incentives to innovate that exist for, and the risks faced by investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services?, 5 July 2013, para. 45.

33 C. Cambini, Economics aspects of migration to fibre and potential welfare gains and losses from an uplift to copper prices, Paper prepared for the New Zealand Commerce Commission, 16 March 2015, p. 9.

86. The Commission is not providing any evidence to which services such externalities are related. Such network externalities have been widely discussed for voice and other interactive service. The higher speed of fibre itself is not related to such communication services. The main difference between copper and fibre broadband is speed and symmetry, so fibre enables realtime broadband video communication of high resolution, which copper cannot do. Downloading, however, is not related to communication or network externalities.

87. It is questionable whether some or even many of the externality effects which the Commission associates with fibre migration depend or even are generated by the migration of users to the UFB. The Commission speaks in abstract terms on more innovative applications and content over fibre which would not otherwise be available or would only become available at a later date.[34] The only concrete example, the Commission mentions is the use of the high-definition video-based service. Many or most of such "innovative" applications, however, do not depend on the use of fibre networks. Moreover, they depend on the use of broadband access at a speed of 25 Mbps (or more). State of the art compressed HD-TV channels require a bandwidth of approximately 9 Mbps. Since households may receive several such programs in parallel (i.e. parents, kids, recorder, PIP, …) an access line bandwidth of 27 or even more Mbps is required. Such broadband speeds are provided by the copper access network via VDSL to a large part of New Zealanders.

88. That is why many countries around the world are not following a FTTP-only approach for superfast broadband access but a multi-technology-mix approach as Australia (in the meantime) and most European countries. The inherent logic of this strategy is that advanced copper access and fibre access are suitable substitutes to generate the economic benefits of superfast broadband to a large degree. From that perspective it is the migration of users to high-speed broadband access which counts which is not only fibre access.

89. The Commission also relates the developments of innovative applications and content over fibre as an externality effect which is fostered and stimulated by more New Zealanders becoming UFB customers. This may be the case for certain applications. Higher levels and better quality of real time gaming, 3D video, holographic presentations and Virtual Reality, telemedicine video diagnosis or tele-teaching with high resolution image transmission, telecommuting or home office in a paperless environment and cloud computing may be some examples for this. In todays world, however, many innovative applications and content are not really developed, implemented and provided nationally. Instead, they are provided on a worldwide basis. It is rather obvious that services provided by YouTube and Netflix fall in this category. Other examples include exclusive content which maybe generated nationally but which is distributed on a worldwide scale like sport

34 See Commission, Uplift paper, para. 51.

events. Externalities and network effects associated with such applications are in many cases relevant but on a worldwide scale. At the margin 100,000 more fibre users in New Zealand therefore contribute to this worldwide externality effects. The relevant effects are, however, counted in millions or hundreds of millions of additional high-speed users. This also means that New Zealand can merely internalise the effects of investing in the better use of network externalities when they are relevant at a worldwide scale.

90. Literature provides a variety of benefits associated with superfast broadband, namely:[35]

- faster file transfer;
- video streaming applications;
- high quality real-time communications;
- multiple applications at the same time.

Those and other benefits are mostly provided by broadband access as provided by VDSL (and sometimes even ADSL) and not just by fibre-based superfast broadband.

91. Most of these benefits can be internalised by users directly and are reflected in their (incremental) willingness to pay for superfast broadband. The cost benefit analysis and their decision to migrate then reflect also the social welfare optimum. Insofar such benefits are irrelevant to justify any intervention like a wholesale price uplift. The (net) benefits are fully reflected in the actual migration decision of users and the actual uptake of superfast broadband. Only if such benefits cannot be internalised by the market-based interaction between suppliers and users, there is reason for a public policy concern and eventually a case for intervention.

92. The Commission calculates its own externality factor according to the same approach as Ofcom applied in 2004 to calculate its network externality surcharge (NES) for mobile termination rates. Ofcom's NES represented 2% of total retail revenues earned from mobile calls. 2% of UFB expenditure seem to represent the lower bound of UFB network externality in the Commission's view. The Commission seems to regard a value of 50% of the consumer expenditure as representing the upper bound of such externality benefits. The Commission does not provide any empirical quantitative evidence on the relevance of the size of the externality effects. Given the different nature of broadband access services compared to mobile voice communications, the network externality for broadband access can only be a fraction of the mobile network externality. If the analogy to mobile network

35 See Houston Kemp, Response to Spark New Zealand's Attachment D: Illustrative estimate of social cost of high price, A Report for Chorus, 12 March 2015, p. 7.

externalities holds and if Ofcom has calculated the NES appropriately, then the Commission in its own logic could only use a fraction of a 2% value as the proper proxy for externalities in broadband access and not a multiple of it.

93. It is worth mentioning that Ofcom was rather lonely as a regular in following a network externality surcharge approach for mobile termination rates. To our knowledge only the regulator in Israel followed a similar approach. All other regulators in Europe and around the world (including the Commerce Commission in New Zealand) rejected the NES approach. It may be useful to shed some light on the reasons why regulators did not apply a NES. For a more detailed analysis of those externalities and the reasons why regulators should not take care of them in their TSLRIC-based pricing decisions we refer to a study which we conducted in 2005 for the ACCC.[36] Albon and York even more strongly argue against considering the externality argument in the mobile termination context.[37]

94. In its last IPP Determination of mobile termination rates (MTAS)[38] the Commission also considered to depart from the price for the MTAS being set at a level of efficiently-incurred costs because of the presence of network externalities. The Commission analysed and stated the presence of network externalities in mobile networks and considered to increase the mobile termination rate above cost including a network externality surcharge. In the end the Commission, however, rejected this option assuming that network externalities are likely to be relatively insignificant given the high levels of mobile penetration.

4.2.4 Timing

95. The Commission's welfare analysis of considering an TSLRIC uplift is related to a 15 year period (up to 2029). On the other hand, the regulatory period for which the Commission is determining the UCLL price is related to a five year period. Although it is correct that potential impacts of a distortion of wholesale prices may be longer than just the regulatory period, it is methodologically questionable to include welfare impacts beyond the regulatory period into consideration for a decision which only holds for the regulatory period. In 2019 the Commission will have to make a new decision on UCLL prices which can be different to the decision it is taking in the context of this FPP.

96. Also the initial fibre wholesale price only is fixed for a period up to 2019. Then it also might be changed. Furthermore, the Government has announced to review

36 Neu, W., Neumann, K.-H. and I. Vogelsang, Mobile Terminating Access Service: Network Externality and Ramsey Pricing Issues, A Consultancy Report to the ACCC, 3 November 2005.

37 Albon, R. and R. York, Mobile termination: Market power, externalities and their policy implications, Telecommunications Policy 30 (2006), 368-384.

38 See Commerce Commission, Standard Terms Determination for the designated services of the mobile termination access services (MTAS) fixed-to-mobile voice (FTM), mobile-to-mobile voice (MTM) and short messaging services (SMS), Decision 724, 5 May 2011, para. 144.ff.

the whole policy and regulatory framework which governs broadband access today. This review might change the whole decision framework for setting the UCLL price. Potential benefits of a price uplift after 2019, if considered at all, might therefore only be considered with a strong discount because of the uncertainty of the relevant parameters.

4.2.5 Missing elements

4.2.5.1 Impact on prices for UFB-based services

97. The Commission's framework does not consider an increase of the fibre retail price as an effect of an increase of the copper wholesale price. Therefore there is the implicit assumption of a zero cross-price elasticity between copper and fibre retail prices. Fibre prices will be unaffected by an increase of copper-based retail prices. Is this assumption realistic?

98. Three factors drive fibre retail prices: The fibre wholesale price, the fibre downstream cost of RSPs and the (incremental) willingness to pay of users for fibre-based retail products. While the first two factors are not affected by a change in copper retail prices, the third factor is. The (incremental) willingness to pay for fibre retail products is not only affected by the fibre retail price, it is also affected by relative retail prices of copper-based and fibre-based products. The current retail price differentials are the result of the RSPs' view on the relative willingness to pay of customers. Both the copper retail and the fibre retail markets are competitive. Therefore, it has to be expected that RSPs react to the relative change of willingness to pay and will increase fibre retail prices if copper retail prices increase following a wholesale price increase to achieve the previous equilibrium.

99. This view is also supported by the analysis of Ingo Vogelsang. Since UFB products are substitutes for copper-based services, *"...a price increase in copper-based services will shift outwards the demands for these other products. Unless these other services are perfectly competitive with a horizontal supply curve, this outward demand shift will lead to price increases for these other products. These price increases will vary by the extent of substitutability with the copper-based products and by the competitiveness in these other product markets (assuming that they form their own markets)."*[39]

100. If fibre retail prices increase at the same (absolute) amount as copper prices no increase in fibre take-up will occur anymore. In that case no welfare benefits can be attributed to the UCLL price uplift anymore. Only the negative welfare effects of

39 I. Vogelsang, The effects of the UCLL contribution to the UBA aggregate on competition for the long-term benefit of end-users in New Zealand telecommunications markets, 2 July 2014, para. 20.

the copper price increase remain in place. One may regard this as an extreme scenario. This can, however, not be excluded. Even if the incremental fibre retail price increase is less than $ 1 the positive welfare gains decrease and the net welfare gains may become or remain negative.

4.2.5.2 Negative externalities for the subscribers remaining on copper-based services

101. If there are externalities specific to UFB network services, there is reason to assume that similar or perhaps even the same network externalities do exist for copper access-based services. In this case the decreasing subscriber base of copper-based access services would generate negative externalities for the remaining subscribers. Ingo Vogelsang mentions as an example that internet browsers are becoming slower because they are being loaded with more and more information.[40]

102. Reduced broadband penetration will result in other network externalities, for example, foregone ability to videoconference at standard broadband speeds, access to educational sites, and access to shopping sites. This latter was an argument made in the United States where the negative externalities were valued at the cost to lower socio-economic demographics of not being able to access cheap discounted offers which were only available on-line.

4.2.5.3 Effects on broadband penetration

103. The Commission does not include broadband penetration effects of its uplift concept in its welfare analysis. The implicit assumption of the Commission therefore is that there is no impact of the retail price increase of copper-based services on broadband subscription and therefore on penetration. This is an unappropriate assumption. There is an impact of price on penetration. Assuming the same own price elasticity of demand of -0.951 as Spark refers to in its February Submission[41], then a UCLL price increase of $ 1 would increase the retail price from $ 79 to $ 80 or by 1.3%. The number of DSL subscribers would decrease by 1.2% (or by 14,700 subscribers). Broadband penetration would be reduced by more than 1%. These effects might even be more significant in reality, because the marginal subscriber groups mostly affected by a price increase usually show higher price elasticities than the average customers.

104. The impact of broadband penetration on macroeconomic indicators becomes even more relevant and important if compared with the impact of broadband speed on the same macroeconomic parameter. Although there are many studies

40 See I. Vogelsang, The effects of the UCLL contribution to the UBA aggregate on competition for the long-term benefit of end-users in New Zealand telecommunications markets, 2 July 2014, para. 28.
41 Spark, February Submission, Attachment D.

on measuring the causality of broadband penetration and GDP growth, there are not too many studies on the latter context. In a 2013 study based on 33 OECD country data for the period 2008-2010, Rohman and Bohlin[42] found that doubling the broadband speed will contribute to 0.3% growth compared with the growth rate in the base year. Their more detailed results signal that the impact of increasing broadband speed on GDP growth largely depends on two aspects: (a) the size of the coefficient of the broadband speed and (b) the existing economic growth in each country. This means that the impact will be relatively greater for countries that experienced lower economic growth during previous years.

105. Several studies show the significant impact of broadband penetration on GDP growth and other macroeconomic parameters. Czernich et al.[43] show that an increase in the broadband penetration rate of 10% increases the annual per capita GDP growth rate in OECD countries by between 0.9 and 1.5%. Similar results are derived by Hätönen[44] for EU countries and other researchers. These results indicate that regulators should be very concerned about the impact of their decisions on broadband penetration. If there is a trade-off of a measure between impacting penetration and impacting broadband speed, then small impacts on penetration rates can easily compensate relative larger impacts on broadband speed.

4.2.5.4 Supply-side constraints

106. The Commission itself mentions in para. 70.3 of its Uplift paper that there may be supply-side constraints in the migration to fibre. In its quantitative welfare analysis it, however, ignored such constraints. In fact supply-side constraints are relevant, at least as long as the UFB networks are not fully deployed.

107. According to the actual UFB roll-out as of March 2014 customers in 46% of the UFB coverage areas (1.34 million end-users amounting to 75% of the New Zealand population) have access to fibre. According to the most recent UFB roll-out plans, Chorus and LFCs will continue to deploy the network to the 1.34 million end-users by 2019.[45] This means that until 2019 a certain but decreasing part of the population will not have access to fibre.

108. The welfare model of the Commission assumes that such constraints do not exist. Therefore the calculated values of the externality effect overestimate the relevant

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42 Rohman. I.K. and E. Bohlin, Does broadband speed really matter for driving economic growth? Investigating OECD countries, http://ssrn.com/abstract=2034284.

43 N. Czernich, O. Falck, T. Kretschmer and Woessmann, L.; Broadband infrastructure and economic growth, CESifo working paper, No. 2861, 2009.

44 J. Hätönen, the economic impact of fixed and mobile high-speed networks, EIB Papers, Volume 16, No. 2, 2011.

45 See the broadband deployment update at http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/pdf-and-documents-library/ultra-fast-broadband-intiative/broadband-deployment-update-march-2015.pdf (accessed 7 May 2015)

effects by the amount of customers which might be willing to migrate but are unable to do so.

109. One way of correcting for this supply side constraint might be to weight the cross-elasticity of demand by the degree of UFB coverage.

4.2.5.5 Switching cost

110. The Commission does not analyse the existence and the relative importance of switching costs as an impediment and barrier of customers to switching from copper to fibre access products. As a consequence switching costs have not been considered in the Commission's calculation of welfare net benefits.

111. Assume that the fibre inhouse cabling requires an investment of $ 400 per fibre household and that the equipment cost of changing to fibre amount to $ 200. On the basis of a 40 year and 5 year lifetime respectively the own investment of the customer of migrating to fibre amounts to an annuity-based cost of $ 7.81 per month. These cost represent switching cost. The amount of these costs is significant and is higher than the price differential between copper-based and fibre-based broadband products.

4.2.5.6 Confidence interval

112. The Excel model of the Commission to calculate the net welfare effects seems to suggest that a TSLRIC uplift would be justified if the model generates a positive net welfare gain. This is methodologically not correct. Most of the parameters which determine the welfare calculation of the Commission are highly uncertain or even speculative. The deviations of the actual parameter values from the "true" values might even add up.

113. As a consequence, the Commission can only draw conclusions from its welfare analysis if it applies a relevant confidence interval to its calculated values. Given the level of uncertainty and the potential cumulative effects we suggest that the relevant interval should be at least 20%. This means that the Commission can only draw a positive TSLRIC uplift decision if the welfare gains exceed the welfare losses by more than 20%.

4.3 A broader framework

4.3.1 The Commission's TSLRIC approach already contains an active migration pricing approach

114. The Commission seems to assume that it contributes to fibre migration if it makes an uplift to the cost-based TSLRIC price by introducing a migration tax. This also means that the reference point for migration in the Commission's view is the TSLRIC price. Only if the actual UCLL wholesale price is higher than the calculated TSLRIC active migration incentivised by pricing is being introduced. A TSLRIC price in the Commission's view would be the reference point which is neutral with regard to fibre migration. This is actually not the case.

115. As Ingo Vogelsang has pointed out in his report to the Commission of 6 November 2014[46] two elements and conceptual decisions of the Commission so far can be viewed as incentives currently provided by the Commission to migrate to fibre: The first element is the inflation of the TSLRIC price by not accepting the re-use of assets and secondly by not accepting a performance adjustment for UFB over copper-based services. From that perspective, which we share, a migration neutral reference point and wholesale price for UCLL would be a price which is based on a TSLRIC calculation which allows for the re-use of assets and which is then reduced by the performance delta between UFB-based and copper-based services.

116. It is a bit speculative at this point in time where the Commission's cost calculations are not stable and re-modelling activities are currently ongoing, to give an estimate of the appropriate reference point. To give a flavour of the magnitudes at stake we nevertheless would like to generate a rather rough calculation for both elements and relate that to the TSLRIC cost calculation published by the Commission in its 2 December 2014 Draft FPP decision.

117. To give an indication on the impact of an asset re-use assumption on the TSLRIC cost calculation, Ingo Vogelsang refers to a WIK study of 2011.[47] In this study the difference between greenfield and brownfield fibre cost, which considers a representative degree of asset re-use, was estimated to be in a range of 13% to 17% of the TSLRIC estimate. The impact of an re-use assumption on the UCLL cost in New Zealand needs of course to be calculated according to New Zealand conditions. To make a conservative assumption let us assume that the low point of WIK's 2011 estimate is relevant. Then the calculated TSLRIC cost - which we

46 See I. Vogelsang, Report on several submissions in the FPP proceeding for UCLL, 6 November 2014, p. 4.

47 See Hoernig, S., Jay, S., Neu. W., Neumann, K.-H., Plückebaum, T. and I. Vogelsang, Wholesale Pricing, NGA Take-up and Competition, Study for ECTA, Bad Honnef, April 2011, available at www.wik.org.

nevertheless regard as much too high due to parameter choice and modelling errors - would not be $ 28.22 but $ 24.55.

118. To calculate the performance delta between the copper access network and the UFB fibre network we can at this stage also only make a rough calculation which we nevertheless regard as rather robust. As shown in the Neumann/Vogelsang paper of 2013[48] the performance delta (∆perf) between a copper and a fibre access network can be calculated on the basis of the retail prices of services provided over both access infrastructures. To be more precise, if retail markets are competitive, the relevant ∆perf is based on the competitors' derived demand for the wholesale access product and has to include in addition to the difference in the retail prices the difference in downstream costs from the wholesale products, if there is any:

$$\Delta perf = (p_F - p_C) - (C_{Fdownstream} - C_{Cdownstream})$$

p_F represents fibre retail prices and p_C copper retail prices. $C_{Fdownstream}$ and $C_{Cdownstream}$ represent the average downstream variable costs of providing FTTH and copper access at retail.

119. If we assume that there are no downstream differences, the calculation goes down to retail price differences. For identifying the retail price differences we can rely on the numbers which the Commission uses in its analytical framework for conducting the welfare analysis. Assuming that the retail prices the Commission is using are representative we end up with the following calculation:

$$\Delta perf = \$\ 85\ ./.\ \$\ 79 = \$\ 6$$

120. On the basis of the calculations presented in para. 117 and 119 we end up with the following migration neutral UCLL price:

$$p_{UCLL} = \$\ 28.22\ ./.\ \$\ 3.67\ ./.\ \$\ 6 = \$\ 18.55$$

Based on the current cost calculations of the Commission (which are according to our February Submission much too high) a proper migration neutral reference UCLL price point would be $ 18.55. About $ 10 of a UCLL price of $ 28.22 would have in other terms already to be regarded as a contribution to incentivising migration to UFB.

121. By not applying a performance delta between the copper-based UCLL service and the fibre MEA based TSLRIC calculation the Commission already significantly distorts the platform competition between the copper access and the UFB fibre platform in favour of the fibre networks. If there is an incremental willingness to pay

48 Neumann, K.-H. and I. Vogelsang, How to price the unbundled local loop in the transition from copper to fiber access networks?, Telecommunications Policy 37(10), 2013, pp. 893-909.

for fibre-based access products and the wholesale access price for copper is determined as the costs of the FTTH network, competition is distorted in favour of fibre. The competitive neutral relationship is defined by applying the performance delta. A copper wholesale access charge which is derived from the FTTH MEA cost by deducting the performance delta as defined above makes the wholesale user indifferent between buying copper access or buying fibre access at TSLRIC of fibre. A copper access charge determined that way is competitively neutral between copper and FTTH access. A copper access charge without considering a performance delta is distorting competition in favour of the fibre network.

122. A similar argument can be made with regard to the impact which geographical TSLRIC averaging has on innovation and reducing investment risks. Averaged national UBA and UCLL charges will be (significantly) above the average of costs in areas where Chorus invests in UFB and will be below cost in rural areas outside the UFB areas. As Ingo Vogelsang points out: "*As a result, geographic averaging of TSLRIC costs will already achieve some compromise between setting prices above true costs in order to incentivze innovations and reduce investment risks and acting in the LTBEU in areas that will not be served by UFB.*"[49]

4.3.2 Who should receive the proceeds of a migration tax?

123. If the migration tax is introduced as an uplift to the TSLRIC price, the proceeds of that tax would automatically flow to Chorus. This seems to be the concept of the Commission. It is neither obvious nor efficient that the proceeds of a tax which should incentivise users to move to a higher quality level product should flow to the owner of the legacy infrastructure. This is stated under the assumption that the TSLRIC price is adequately determined such that all relevant investment incentives are appropriately reflected in the TSLRIC price.

124. Besides building the fibre network Chorus can do nothing to motivate users to use the fibre network instead of using the copper access network. In the structurally separated environment of New Zealand it is basically the job of the RSPs (and OTT players) to provide price structures, service features and innovations which make it attractive for users to migrate to the fibre networks.

125. Handing over the proceeds to Chorus therefore is just a transfer of wealth from end-users to Chorus, but does not generate any incentive effect with regard to enhancing the uptake of fibre. If the migration tax is introduced, proceeds should therefore be used to positively influence migration. It may be used for information

49 See I. Vogelsang, What effect would different price point choices have on achieving the objectives mentioned in s.18, the promotion of competition for the long-term benefit of end-users, the efficiencies in the sector, and incentives to innovate that exist for, and the risks faced by investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services?, 5 July 2013, para. 6.

and advertising campaigns which try to convince users that it is in their interest to migrate. The money may be used to foster innovation and attractive applications or it may be used to reduce switching cost for users. It might even go back to the Government as a repayment of the UFB subsidies.

126. Also Martin Cave in a submission on behalf of Chorus analyses a tax on the price of copper as an approach of fostering the migration.[50] This tax imposed on the price of copper would make it expensive to access seekers to maintain copper products. At the same time the tax should make it unprofitable for the access provider to keep the copper network. This approach implicitly and necessarily assumes that the access provider does not keep the proceeds of the migration tax.

4.3.3 Who should contribute to a migration tax?

127. According to the Commission's framework all fixed line users which use the legacy copper access network shall be subject to a migration tax. This includes broadband users and users of the PSTN (only). It includes users in the UFB coverage areas and those outside the UFB coverage areas.

128. If the concept of the Commission is intended to incentivise users of the copper access infrastructure to migrate to the fibre networks it is not in all respect targeted. Users outside the UFB footprint are penalised for not migrating to the UFB network although they have no possibility to migrate and even though they might wish to. This includes users outside the UFB area and users within the UFB area where the fibre network is not yet deployed.

129. Telephony users which are not (yet) broadband users cannot be expected to move directly to superfast broadband products. Their entry level broadband products will be those which are provided over the copper access network. It is not a rational and efficient consumer choice to go for the highest level products first. This view might even generate switching costs. As a consequence, such users should be exempted from paying the migration tax.

130. Telephony users should be exempted from the migration tax for another reason. It is not supported by demand studies that within a few years all fixed-line telephony users will become (fixed-line) broadband users. Some will decide to remain telephony-only users and not to subscribe to broadband at all. Some other users may decide to fulfil their broadband access needs by mobile broadband. If such users would have to pay a migration tax, the platform competition between mobile and fixed-line networks will be inefficiently distorted.

50 See Cave, M., Regulating the price for copper in New Zealand, Report prepared for Chorus, 2013.

131. There are applications of UCLL lines which are neither related to broadband nor to telephony. Such applications include leased lines (up to 2 Mbps), remote control and alarm lines, point of sales, EFPOS and others. For such applications fibre-based superfast broadband is not a viable alternative. Why should such users be penalised for not using a service which is not suited for their application? From an efficiency point of view the application of a migration tax to such users does not make sense.

4.3.4 Distributional effects

132. The welfare criterion of consumer surplus is neutral with regard to distributional impacts of a price change. One might also say that this welfare criterion ignores distributional impacts. It does not matter which consumer groups face a net benefit or a net cost of a price change. As long as the sum of the net benefits of those customers who win is larger than the sum of the net cost of those who loose, this welfare criterion signals a positive total welfare gain.

133. Given the high relevance of avoiding a digital divide in New Zealand as a public policy concern and goal, the Commission cannot (totally) ignore distributional impacts in its welfare analysis.

134. The demand patterns of copper-based and fibre-based access signal relevant distributional impacts of incentivising fibre migration by means of pricing measures. According to New Zealand 2013 Census data, which Spark presented in its February Submission[51], household broadband access varies by household income. The 10% of households with income of less than $ 20,000 have the lowest proportion of broadband access (44%), while more than 90% of the top 23% income households have broadband access. At the same time households which use fibre broadband access are characterised by above average income.

135. Chorus' recent analysis of residential UFB demand shows a clear relationship of household income and fibre demand.[52] Urban affluent families which are the top 12% of New Zealand households in terms of income show the highest uptake rates. These customers are highly educated, likely to own a business and typically aged in the 45 to 64 year age group. Similarly high take-up rates can be observed in "financially secure families", typically established homeowners with children and international residents.

136. The structural demand characteristics reveal strong distributional and digital divide impacts of a migration tax approach to foster fibre take-up. The negative impact of

51 See Spark New Zealand, Submission, UBA and UCLL FPP pricing review draft decision, 20 February 2015, p. 81f.

52 See Chorus, Understanding residential UFB demand, https://www.chorus.co.nz/the-nz-market/undefined, downloaded on 24.04.2015.

a copper retail price increase will over proportionally reduce penetration of low income households. The already existing digital divide problem will be aggravated. Those which not yet have broadband access will be discouraged to apply for it even more. In addition, users more concentrated in remote and rural areas who do not subscribe to broadband and only use fixed line voice will have to pay more for their basic communications. On the other hand, the positive net benefits of fibre externalities will be more concentrated in favour of higher income households and business.

137. The Commission's approach includes inherently an additional digital divide element. According to the Commission's framework customers that are only served by UCLF services without broadband have to contribute to the migration tax. These users are not using broadband today and might not even use it tomorrow. These users pay more without any (potential) benefit to them.

4.3.5 More targeted and more welfare enhancing alternatives to a migration tax

4.3.5.1 Lowering fibre prices

138. Migration to fibre could be made more attractive by lowering fibre retail prices. If the Government is unhappy with the current speed of migration it might take initiatives to lower the fibre network wholesale prices. Maximum prices have been set through to 2019.[53] They are the result of an negotiation process between the Crown and the LFCs and cannot be changed by the LFCs and Chorus themselves or by regulatory interventions of the Commission. LFCs and Chorus, however, are free to implement lower prices in order to boost uptake.

139. Lowering fibre wholesale prices may require a packet arrangement which may include a higher level of financial contribution from the Government. Nevertheless, it remains a straight forward economic approach to lower the directly relevant prices which influence take-up. The current FTTH TSLRIC calculations of the Commission indicate anyhow that the fibre wholesale prices are too high in a TSLRIC perspective. There is no good economic and welfare reasoning to adopt (and distort) a regulated price to another relevant price in the market which is according to a comparable regulatory standard too high.

140. Lowering the fibre wholesale price would more directly incentivise users to migrate than the introduction of a migration tax to copper-based access. In principle the general pricing mechanism is similar: the relative prices come closer. There is, however, the major difference that a decrease of the fibre wholesale price does

53 See http://www.crownfibre.govt.nz/wp-content/uploads/2013/03/Chorus-Published-UFB-Price-Caps-Document-3-October-2012.pdf (accessed 7/5/2015)

not entail the negative implications on consumer welfare as an increase in the copper-based UCLL price. From a welfare point of view a decrease of the fibre wholesale price clearly dominates any uplift of the UCLL price. Even though the fibre wholesale price is not under the regulatory control of the Commission, from a public policy perspective this measure remains relevant and is definitively preferable from a welfare point of view. This holds in particular as the Commission intends to act in favour of public policy goals which are not (directly) reflected in its statutory regulatory framework.

141. Chorus has some influence on the fibre price. Chorus requires approval from CFH if it intends to increase its UFB wholesale charges.[54] CFH has indicated that they will not approve any UFB wholesale price increase. Chorus, however, has the ability to decrease its UFB wholesale charges. If Chorus is unhappy with the degree of migration it has a relevant variable at its disposal to incentivise migration. Is the revealed business behaviour of not using this option not an indication that Chorus is satisfied with the speed of migration?

4.3.5.2 Incentivising RSPs to migrate customers

142. It is mainly the product and pricing policy of RSPs which can motivate users to migrate from copper to fibre-based access products. Incentivising these market players to migrate users would be a rather targeted approach to foster migration.

143. Increasing the financial flexibility of RSPs by UCLL and UBA wholesale pricing would enable them to make it more attractive to users to migrate. RSPs meet customer requirements and promote fibre uptake primarily through value added fibre-based services. Examples include increased outbound calling and promotions. Additionally, both Spark and Vodafone are extending to include new VOD services with Spark's Lightbox, and Vodafone's bundling of either Netflix's New Zealand offering, or Sky TV's Neon service.

4.3.5.3 Subsidizing users

144. The Commission's approach relies on penalising users for not having migrated yet, even whose which have (currently) no chance to migrate. This is an uncommon approach of strengthening demand for using the fibre network.

145. In other jurisdictions it is more common to accompany demand-side measures with positive incentives to migrate. In a study for the European Independent Regulatory Group a study team of the Florence School of Regulation collected demand-side measures to foster broadband penetration for a broad set of countries

54 See I. Vogelsang, The effects of the UCLL contribution to the UBA aggregate on competition for the long-term benefit of end-users in New Zealand telecommunications markets, 2 July 2014, para. 11.

and provided an analytical assessment of such measures.[55] Demand-side measures include increasing useful content, availability, increase awareness, increase IT skills, increase quality of broadband experience, targeted subsidies/tax reductions, demand measurement and demand aggregation.

146. Any approach of positively incentivising users is significantly more targeted than the Commission's approach and therefore more efficient and does not cause similar negative effects on consumer welfare. It is "only" the negative macroeconomic effects of taxation which are on the negative side of such a measure.

147. It is more and more recognised in other jurisdictions that supply-side measures are not enough to enhance the migration to superfast broadband. There is more and more attention to demand-side measures to accompany supply-side measures (like subsidising the fibre network deployment). In an analysis of 134 national broadband plans in 2013 Cullen International identified that the majority of these plans already integrated demand-side measures.[56] There is even some analytical work on the table that demand-side measures to foster superfast broadband deployment are even more efficient than supply-side measures.

148. Such demand-side measures are not at the disposal of the Commission. But from a public policy perspective they have to be taken into consideration. This holds in particular when such measures look more efficient from a consumer welfare perspective.

4.3.5.4 Switching-off the copper network

149. The most targeted way of managing the change from the legacy to the available advanced access infrastructure is to define a timetable for switching-off the copper network. This approach sounds radical but has some beneficial features. Nonetheless, such policy considerations are beyond the scope of this copper pricing review, and beyond the Commission's remit as industry regulator. The following discussion is therefore for general interest, and not directed towards recommendations to the Commission in this copper pricing review.

150. If the public policy goal in New Zealand is to migrate all fixed-line customers in a relative short period of time to the fibre network infrastructure, developing, negotiating and fixing a copper switch-off strategy may be a viable public policy option. Having such a strategy in place would generate clear and transparent signals to all market players. This invites efficient adoption decisions to this change in access infrastructure. The wholesale pricing system would not be distorted by the placement of various price related incentive schemes which might and probably

55 Florence School of Regulation, Study on broadband diffusion: Drivers and policies, for IRG, 2011.
56 See Ph. Defraigne, Cullen International, Learnings from national broadband plan implementations, Broadband workshop, Oman, December 1, 2014.

have limited targeted effects. Not distorting the pricing system avoids the inefficiencies and negative welfare effects associated with such measures.

151. From a cost efficiency point of view a copper switch off-strategy would generate a lot of operating efficiency gains because the operating cost of running and maintaining two access infrastructures for Chorus would be avoided. The business case for the UFB investments would significantly improve because the UFB fibre infrastructure which is basically sunk investment generates higher returns at a much earlier stage than a slowly moving migration process driven by individual decisions of RSPs and end-users.

152. The improvement of the UFB fibre business case may or may not fully compensate Chorus for the stranded copper network assets associated with a copper switch-off strategy within a few year period (after the completion of the UFB roll-out). The depreciation status of Chorus' copper access assets, however, indicates that there will only be a limited amount of stranded assets left if the copper networks still runs for let's say another five years before it is switched-off. Additionally, already today without a defined copper switch-off strategy there is a limited amount of capital investment into the copper access network for expansion and replacement. It would be a rational choice to further reduce such investments and keep them at their lowest possible level to keep service quality under a forced migration policy.

153. It remains the task of a quantitative analysis which we cannot conduct here of whether the remaining copper network stranded assets will already be fully compensated and financed by the improvement of the UFB fibre business case. It has a high probability that this will be the case, at least to a high degree. If certain stranded assets remain the issue, a potential compensation through the Government comes up. If there is truth in the externality implications of a forced migration to the UFB, then a copper switch-off strategy should pay off from a welfare point of view. This holds in particular because the negative implications associated with the forced migration approach of the Commission will be avoided under a copper switch-off strategy.

154. New Zealand's closest neighbour Australia provides useful insights into how such an approach may be implemented and which issues have to be solved in detail. One may even argue that the institutional environment in New Zealand better balances the incentives and the financial flows of a copper switch-off strategy than in Australia and makes it therefore easier to implement. In Australia, Telstra loses a major part of its business to NBN Co as a result of copper switch-off. The improvement of the fibre business case could fully be internalised by the new infrastructure entity NBN Co (and not by Telstra). This structure required much higher financial compensation schemes than would be needed in New Zealand. In New Zealand Chorus can directly internalise the benefits of a copper switch-off in sav-

ings of operating expenditure and the improvements of its fibre UFB business case. Different to Telstra, Chorus will not be losing business due to copper switch-off. Revenues which have formally be generated over the copper access network will now be generated as revenues of the fibre access network.

155. The last proposition needs one qualification: In those areas where the LFCs build the fibre network and not Chorus, Chorus will lose (more) business of a copper switch-off to the LFCs earlier than under a slower migration development.

156. The contracts between Chorus and CFH require to roll-out fibre over the period to 2019 and impose penalties for failure to achieve the deployment targets. "The contract is premised on fibre being prioritised - which precludes Chorus from making further investment in copper, but the contract contains no specific requirements for migration from copper to fibre. Nor does it contain provisions for or restrictions on the switch-off of the copper network."[57]

4.4 Overall assessment of the migration tax

157. The migration tax approach of the Commission intends to foster the migration of users form copper-based to fibre-based access. Instrumentally, the Commission can only use wholesale price as its action parameter to indirectly influence the consumer choice. Even when wholesale price changes are directly reflected in corresponding retail price changes which inform the consumers' choice to migrate, it has to be stated that the price of copper-based access only has a limited impact on consumer's choice. Other factors like quality and content provided over fibre and copper seem to be more decisive factors. This indicates that the customers' choice to migrate to fibre has to be seen in a broader framework before it might be influenced efficiently. If fibre prices react on copper price increases then the impact of a wholesale price change might even be totally absorbed and could become (totally or partially) ineffective.

158. The intended migration tax does not only seem to be an uneffective measure. The welfare framework provided by the Commission also indicates that the TSLRIC uplift will also generate a net welfare loss because of its collateral damages. Even the parameter set of the Commission indicates that it is rather difficult to generate a positive net welfare gain. Our analysis of these parameters clearly indicates that they have to be modified with the result of definitively achieving negative welfare effects. The results would even become more negative if certain missing elements of the Commission's framework would be included in the analysis.

159. The Commission's framework analyses marginal welfare effects of a price change by $ 1 per month. The Commission does not reveal what the potential range of an

57 See Cave, M., Regulating the price for copper in New Zealand, Report prepared for Chorus, 2013.

uplift it might consider. The implicit assumption of the Commission seems to be that this does not matter because the welfare effects are linear in its determining parameter. Doubling the amount of the uplift would double the welfare effects. This must not and probably will not be the case. To give an example: it is unrealistic and even faulty to assume a constant cross-price elasticity of demand independent of the degree of take-up. Already the studies which the Commission refers to in Attachment B of its Uplift paper indicate that cross-price elasticities will decrease with penetration. This means if a cross-price elasticity of 1.2 is relevant (what we already doubt), for economic consistency reasons this elasticity should be (much) lower at penetration levels of 50% or more. Similar considerations hold for other parameters.

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