Final report for Vodafone New Zealand

Review of the Telecommunications Act 2001

Key issues

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NETWORK STRATEGIES
• Telecommunications Strategy •

0 Executive summary

As in New Zealand, many overseas policy-makers aim to encourage investment in and deployment of high speed broadband networks in the short- to medium-term. However unlike New Zealand the level of copper wholesale pricing is not considered or used as a lever to assist in achieving this objective. In the Review of the Telecommunications Act 2001 the Government proposes to set wholesale copper access prices to be approximately equivalent to fibre prices as a means of supporting the economics of the UFB deployment. Three options are proposed for setting copper prices with reference to UFB prices – all involve altering the cost-based copper prices estimated using international benchmarks by the Commerce Commission. All three options involve a departure from cost-based pricing principles for copper access since the reference-point is a non cost-based price – UFB prices were the outcome of a negotiation process in which market price points appear to have been the key driver, not costs.

The Review discussion document claims that the proposed pricing approach is consistent with the 2001 Act's pricing principles – an efficient forward-looking long-run cost (LRIC) standard. This claim relies on acceptance of the assertions that:

- fibre is the Modern Equivalent Asset (MEA) of copper
- contracted UFB prices are an accurate reflection of copper replacement / MEA cost.

However these assertions cannot be correct as the proposed prices will be **higher** than a true LRIC model would estimate. They will be higher than the proxy LRIC benchmarks estimated by the Commerce Commission. An appropriate MEA methodology requires technological neutrality and assumes the most efficient forward-looking technology will deliver the service in question at lower cost than actual cost of service provision (which may well include the inefficiencies of the access provider).

In this time of technological transition regulators are ensuring that the use of inappropriate MEAs does not lead to over-priced copper legacy services. Modifications to pricing practices include:

- anchor pricing (which assumes continuation of the legacy service)
- regulated asset base approaches (which capture actual depreciated equipment values)
- adjustment to allow for the differing capabilities and costs of the legacy and new technologies – although there is no consensus as yet on the optimal approach for this adjustment.

As a result we now see declining copper wholesale broadband access prices in a number of jurisdictions. Note that the Commerce Commission's benchmarking includes prices from Sweden – a country that already applies a fibre MEA in its cost modelling and (counter to emerging best practice) makes no downward adjustment for the more limited capabilities of copper.

The above practices ensure that the risks of new investments are not borne by the consumer. This is completely the opposite of the proposed mechanism in New Zealand which is to increase the wholesale broadband access prices above cost so that the risks of the new investments are borne by consumers. Furthermore, in the case of New Zealand, the consumer (in the role of the tax-payer) is already providing a subsidy for the deployment of the new high-speed broadband infrastructure. To increase the price of copper access services to a level higher than justified by benchmark LRIC costs implies an additional inefficient transfer from the consumer to Chorus.

As regards consumers, the New Zealand broadband market is currently characterised by:

- high entry-level broadband prices (in relation to other OECD countries)
- affordability being a significant concern for residential and business market segments
- much of the recent growth in the market being due to migration from dial-up services
- residential market segments that are currently under-represented in broadband take-up, with affordability being a key factor in constraining demand.

By setting copper prices to be similar to fibre prices:

- users will be obliged to pay high copper prices for a number of years before fibre is deployed in their area
- there will be greater stimulus over the six-year rollout period for encouraging migration to readily available wireless broadband, mobile broadband and cable services, particularly for residential users, and thus fibre will compete against several technologies, not just copper.

A more compelling reason to migrate to fibre from copper would be if it offered greater performance benefits and functionality – designing a low end service offering to be relatively comparable to ADSL (and with potentially lower speed than VDSL) certainly will not persuade consumers to go to the effort of switching.

The end result will be stagnation in the fixed broadband market, and the fundamental problem that the Government wishes to address – that of removing barriers to fibre uptake – still unresolved.

We recommend that the Government does not proceed with any of the options listed in the discussion document, but retains the existing regulatory framework with TSLRIC pricing principles. This has the advantage of avoiding further short-term uncertainty and longer-term uncertainty, since, after effectively a six year glide path, we anticipate that there would be a major step change in prices – assuming that cost-based regulation is re-introduced at that time.

However, if the Government believes that some form of intervention is essential then it could consider policies that would support Chorus' revenue maximisation strategy – namely, uptake of the higher bandwidth products including VDSL and premium fibre products, or ensuring the availability of inexpensive broadband services for market segments with currently low take-up due to affordability constraints.

In addition, our view is that unbundling can only be advantageous for competition, and the early implementation of either physical or virtual fibre unbundling may create a market stimulus similar to that which occurred with the introduction of copper unbundling in New Zealand. With both Layer 1 and Layer 2 access, RSPs have more flexibility with the development of service offerings, increasing the competitive tension to the benefit of end-users.

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1 Introduction

The Government discussion document[1] for the Review of the Telecommunications Act 2001 focuses on the wholesale price of access to copper as a matter of priority. As per its legislative obligations, the Commerce Commission (the Commission) has recently been engaged in a process of benchmarking prices to reset UBA (unbundled bitstream access) and UCLL (unbundled copper local loop) wholesale prices. The Government is concerned that the Commission's benchmarking process may lead to significantly lower copper access prices than the equivalent UFB (Ultra Fast Broadband) wholesale prices, which were set in a contractual agreement between the Crown and Local Fibre Companies (LFCs). Such a pricing gap will, according to the Government, have a significant impact on Retail Service Providers' (RSPs) choice of copper and / or fibre products which will in turn affect fibre product availability and uptake, together with the economics of the fibre deployment.

The discussion document suggests that there is a risk that the Commission's wholesale copper access prices may be substantially lower than 'the actual cost of a replacement network'. Furthermore it argues that that this actual cost is known 'as a result of prices set through the robust tender process' for the Crown-subsidised UFB (Ultra Fast Broadband) initiative.

> The fibre network can be regarded as a suitable replacement network because no-one would now replace the copper network with a new copper network: they would lay fibre[2].

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1 Ministry of Business, Innovation and Employment (2013), *Review of the Telecommunications Act 2011*, Discussion Document, August 2013.

2 *Ibid*, paragraph 18.

The preliminary conclusion in the document is that copper access prices (UCLL and UBA together) should be approximately equal to the fibre prices that resulted from the UFB tendering process. The document then considers options for setting copper prices with reference to UFB prices, highlighting a perceived need to act quickly so as to provide investor certainty. The three proposed options are:

Commerce Commission sets prices by reference to UFB contract prices	This would involve the Commission setting a total copper price point in the range of low end UFB fibre prices between NZD37.50 and NZD42.50. The UBA price would then be locked in at the level set through benchmarking by the Commission under the current regime. The UCLL price would be set as the difference between the total copper price and the UBA price.
Government sets a new UBA price	The Government would set a total copper price point in the range of NZD37.50 to NZD42.50. The UCLL price would then be locked in at the level currently set through benchmarking by the Commission (NZD23.52). The UBA price would be the difference between the total price and the UCLL price.
Government sets a new UCLL price	The Government would set a total copper price point in the range of NZD37.50 to NZD42.50. The UBA price would be locked in at the level set through benchmarking by the Commission (set to be finalised in late August / early September 2013). The UCLL price would be the difference between the total copper price and the UBA price.

Thus, two of the three proposed options involve the Government setting copper prices directly, rather than the Commission setting prices in its role as telecommunications regulator.

Vodafone New Zealand has requested that Network Strategies provide an independent view of the implications and key arguments that underpin the discussion document's policy options in respect of copper wholesale pricing, including:

- the notion that the UFB network may be construed as the modern equivalent asset (MEA) for the copper network
- the relationship between UFB wholesale prices determined by the Government in conjunction with the UFB tender process and the actual cost of a replacement network
- costing issues that may arise in relation to periods in which legacy networks are in a transitional stage
- the longer-term (post-2019) implications for wholesale regulatory price-setting in New Zealand of selecting non cost-based wholesale access prices as a short-term measure
- the implications for potential future industry compensation levies for the provision of Telecommunication Service Obligations (TSO) using copper assets.

Following this Introduction this report provides:

- an overview of international policy, practices and experience in relation to copper and fibre regulated pricing (Section 2)
- an examination of MEA principles in LRIC (long-term incremental cost) modelling (Section 3)
- an analysis of copper and fibre costing issues in the New Zealand context (Section 4)
- pricing scenario analysis (Section 5)
- a discussion of longer-term implications of the proposed Government options (Section 6)
- our recommendations and conclusions (Section 7).

Although this report has been commissioned by Vodafone New Zealand, the views expressed are entirely those of Network Strategies.

2 Pricing to promote fibre: international experience

The discussion document notes that internationally there is considerable debate about pricing legacy infrastructure during a time of transition to new technologies[3]. There is also a claim that the proposed approach of setting copper access prices with reference to contracted UFB fibre prices 'is consistent with the EU approach outlined in Annex C, where the fibre network is identified as the obvious reference point to UFB prices for fibre'[4]. We note that, apart from this, there is no discussion within the main body of the document of regulatory approaches in other jurisdictions. At the same time MBIE officials indicated (at the recent InternetNZ Forums on the document) that they have relied upon international precedents for the proposed approach.

In this section we consider:

- the nature of EU regulatory policy with respect to copper and fibre pricing
- the relevance of regulatory approaches of countries cited in Annex C of the discussion document.

2.1 EU regulatory policy: the context

In considering broadband investment policy in Europe it is important to bear in mind that the European context is significantly different to that of New Zealand.

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3 *Ibid*, paragraph 152.

4 *Ibid*, paragraph 177.

There are no national fibre initiatives in Europe that are comparable to New Zealand's UFB project. Some European countries are characterised by numerous regional fibre deployment initiatives by non-incumbent operators. In fact there are over 260 regional fibre projects in Europe. This approach is particularly common in Scandinavia where local utilities and municipalities are major players in the fibre broadband market.

Fixed broadband services in Europe are provided primarily through copper and cable technologies. Exhibit 2.1 illustrates broadband penetration levels in the European Union between January 2006 and January 2013, split by the type of technology used. The majority of fibre-based broadband services are provided in Europe by new entrants while in general incumbents continue to rely on copper-based services. The overall trend in Europe in recent years has been to deliver higher speeds with DSL and cable technologies.

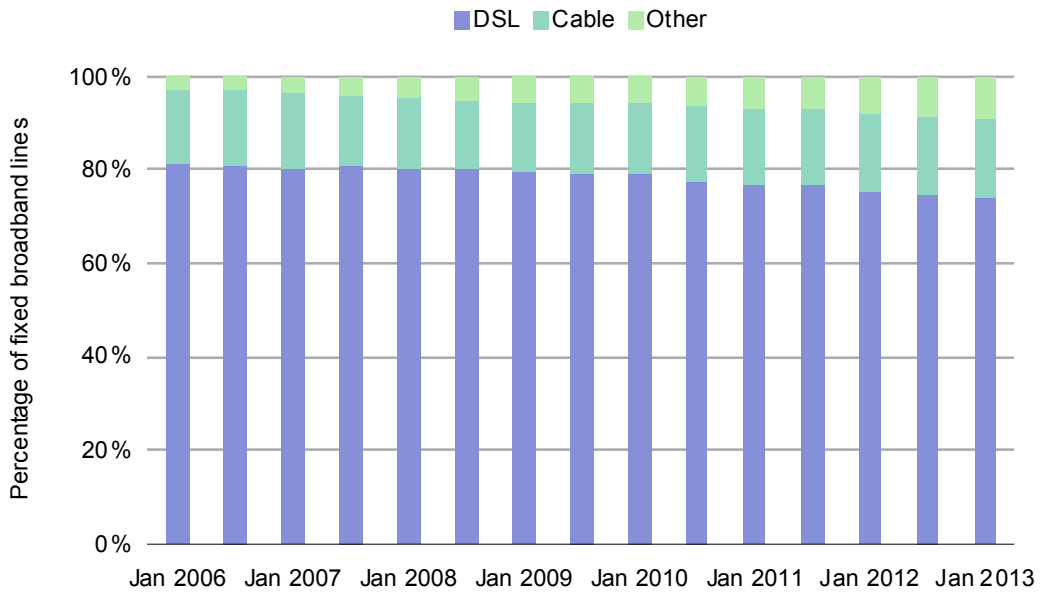

Exhibit 2.1: *European Union fixed broadband lines by technology share, January 2006 – January 2013 [Source: Source: Digital Agenda Scoreboard]*

As of January 2013 59% of fixed lines in Europe delivered speeds of up to 10Mbit/s. Only 3.4% of fixed broadband connections provided a minimum 100Mbit/s download.[5] Meanwhile, the European Digital Agenda[6] sets ambitious targets of achieving 30Mbit/s for all citizens and at least 50% of European households subscribing to broadband connections of 100Mbit/s by 2020. These targets are substantially higher than the minimum uptake levels specified in the UFB agreements (namely 20% uptake of passed premises by 2020). This implies that the imperative to drive migration may be higher in the European Union than in New Zealand. Furthermore, in Europe the deployment of these networks primarily depends on private investment and therefore incentives to invest in high-speed broadband infrastructure are a key consideration for policy-makers. As such a debate emerged concerning the potential influence of 'high' or 'low' regulated copper prices and associated commercial incentives to invest in fibre networks. In contrast, the New Zealand UFB initiative is a public-private-partnership (PPP) between the Crown and local fibre companies. Chorus' investment in the fibre network in New Zealand has been agreed by contract and therefore this investment will not be influenced by copper prices.

There is a state aid provision for broadband networks in Europe, but it is not similar to the New Zealand PPP. It was developed as a component of the European Economic Recovery Plan recognising the importance of broadband in fostering growth and innovation as well as its role in social / territorial cohesion. While the European Commission contributed EUR1.02 billion towards the European Agricultural Fund for Rural Development (EAFRD), part of which was designed for use in broadband rollout in rural areas, member states also announced plans to support deployment in both rural and urban areas. State aid in broadband deployment was noted by the European Commission as a means to achieving a desirable, equitable market outcome as well as achieving objectives of common interest. However, the Commission also noted that it must be ensured state aid is not used in areas in which market operators would normally choose to invest or have invested at the risk of undermining broadband investment incentives.[7] This implies that, had New Zealand

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5 Digital Agenda for Europe (2013) *Fast and ultra-fast Internet access – analysis and data*, available at https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access.

6 See http://ec.europa.eu/digital-agenda/en/our-goals/pillar-iv-fast-and-ultra-fast-internet-access.

7 European Commission (2009) *Communication from the Commission – Communication Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks*, 20 September 2009.

introduced similar state aid provisions, the UFB initiative would not have occurred since commercial fibre networks already existed in a number of urban areas (for example, Auckland, Wellington and Christchurch).

European consultation on costing methodologies

The discussion document refers to the European Commission's July 2012 policy statement on enhancing broadband investment by Vice President Kroes which said[8]:

> … given the significant competitive relationship between copper and NGA networks, we are not convinced that a phased decrease in copper prices would spur NGA investment. … the appropriate "modern equivalent asset" for calculating copper access costs seems to be a fibre network: after all, no operator would today build a copper network.

This policy statement followed a public consultation by the European Commission on costing methodologies for key wholesale access prices in late 2011[9]. A review of the responses to this consultation reveals that most respondents largely opposed the notion that wholesale copper access prices could be set using fibre as the MEA for copper[10].

Following the release of the policy statement, in December 2012 the European Commission issued a draft Commission Recommendation on costing methodologies to enhance broadband investment.[11] While it still recommends the bottom-up LRIC+ approach for costing next generation access (NGA, or fibre), the recommendations go further to state that legacy civil engineering assets should be valued using a Regulatory Asset Base (RAB) approach, not as full replacement costs. The RAB of legacy assets is to

8 European Commission (2012) *Enhancing the broadband investment environment – policy statement by Vice President Kroes*, MEMO/12/554, July 2012.

9 European Commission (2011) *Questionnaire – for the public consultation on costing methodologies for key wholesale access prices in electronic communications,* 3 October 2011.

10 For example, incumbent operators BT, Telefónica (also an alternative operator), and Telecom Italia, and alternative operators Vodafone, Tele2 and Wind were all opposed to using fibre as the MEA for copper.

11 European Commission (2012) *Commission Recommendation on consistent non-discriminations obligations and costing methodologies to promote competition and enhance the broadband investment environment*, December 2012.

be set at 'book value net of the accumulated depreciation at the time of calculation, indexed by an appropriate price index'. Furthermore, the EC states that reusable legacy civil engineering assets that are fully depreciated but still in use should not be included within the costs.

The Recommendation suggests that for costing wholly copper-based access products, an FTTC (fibre-to-the-cabinet) network could be used as the modern equivalent asset with an adjustment to reflect differing performance features.

> For this purpose, the NRAs should consider an FttC network to be the modern efficient NGA network and should estimate the cost difference between an access product based on FttC and an access product based entirely on copper by making the relevant adjustments in the FttC engineering model, e.g. replacing the optical elements with efficiently priced copper elements, where appropriate.[12]

BEREC (Body of European Regulators for Electronic Communications) was invited to comment on this draft recommendation.[13] Its March 2013 opinion supported the aim of achieving stable and predictable copper prices in line with the principle of cost orientation – this would encourage efficient NGA investment as well as provide a competitive safeguard to third-party access seekers. However it had a number of reservations concerning the proposed costing methodology of the draft Recommendation. In particular BEREC recommended that the Commission states the appropriate general principles for modelling cost-oriented copper prices while remaining technologically-neutral, thereby deleting the reference to FTTC as MEA.

> If infrastructure competition is successful, BEREC is of the view that migration will not only take place between the SMP operators' copper and fibre networks, but consumers will also be migrating to cable networks and other operators' fibre or mobile networks.[14]

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12 *Ibid.*

13 BEREC (2013) *Commission draft Recommendation on non-discrimination and costing methodologies – BEREC Opinion,* 26 March 2013.

14 *Ibid.*

A final recommendation has just been published by the European Commission[15] which recognises the need for technological neutrality in costing methodologies and accordingly offers regulators considerably more flexibility than the draft recommendation. The LRIC standard is endorsed for wholesale access pricing as providing for recovery of efficiently incurred costs, although the RAB approach remains recommended in relation to legacy civil engineering assets to guard against cost over-recovery by incumbent access providers. The Commission makes it very clear that where modern technologies such as FTTC or FTTH are used in cost modelling then adjustments are necessary to reflect the different characteristics of the copper network.

> An FttH network, an FttC network or a combination of both can be considered a modern efficient NGA network. Under this approach the cost calculated for the NGA network should be adjusted to reflect the different features of a copper network. This requires estimating the cost difference between an access product based on NGA and an access product based entirely on copper by making the relevant network engineering adjustments to the NGA model to determine the wholesale copper access price[16].

The Commission further states that implementation of its recommended approach for wholesale copper pricing should deliver average monthly rental access price for the full unbundled copper local loop within a band between EUR8 and EUR10.

There are clear differences in the measures recommended by the European Commission, in comparison to the New Zealand government proposals. In particular, the New Zealand proposals ignore differences in performance between the copper and fibre technologies in the options for setting prices.

With respect to wholesale access for next generation networks, the European Commission has recommended that prices not be regulated, in view of demand uncertainty and the importance of wholesale pricing flexibility to support 'price differentiation on the retail

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15 European Commission (2013), *Commission recommendation of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment*, C(2013) 5761 final, 11 September 2013.

16 *Ibid*, paragraph 41.

broadband market in order to better address consumer preferences and foster penetration of very high-speed broadband services'[17].

2.2 Regulatory approaches cited in the discussion document

The Government discussion document cites regulatory approaches adopted in Australia, Italy, the Netherlands, Singapore and the UK. While the document highlights the approaches in these countries with respect to the pricing of copper services, the circumstances in these countries are significantly different and therefore not necessarily directly comparable to New Zealand.

2.2.1 Australia and Singapore

As in New Zealand, the Governments of Australia and Singapore have both committed public funding towards national high speed broadband infrastructure.

Australia

Australia's National Broadband Network (NBN) aims to cover 93% of Australian premises by the year 2021. The remaining 7% of premises are to receive high speed broadband access through fixed-wireless (4%) and satellite services (3%) by 2015. The copper network currently in use (owned by incumbent operator Telstra) will progressively be disconnected with the rollout of the NBN. It is therefore expected that the majority of premises currently connected to the copper network will migrate to at least the basic NBN fibre offerings.[18] As at June 2013 uptake was almost 14% of premises passed including

17 *Ibid*, paragraph 49.

18 NBN Co Limited (2010), *Corporate Plan 2011 – 2013*, available at http://www.nbnco.com.au/assets/documents/nbn-co-3-year-gbe-corporate-plan-final-17-dec-10.pdf.

brownfield, greenfield and fixed wireless connections (Exhibit 2.2).[19] Speeds of up to 100Mbit/s will be offered to RSPs with an entry level wholesale speed of 12Mbit/s.[20]

	June 2013
Premises / lots passed	
Brownfield	286 000
Greenfield	55 000
Fixed wireless	320 000
Satellite (estimated number of eligible users)	
Total	*661 000*
Premises activated	
Brownfield	44 000
Greenfield	10 000
Fixed wireless	37 700
Satellite	
Total	*91 700*
Total uptake	*13.9%*

Exhibit 2.2: *Key NBN metrics, June 2013 [Source: NBN Co]*

NBN Co was established by the Australian government to design, build and establish the open-access, wholesale only network. NBN Co's Special Access Undertaking (SAU)[21] sets out its 30-year regulatory framework through which NBN Co will set price and non-price terms and recover rollout costs. According to the SAU NBN Co is to keep its wholesale prices fixed for five years (until June 2017) and to limit later increases to less than inflation in order to ensure wholesale price reductions over time.[22]

As regards wholesale copper pricing, in 2010 the Australian regulator (ACCC) examined the case for replacing the existing TSLRIC+ methodology with the Regulated Asset Base

19 NBN Co (2013), *34,500 Australian homes and businesses now using the NBN,* 29 January 2013, updated June 2013.

20 NBN Co (2013), *The need for speed*, 3 April 2013.

21 NBN Co Limited (2011), *NBN Co Special Access Undertaking in respect of the NBN Access Service*, 5 December 2011, available at http://www.nbnco.com.au/getting-connected/service-providers/sau.html.

22 NBN Co Limited (2011), *NBN key wholesale prices frozen for five years*, Media release 5 December 2011, available at http://www.nbnco.com.au/news-and-events/news/nbn-key-wholesale-prices-frozen-for-five-years.html.

(RAB) approach[23] for regulated fixed line services. Subsequently the RAB approach was implemented on an interim basis in March 2011[24], with a final determination in July 2011[25]. Note that RAB approaches had previously been used in other regulated utilities in Australia, such as electricity and gas, but this was the first application to telecommunications.

The ACCC cited a number of reasons for considering that the TSLRIC+ approach may no longer be appropriate for Australian fixed line services:

- the uncertainty created by ongoing asset revaluation, and the risk of under- or over-recovery of costs by the access provider
- the possible failure to capture previous depreciation of actual assets, leading to an over-recovery of cost when assets are revalued at optimised replacement cost under the TSLRIC+ approach
- the difficulty of establishing appropriate MEA values
- the 'enduring bottleneck characteristics' of the copper access network and the observed increasing cost of bypassing it.[26]

In the ACCC's view not only did the RAB approach appear to provide more certainty, it also takes into account previous depreciation, and does not require MEA values.

Note that currently the ACCC is undertaking a review to consider whether it is necessary to continue to regulate fixed line access services in the light of the NBN deployment[27].

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23 Australian Competition and Consumer Commission (2010), *Review of the 1997 telecoms access pricing principles for fixed line services*, Draft Report, September 2010.

24 Australian Competition and Consumer Commission (2011), *Interim Access Determinations*, Nos 1-6, 2 March 2011.

25 Australian Competition and Consumer Commission (2011), *Inquiry to make final access determinations for the declared fixed line services*, July 2011. The final determinations for the declared services are available at http://www.accc.gov.au/content/index.phtml/itemId/998510.

26 Australian Competition and Consumer Commission (2010), *Review of the 1997 telecoms access pricing principles for fixed line services*, Draft Report, September 2010. See Section 4.1.

27 Australian Competition and Consumer Commission (2013), *Fixed Services Review: discussion paper on the declaration inquiry*, July 2013.

Singapore

In Singapore the Next Generation Nationwide Broadband Network is a project driven by the Intelligent National 2015 (iN2015) masterplan which was developed by the Infocomm Development Authority of Singapore (IDA). The nationwide fibre-to-the-premise network has open access requirements at both passive and active levels, supported by a three layer organisational structure[28]:

- at the first layer 'NetCo' is responsible for the design, build and operation of the passive infrastructure, and is subject to structural separation requirements
- at the second layer 'OpCo' provides wholesale network services over the active infrastructure, and is subject to operational separation requirements
- at the third layer RSPs offer services to end-users.

The Government is providing a grant of up to SGD750 million (NZD1029.91 million PPP) to support network deployment and SGD250 million(NZD343.30 million PPP) for OpCo. In 2008 the OpenNet Consortium was selected as the NetCo. This Consortium included incumbent operator SingTel, and consequently its existing passive infrastructure is being used in the deployment. OpenNet's commercial launch was in 2010, with its wholesale prices set relatively low (SGD15 / NZD20.60 PPP per month for each residential fibre connection, and SGD50 / NZD68.66 PPP per month for each non-residential connection) to encourage competitive retail prices.

OpenNet stated that as of 30 June 2012, it had rolled out fibre to 95% of all Singaporean premises[29]. By December 2012 there were 250 000 fibre broadband subscribers, with over 20% of Singaporean households subscribing to fibre connections[30]. By July 2013 there were 380 000 fibre broadband subscribers[31]. Fibre services are being marketed by numerous RSPs at attractive retail prices using speed as the key selling point, with entry-

28 See http://www.ida.gov.sg/Infocomm-Landscape/Infrastructure/Wired/What-is-Next-Gen-NBN/Industry-Structure

29 See http://www.opennet.com.sg/press/opennet-completes-initial-roll-out-of-singapore%e2%80%99s-nationwide-fibre-network/

30 See http://www.opennet.com.sg/press/more-than-1-in-5-households-on-fibre-fibre-broadband-gaining-traction-rapidly/

31 See http://www.opennet.com.sg/press/record-high-demand-for-fibre-in-june-2013/

level products offering download speeds of 100Mbit/s at a monthly rental of around SGD50 (NZD68.66 PPP). In contrast ADSL products are priced lower (SGD29 to SGD37 / NZD39.82 to NZD50.81 PPP) and offer maximum speeds of 15Mbit/s.[32]

The New Zealand discussion document notes that 'the risk of tension between copper and fibre wholesale pricing appears to be being mitigated in Singapore through a managed migration plan'[33]. However we have found no evidence that the copper network is to be decommissioned as part of the NBN initiative. The only development in this regard has been SingTel's recent announcement that it will not deploy copper infrastructure to new buildings from December 2013[34], and that this will boost fibre uptake.

Furthermore, there is no evidence that the relativity between wholesale fibre and copper prices is being used as a mechanism by the regulator to promote fibre uptake. Access providers are obliged to provide Reference Offers for specified wholesale services on non-discriminatory terms to access seekers at published prices that have been approved by the regulator[35].

Implications for UFB

The decommissioning of Telstra's copper network in Australia is in sharp contrast with the UFB initiative because fibre and copper services will be directly competing with each other in New Zealand. Also, in contrast to New Zealand, Singapore is a small, densely populated country with 100% of its residents based in urban areas. The economics of fibre deployment in a small highly urbanised environment are obviously different from those

32 The regulator provides regular price comparisons of retail ADSL and fibre products, available at http://www.ida.gov.sg/applications/rbs/chart.html

33 Ministry of Business, Innovation and Employment (2013), *Review of the Telecommunications Act 2011*, Discussion Document, August 2013. See Annex C.

34 See http://info.singtel.com/node/12772.

35 See http://www.ida.gov.sg/~/media/Files/PCDG/Licensees/NextGen%20NBN/OpenNetsInterOffer/2012/Schedule15.pdf for fibre and http://www.ida.gov.sg/~/media/Files/PCDG/Licensees/Interconnect%20Access/SingTelsRIO2012/Approved_RIO/Schedule9_20120202.pdf for copper.

related to the UFB project in New Zealand. For example, while Chorus' 24 UFB areas include Auckland and Wellington, much of the South Island is also included (with the exception of Christchurch).

Despite these differences, Crown Fibre Holdings (CFH) views Australian and Singaporean fibre uptake as providing relevant indicators for New Zealand. In the event of a breach of Chorus' contractual agreement to promote fibre products to RSPs (rather than copper products) in its UFB areas, Chorus must undertake remedial action to improve take-up on the fibre network to the level that would have been achieved absent the breach. As a check, CFH will benchmark Chorus' fibre uptake with Australia and Singapore, although it does acknowledge in the agreement that there are differences in local conditions (including regulatory)[36]. As we have noted above, Singapore is achieving rapid uptake which appears to be driven by the superior bandwidth offered by the fibre products which clearly compensates for the retail price differential over the lower bandwidth copper products.

2.2.2 European countries

As previously discussed, policies in the European countries are primarily focused on attracting private investment towards the rollout of NGA networks with ambitious targets of the European Digital Agenda to achieve widespread coverage. Given that in New Zealand public funding has been provided towards the cost of the UFB, the terms of which have been agreed by contract, the need to attract investment is not a major consideration as it is in Europe.

Furthermore we can find no country with exactly the same regulatory settings as those of New Zealand's UFB initiative. The UFB network is open access, but not at Layer 1 until 2020 for the mass market. Both Layer 1 and 2 access are common in many European initiatives which have no public involvement (fibre unbundling is discussed in more detail in Section 3.4). Service providers with vertically integrated operations are typically

36 Crown Fibre Holdings (2011), *Network Infrastructure Project Agreement, Telecom New Zealand Limited and Crown Fibre Holdings Limited*, 24 May 2011. See Schedule 2.

permitted to deploy and sell fibre to retail customers, whereas in New Zealand Chorus has been required to separate structurally from Telecom.

United Kingdom

In the United Kingdom Broadband Delivery UK (BDUK)[37] funding is available through a bidding process to local authorities, however the funding of ultra-fast broadband primarily relies on private investment. Ofcom's 2013 Communications Market Report states that the number of subscribers to superfast broadband services increased from 1.9 million in Q2 2012 to 3.8 million in Q1 of 2013.[38] At this time, superfast broadband take-up comprised 17.5% of non-corporate connections. Fibre broadband subscriptions currently make up only a small proportion of fixed broadband connections with Ofcom reporting that in 2012 "Other" broadband subscriptions, including fibre, constituted approximately 5% of total subscriptions (Exhibit 2.3).

37 See https://www.gov.uk/broadband-delivery-uk.

38 Ofcom (2013), *Communications Market Report 2013,* Research Document, 1 August 2013.

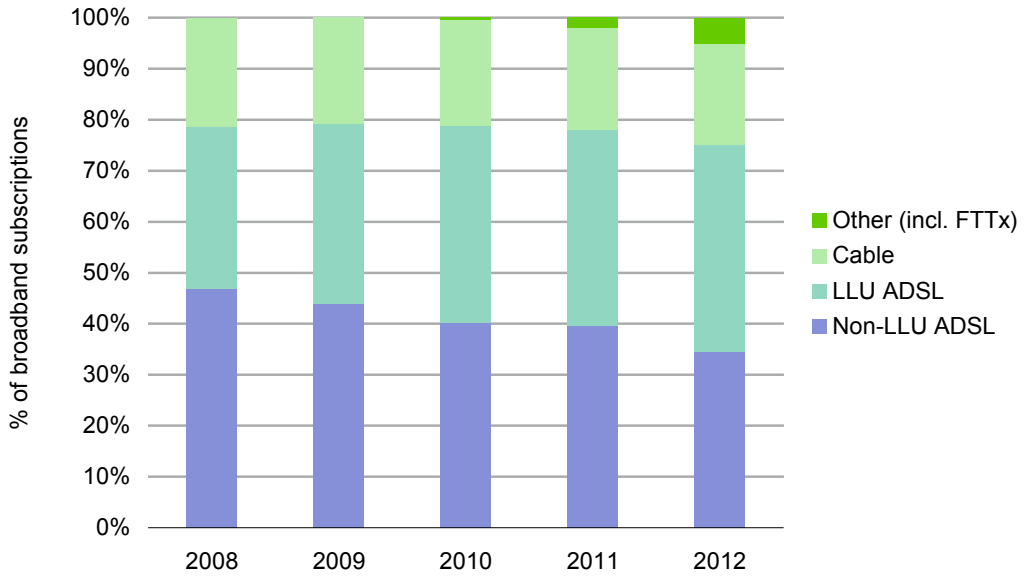

Exhibit 2.3: *Broadband by technology share, United Kingdom, 2008–2012 [Source: Ofcom]*

The take-up of fibre services has been increasing rapidly. According to BT's 2012/2013 annual report approximately 15 million premises had been passed by BT's fibre network with 1.3 million subscribers.[39] Ofcom's estimates show that approximately 56% of UK homes were able to receive either BT Openreach or Kcom fibre broadband services by the end of 2013.[40]

BT has committed to providing fibre broadband availability to 67% of UK households by 2015 through either FTTC (fibre-to-the cabinet) or FTTH (fibre-to-the-home), with most of the network being FTTC. It is estimated that deployment is 18 months ahead of the original schedule. BT Openreach doubled the speeds provided over its FTTC network to a maximum of 80Mbit/s download in April 2012 (20Mbit/s upload). Maximum speeds offered over the BT Openreach FTTP (fibre-to-the-premise) network also increased to up to 330Mbit/s (30Mbit/s upload).

39 BT (2013), *BT Group plc, Annual Report and Form20-F2013,* May 2013.

40 Ofcom (2013), *Communications Market Report 2013,* Research Document, 1 August 2013.

Other than BT's fibre broadband rollout, the main provider of superfast broadband services in the UK is Virgin Media, through its cable network. Virgin Media had approximately 2.5 million superfast connections at the end of March 2013, compared to 843 000 the previous year. Ofcom's estimates show that approximately 48% of UK homes were passed by Virgin Media's cable broadband network in June 2013. According to Ofcom, growth in subscribers to superfast broadband services is expected to slow after the completion of Virgin Media's upgrade programme which doubled the speeds provided by most of Virgin Media's cable broadband connections at no extra cost to the subscriber. The upgrade of Virgin Media's network to offer speeds of up to 120Mbit/s is expected to be completed by the end of 2013.[41]

The New Zealand discussion document notes that Ofcom has given BT flexibility in pricing wholesale access fibre services while maintaining cost-based LLU / passive services prices, and is unlikely to alter copper pricing in an attempt to support fibre investment. There is no mention in the discussion document, however, of Ofcom's anchor pricing approach for copper, which is surprising as it is very relevant to the question of appropriate wholesale pricing for legacy services in times of technological change.

> … there are circumstances where we do not set charges on the basis of MEA costs. During a period of major technological change, we generally adopt an approach to charge control setting which we refer to as the "anchor product pricing" approach. Following the anchor product pricing approach, we do not allow prices to rise above the level implied by the hypothetical continuation of the existing technology, which prevents the introduction of new technology increasing the prices for the same services provided on the basis of the legacy technology[42].

A key objective in adopting this pricing methodology in preference to a MEA approach was to avoid increases in the prices of regulated copper products driven by the introduction of new technology. In Ofcom's assessment, this approach avoids over-recovery of cost by the incumbent, avoids placing the risks of the new technology on the consumer (via higher access prices), and minimises risks of inappropriate regulatory intervention:

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41 *Ibid.*

42 Ofcom (2012), *Charge control review for LLU and WLR services*, Position Statement, 7 March 2012. See Section 3.2.2.

> … our anchor pricing approach reduces the practical difficulties of setting prices. It thereby reduces the risk of regulatory failure. To a large extent, it pushes the assessment of whether and when it is appropriate to introduce new technology away from Ofcom, and onto Openreach. Openreach bears the risks associated with introducing the new technology, rather than the consumer. If the new technology is successful and results in lower costs, then Openreach retains the benefits of introducing the new technology, until prices are gradually moved to reflect the new technology. Conversely, if the new technology is unsuccessful, consumers are protected from higher prices.

Italy

The discussion paper includes a brief note regarding the situation regarding regulated pricing for copper and fibre, however we suggest some additional information may be helpful to clarify the situation in Italy.

In a recent draft decision by the Italian regulator (AGCOM), 2013 prices for the copper network were proposed (which are to be retrospectively applied). Copper LLU prices were based on the regulator's bottom-up LRIC (BU-LRIC) model that had previously been used to set prices for 2010–12, with updates to a number of assumptions relating to demand, mark-up for commercialisation costs, and maintenance costs. These new assumptions resulted in a the proposed LLU price decreasing by 6.5% from that of 2012.[43]

For wholesale broadband access (bitstream), prices had previously been set by a mark-up on LLU, but for 2013 AGCOM proposes to use prices from its BU-LRIC model. The proposed prices are significantly lower than those for 2012, with shared bitstream decreasing by 13.5% and full (naked) bitstream falling by 22.3%.[44]

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43 European Commission (2013) *Cases IT/2013/1489-1490: Details of the price control obligation in the markets for wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location and wholesale broadband access in Italy*, 12 August 2013.

44 *Ibid*.

These 2013 prices will be the basis for a glide path to be applied over the period 2014–16, with the end point in 2016 being prices determined from an updated BU-LRAIC model for the copper network (Exhibit 2.4). The assumptions within the model have been updated take into account demand migration to NGA services over this period.

A second BU-LRIC model has been used to derive prices for NGA, and the underlying demand is consistent with the migration from copper assumed in the legacy network model. Note that the proposed 2016 prices for fibre are higher than for copper (Exhibit 2.4). AGCOM intends that the 2013 fibre prices will be confirmed via an approval process of the relevant operators' Reference Offers, similar to that used for the 2012 fibre prices. Thereafter a three-year glide path will be used to smooth the transition from the 2013 prices to the 2016 LRIC-based prices.[45]

	Actual (EUR)	*Proposed (EUR)*	
	2012	*2013*	*2016*
Copper			
Full LLU	9.28	8.68	8.88–9.29
Shared LLU	–	0.86	0.80
Shared bitstream	7.79	6.74	3.79–3.87
Full bitstream	19.50	15.14	14.16–14.79
Fibre			
VULA on FTTC (shared line)	–	–	10.38
VULA on FTTC (dedicated line)	–	–	16.99–17.04
VULA on FTTH (100Mbit/s / 10Mbit/s)	–	–	21.12
VULA on FTTH (40Mbit/s / 40Mbit/s)	–	–	29.27
VULA on FTTH (100Mbit/s / 100Mbit/s)	–	–	73.34

Exhibit 2.4: *Proposed wholesale copper and fibre prices, Italy (EUR) [Source: AGCOM]*

45 AGCOM (2013) *Identificazione ed Analisi dei Mercati dei Servizi di Accesso alla Rete Fissa (Mercati nn. 1, 4 e 5 fra quelli Individuati dalla Raccomandazione 2007/879/CE), Allegato B alla Delibera n. 238/13/CONS*, 21 March 2013.

2.3 Conclusions

The Government's proposed approach of setting copper access prices to be roughly equivalent with fibre prices is inconsistent with overseas costing policy and practices which typically are based on principles of technological neutrality. As in New Zealand, European policy-makers are keen to encourage investment in and deployment of high speed broadband networks by 2020, but the level of copper wholesale pricing is not being used as a lever to assist in achieving this objective.

To promote effective competition international regulatory best practice requires the continued use of LRIC principles in pricing wholesale copper-based services, in the situation where an access provider has significant market power. It is true that regulators are making amendments to the implementation of these principles in this time of technological transition, but these changes are to ensure that copper legacy services are not **over**-priced. Thus currently we see declining copper wholesale broadband access prices in a number of jurisdictions, such as Italy. These practices ensure, as noted by Ofcom, that the risks of new investments are not borne by the consumer. This is completely the opposite of the proposed mechanism in New Zealand which is to increase the wholesale broadband access prices above cost so that the risks of the new investments are borne by consumers.

Furthermore, in the case of New Zealand, the consumer (in the role of the tax-payer) is already providing a subsidy for the deployment of the new high-speed broadband infrastructure. To increase the price of copper access services to a level higher than justified by benchmark LRIC costs implies an additional inefficient transfer from the consumer to Chorus.

3 The Modern Equivalent Asset principle

The discussion document proposes that in the New Zealand context the appropriate MEA for copper is fibre, on the basis that this technology would be selected to replace the existing fixed copper network, and furthermore that the UFB tender process has revealed the actual costs of a replacement fibre network[46]. Since a competitive process was used, the document suggests that the contracted prices reflect efficient costs, and as such the costs of fibre deployment in New Zealand may be estimated with reference to entry-level UFB fibre prices. This, then, is the justification for the main conclusion of the document – that it is appropriate for copper and fibre wholesale prices to be 'roughly equivalent' during the UFB build period.

In this Section we consider:

- the views in the discussion document on pricing principles (Section 3.1)
- whether fibre really is the MEA of copper (Section 3.2)
- relevant experience in other countries (Section 3.3)
- technical issues in estimating copper prices using a fibre MEA (Section 3.4)
- the implications of all of the above (Section 3.5).

3.1 Background

The discussion document endorses the pricing principles that currently guide the setting of UCLL and UBA prices – that is, long-run forward-looking costs (TSLRIC) – as

46 *Ibid*, paragraph 175.

international best practice and theoretically sound for pricing access to monopoly assets, on the basis that these produce efficient prices that are:

> …not too low that they discourage investment and innovation by telecommunications companies in modern replacement networks, but no higher than they need to be, so that consumers benefit from falling costs over time.[47]

It is indeed the case that telecommunications regulators widely rely on the TSLRIC construct as the most appropriate economic cost standard for pricing wholesale monopoly services for a number of reasons:

- appropriate incentives are offered for efficient entry and exit decisions
- efficient investment is encouraged – prospective service providers choosing whether to build network or rent can base decisions on relative cost
- allocative efficiency is promoted
- incumbent access providers have incentives to maintain assets while minimising costs as costs due to any inefficiencies cannot be passed on to their wholesale customers.

Regulators typically develop a bottom-up economic / engineering cost model to estimate TSLRIC prices. This involves estimating the cost of replicating the functionality of the network if it had to be built from scratch today. Current market or replacement cost is applied, the network is dimensioned to meet current (and forecast) demand and the number and type of modern equivalent assets (MEA) that need to be costed are estimated. Different technologies may be considered as possible MEAs, provided that they represent an efficient means of delivering the service to be costed at a similar level of quality. For example, broadband access services could potentially be provided by copper, fibre or wireless technologies (Exhibit 3.1).

47 *Ibid*, paragraph 20.

Broadband technology	*Maximum download speed (Mbit/s)*	*Maximum upload speed (Mbit/s)*
Copper		
ADSL2+ (per user)	24	1
VDSL (per user)	50	10
Fibre		
GPON (aggregate)[1]	2 488	1 244
Wireless		
LTE (per user)[2]	100	50
LTE – Advanced (per user)[3]	300	150

Exhibit 3.1: *Speeds of broadband technologies [Sources: TrueNet[48], Alcatel Lucent[49], Agilent Technologies[50]]*

1 The per-user speed depends on the number of users connected to the GPON network.

2 LTE can support higher speeds with the use of multiple antennas.

3 The standards for LTE Advanced specify that maximum speed can be up to 3Gbit/s download and 1.5Gbit/s upload. The speeds above have been achieved in trials in Hong Kong.

The discussion document accepts the importance of the MEA principle in pricing access to monopoly assets [51]:

> It is widely accepted internationally that the price for access to monopoly or 'bottleneck' assets like the underlying telecommunications network should be based on the cost of "modern equivalent assets". The underpinning theory to this principle is that if a competitive market existed for these services it would deliver prices at these levels.

The appropriate MEA for wholesale copper products in New Zealand, according to the discussion document, is fibre. The implication of specifying fibre as the MEA of copper is that one single access price is applicable to both copper and fibre products.

48 TrueNet, *All about Broadband*, available at https://www.truenet.co.nz/about-broadband.

49 Alcatel Lucent, *GPON – Gigabit Passive Optical Network*, available at http://www3.alcatel-lucent.com/technology/gpon/.

50 Agilent Technologies, *Understanding LTE*, available at http://www.agilent.co.nz/about/newsroom/tmnews/background/lte/.

51 *Ibid*, paragraph 21.

3.2 Is fibre really the MEA for copper?

Although the notion that a hypothetical new entrant would today choose to deploy fibre rather than copper is intuitively plausible, it gives rise to many potential inconsistencies with traditional MEA implementation principles, including:

- the need to select the MEA on the basis that for a particular service the MEA delivers at lower cost than the existing technology
- the need to apply equivalence in MEA selection – that is, if the MEA offers more functionality than the legacy asset then this must be taken into account.

In short, it is essential to ensure that we are comparing like with like, otherwise perverse outcomes may follow.

Let us consider a practical example in the New Zealand context. The Commerce Commission throughout the 2000s engaged in TSLRIC modelling as the means to cost the Telecommunications Service Obligation (TSO). Over a period of eight years, Network Strategies, on behalf of some of the liable parties, reviewed this modelling and developed its own cost models where it believed that the Commission's model did not adequately reflect modern efficient technologies capable of delivering the TSO. Specifically for each TSO year we investigated what technology a hypothetical new entrant might select which would deliver the TSO service at lower cost than the existing technology. We found that in many of the exchange service areas (ESAs) mobile technology was available (Exhibit 3.2) and could deliver the equivalent TSO service at a considerably lower cost than the existing wireline solution. In other words, mobile technology could readily be substituted for the existing TSO service solutions. By definition this, then, is the MEA in these areas.

Had we selected a different technology for the MEA that delivered a 'gold-plated' solution for TSO services then the TSO provider may have been compensated by liable parties for an amount higher than efficient or even actual costs. It follows that the TSO provider would have no incentive to reduce costs and improve efficiency while liable parties would have faced inefficient transfers of value.

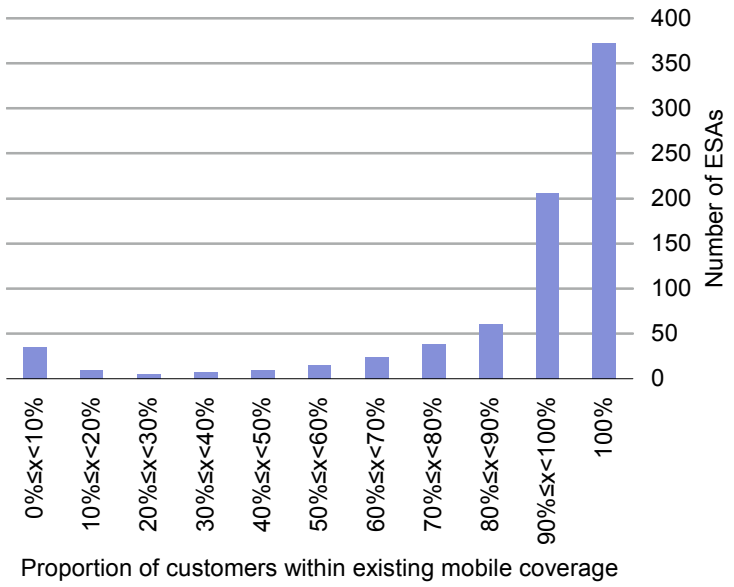

Exhibit 3.2:
Distribution of proportion of TSO customers within existing mobile coverage, by ESA [Source: Network Strategies]

These issues raise a number of practical challenges in attempting to use fibre as the MEA for copper on a national basis:

- The degree of functionality offered by a fibre network is considerably greater than copper – this makes it difficult to compare characteristics.

- Wholesale services available on copper networks may differ substantially from those available on fibre – that is, exactly equivalent services may not be observable. Further discussion of this issue follows in Section 3.3.4.

- Fibre network coverage is typically less than that of legacy copper networks, yet the cost would have to be assessed based on a hypothetical nation-wide fibre deployment (unless there is geographic pricing differentiation).

Such complications make it difficult to mount a case that fibre may be used as the MEA for copper in the absence of some form of adjustment procedure. The importance of such a

procedure is emphasised by the Body of European Regulators for Electronic Communications (BEREC)[52]:

> If the MEA has greater functionality and/or flexibility than the existing technology, a methodology is then required to "abate" or reduce the MEA costs for the services of a reduced "quality". When choosing the MEA the regulator must be careful not to prejudge technological choices of the operator or cut off technological options. The choice will also depend on the competitive pressure from alternative infrastructures (e.g. cable, mobile).

In the UK Ofcom has rejected the use of fibre as the MEA for copper on the grounds that implementation would be prone to error, particularly in view of the requirement to adjust for functionality:

> … the scope for error in using FTTP to determine the cost of services delivered over the existing copper network would be considerable, both in determining the costs of an MEA network and also the calculation of how much to reduce (or 'abate') the costs of the FTTP assets to take account of the lower functionality of the existing copper network[53].

Likewise, BT states that fibre cannot be used as the MEA for copper for similar reasons. In particular BT notes that the ongoing costs of fibre are difficult to assess and may not be lower than copper. As such BT contrasts estimated costs from the Broadband Stakeholders Group (BSG) for deploying a FTTN/GPON network of GBP24.5 billion with its historical capital expenditure on the copper network GBP6.1 billion (using an 18 year time horizon)[54]. Other reasons cited by BT that indicate fibre is not the MEA for copper are:

- much of the fibre being deployed in the UK in its access network is for a FTTC overlay network so the fibre is not replacing copper

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52 BEREC (2011), *BEREC's answer to the Commission's questionnaire on Costing methodologies for key wholesale access prices in electronic communications*, 9 December 2011. See page 21.

53 Ofcom (2013), *Fixed access market reviews: Approach to setting LLU and WLR Charge Controls*, 20 August 2013. See paragraph 3.38.

54 BT (2011), BT's response to the Commission's questionnaire for the public consultation on costing methodologies for key wholesale access prices in electronic communications, 28 November 2011.

- a fibre network requires power to be available at the customer's premises unlike the copper network for which services – including emergency services – may be supplied using standby power supplied by the local exchange building[55].

With no adjustment fibre-based costs simply cannot represent efficient costs for copper wholesale services. Since the Commerce Commission's benchmarking indicates that the efficient costs of the UCLL and UBA services are less than the UFB entry-level fibre price, implementation of the proposals in the discussion document would imply that Chorus will receive a greater subsidy than it is already obtaining through its UFB contract while consumer welfare would be adversely affected through higher copper prices. The negative impact on consumer welfare is all the more evident in areas in which UFB services will not be available, as the discussion document indicates that there should be no dispensation in wholesale copper pricing for non-UFB areas.

3.3 Relevant experience in other countries

3.3.1 Denmark

In Denmark FTTH is available on a widespread basis, accessible to 41% of Danish households as at mid-2012, compared to 36% and 31% (respectively) at the same point in time for the previous two years. Fibre bitstream is a regulated service, as are copper bitstream and LLU services. Regulated prices are set for these services using a LRAIC modelling approach with separate cost models for copper, fibre and cable. In November 2011 the Danish regulator notified the European Commission of its proposed 2012 prices based on model results (Exhibit 3.3). The European Commission noted the large price differential between copper and fibre bitstream, which was explained by the Danish regulator as reflecting the higher cost of fibre, even though economic depreciation had been applied for the fibre bitstream modelling.

55 *Ibid.*

	2011	*2012 (proposed)*	*Annual variation (%)*
LLU – full	820	825	+0.61
LLU – shared	410	412	+0.49
Copper bitstream – layer 1	757	752	-0.66
Copper bitstream – layer 2	889	932	+4.84
Fibre bitstream – DONG area	1689	1712	+1.38
Fibre bitstream – other areas	2294	2334	+1.75

Exhibit 3.3: *Danish annual regulated prices, as notified to the European Commission, DKK per line [Source: Danish Telecommunication Authority]*

In 2011 the Danish regulator did not consider that fibre was an appropriate MEA for fibre, but reassessed this in the subsequent model review two years later. This assessment was undertaken by consultants using three key criteria[56]:

- technological: whether fibre-based products can replace copper / cable-based products
- cost: the comparative costs of deploying the different networks
- market behaviour: whether behaviour on both the supply and demand side of the market indicate that fibre is the MEA of copper / cable.

Note that the incumbent, TDC, operates copper, cable and FTTH access networks. In Denmark FTTH networks have historically been deployed by utility companies, and TDC acquired the network of one of these (DONG).

The consultant's analysis found that:

- FTTH offered a superior technological performance compared to copper and cable, providing the same or higher bandwidth
- although the cost of a FTTH access network was higher than that of either copper or cable, considerable operational economies may be available from fibre and over time the price of fibre may decline

56 TERA Consultants (2013), *Modification and development of the LRAIC model for fixed networks 2012-2014 in Denmark, MEA Assessment*, Danish Business Authority Ref:2012-55-DB-DBA-v2.3, May 2013.

- since 2008 in relation to the total broadband market, the proportion of DSL subscriptions has been decreasing, cable subscriptions have been static, and fibre subscriptions have been steadily increasing to reach over 10% of the broadband market in 2012 (Exhibit 3.4). In general consumers appear to be demanding higher broadband speeds, although this may simply reflect aggressive pricing rather than a genuine change in demand patterns
- FTTH appears to be the preferred infrastructure for new entrants (utilities) in Denmark.

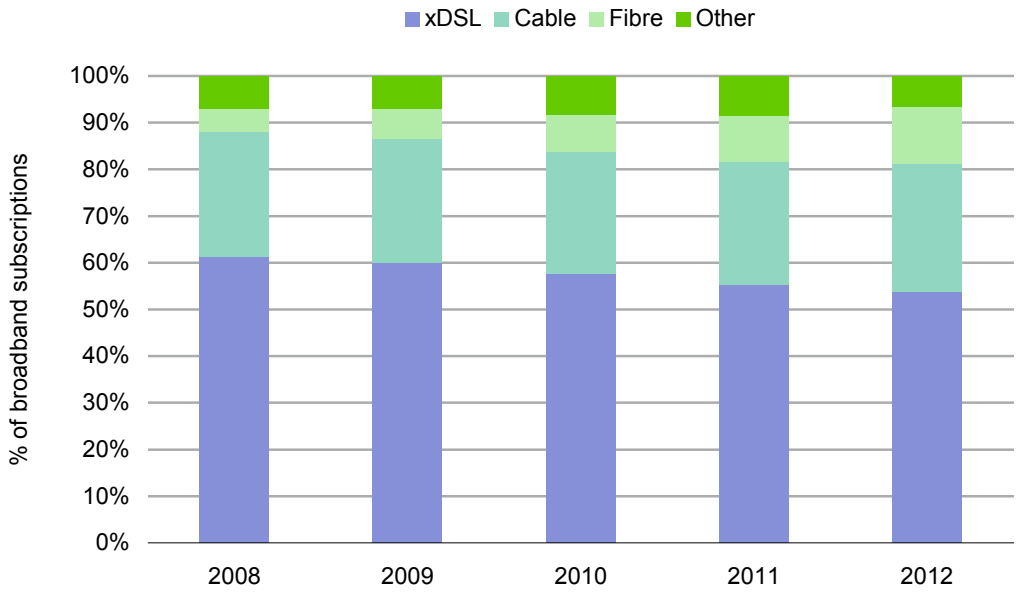

Exhibit 3.4: *Denmark – broadband by technology share, 2008-2012 [Source: Danish Business Authority]*

The study concluded that on balance FTTH can be considered the MEA of copper and cable in Denmark, with the technological and market criteria presenting the strongest case for adopting fibre as the MEA of copper.

However, the study then discusses the impact of the FTTH MEA on prices, particularly how fibre prices should be adjusted to set copper and cable prices. To this end, a number of options were considered:

- adjustments based on consumer preference

- adjustments based on technological performances
- adjustments based on costs.

The first two possible adjustments bear no relation to the differential costs of copper and fibre and as such would not enable efficient cost-recovery or encourage cost-efficient investment. Consequently considering the regulator's statutory objectives (price control obligations in promoting efficiency and sustainable competition and to maximise consumer benefits), it was concluded that an adjustment based on cost is most appropriate. This would be implemented by estimating both the FTTH cost, and the costs of copper and cable networks, with the differentials in cost being used to inform the price differential for the regulated products. It should be noted that FTTC will be included in the copper modelling[57]. Note also that the Danish regulator does not propose to include a risk premium for fibre deployment in its cost comparisons on the basis that the risks faced by a new entrant are the same, whether they invest in copper or FTTH[58].

3.3.2 Sweden

The Swedish regulator, PTS, uses a LRIC model for setting price controls for unbundled local loop and bitstream. From the 2011 version of this model, PTS has held the view that fibre and wireless are the MEAs for copper access technology, and would minimise the forward-looking cost of the infrastructure. PTS now perceives copper and fibre as substitutes, with fibre completely replacing copper in the long-term. Note that in Sweden, fibre has been deployed since the 1990s, mainly through local municipalities. There is now widespread fibre deployment and new deployment of copper is almost non-existent.

Similar to the situation in Denmark, since 2008 the share of DSL subscriptions in the total broadband market has steadily decreased in Sweden whereas the share of cable subscriptions has remained relatively constant and the share of fibre subscriptions has increased from approximately 20% in 2008 to almost 35% in 2012 (Exhibit 3.5).

57 Erhvervsstyrelsen (2013), *Consultation note regarding MEA assessment*, 1 May 2013. See page 7.

58 *Ibid*, page 14.

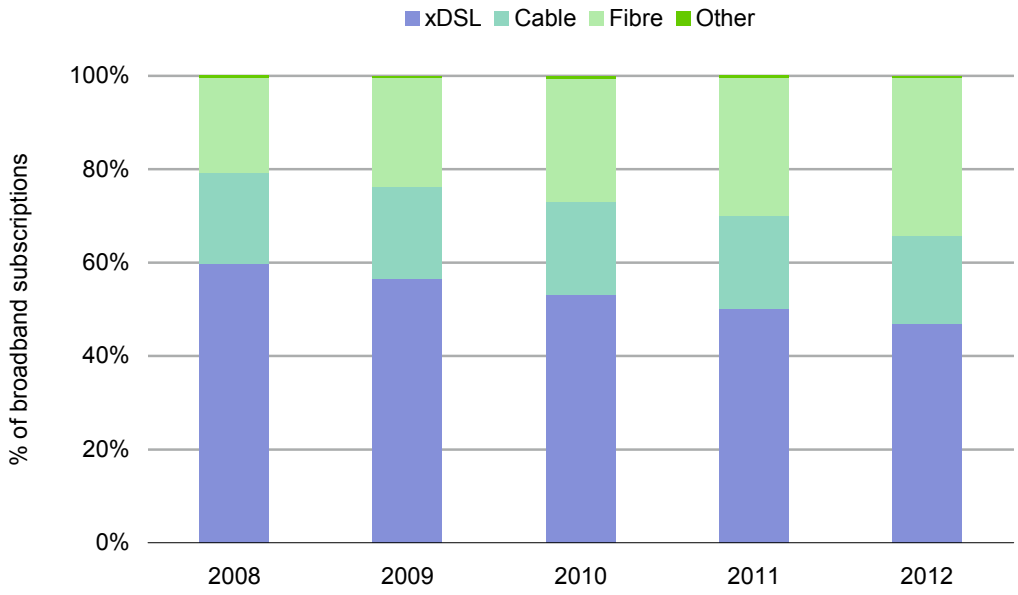

Exhibit 3.5: *Sweden – broadband by technology share, 2008-2012 [Source: PTS]*

The price for unbundled fibre – derived by the PTS model – is geographically de-averaged with separate prices in each of four geotypes (excluding the geotype corresponding to sparsely populated areas). The price for fully unbundled copper access is the average across these four geotypes. PTS estimated the cost of deploying copper to be similar to, or slightly higher than, the cost of deploying fibre.[59] Wireless infrastructure is the MEA for copper in areas with low population density, where only voice or low capacity lines are provided.

Physical unbundling of fibre is available, and prices are also determined by the PTS cost model. Fibre bitstream prices are higher than copper bitstream.

59 European Commission (2011) *Commission decision concerning case SE/2011/1205: Further details of price control remedies – review of the LRIC model*, 12 May 2011.

TeliaSonera, an incumbent copper and fibre access provider in Sweden, claims that the Swedish model underestimates the deployment costs for fibre because[60]:

- copper penetration remains significantly higher than fibre penetration, and there is uncertainty regarding further fibre uptake, given competition from other technologies (including mobile)
- no additional cost is included for parallel operation of copper and fibre networks
- the model assumes low risk due to the predominance of copper
- there is no allowance for the difference in capabilities of copper and fibre networks.

TeliaSonera concludes that the model output does not reflect costs, and consequently regulated prices based on these estimated costs do not deliver appropriate investment and uptake incentives.

> There must be a pricing method that takes into account the difference in business environment and capability between copper and fibre. Otherwise the model will produce a price level for fibre that does not enable a massive deployment and the following transition from copper to fibre[61].

Thus TeliaSonera expects that a cost-based model should deliver higher costs for fibre access than copper, enabling a wholesale price differential that would encourage fibre uptake with fibre prices higher than copper prices.

> If the regulated wholesale price for fibre is equal to or below the copper price this will effectively remove the possibility to charge a higher price for the extra capability that fibre performs and thereby also remove one of the key drivers for the transition from copper to fibre.[62]

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60 TeliaSonera (2011), *TeliaSonera's response to the European Commission consultation on costing methodologies for key wholesale access prices in electronic communications*, 28 November 2011.

61 *Ibid*.

62 *Ibid*.

3.3.3 Switzerland

As in Denmark and Sweden, Switzerland has copper, cable and fibre access networks, with a number of utility companies operating fibre networks. Swisscom owns the copper network (offering ADSL and VDSL services to 98% of the population[63]) and engages in various fibre projects, while there is also a cable network with approximately 70% coverage of the country.[64] DSL and cable subscriptions as a proportion of the total broadband market have remained relatively constant since 2008, while fibre subscriptions constituted approximately 1% of broadband subscriptions in 2011 (Exhibit 3.6).

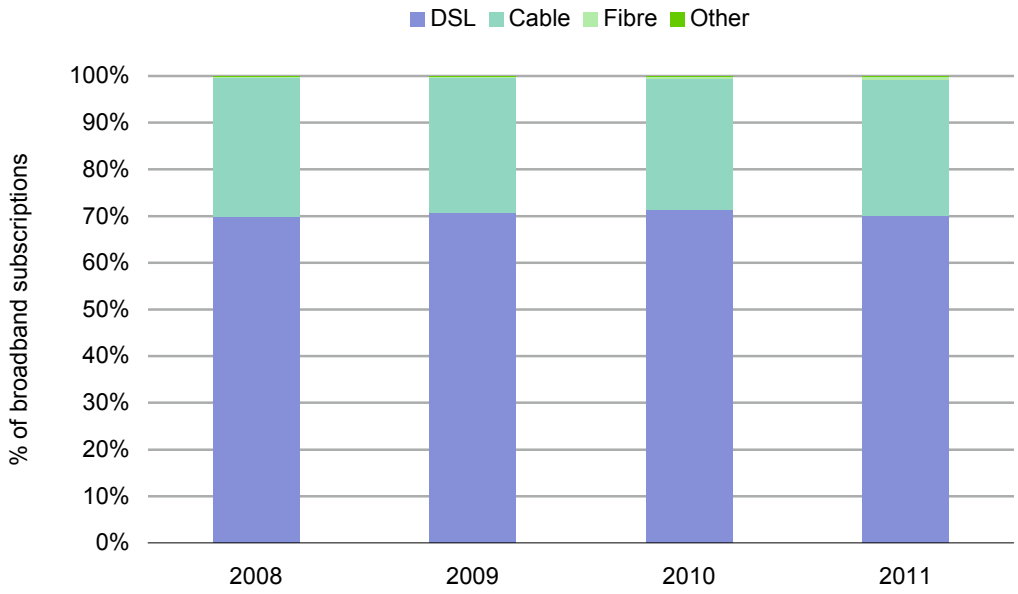

Exhibit 3.6: *Broadband by technology share, Switzerland, 2008-2011 [Source: BAKOM]*

A public consultation on wholesale products and services was launched by the Swiss regulator (BAKOM) in early 2012.[65] A focal point of the consultation was the impact on

63 Swisscom (2007), *Faster Internet access: VDSL bandwidths of up to 16,000 kbps are now a reality*, press release, 8 May 2007.

64 See http://www.upc-cablecom.ch/en/about/about-us/company/.

65 BAKOM (2012), *Public survey of experts concerning methods for determination of regulated wholesale prices in the telecommunications sector, 2012.*

regulated prices (calculated using a traditional LRIC standard) of declining demand for the copper local loop. In particular, these changing market conditions were leading to increasing copper prices rather than a decreasing trend.

> It can already be observed that the demand for copper local loops is falling. Because of the expansion of next generation access networks, it is to be expected that this drop in demand will become more pronounced in the future. … Falling demand also leads to reduced economies of scale, as the large block of fixed costs in a network is spread over a smaller quantity. In the long-run incremental costs (LRIC) model, this development leads to rising prices: a result which would not be expected in markets with functioning competition. Reduced demand would instead tend to express itself in falling prices with technologies which were running out of steam. Accordingly, the incentives for investment might be distorted with LRIC and might in the long run be weakened.[66]

In other words, the Government held concerns that using LRIC with a hypothetical new entrant to determine cost-based prices was delivering an outcome which was inconsistent with expected behaviour in a competitive market.

Proposed changes to the ordinance on telecommunications services were announced by the Swiss Federal Council in April 2013 giving stakeholders an opportunity to comment by 21 June 2013.[67] The proposed changes include the use of FTTH as a MEA for copper, with pricing for the copper local loop calculated using a 'performance delta' to adjust for differing levels of efficiency, quality and cost exhibited by fibre and copper technologies. A final decision has not yet been published.[68]

The notion of adjustment via a 'performance delta' is based on consultancy advice from WIK-Consult[69] to the effect that wholesale prices should be calculated using the market

66 *Ibid*,

67 The Swiss Federal Council (2013), *Modifications de l'ordonnance sur les services de télécommunication (OST) – Rapport explicatif,* 17 April 2013.

68 See *http://www.ofcom.admin.ch/dokumentation/gesetzgebung/00909/04220/index.html?lang=fr.*

69 WIK-Consult (2012), Analysis of alternative methods of price regulation and Neumann and Vogelsang (2013), *How to price the unbundled local loop in the transition from copper to fiber access networks?*, available at http://www.sciencedirect.com/science/article/pii/S0308596113000955.

valuation (or end-user prices) of copper and fibre broadband including an allowance for any downstream costs incurred by the RSP. Pricing on this basis would in theory make RSPs neutral between wholesale and fibre access products and in practice their decisions would be driven by their perceptions of potential product volumes. In very simple terms, the delta is the price difference (as a percentage) that customers are willing to pay for higher performance offered by fibre. For example, if this differential is 25% then the wholesale cost of a copper connection would be 25% less than the estimated cost of a fibre connection.

WIK-Consult argues that this will ensure competitive neutrality in addition to balancing the replacement and migration effects of fibre investment.[70] In particular this approach will deliver a wholesale differential that:

- is sufficiently large to encourage the access provider to invest in fibre infrastructure (a replacement effect)
- underestimates the true performance delta, with the result that the differential may provide incentives for consumers to switch from copper to fibre (a migration effect) – although the approach is not intended to be tilted in favour of fibre.

WIK-Consult also advised that the upper and lower limits of copper prices should be fixed:[71]

> … as additional regulatory restrictions. The upper price limit should be the last price determined in accordance with the FL-LRIC of the access network. Should the MEA approach lead to a higher value, FTTH could no longer serve as an MEA for copper. The lower price limit should be the short-term costs of the copper network, because it would otherwise not be rational to continue to operate the network.

Accordingly, the proposed revision to the ordinance includes:

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70 Neumann and Vogelsang (2013), *How to price the unbundled local loop in the transition from copper to fiber access networks?*, available at http://www.sciencedirect.com/science/article/pii/S0308596113000955.

71 WIK-Consult (2012), Analysis of alternative methods of price regulation.

- a price floor determined by the short-term costs required by the operator to continue offering the service
- a three-year glide path, in the event of a significant decline in access prices
- provisions to prevent price discrimination.

3.3.4 Relevance of a fibre MEA for New Zealand benchmarking

In the current New Zealand Commerce Commission's benchmarking process for UBA, Denmark and Sweden have been selected as appropriate comparators for New Zealand. The Danish benchmark value has been sourced from the current version of the regulator's cost model, which has not as yet implemented a fibre MEA. However the Swedish benchmark value has been sourced from the model that uses the fibre MEA. As this model includes no adjustment to allow for any differences between copper and fibre, *a priori* we would expect that the copper wholesale price would be over-estimated. Indeed, the Commission's consultant, Professor Ingo Vogelsang, notes that the MEA in the Swedish model is unadjusted for 'quality differences between copper and fiber access', and concludes that with respect to copper wholesale products such an approach would yield 'an upper bound for the true MEA (at least in high-density areas)'[72].

3.3.5 Summary

We conclude that only two countries (Sweden and Denmark) are currently using fibre as a MEA for copper, while Switzerland is considering the adoption of a fibre MEA. Fibre services are well established in Sweden and Denmark, although there are still more copper subscriptions than fibre in all three countries. Wholesale fibre access is regulated in these countries. This means that cost-based fibre access prices must be estimated, and as such the higher the subscriber base the lower the estimated price. A fibre-only model may be expected to generate relatively high prices for fibre access if there are relatively few

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

current and forecast subscriptions over which to allocate cost. This was demonstrated clearly in the Danish fibre bitstream results from different cost models (Exhibit 3.3). However it is possible to amalgamate copper and fibre demand into one model if we use fibre as the MEA of copper. This should have a downward impact on the estimated fibre cost, thereby addressing one of the practical problems associated with the wholesale pricing of fibre services.

The Swedish regulator claims that fibre is the MEA that minimises forward-looking cost, however internationally much uncertainty remains regarding fibre investment costs and eventual operational economies. The Swedish incumbent operator believes that the regulator's model implementation has under-estimated true fibre costs with the result that wholesale fibre prices have insufficient premium over copper prices.

It is clear that as yet there is no widely accepted regulatory best practice with respect to the treatment of fibre as a MEA for copper. Furthermore, the three countries considered above either allow for a performance delta to included in the difference between the prices or do not exclusively rely on fibre as the MEA where other technologies are more cost effective. The New Zealand Government proposal – with a single MEA with no adjustment – is very different to the approaches used by these countries.

3.4 Estimating cost-based copper prices using fibre networks

As noted by Professor Ingo Vogelsang GPON networks presents a practical difficulty for costing copper products using fibre as the MEA:[73]

> Applying FTTH as the MEA for copper access, however, can involve substantial difficulties, the main one being that currently straightforward wholesale services for UCLL and bitstream access only appear to exist for point-to-point FTTH technologies. In contrast, UCLL for GPON networks appears to be not currently available. This means that for

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

GPON currently only the total costs for UBA could be calculated but not the separate parts for UCLL and the incremental costs of adding UBA to UCLL.

Professor Vogelsang is correct: it is not currently feasible to provide unbundling over GPON. With this architecture, there is a shared fibre from the exchange, which is enabled by a passive optical splitter located between the exchange and the customers' premises (Exhibit 3.7).

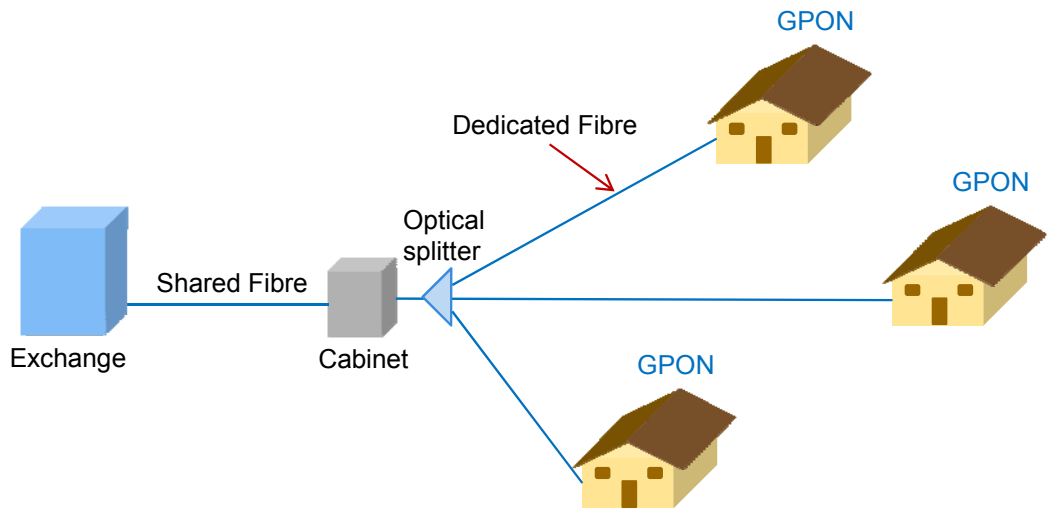

Exhibit 3.7: *GPON architecture [Source: Network Strategies]*

The main fibre technologies deployed in New Zealand are GPON (for homes and small businesses under the UFB rollout) and P2P (for large scale networks). In Sweden and Switzerland P2P is the dominant technology.[74] Note that Chorus is required to provide Layer 1 unbundling after 31 December 2019[75]. Unbundling is already available in P2P areas (mostly CBDs and business areas).

Ofcom noted that:

74 FTTH Council Europe (2013), *Creating a brighter future – Case studies collection*, September 2013; Lin C (2006), *Broadband Optical Access Networks and Fiber-to-the-Home*.

75 Crown Fibre Holdings (2011), *Network Infrastructure Project Agreement, Telecom New Zealand Limited and Crown Fibre Holdings Limited*, 24 May 2011. See Schedule 3, Annexure 2.

> Physical unbundling of fibre under a PON architecture is only possible at the passive optical splitter. With this arrangement competing [service providers] would need to have their own fibre connections between the exchange and the passive splitter, then when end users switch between different [service providers] the dedicated fibres to end users would need to be disconnected from one [service provider's] network and connected to the other [service provider's] network at the passive optical splitter.
>
> …Given that there is likely to be a large number of passive splitter locations and that the process for disconnecting/reconnecting end user fibres will require significant manual intervention, this type of fibre unbundling is likely to be costly and impractical.[76]

Physical unbundling under GPON architecture will be possible with deployment of a new technological development known as 'wavelength unbundling' – this is expected to be commercially available by 2015.

However, as a transitional measure regulators in some jurisdictions where there are GPON fibre networks have required the operators to provide a 'virtual unbundled local access' (VULA) product. This was first introduced in 2010 by Ofcom in the United Kingdom.[77] Prices for VULA in the UK are not regulated, the only obligation was that prices were to be fair and reasonable, and that Ofcom would monitor prices to ensure against the risk of anticompetitive outcomes. In the current review of the fixed access market Ofcom believed that there are competitive constraints that reduce the risk of unregulated pricing plus also there was a strong risk of setting inappropriate pricing due to demand uncertainty.[78] It proposes to supplement the requirements for fair and reasonable pricing with guidance as to how Ofcom will undertake any assessment of compliance for the VULA margin. Consultation for this review closes on 25 September 2013, and Ofcom's statement is expected to be released in the first quarter of 2014. It should be noted that Ofcom has also

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76 Ofcom (2010), *Review of the wholesale local access market: statement on market definition, market power determinations and remedies*, 7 October 2010. See paragraph 6.58.

77 Ofcom (2010), *Review of the wholesale local access market: statement on market definition, market power determinations and remedies*, 7 October 2010.

78 Ofcom (2013), *Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30*, consultation, 3 July 2013.

recently opened an *ex post* investigation of an alleged margin squeeze with respect to the VULA margin.[79]

VULA is also available in Denmark, Italy (see Section 2.2.2) and in Austria, where it is known as VULL ('virtual unbundled local loop'). Prices for the Danish VULA product are based on the historic costs of the copper network.[80]

In the New Zealand context, the outline of Layer 1 unbundling in the NIPA[81] does not appear to consider wavelength unbundling. Instead it suggests that unbundling is to occur via two fibres from the end user's premises to the splitter, and multiple feeder and distribution feeders. Given that unbundling is not proposed until 2020, such an architecture may well be superseded by technological developments which could deliver a more cost-effective and efficient solution.

3.5 Conclusions

As a general principle access prices should be cost-based and reflect the forward-looking cost of efficient service provision. This principle is consistently applied today as international regulatory best practice for copper wholesale pricing. It provides appropriate price signals to the market, thereby avoiding market distortion and promoting competition to the benefit of end-users.

While the discussion document endorses the TSLRIC standard as appropriate for wholesale copper pricing in New Zealand, it proposes that fibre technology is a more suitable MEA than copper since the former would be the technology of choice for a hypothetical new

79 Ofcom (2013), *Complaint from TalkTalk Telecom Group plc against BT Group plc about alleged margin squeeze in superfast broadband pricing*, case CW/01103/03/13, 1 May 2013. Available at http://stakeholders.ofcom.org.uk/enforcement/competition-bulletins/open-cases/all-open-cases/cw_01103/?utm_source=updates&utm_medium=email&utm_campaign=cw_01103.

80 European Commission (2012), *Commission Decision concerning Case DK/2012/1399: Remedies related to the wholesale market for network infrastructure access – setting of maximum prices for Virtual Unbundled Local Access (VULA) in Denmark*, 17 December 2012.

81 Crown Fibre Holdings (2011), *Network Infrastructure Project Agreement, Telecom New Zealand Limited and Crown Fibre Holdings Limited*, 24 May 2011. See Schedule 3, Annexure 2.

entrant. However, for a number of reasons it is evident that at this point in time fibre cannot be seamlessly swapped for copper as the MEA in New Zealand:

- investment in copper infrastructure is still occurring, particularly for VDSL services
- the GPON network architecture does not deliver physical services that are the equivalent of an unbundled copper service (although virtual unbundling has been implemented in other jurisdictions)
- fibre is only available on a limited geographic basis so cannot serve as a ubiquitous MEA, even when the UFB deployment is complete
- given the early stage of fibre deployment, there is still considerable uncertainty regarding the costs while demand remains low
- many characteristics of fibre (costs, network performance) differ substantially from copper, meaning that to achieve 'equivalence' with copper it is necessary to consider introducing adjustments to the analysis – there is no consensus regarding an appropriate approach for this as few regulators have attempted implementation of a fibre MEA.

4 UFB: the economics of deployment

MBIE officials at the InternetNZ Forums on the discussion document indicated that the economics of the UFB deployment were a key consideration underlying the Government's proposed pricing mechanism. From the discussion document[82]:

> The relative price of access for telecommunications companies to the copper network, and to the fibre network as it is rolled out, has a big impact on whether telecommunications companies choose to use fibre (where it is available) or stay on copper. This in turn affects the availability of new fibre-based services to consumers, the uptake of those services and the economics of the roll-out of fibre.

Little information has been made available as to the extent of any emerging financial problem with the UFB deployment. Thus we consider, in this Section:

- the Chorus contract with CFH (Section 4.1)
- current and historical cost information concerning the deployment (Section 4.2)
- known business risks (Section 4.3)
- independent estimates of the cost of UFB in New Zealand (Section 4.4)
- whether UFB prices represent efficient costs (Section 4.5)
- the implications of the above (Section 4.6).

82 Ministry of Business, Innovation and Employment (2013), *Review of the Telecommunications Act 2011*, Discussion Document, August 2013. See paragraph 171.

4.1 Chorus' contract with CFH

The Chorus contract with CFH is for the design and build of a fibre network for 24 of the 33 UFB areas, including Auckland, eastern and southern parts of the North Island and much of the South Island (excluding Christchurch). Government investment for this will amount to approximately $929 million. This funding will be available in stages and is dependant upon Chorus achieving agreed milestones, with completion by 31 December 2019. By June 2013 approximately 149 000 premises were to be passed, with 106 000 to be passed annually thereafter (with the exception of the final year). Actual figures from Chorus indicated that 153 000 premises had been passed by the end of June 2013. At completion the network should pass about 830 900 premises.

The Crown contribution includes both equity and debt securities. There is a condition in the contract that Chorus must achieve 20% penetration of premises passed in its UFB areas by 2020 in order to avoid early repayments.

The terms of the 2011 Network Infrastructure Project Agreement (NIPA) between CFH and Telecom include a commitment that Chorus will actively support the Government's UFB uptake objective of maximising connections to the UFB network[83]. As such Chorus has undertaken to prioritise investment in fibre access and uptake while minimising ongoing copper investment in future business plans. This includes specific limitations on Chorus' further copper deployment. In particular Chorus must:

- not build any new copper to the home networks in Chorus' UFB areas
- not deploy any further copper-based cabinets beyond those in the existing cabinetisation programme
- restrict VDSL deployment to sites that exist as at 31 December 2011.

However, we do not believe that this agreement precludes Chorus from further upgrades to existing VDSL sites, as the agreement permits investment to enhance the current product to

83 Crown Fibre Holdings (2011), *Network Infrastructure Project Agreement, Telecom New Zealand Limited and Crown Fibre Holdings Limited*, 24 May 2011. See Schedule 1.

deliver superior performance[84]. We note there have been technology trials that increases the bandwidth available over VDSL to speeds comparable with 1Gbit/s fibre.[85] While this G.fast[86] vectoring technology will not be commercially available for several years, VDSL vectoring is currently being deployed by a number of operators, including AT&T, Belgacom, Deutsche Telekom, KPN and Telekom Austria. With VDSL vectoring, speeds can increase to 100Mbit/s, however in an unbundled exchange or cabinet, it can only be implemented by one operator, which may create a requirement for regulatory intervention.

4.2 Under-estimation of the cost

In addition to the Crown funding of $929 million, in 2011 Chorus estimated that the total cost of deploying the common elements of the fibre network in its 24 UFB areas will be between $1.4 billion and $1.6 billion. In February 2013 Chorus amended this estimate to $1.7 to 1.9 billion.

Chorus is responsible for funding the connection of FTTH for standard residential customers[87], and which it estimated in 2011 to be $900 to $1 000 per premise. In contrast, in its 2013 Annual Report Chorus stated that the average cost per premises passed was $3 048. Chorus noted that the much higher average cost reflected 'the start up nature of this programme and the lack of volume to support scale efficiencies'[88].

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84 Crown Fibre Holdings (2011), *Network Infrastructure Project Agreement, Telecom New Zealand Limited and Crown Fibre Holdings Limited*, 24 May 2011. See Schedule 2, Annexure 2.

85 Alcatel-Lucent (2013), *Alcatel-Lucent and Telekom Austria Group complete world's first trial of new technology enabling ultra-fast broadband over existing copper networks*, media release, 2 July 2013.

86 G.fast is a new International Telecommunication Union (ITU) broadband standard that promises to provide high bit rates on very short loops.

87 This is defined as the first 15 metres of new trenching to connect a home, or up to 100 metres of fibre where there is an available duct, or a single overhead aerial span. For residential connections where distances exceed the above, Chorus is offering free installation (up to 200 metres) for a limited period in the initial stage of the deployment.

88 Chorus (2013), *Chorus 2013 Annual Report*. See page 13.

4.3 Business risk: the uncertain demand for fibre

In 2011 Chorus identified uncertain end-user demand for fibre as a business risk associated with the UFB initiative, highlighting[89]:

- limited New Zealand and international experience in relation to uptake of high-speed broadband services
- the importance of compelling applications and service propositions
- the need for Chorus to provide a sufficient quality of service.

Given these uncertainties Chorus concluded that the effect on 'revenue, profitability and cash flow of various fibre uptake scenarios is complex and unpredictable'[90]. On the one hand the switching of an end-user from copper to fibre services leads to a decrease in copper revenue, but on the other hand it increases fibre revenue. However, if the fibre uptake is limited mainly to the basic product, Chorus expects that this will adversely affect profitability[91].

> New Chorus' future revenues and profitability will be affected by both the level of fibre uptake and the mix of fibre services sold between basic plans and higher-priced premium services. Because an end-user's uptake of fibre will often be accompanied by an offsetting loss of revenue as the end-user disconnects from the copper network, New Chorus bears the cost of initially connecting Premises to the fibre network and the profitability of fibre services depends on the mix between lower priced basic plans and higher priced premium services. New Chorus' profitability may be adversely affected by uptake that is either too low, too high or that is overly weighted to basic services.

In addition, it is important to note that Chorus identified in 2011 that, due to the new regulatory framework, there was a risk that copper-based wholesale prices could be

89 Telecom New Zealand Limited (2011), *Share in two journeys, Demerger of Chorus Limited by Telecom Corporation of New Zealand Limited*, 13 September 2011. See Section 9.2.1.

90 *Ibid.*

91 *Ibid.*

significantly below the contractually agreed fibre prices[92]. Thus the risks associated with both end-user demand and copper regulated prices were known to Chorus and explicitly identified to shareholders prior to separation.

4.4 Independent New Zealand fibre deployment cost estimates

So how closely do the UFB contracted prices reflect cost? On behalf of InternetNZ, three years prior to the UFB contractual process, Network Strategies modelled the cost of achieving very high-speed broadband connectivity (with a target of 100Mbit/s for domestic users and 1Gbit/s for commercial users) for 75% of New Zealand's population[93]. The results of our model provide indicative costs for the fibre network in New Zealand.

The following business models were examined:

- a lit-fibre (Layer 2) fibre to the premises (FTTP) operator that provides Ethernet services (using either GPON or active Ethernet technologies), building the network from scratch
- a 'Layer 0' provider that provides an open access structure-only (duct) network
- a 'Layer 1' provider that provides unlit fibre in a GPON architecture
- a utility expansion model where a utility uses existing ducts and poles to deploy fibre (and offers Layer 2 services).

Connection costs (CPE and wiring) were included in the model for the FTTP operator, and it was assumed (for the base case) that all new fibre infrastructure would be placed underground. Take-up was assumed to be 30% of homes passed after two years, which was comparable to that being experienced in the United States.

The total investment requirements for the various business models (Exhibit 4.1) indicate the level of significance of the costs of trenching and installing ducts. Any network that can

92 *Ibid*, see Section 9.2.5.

93 Network Strategies (2008), *Broadband strategy options for New Zealand: an analysis of possible infrastructure models*, 15 December 2008, available at http://old.internetnz.net.nz/issues/newzealand/broadband-strategy-options-for-new-zealand/.

avoid these costs – such as in the utility expansion model – will realise significant cost savings. Note, that with respect to the utility expansion model it is assumed that existing ducts and poles are used to deploy fibre for 50% of the network.

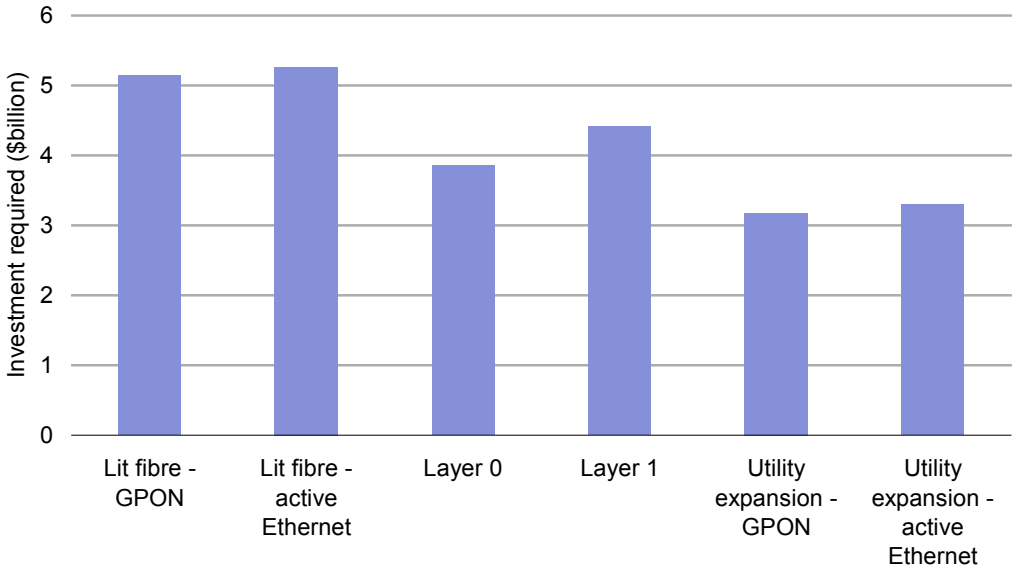

Exhibit 4.1: *Total investment required, by business model [Source: Network Strategies]*

In addition we modelled an extension to Telecom's cabinetisation rollout based on a fibre to the node (FTTN) architecture. This scenario uses VDSL2 with a theoretical maximum data rate of 250Mbit/s.

Exhibit 4.2 below shows the total investment required over the life of the business model for each of the three technologies in the 'lit fibre' (Layer 2) scenario and assuming the 'premium service' take-up[94] scenario: $1.2 billion for FTTN/VDSL2, $5.1 billion for GPON, and $5.3 billion for active Ethernet. GPON and active Ethernet are closer than

94 The take-up assumption in this scenario is comparable to that experienced in the United States, and the 100Mbit/s wholesale tariff set to a level which would result in similar retail tariffs to those of the Verizon FiOS service. These prices are considerably higher than NZD50, so expectations for mass market adoption must be considered unlikely unless tariffs fall at a faster rate than in our scenario.

expected because while the active Ethernet electronics are more expensive, GPON requires far more feeder fibre which reduces its cost advantage.

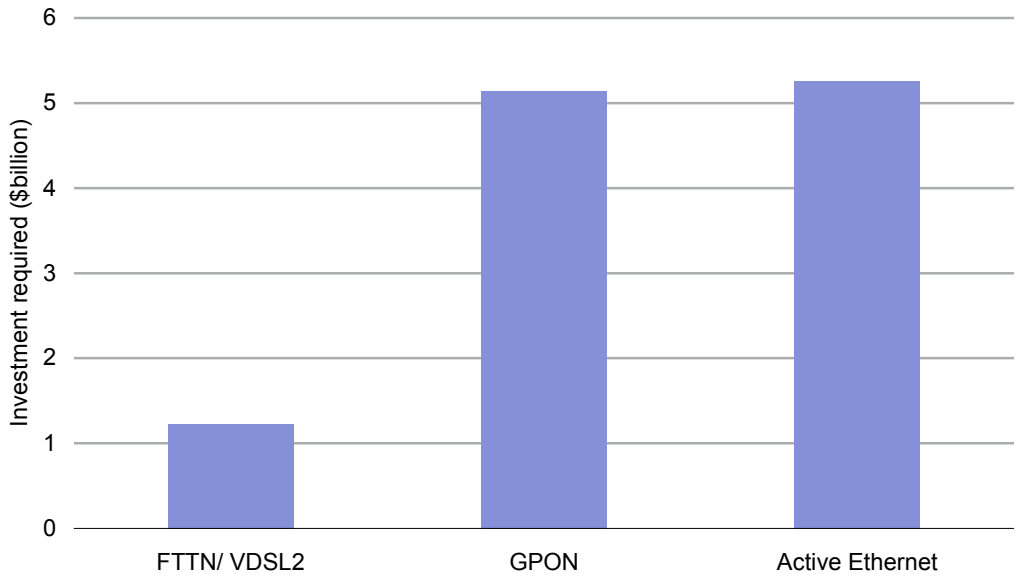

Exhibit 4.2: *Total capital investment requirements for FTTN/VDSL2, GPON and active Ethernet [Source: Network Strategies]*

Exhibit 4.3 shows the investment required per premise passed[95] (excluding per-premise costs), and per customer connected[96] (including per-premise costs), for each technology. The investment per premise passed for FTTP is $1948, which is about four times the cost of FTTN/VDSL2.

95 Network investment divided by the number of premises that are within network coverage.

96 Network investment divided by the number of customers.

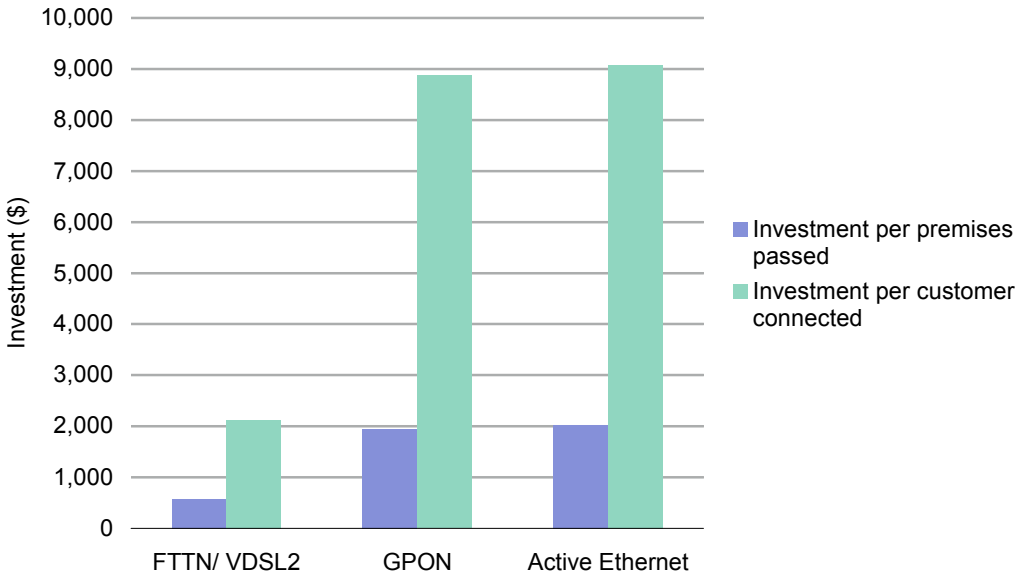

Exhibit 4.3: *Investment per premise passed and investment per customer connected, by technology [Source: Network Strategies]*

As a comparison, in Europe a cost of EUR1000 to EUR2000 for fibre to pass premises is widely cited.

Our own New Zealand UFB cost estimates, together with the European benchmarks, indicate that the initial UFB costs quoted by Chorus in 2011 may well have been under-estimates.

4.5 Do UFB prices represent efficient costs?

UFB wholesale prices represent the outcome of a commercial negotiation between CFH and the LFCs. The details of this negotiation have not been made public and so it is difficult to make an assessment of the extent to which the final contracted prices reflect cost.

We do know, however, that a wholesale pricing 'template' did constitute part of the negotiation process. The document specified price caps for 'template' products and was

first released when CFH announced that it had reached an agreement with NorthPower to deploy fibre in parts of Northland[97]. This was prior to the agreements reached with the other LFCs, including Chorus.

The template document states that the LFC will offer:

- a consumer entry level product for $40 or less per month, with download speed of 30 Megabits per second (Mbit/s) and upload at 10Mbit/s
- a 'triple play' entry product with a higher downstream Committed Information Rate (CIR) of 10Mbit/s designed to carry high definition pay TV as well as voice and broadband, to be initially priced at $45 or less
- a product for the home priced at $60 or less, providing 100Mbit/s download speed and 50Mbit/s upload.

Furthermore, the price of the entry level product is compared in the template document with the price and specifications of the copper product EUBA40.

> This is lower than the current price of 'Naked DSL', a wholesale copper product which supports ADSL2+ broadband services without a phone line, known in the industry as EUBA 40. 'Naked DSL' services have a maximum download speed of 24Mbps and 1Mbps upload. 'Naked DSL' has a guaranteed download speed, known as a Committed Information Rate (CIR) of 45 Kilobits per second. The Ultra fast fibre entry level product has a CIR of 2.5Mbps – this offers approximately 50 times greater dedicated bandwidth than 'Naked DSL'.

The above discussion suggests that the wholesale prices were not cost-based, but aligned with price points that were selected as appropriate by CFH. If the UFB wholesale prices are not cost-based, and we tie copper wholesale prices to UFB wholesale prices, then it is clear that in doing so we are departing from the cost-based standard which we have applied in New Zealand since 2001.

97 See http://www.crownfibre.govt.nz/media/10674/fact%20sheet%20-%20agreement%20with%20northpower%20limited.pdf.

4.6 Implications

There is insufficient publicly available information on Chorus' UFB deployment to draw firm conclusions concerning the ongoing financial viability of the investment. From our own information, coupled with the limited financial information disclosed by Chorus, it appears that Chorus may well have under-priced in respect to the UFB contract. Moreover, the UFB wholesale prices appear to have been set by CFH according to pre-determined price points to achieve uptake and so may not reflect cost.

As the Government UFB subsidy is fixed, to achieve its obligations Chorus may have to raise additional capital to fund investment and seek higher revenues from other services. Thus during the period to 2020 to improve the economics of the roll-out we would expect that Chorus will target:

- pricing of legacy regulated copper products at a premium over cost
- faster UFB uptake – in particular uptake of the higher bandwidth products
- rapid upgrading of the VDSL product, together with high uptake.

The issue of legacy pricing appears to be the major focus of the current Government review. In 2020 we anticipate that Chorus will present a case to Government that the UFB contracted prices were not cost-based, that it has been unable to obtain a fair return on its investment, and consequently that wholesale fibre prices should either be unregulated or if regulated must increase substantially from current levels. A fuller discussion of long-term implications follows in Section 6.

5 Pricing scenario analysis

5.1 The broadband market in New Zealand

The take-up of broadband in New Zealand is slightly higher than the OECD average, (Exhibit 5.1), however the market does appear to be reaching saturation. Over the past few years, broadband has experienced strong growth, but the total Internet market has increased only slightly, which suggests that the broadband market has largely been driven by subscribers switching from dial-up services – note that in 2011 New Zealand had the highest proportion of dial-up services of any country in the OECD (Exhibit 5.2).

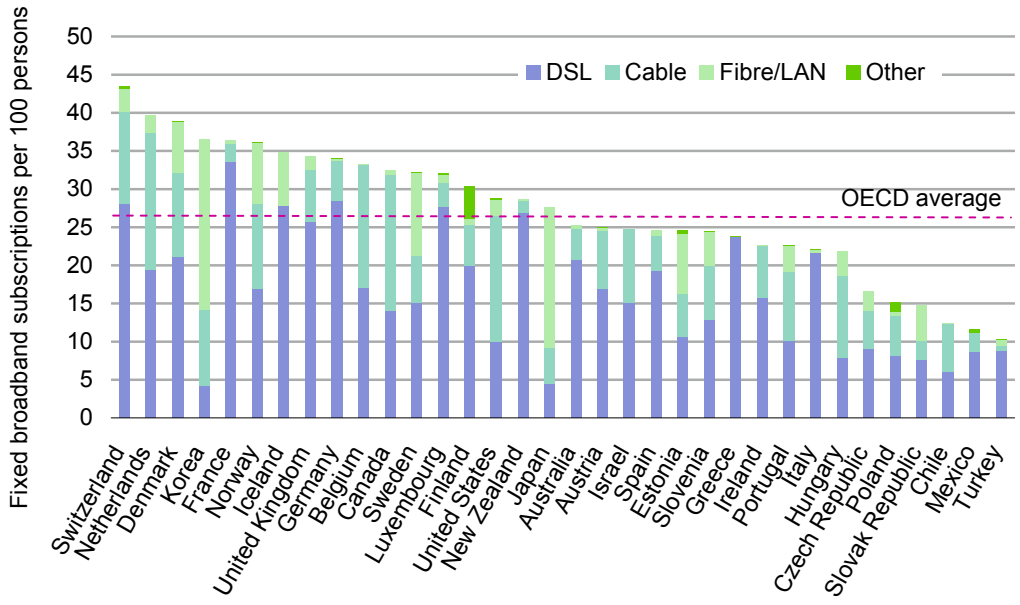

Exhibit 5.1: *Fixed broadband penetration for OECD countries, December 2012 [Source: OECD]*

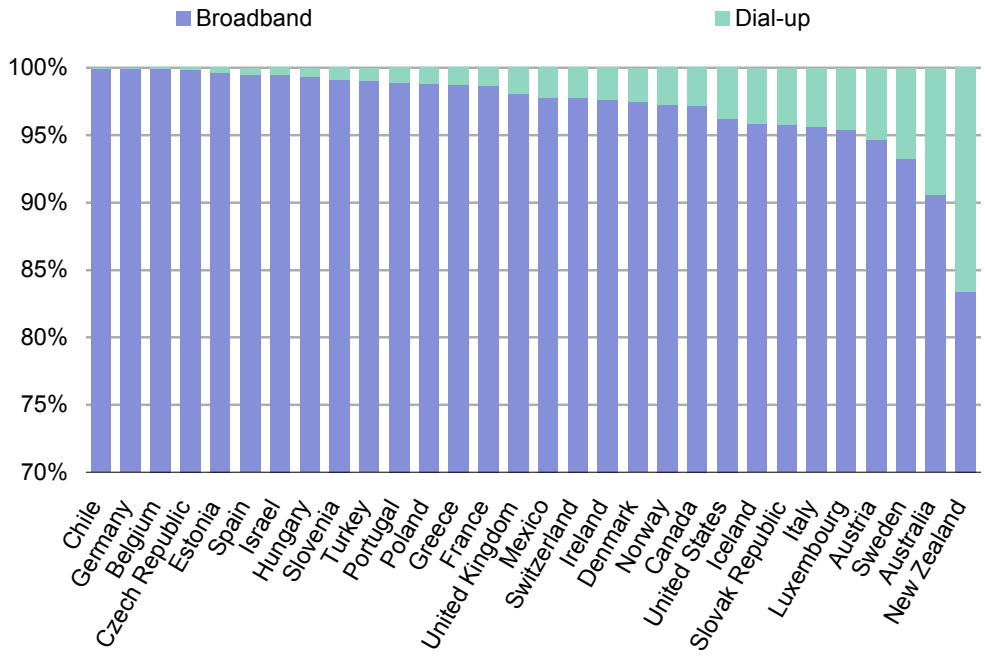

Exhibit 5.2: *Dial-up and broadband shares of fixed Internet subscriptions, December 2011 [Source: OECD]*

More recent information from the Commerce Commission suggests that as at June 2012, there were 114 000 dial-up subscriptions[98] which comprised approximately one in twelve (8.4%) fixed line Internet subscriptions[99]. This confirms that New Zealanders have been much slower than other OECD countries in migrating from dial-up to broadband. Furthermore as the dial-up subscriber base shrinks, growth in the New Zealand fixed broadband market is likely to stall, unless subscriptions can be increased in market segments with low take-up.

98 Ministry of Business, Innovation and Employment (2013), *Review of the Telecommunications Service Obligations (TSO) for Local Residential Telephone Service*, July 2013.

99 Commerce Commission (2013), *Annual Telecommunications Monitoring Report 2012*, April 2013.

5.2 Affordability: constraining market growth

Even though the take-up of broadband in New Zealand is slightly higher than the OECD average, it is clear that affordability represents a significant barrier to further growth in the market.

In its 2012 Annual Monitoring Report the Commerce Commission estimated that 78% of residential fixed lines also had broadband[100], however Statistics New Zealand has issued a more comprehensive picture of household broadband take-up and use[101]. According to Statistics New Zealand, three-quarters (75%) of all households had broadband access in 2012, however only 63% of households had broadband delivered via a landline – other forms of broadband access included cable, satellite, cellular mobile, wireless broadband and fibre. It should be noted that the options available to consumers depend very much on what technologies are deployed in their area.

Clearly one factor that would constrain the growth in fixed broadband is fixed-mobile substitution and in particular the rise of mobile-only households. As at 2012, 13% of New Zealand households[102] had no landline – this has almost doubled from 2001 when only 7% of households were without landlines[103]. Anecdotal evidence suggests that some consumers are relinquishing landlines and relying solely on mobiles for both voice and data communications – a trend that has been apparent in other markets, including Australia and Europe.

Higher income groups are much more likely to have home broadband services. Just over half (53%) of low income households – namely those with annual incomes of less than

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100 Commerce Commission (2013) *Annual Telecommunications Monitoring Report 2012*, April 2013.

101 Statistics New Zealand (2013) *Household Use of Information and Communication Technology: 2012*, 22 April 2013.

102 Statistics New Zealand (2013) *Household Use of Information and Communication Technology: 2012*, 22 April 2013.

103 National Office for the Information Economy (2002) *The Current State of Play: Australia's Scorecard*, April 2002. Data from Nielsen//NetRatings 2001 survey.

NZD30,000 which comprise more than a quarter (27%) of all households – have broadband services (Exhibit 5.3).[104]

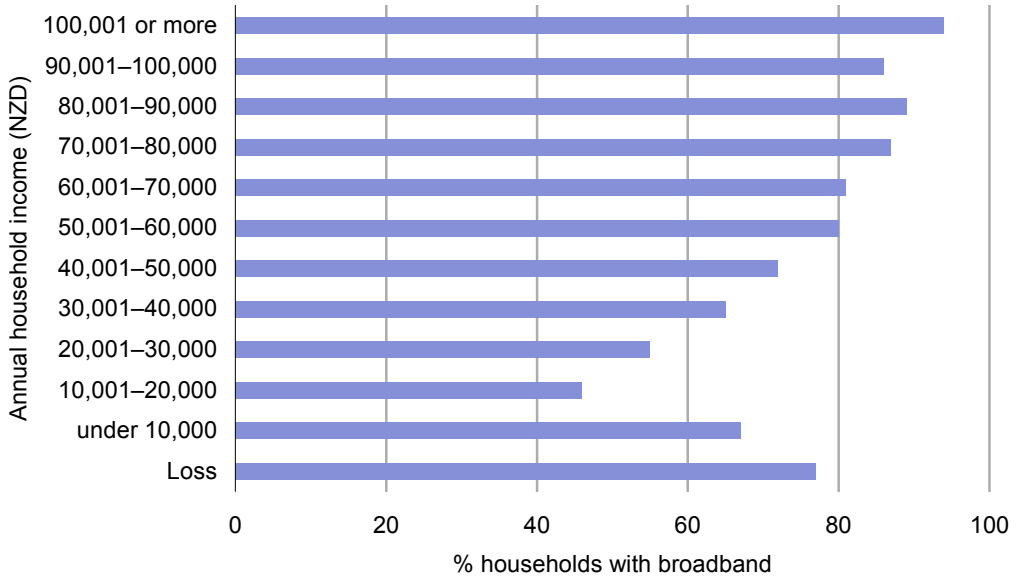

Exhibit 5.3: *Broadband take-up by annual household income, 2012 [Source: Statistics New Zealand]*

The two main reasons for not having Internet access are lack of interest (46% of no-Internet households) and high costs (36% of no-Internet households). However in households with dependent children, 63% claim that high costs are the principle reason for not having Internet access.

Much of the growth in the broadband market over the past few years has been due to subscribers switching from dial-up services, however this avenue for service providers is closing as there are relatively few dial-up subscriptions remaining (just 4% of households in 2012[105]). Broadband penetration will only increase by targeting lower income market

104 Statistics New Zealand (2013), *Household Use of Information and Communication Technology: 2012*, 22 April 2013.

105 Statistics New Zealand (2013), *Household Use of Information and Communication Technology: 2012*, 22 April 2013.

segments (annual household income up to NZD70,000) – there is little room for growth elsewhere.

Although fixed broadband penetration in New Zealand is slightly above the OECD average – with ranking 16 out of the 34 OECD nations – prices are relatively high. The OECD average entry level price as at September 2012 was USD27.55 PPP – in New Zealand entry level prices were the seventh highest in the OECD at USD34.47 PPP (Exhibit 5.4).[106] It should also be noted that in only one of the countries with a higher entry price – Iceland – are explicit data caps the norm, the other countries having either no data caps (France and Norway) or both capped and uncapped offers (Ireland, Mexico and Spain).

It is clear that inexpensive offerings for fixed broadband in New Zealand have not been keeping pace with those in other OECD countries. In 2008 New Zealand had the seventh lowest entry price in the OECD (USD15.12 PPP, or USD16.46 adjusted for inflation)[107], so within a period of four years, entry prices have more than doubled and New Zealand is now one of the more expensive countries for an entry level service. Service offerings have evolved, to deliver greater bandwidths and higher data caps, nonetheless a broadband service has become significantly less affordable for many consumers.

In its examination of trends in fixed broadband prices[108] the OECD noted that since 2010, price rises have in general accompanied increases in bandwidth. However New Zealand was one of only six OECD countries in which there were price rises but no accompanying increases in bandwidth over the period 2010 to 2012.

If prices – and in particular entry level prices – for fixed broadband remain high, together with an increase in mobile-only households, then the outlook for the overall broadband market in New Zealand is one with little or no growth over the short- to medium-term.

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106 OECD (2013), *Communications Outlook 2013*, OECD Publishing.

107 OECD (2007) *Communications Outlook 2007*, OECD Publishing.

108 OECD (2013) *Communications Outlook 2013*, OECD Publishing.

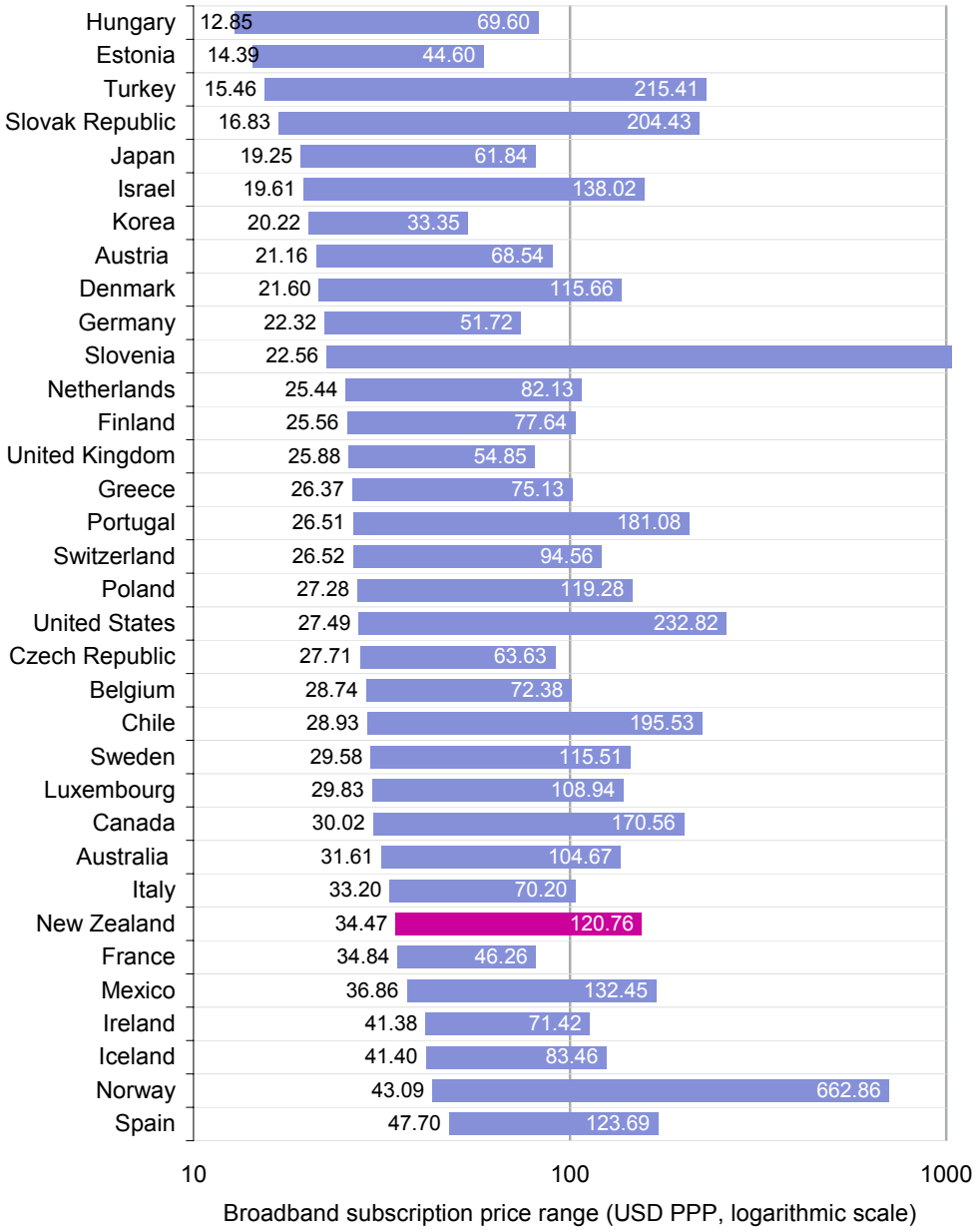

Exhibit 5.4: *Fixed broadband subscription price ranges, including line charge, September 2012 (USD PPP) [Source: OECD]*

5.3 The business market

A survey by Statistics New Zealand[109] found that 94% of businesses used broadband in 2012, however this proportion had not increased since the previous survey two years earlier. Take-up of broadband varies by size of business (Exhibit 5.5) and by industry (Exhibit 5.6), however dial-up services are still being used by 6% of all businesses. Affordability is also an issue, with ongoing and usage costs being a consideration of 43% of all businesses.

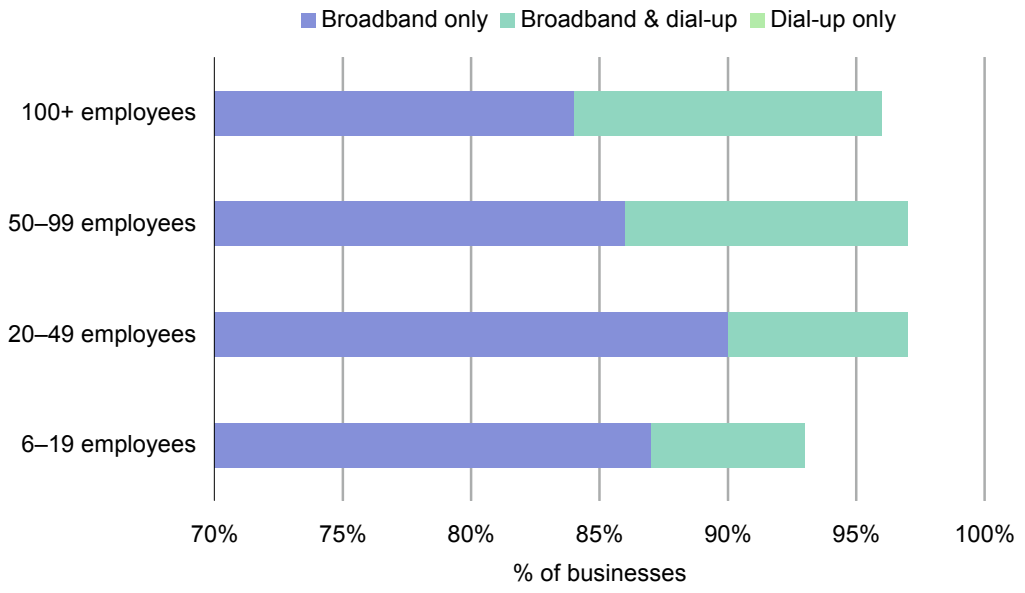

Exhibit 5.5: *Proportion of businesses using the Internet, by business size, 2012 [Source: Statistics New Zealand]*

109 Statistics New Zealand (2013), *Business operations survey 2012*, 15 April 2013.

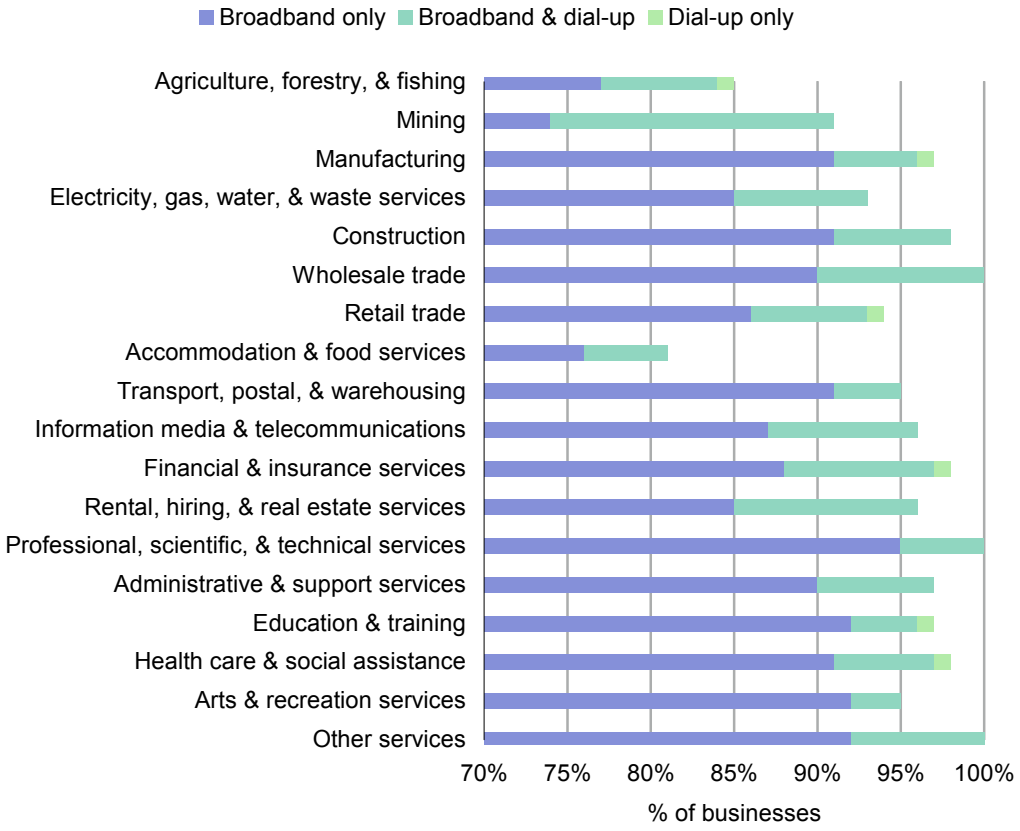

Exhibit 5.6: *Proportion of businesses using the Internet, by industry, 2012 [Source: Statistics New Zealand]*

Businesses will need to have a clear reason for migration to fibre services. While price parity may be one mechanism to achieve this, maintaining a high cost for a business input over the medium term would prevent businesses from passing on otherwise anticipated future cost savings to their customers. Other mechanisms to encourage business migration would be preferable.

5.4 Will the proposed wholesale price address affordability?

The three options for a price mechanism for copper broadband proposed by the Government all aim to deliver a total copper price (UCLL + UBA) of NZD37.50 with

annual increments of $1 each year to reach NZD42.50 in 2019. This would be in place over the UFB build period to 2020.

This proposed total copper price is lower than the current wholesale copper price (Exhibit 5.7). We note that the Commerce Commission's current exercise for deriving cost-based benchmarks for UBA has not yet concluded, but the expectation is that the result will be significantly lower than the previous UBA price, which was based on a retail-minus methodology, and thus the resultant UCLL + UBA price may well be lower than the proposed total copper price.

Service	*Monthly rental*
UCLL (December 2012)	
Urban	19.08
Rural	35.20
Average (from 1 December 2014)	23.52
Basic UBA	21.46

Exhibit 5.7: *Current wholesale copper prices [Source: Commerce Commission]*

How does the Government's proposed wholesale total copper price compare with the retail prices analysed by the OECD? Based on the OECD's PPP conversion rate for 2012[110], the lower end rate is equivalent to USD25.94 PPP, which is higher than the retail entry price in 14 of the OECD countries.

> The retail price will be higher again. If we assume a retail margin of 40%, then the resultant retail price (NZD52.50 or USD36.31 PPP) will still be amongst the highest entry level prices in the OECD.

There will be no inexpensive service offerings available to consumers and so copper and fibre broadband services will continue to be out of reach for a significant proportion of New Zealand households. For such consumers wireless broadband, mobile broadband or cable may offer a substitute that is more compatible with affordability constraints.

110 OECD *Main Economic Indicators*, downloaded 3 September 2013.

5.5 VDSL and its role in the market

Many operators around the world have already recognised that VDSL has a significant role to play in the transition from copper to fibre broadband. New Zealand will be no exception.

> In June 2013 Chorus began offering VDSL at a price aligned with the current Enhanced UBA wholesale price of $21.46. VDSL had previously been offered as a premium service with commercial pricing of $40.00 and uptake had been minimal. The new VDSL product is expected to provide more New Zealanders with the opportunity to enjoy higher speed connections, and also make New Zealand a more attractive market for the development and deployment of high bandwidth applications. Faster copper-based technology forms an important stepping stone to fibre. Like any technology upgrade, the move to fibre will be a long term transition and VDSL has an important role in the interim. The number of VDSL connections had increased to 4,000 by 30 June 2013 with retail service providers beginning to market it more widely. VDSL utilises existing copper based capability and can provide download speeds of about 20-50Mbps and upload speeds of up to 20Mbps, subject to an end-user's distance from the broadband equipment and line capability.[111]

By comparison, the low end fibre offering provides a maximum of 30Mbit/s download and 10Mbit/s upload – providing only a marginal performance improvement on ADSL. Subject to distance from the broadband equipment and line quality – VDSL could deliver a superior service for many consumers.

Chorus claims that at the current time about two-thirds of its lines (1.2 million) have a VDSL capability of 20Mbit/s or greater, and that around 55% of premises outside UFB areas will be within the VDSL footprint at the conclusion of the Rural Broadband Initiative (RBI) rollout.[112]

> Chorus will offer VDSL in all regions until mid-2015, and stop selling it progressively as the fibre roll-out is completed in areas where Chorus was selected for UFB.

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111 Chorus (2013) *Annual Report 2013,* 29 August 2013.

112 Chorus (2013), *Chorus launches mass market VDSL product as step towards fibre*, media release, 15 May 2013.

> Fibre is the superior technology and we are clear that VDSL is a stepping stone to fibre. As such, we are offering VDSL in Chorus UFB areas in the interim, but will not sell any new VDSL connections once our fibre build is complete in Chorus regions.[113]

However, Chorus did add a further qualification in that VDSL provision may be reviewed "if its continued availability affects fibre uptake in Chorus' UFB areas"[114]. Furthermore, as noted in Section 4.1, Chorus could upgrade its existing VDSL sites, which would deliver a service comparable to the 100Mbit/s fibre product.

Note that Chorus gained 4000 VDSL subscriptions in less than one year – by comparison over the twelve months to June 2013 it also gained 9000 fibre connections.[115]

Chorus' VDSL product is not regulated, and thus Chorus has total freedom to price the product as it wishes – it is not obliged to continue to maintain an alignment with the EUBA product. Note also that the EUBA price quoted by Chorus is the entry level EUBA product, which is currently priced the same as for BUBA. Given the length of time for the UFB build this is clearly not purely a brief introductory offer, and thus must be able to return an acceptable margin for the VDSL product for the short term at least.

Chorus will market VDSL in the LFC areas – and in this instance VDSL will definitely not be positioned as a "stepping stone to fibre", but will be directly competing with the LFCs' fibre offerings.

As at September 2013 Telecom's retail VDSL service offerings are clearly targeting subscribers in areas not currently covered by fibre and who are seeking a superior performance to that of ADSL. Telecom is pricing VDSL identically to the low end (30Mbit/s) fibre product (NZD95 per month including 80GB data).[116] Furthermore, disconnection fees are waived for subscribers switching to fibre once it becomes available,

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113 *Ibid*.

114 *Ibid*.

115 *Ibid*.

116 Telecom New Zealand website, accessed 3 September 2013.

so subscribers have a well-defined upgrade path to greater bandwidth, rather than having to rely on ADSL until fibre becomes available.

It would clearly be a superior outcome for Chorus if it could encourage greater take-up of VDSL over ADSL, as the incremental revenue (above that from the proposed total copper price) could prove significant (Exhibit 5.8)[117].

VDSL subscriptions	*Annual incremental revenue (NZD, millions)*
50,000	4.49
100,000	8.98
200,000	17.95
300,000	26.93
400,000	35.90
500,000	44.88

Exhibit 5.8: *Estimated incremental wholesale revenue from VDSL [Source: Network Strategies]*

5.6 Potential scenarios for broadband pricing

Chorus

Based on the benchmark analysis conducted by the Commission, the Government's proposed total copper price is likely to be significantly above cost, which will allow Chorus to continue to benefit from excessive margins. This will permit Chorus to cross-subsidise aggressive VDSL pricing in LFC areas and technology upgrades to existing VDSL sites, in addition to its fibre build.

Local Fibre Companies

LFC fibre offerings will be subject to price regulation. The VDSL product from Chorus is not regulated, and so Chorus will have total freedom to implement aggressive pricing in order to attack the low

117 The estimated incremental revenue per VDSL subscription was calculated by assuming that the wholesale VDSL price is maintained at Chorus's current price ($21.46) plus $23.52 for UCLL (option 2), and then subtracting the total copper wholesale price (assumed to be $37.50). This was then multiplied by the given number of VDSL subscribers to obtain the incremental revenue per month, and then multiplied by 12 to obtain the annual incremental revenue. Although the total copper wholesale price is to be increased each year, we assume that Chorus will apply similar annual increments to the VDSL product, and so the increment remains constant over time.

end LFC fibre offering. Without a competitive low end product LFCs are likely to struggle to gain market share and their business models may fail even before UFB rollout is complete.

Under the outcome of business failure, Chorus is likely to seek to acquire the LFCs – this would be extremely attractive especially if the fibre rollout is largely complete. Alternatively the Government may need to provide additional support to the LFCs.

Telecom

Telecom is prohibited from unbundling until 1 December 2014. Once it is free from that restriction, it may commence a rapid unbundling program in order to reduce its costs. The costs to convert unbundled copper into a full Internet service may be as low as NZD4.00, based on submissions received from RSPs during the current Commission's benchmarking exercise[118] [119]. Telecom, as the largest service provider, is likely to have greater economies of scale than the other RSPs, so its costs may be even lower. Therefore unbundling will save Telecom the difference between this cost and the UBA price, however due to cabinetisation only a portion of Telecom's lines could be unbundled (approximately half of all lines have been cabinetised).

Under Option 2, and assuming a total copper price at the low end of the Government's range, the resultant UBA price would be $13.98. If we then assume Telecom's cost of converting unbundled copper to a full Internet service is $4.00 per month, then Telecom's annual cost saving from unbundling 300 000 lines[120] would be $35.9 million. This would be an incentive for accelerating Telecom's unbundling program.

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118 Flip Limited (2013), *Unbundled bitstream access service price review consultation*, 1 February 2013.

119 CallPlus and Kordia (2013) *Unbundled Bitstream Access Service Price Review*, January 2013.

120 As at June 2013, Telecom had 630 000 broadband connections – 300 000 lines represents 48% of Telecom's current subscriber base. See Telecom (2013) *Annual Report 2013*.

An alternative strategy for Telecom would be to assume that the Government's proposed price setting mechanism would create difficulties for RSPs that have fewer options for alternative revenue streams. With fixed broadband remaining relatively unaffordable, there will be little, if any, growth in the market, and thus a reasonable expectation is that within the next few years some market consolidation is likely to occur as RSPs struggle to increase revenues. Telecom's diverse product portfolio may provide some protection in the short- to medium-term.

Retail Service Providers

For exactly the same reason as described above for Telecom, RSPs that have unbundled will be in a far superior position to those requiring the full copper product (UCLL + UBA). If RSPs have not already unbundled, they may initiate unbundling or accelerate existing programs.

RSPs requiring the full copper product would find it difficult to compete against Telecom or RSPs that have a large proportion of lines already unbundled. The Government's proposed pricing mechanism would effectively impose a significant barrier for new players, reducing the commercial feasibility of one of the established rungs on the ladder of investment.

RSPs would view Chorus' VDSL product as complementing their existing service offerings, providing an upgrade path for their customers seeking greater bandwidths while waiting for UFB deployment. The VDSL service will therefore be actively marketed by RSPs.

Consumers

For the most part consumers will be the ultimate losers from the Government's intervention in copper pricing. Prices for ADSL services will continue to be amongst the highest in the OECD, and broadband services will remain out of reach for many households, increasing the digital divide. Consumers are already subsidising the UFB via taxes, and continued high copper prices will simply be an

additional tax on all consumers, even those who will not benefit from the UFB.

Consumers will look to services such as wireless broadband, mobile broadband and cable for more affordable options, and so in a worst case scenario the market for copper and fibre broadband may actually decrease.

The only potential winners will be those located in LFC areas who will be able to reap the benefits of competitively priced VDSL. Nonetheless the VDSL product may still be unaffordable for many.

5.7 Conclusions

The setting of fibre prices in New Zealand through the UFB contractual negotiation process is unlikely to have delivered prices appropriate for costing existing assets, and thus we anticipate that over the next few years we will be seeing an increasing divergence of New Zealand wholesale fibre prices from European benchmarks. The clear risk is that continued high prices for both fibre and copper – given Government's proposed approaches to price regulation – are likely to constrain the overall broadband market in New Zealand when compared with other countries.

Given that the UFB rollout is not expected to be completed until 2019, with the copper prices under two of the options able to be implemented from November 2014, many end customers over this five-year period could well face a situation with higher retail copper prices and no fibre alternative. Therefore the Government's options on copper pricing have the potential for constraining the New Zealand fixed broadband (fibre plus copper) market – perhaps stalling growth in demand or at worse creating a decline in fixed broadband subscriptions, if customers switch to alternative services such as wireless broadband, mobile broadband and cable

Furthermore, a more compelling reason to migrate to fibre from copper would be if it offered greater performance benefits and functionality – designing a low end service

offering to be relatively comparable to ADSL (and with potentially lower speed than VDSL) certainly will not persuade consumers to go to the effort of switching.

6 Longer-term implications of Government options

The Government's proposed pricing mechanism will apply over the transition period of the UFB build, until 2020. So what will happen next?

- Should copper prices be set to cost-based fibre prices?
- Should differential prices for copper and fibre be set?
- How should the unbundled fibre product be priced?

As noted in Section 4.2 Chorus has already flagged that the cost per premises passed is considerably higher than its original estimates. While this cost could certainly reduce over time due to increasing economies of scale and elimination of inefficiencies associated with the start-up phase of deployment, it may not reduce to that of Chorus' original estimate which is considerably lower than both benchmark data and our own cost estimates. From 2020 Chorus would therefore wish to see high copper prices (relative to fibre) and increases in fibre prices.

High copper prices — There would be considerable pressure on Chorus to maximise fibre take-up, far beyond the 20% target set for 2020. Chorus would endorse the view that copper should not be priced at a significant discount to fibre, as this would discourage consumers migrating to fibre.

Increase fibre prices — Depending upon the demand mix across the various fibre options, various strategies to increase revenues will be employed. These strategies may include:

- price rises for some (or all) of the product offerings

- changing the price relativities of the various product offerings to encourage end users to shift to higher value options
- elimination of the current entry level fibre product, and creating a higher value product as the new entry level product.

6.1 Copper prices equal to fibre prices

This option would be essentially a continuation of the Government's proposed price setting mechanism, with the difference that the fibre prices would be set using an appropriate forward-looking cost-based approach, such as LRIC modelling. This is likely to lead to a discontinuity with the current prices.

Outside the UFB areas the regulated copper price will need to be determined separately, which is likely to result in geographically de-averaged prices.

Furthermore, this approach raises the same issue as that currently under review in the discussion paper – namely, how should the total copper price be split into UCLL and UBA? A high UBA price will perpetuate the incentive for RSPs to unbundle and deter new players from entering the market. A high UCLL price imposed on assets that may be fully depreciated will deliver excessive returns to Chorus and maintain New Zealand's position as one of the most expensive in the OECD for entry level retail broadband.

Setting copper prices equal to fibre prices would however minimise any price barriers that would deter end customers from migrating to fibre services, and thus this option is likely to be preferred by Chorus. Note however VDSL will become a key factor that will affect the level of migration.

If VDSL remains an unregulated service:

- Chorus will increase the price of VDSL in its UFB areas to encourage migration to fibre
- in LFC areas, Chorus' VDSL will be priced competitively against fibre, and may well be priced lower than the regulated ADSL services.

It is unlikely that VDSL will remain unregulated, especially if Chorus wishes to upgrade to vectoring technology which will affect all the operators with a presence in unbundled exchanges. Some type of regulatory intervention will be essential.

If price regulation is introduced for VDSL, then clearly there will be a need to implement differential pricing for ADSL and VDSL – the two products should not be priced identically due to their differing cost elements and capabilities. One option could be to match ADSL and VDSL prices to those of different fibre options (assuming there is such a match), otherwise the end result would be to have differential pricing for copper and fibre (that is, the option discussed in Section 6.2 below).

The only rationale for setting copper prices equal to fibre prices would be to continue to encourage migration from copper to fibre. The question then becomes – what is the threshold beyond which this advantage is no longer required? By implication, adoption of this option suggests that the advantage is to continue in perpetuity, which may represent a dangerous precedent.

6.2 Differential pricing for copper and fibre

Long-run forward-looking costs (TSLRIC) are viewed as international best practice and theoretically sound for producing efficient prices for access to monopoly assets. However, as we have seen in Section 3, regulators are realising that different approaches may be required for copper and fibre. Options could include:

- separate models and costing methodologies for copper and fibre
- cap the price of legacy copper
- alter the costing standard from TSLRIC to a RAB approach for legacy copper
- copper prices set to fibre prices less an adjustment.

Whatever method is selected, the transition from one methodology (namely the Government's proposed price setting mechanism) to an alternative typically involves a step change in price, and this step – as we have seen when the UBA pricing methodology changed from retail-minus to cost-based – can be quite large.

Under the proposed mechanism, there will effectively be a glide path over a period twice as long as the usual three year period employed by regulators. Hence the outcome from a price review in which there is a major step change in prices – especially cost-based prices – would not be considered remarkable. Under such circumstances, Chorus is likely to argue that it would be unfair to impose a significant price change (that is, a significant price decrease for copper) – even though the price review and the subsequent outcome would be a surprise to no-one. Indeed this is very similar to the current situation. While a significant decrease in the UBA price (due to the change in methodology) was predictable, Chorus argues that the change was more than expected and is having a chilling effect on investment.

We anticipate that a detailed cost study will find that the price of copper should decrease, given that the legacy network will be almost fully depreciated. Any type of glide path would ensure that Chorus would continue to reap the benefits of excessive profits on the copper network for several years from 2020. This cost study will also update the fibre prices to reflect forward-looking costs, and thus the profits from copper could cross-subside other aspects of the Chorus business – such as competing with LFCs via enhanced VDSL offerings (if VDSL remains unregulated).

6.3 Fibre unbundling

There may be some pressure from RSPs (including Telecom) to unbundle fibre prior to the date specified in the NIPA (that is, by 31 December 2019), if it is believed that retail demand for fibre broadband would be increased with the availability of an unbundled wholesale offering. It is uncertain whether Chorus will also be keen to unbundle – this is likely to depend on a number of factors including:

- achievement against target
- the mix of demand across the various fibre offerings
- cost of unbundling
- how the unbundled product is to be priced.

Once wavelength unbundling (see Section 3.4) becomes available – which we expect to occur prior to 2020 – there will be no technical constraint on implementing unbundling in

the UFB. We expect that Chorus will be assessing the feasibility of wavelength unbundling and, once the technology is commercially released, will compare the cost of deployment against the cost associated with the unbundling solution specified in the NIPA. Indeed, Chorus' current UFB rollout plan may already anticipate the availability of wavelength unbundling. Subject to the results of such a comparison, Chorus may seek to amend the NIPA to permit the use of wavelength unbundling rather than being constrained to a legacy – and potentially less efficient – architecture.

Our view is that unbundling can only be advantageous for competition, and the early implementation of either physical or virtual fibre unbundling may create a market stimulus similar to that which occurred with the introduction of copper unbundling in New Zealand. With both Layer 1 and Layer 2 access, RSPs have more flexibility with the development of service offerings, increasing the competitive tension which can only benefit end-users.

Regardless of when fibre unbundling becomes available the Commission will need to review the service and determine whether or not prices are to be regulated. Regulated prices will require the Commission to derive a suitable methodology – which will likely be informed by precedents set in other jurisdictions, which will have had either physical or virtual unbundling of fibre for many years (as noted in Section 3.4 the VULA product in the UK was introduced in 2010). In the price-setting exercise, the relativities of bundled and unbundled copper together with bundled and unbundled fibre will need to be considered.

7 Conclusions

The discussion document proposes continuation of the 2001 Act's principle of pricing access to the fixed network on the basis of long-run forward-looking costs, with one change:

> …to make it clear that the cost of rolling out the fibre network (as discovered through competitive tendering) provides the most suitable proxy for the cost of a replacement copper network.[121]

The three implementation options all involve the selection of a price point for the total copper price (UCLL+UBA) with reference to the price of the basic UFB product (which starts at $37.50 and increases by $1 annually to reach $42.50 in 2019). These options would replace the current Commission process in which UBA and UCLL prices are being set according to the legislated Initial Pricing Principle methodology: benchmarking against similar services in comparable countries using data from long-run forward-looking cost models. According to the discussion document, the Commission's process is associated with a risk of delivering prices that are 'lower, and possibly substantially lower, than the actual cost of a replacement network'[122].

It is important to note the differing outlook for competition under the three options:

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121 Ministry of Business, Innovation and Employment (2013), *Review of the Telecommunications Act 2011*, Discussion Document, August 2013. See paragraph 23.

122 *Ibid*, paragraph 19.

- **Option 2** – the UBA price would be set higher than cost, and thus this would provide greater incentive for RSPs to unbundle. However this must be offset against the constraint of cabinetisation – approximately half of all lines are cabinetised, and thus cannot be unbundled, and so the incentive is not as great as in a non-cabinetised network. Nonetheless, retail prices would be lower than under options 1 and 3, and thus this option would deliver a greater benefit for end users.

- **Options 1 and 3** – the UCLL price would be set higher than cost, which would result in less incentive for RSPs to unbundle as the efficiencies that could be attained via unbundling would be lower than with option 2. Furthermore retail prices would be higher than under option 2, and thus consumer welfare would be reduced.

7.1 Are the options consistent with existing pricing principles?

The options proposed in the discussion document are inconsistent with the principle of pricing copper access on the basis of long-run forward-looking costs for two main reasons:

- the proposed use of fibre as the MEA of copper is unsound
- the contracted UFB wholesale prices are extremely unlikely to provide an accurate reflection of cost.

Effectively all three options involve the abandonment of cost-based pricing for copper access. In each option the price of copper is to be set with reference to a non cost-based price which was the outcome of a negotiation process in which prices appear to have been set with reference to market price points.

From the Commission's process we already know the approximate TSLRIC prices of the UCLL and UBA services since benchmark prices serve as a proxy for the Final Pricing Principle (namely a New Zealand-specific TSLRIC cost model). As the options in the discussion document, using a fibre MEA construct, deliver prices higher than the benchmark then it follows that FTTH cannot be the MEA for copper in New Zealand. In the absence of any other evidence we must assume that that a New Zealand TSLRIC cost model would deliver costs for UCLL and UBA services that would not depart substantially from the proxy benchmark results.

If in a Final Pricing Principle modelling exercise we attempted to used FTTH as the MEA then there would be a number of difficulties to resolve including:

- the need to introduce adjustments for the many characteristics of fibre (costs, network performance) that differ substantially from copper – and there are no regulatory precedents or 'best practice' for this to date since few regulators have attempted implementation of a fibre MEA
- the GPON network architecture does not currently deliver physical services that are the equivalent of an unbundled copper service – this means that we would not actually be able to model the service in question
- the limited spatial availability of fibre constrains its application as a national MEA, even when the UFB deployment is complete
- given the early stage of fibre deployment, there is still considerable uncertainty regarding the costs while demand remains low – recent Chorus information and our own independent estimates in fact indicate that Chorus' initial UFB costings were incorrect.

So if the use of a fibre MEA for copper is inconsistent with key traditional MEA principles – such as delivering the same service at lower cost – what costing approach is optimal in a time of technological migration? Should New Zealand drop TSLRIC principles for costing wholesale copper access? Our review of relevant international policy and regulation showed that LRIC principles remain best practice, although some changes have been proposed and / or implemented in the light of technological advance:

Regulated Asset Base for copper – applied in Australia, recommended by the European Commission	This approach involves using the actual asset base for wholesale price setting. In theory it enables the access provider to recover efficient **actual** costs in addition to allowing for both depreciation and a reasonable rate of return on investment in sunk assets. Hence prices calculated on this basis tend to reflect the actual cost of investment. This approach avoids the problem of the appropriate MEA completely. It also avoids possible cost over-recovery if the revaluation of copper assets at optimised replacement cost (i.e. the TSLRIC approach) leads to increasing modelled prices. In simple terms, this approach addresses the situation where TSLRIC prices increase during technology transitional periods due to falling copper

volumes (demand) coupled with increasing cost trends for inputs (equipment).

In its latest Recommendation the European Commission still endorsed the bottom-up LRIC+ approach for costing fibre but indicated that legacy civil engineering assets should be valued using an RAB approach (not as full replacement costs), while fully depreciated reusable legacy civil engineering assets should not be included within the costs.

Anchor pricing for copper – already applied in the UK

Where the new technology is associated with higher costs, copper prices should not be permitted to increase above the level implied by the hypothetical continuation of the existing technology. In Ofcom's view the adoption of this anchor pricing principle ensures that consumers do not bear the risks of the access provider's investment in new technology, avoids over-recovery of cost by the incumbent and minimises risks of inappropriate regulatory intervention.

Fibre cost model with adjustment for copper – in the process of implementation in Denmark and Switzerland

In countries where some copper volumes are declining and fibre wholesale product prices are regulated, it may be possible to develop a fibre-based costing model, and introduce adjustments to estimate copper prices. An adjustment based on costs has been proposed for implementation in Denmark while an adjustment based on end-user value has been proposed for Switzerland. In both cases it is expected that the resultant copper cost estimates will be lower than those for 'similar' fibre services, reflecting the different value of the services.

As fibre-based services are not regulated in New Zealand, a fibre cost model is unnecessary at this point in time. As regards wholesale copper prices, international precedents indicate that the appropriate regulatory intervention when a legacy network is being replaced by newer technology ensures that inefficient over-compensation of the access provider does not occur and that consumers do not bear the cost of the new investment. As such, RAB or anchor pricing approaches may be appropriate for copper-based services.

7.2 What incentives will the options provide?

In the previous Section we demonstrated inconsistency of the options in the discussion document with both existing pricing principles and international regulatory practice. Therefore selection of one of the three options would need to be justified using a different underlying rationale. Since Government believes that approximately equal copper and fibre access prices would eliminate financial disincentives for consumers to select fibre services or for RSPs to provide them[123], let us consider the possible impact of the proposed market intervention on incentives.

Consumers

Although broadband uptake in New Zealand is slightly higher than the OECD average, it is clear that affordability represents a significant barrier to further growth in the market. Implementation of any of the discussion document options will mean that there will be no inexpensive service offerings available to any consumers (whether they are in UFB areas or not). Hence both copper and fibre broadband services will continue to be out of reach for a significant proportion of New Zealand households. Such consumers may have a financial incentive to substitute wireless broadband, mobile broadband or cable if these services are more compatible with affordability constraints. The overall fibre and copper broadband market may have little or no growth over the short- to medium-term or in a worst case scenario may even decline.

Retail Service Providers

The efficiencies that can be delivered via unbundling are constrained due to cabinetisation, however approximately half of all lines are non-cabinetised and can be unbundled.

Telecom Telecom is prohibited from unbundling until 1 December 2014. Once it is free from that restriction, depending upon which option is

123 *Ibid*, paragraph 21.

implemented, it may commence a rapid unbundling program in order to reduce its costs. Alternatively, it may anticipate that high wholesale prices would result in market consolidation, enabling it to increase market share through acquisition of customers from other RSPs.

Other Retail Service Providers

RSPs that have unbundled will be in a far superior position to those requiring the full copper product (UCLL + UBA). If RSPs have not already unbundled, they may initiate unbundling or accelerate existing programs. Meanwhile RSPs requiring the full copper product would find it difficult to compete against Telecom or RSPs that have a large proportion of unbundled lines. The Government's proposed pricing mechanism would effectively impose a significant barrier for new players, reducing the commercial feasibility of one of the established rungs on the ladder of investment.

Chorus' VDSL product will complement existing RSP service offerings, providing an upgrade path for their customers seeking greater bandwidths while waiting for UFB. The VDSL service will therefore be actively marketed by RSPs (including Telecom).

7.3 Price expectations for copper

According to the discussion document:

> …if copper prices end up substantially lower than fibre prices, this undermines the basis on which the LFCs and Chorus contracted to roll out fibre.[124]

The pricing principles for copper to 2019 were amended only two years ago. At the time of contractual agreement these updated principles were well known to all parties. Participants

[124] *Ibid*, paragraph 21.

in the UFB tender process expected declining wholesale copper prices, and would have estimated a range for the likely quantum of the decline.

Chorus examined various fibre uptake scenarios prior to its UFB commitment and highlighted to its shareholders the associated uncertainties and complexities. On one hand the switching of an end-user from copper to fibre services leads to a decrease in copper revenue, but on the other hand it increases fibre revenue. No tipping points were identified for copper pricing. However, Chorus did make it clear that profitability would be adversely affected if fibre uptake is limited mainly to the basic fibre product. The unregulated copper VDSL product and the higher bandwidth fibre offerings are viewed as key revenue drivers.

Finally it should be noted that the wholesale copper prices are being set by the Commission by benchmarking with similar services from comparable countries using LRIC cost models. If these benchmark prices are inappropriate then so too is New Zealand's legislated copper access pricing principle.

7.4 Recommendations

We recommend that the Government does not proceed with any of the options listed in the discussion document, but retains the existing regulatory framework with TSLRIC pricing principles. The use of the contracted fibre prices as the reference point for pricing wholesale copper services would mean a departure from the existing pricing principles. This would be extremely risky and could deliver unintended consequences for consumers, RSPs and the Government. Furthermore in 2020, after effectively a six year glide path, we anticipate that there would be a major step change in prices – assuming that cost-based prices are re-introduced at that time.

However, if the Government believes that some form of intervention is essential then it could consider policies that would support Chorus' revenue maximisation strategy – namely, uptake of the higher bandwidth products including VDSL and premium fibre products, or ensuring the availability of inexpensive broadband services for market segments with currently low take-up due to affordability constraints. This may encompass:

- Ensuring that wholesale fibre products are positioned as a premium product, and hence priced at a premium over basic copper products. Since the wholesale fibre pricing is fixed until 2019 this would mean a reduction in copper pricing from current levels. If Government is not minded to rely on the Commission process, it could consider basing copper prices on short-run incremental cost, given that in UFB areas Chorus will only be incurring maintenance costs for the copper network. Alternatively an RAB or anchor pricing approach could be adopted.

- Providing non price-based incentives to stimulate migration to higher-speed services such as:
  - relaxing exclusivity constraints for content provision
  - financial benefits – such as subsidies or tax breaks – for business users
  - ensuring regulatory settings are appropriate to encourage bundling of desirable content, applications or devices with fibre services
  - extending campaigns to promote awareness of new applications that will become accessible via higher-speed broadband products.

Annex A: Glossary

ACCC: Australian regulator

ACM / OPTA: Dutch regulator

ADSL: Asymmetric Digital Subscriber Line

AGCOM: Italian regulator

BAKOM: Swiss regulator

BEREC: Body of European Regulators for Electronic Communications

BDUK: Broadband Delivery UK

BSG: Broadband Stakeholders Group

BT: British incumbent operator

BU-LRIC: Bottom-up long-run incremental cost

CBD: Central Business District

CFH: Crown Fibre Holdings

CIR: Committed Information Rate

DONG: Danish utility company, previously operating a fibre network

DKK: Danish Kroner

DSL: Digital Subscriber Line

EAFRD: European Agricultural Fund for Rural Development

EC: European Commission

ESA: Exchange service area

EU: European Union

EUBA: Enhanced unbundled bitstream access

EUR: Euro

FL-LRIC: Forward-looking long-run incremental cost

FTTC: Fibre-to-the-cabinet

FTTP: Fibre-to-the-premise

FTTH: Fibre-to-the-home

G.fast: New ITU standard to provide high bit rates on very short loops

Gbit/s: Gigabits per second

GBP: British Pound

GPON: Gigabit Passive Optical Network

ITU: International Telecommunication Union

kbit/s: Kilobits per second

LFC: Local Fibre Company

LLU: Local loop unbundling

LRAIC: Long-run average incremental cost

LRIC: Long-run incremental cost

LTE: Long Term Evolution

MBIE: Ministry of Business, Innovation, and Employment (New Zealand)

Mbps: Megabits per second

Mbit/s: Megabits per second

MEA: Modern Equivalent Asset

NBN: National Broadband Network

NGA: Next generation access

NIPA: Network Infrastructure Project Agreement

NRA: National Regulatory Authority

NZD: New Zealand Dollars

OECD: Organisation for Economic Co-operation and Development

OPTA / ACM: Dutch regulator

P2P: Point-to-point

PON: Passive Optical Network

PPP: Public-private-partnership

PPP: Purchasing Power Parity

PTS: Swedish regulator

RAB: Regulatory Asset Base

RSP: Retail Service Provider

SAU: Special Access Undertaking

SMP: Significant market power

TDC: Denmark's incumbent operator

TSLRIC: Total Service Long Run Incremental Cost

TSO: Telecommunications Service Obligations

UBA: Unbundled bitstream access

UCLL: Unbundled copper local loop

UFB: Ultra Fast Broadband

USD: United States Dollars

UK: United Kingdom

VDSL: Very High-Speed Digital Subscriber Line

VULA: Virtual unbundled local access

VULL: Virtual unbundled local loop

WLR: Wholesale Line Rental