



Why a Review of Wholesale Copper Access Services Must Consider the Transition to Fibre

A Report for Bell Canada

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1 Introduction

The CRTC is currently reviewing the framework for regulating the wholesale services market (“Framework Review”). A major part of this proceeding is to review the regulatory status of wholesale services and associated policies, including service pricing.

The existing pricing methodology for wholesale services, including the wholesale pricing of traditional copper facilities as the technology used to access end-customers—known as Phase II costing—uses the broad economic and costing framework characterised by estimating the service’s long run incremental costs (LRIC) and allowing for recovery of some common costs via mark-ups. This approach sets the regulated price of a service as a function of its own costs, but it does not examine what broader impact that the rate set may have on other services.

We are notably aware that the CRTC has repriced or is in the process of repricing a number of legacy wholesale access products (such as Unbundled Local Loops (ULL), Competitor Digital Network (CDN) DS-0 and DS-1 access services, and so on) and that these rate revisions may be carried out without regard to the impact on next generation access deployment. We are therefore concerned that the CRTC may be contemplating changes leading to lower prices for wholesale services provided over copper access networks (CAN) which will impact investment incentives in the transition to fibre services over next generation access networks (NGAN)—whether fibre-to-the-node (FTTN) or fibre-to-the home (FTTH).

In this paper, we provide recommendations to assist the CRTC in considering alternatives to the current method of setting rates based on costs plus a markup for certain services, in particular for legacy copper services (i.e., services that are provided over the legacy copper network). A more holistic approach to rate setting for such services should help the CRTC achieve better outcomes in terms of investment, efficiency and consumer benefits.

Hence, the key theme explored in this Report is why pricing coordination between fibre and copper services is necessary. This theme is supported by recent economic literature on the topic and practical considerations, using relevant experience from Europe and New Zealand, that highlight the risks resulting from a lack of pricing co-ordination.

We note that in this Report we do not carry out a detailed examination of the structure and level of copper pricing in Canada. Since we are concerned about the relative pricing between copper and fibre, we do not attempt to assess whether current regulated wholesale prices in Canada are “high” or “low”. Furthermore, we are not discussing how pricing regulation of fibre should be carried out. The rest of this Report is organised along the following lines:

- In Section 2, we explain why reductions in wholesale copper prices may not be in the public interest and the effect of copper price reductions on economic efficiency;
- In Section 3, we consider specifically how the regulated price of wholesale copper services affects fibre rollout;
- In Section 4, we present recent and relevant experience from New Zealand and Europe on this issue; and

- In Section 5, we conclude why the CRTC must take into account the relative pricing of copper and fibre in future pricing of wholesale services.

2 Reducing wholesale copper prices will lower economic efficiency

In this section, we examine the possible effects of a reduction in the price of wholesale copper services on overall economic efficiency. In order to conduct this analysis, it is useful to break down efficiency into three constituents: allocative, productive and dynamic:

- Allocative efficiency relates to the service mix made available to consumers. It answers the question “What should we produce?”
- Productive efficiency relates to the cost of producing output – for a given level of output, productive efficiency aims at lowering the costs of production. It answers the question “How should we generate this output?”
- Dynamic efficiency relates to the optimal evolution of the economy over time. It answers the question “How do we steer towards the future we desire?”

In an ideal world, a particular policy will further all three types of efficiency. In reality, however, policy choices involve a trade-off between conflicting goals. We conclude that whilst it is possible for the CRTC to pursue short-term goals of allocative efficiency, the negative effects of reducing the price of copper on productive and dynamic efficiency are likely to outweigh any gains in allocative efficiency.

2.1 Allocative efficiency

Allocative efficiency refers to an economic outcome in which the marginal utility that consumers receive from consumption of a good or service equals the marginal cost of its production.

The general logic of access prices that reflect forward-looking costs is that they allow cost recovery by an efficient access provider, are competitively neutral across access seekers, and (to the extent feasible under the prevailing cost conditions) lead to allocatively efficient end user prices.

As forward-looking prices, they are usually based upon the proposition that existing assets will be (or would be) replaced by similar assets (that is, a copper-based loop). But that necessary foundation for LRIC access pricing does not hold in light of the technological advancement and the principle that the modern equivalent asset (MEA)¹ of copper is fibre. It is likely that suppliers and customers in the marketplace have adjusted their expectations to take account of fibre as the technology of the future. If this is the case, then the whole justification for pricing services such as ULL] at the LRIC of such loops is undermined.

¹ The MEA is an asset that provides similar function and equivalent utility to the asset being valued, but is of a current technology. It is considered when calculating the replacement cost of an existing asset. However, we note that in the loop decision (Decision 2011-24), the CRTC characterized the NBV as providing an appropriate measure of the prospective incremental cost for the cost of the copper cable:

the forgone net salvage value, as proxied by the copper cable NBVs, provides an appropriate assessment of the prospective incremental capital costs associated with the Bell companies' use of their existing copper cable plant to provide the unbundled loop service (the NBV costing approach). See Telecom Decision CRTC 2011-24, Bell Aliant Regional Communications, Limited Partnership and Bell Canada – Monthly recurring rates and service charge rates for unbundled loops in Ontario and Quebec, 12 January 2011, paragraph 30.

In normal conditions, where incentive regulation has promoted productive efficiency and where innovation is incremental in nature, it makes sense to focus access pricing on the attainment of allocative efficiency.

However, a LRIC does not necessarily elicit the build/buy decisions that would take place in a competitive market. Instead, LRIC involves the application of the highly theoretical concept of perfect contestability – costless, immediate hit-and-run entry – to a market characterised by significant sunk investment costs. In other words, it mimics the outcomes in markets that do not actually exist.

The effect of the two factors above is that there may be no clear characterisation of an allocatively efficient LRIC price.

In reality, the allocatively efficient price for sunk assets such as a fixed line telecommunications networks is likely to be very low. This is because the marginal cost of using those sunk assets is very low. However, setting very low prices for the use of that infrastructure can, of course, compromise incentives to invest in new infrastructure, thereby compromising *dynamic* efficiency, an issue that we will examine after discussing productive efficiency.

2.2 Productive efficiency

Productive efficiency indicates the achievement of cost minimisation when producing a given level of output. What is the connection between copper pricing and productive efficiency? Let's consider this in the context of a geographic area where there is one owner of both copper and fibre infrastructure, and that owner uses both networks to provide service even though the service (or outputs in an economic perspective) could be produced by one network alone.

Having the same firm run a legacy copper network side by side with a new fibre network is costly. Each network individually has strengths. Fibre has increased capabilities and low running costs; copper requires no significant new investment. Running them together diminishes both strengths – through imposing a combination of high capital and high running costs.

The productively efficient approach for the network operator is to switch off rapidly the copper network and force access seekers and end users to switch to fibre products. We regard this transition as obvious as the fibre network can be viewed as the natural evolution of the access network.² In reality, of course, there are both technical and commercial constraints unrelated to pricing that mean that such a transition will be a long-term process, but here we consider the impact of pricing, all other things equal. Thus, the policy considerations of pricing are relevant even though no ILEC in Canada has announced any specific plans to actually shut off the copper network.

Therefore, the chosen copper pricing method should stimulate efficient migration from copper to fibre, on the part both of consumers and of operators. A low price of access to copper will negatively affect migration speed through two main mechanisms: consumers' incentives to migrate to fibre and operators' incentives to invest in fibre.

² To put it another way, the fibre is the modern equivalent asset (MEA) of copper. The eventual shut-down of the copper network should not be considered narrowly as simply stripping out the copper lines that go into homes, but can also be considered more broadly as the replacement of core switching (TDM) and transmission networks as well as the copper access network.

With broadband and superfast broadband belonging to the same retail market, there cannot be a great price differential between them. Otherwise, consumers would stick with the less expensive service. As the wholesale price impacts on retail price, the wholesale price differential as well cannot be too large.

Therefore we believe that lower copper prices may be against the public interest:

- a lower copper price will make it less likely that customers will voluntarily migrate and they will continue to be serviced using a legacy network; and
- a lower copper price will thereby undermine the business case for fibre investments, delaying the switch-off to a later date.

An obvious corollary of the above is that a reduction in the price of copper loops is likely to have an additional adverse effect on productive efficiency: it makes copper more attractive to alternative suppliers of access.

The presence of a large number of unbundled customers will create a stronger constituency of access-based retail service providers that will vigorously oppose switching off the copper network and delay the productive efficiency gains associated with that outcome.

This discussion also underlines the importance of a regulatory commitment to allow the closure of the copper network, possibly after a specified notice period. For example, the European Commission recommends a notice period for copper switch off of five years, or less if equivalent access is provided.³ Absent such an explicit announcement, unbundlers may seek to rely upon a legitimate expectation of continuing service.

2.3 Dynamic efficiency

The procedures for establishing which conditions support dynamic efficiency, let alone the degree to which they do so, are subject to less agreement than those relating to productive and allocative efficiency. However, the imperatives of a connected, global economy, together with world-leading appetite for broadband by Canadian consumers require the consideration of encouraging investment in new services: objectives leading to high quality services, innovation, and responding to the needs of user requirements.

Fibre-based high speed broadband falls naturally into this class. Moreover, since broadband is often regarded as a 'general purpose technology,' the possibility that the benefits of high speed broadband might penetrate into all aspects of the Canadian economy cannot be disregarded, however difficult it may now be to quantify. Given this situation, it is appropriate to give retail service providers an incentive to invest in, and retail customers an incentive to purchase, new fibre services, as opposed to 'current generation' copper services.

As far as dynamic efficiency and incentives to innovate are concerned, possible reductions in wholesale copper prices are likely to put considerable and conflicting pressure on the CRTC. Doing so is likely to cut the retail price to end users of current generation broadband users, but it seems inescapable that it will weaken the prospects for and augment the risks assumed by fibre operators. In geographic areas where copper and fibre networks compete, the pricing outcome will depend upon a combination of regulation and competition. The competitive edge would generally rest with the copper

³ See European Commission, Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) 2010/572/EU), para. 39.

network, where the assets are sunk and have a finite remaining life, but one which is capable of being extended both by continuing developments in copper's capabilities and by a regulator-determined cut in prices.

We are aware that the "ladder of investment" approach is often used to encourage lower wholesale prices in a copper world. A central theme of the 'ladder of investment' approach to broadband regulation is to encourage entry of access seekers to by reducing their initial infrastructure investments, in the interests of more intense competition, a greater degree of product differentiation and more investment in the future once experience is gained in the market.

The actual efficacy of the ladder of investment approach is under serious doubt. There is extensive academic literature that suggests mandatory unbundling had a negative impact on investment by alternative operators (as well as by incumbents). The evidence is well summarised in Cambini & Jiang's (2009)⁴ authoritative review of literature which examines more than 20 empirical studies and concludes that "most of the evidence shows the local loop unbundling discourages both ILECs and CLECs from investing in networks." A more recent study by Crandall et al (2013)⁵ also shows that the long run effects of copper unbundling on household broadband penetration is negative, supporting previous research that copper unbundling has slowed the deployment of FTTP infrastructure. The paper also concludes that mandated unbundling of fibre networks would likely deter deployment of next generation access networks.

The Canadian experience also seems to suggest that access seekers have not been making significant long-run investment. We note that, the Canadian Telecommunications Policy Review Panel stated that "[t]here is no evidence the CRTC's 'stepping-stone' strategy has provided an effective transition to greater reliance by entrants on their own facilities. There is, on the other hand, reason to believe these policies have distorted the behaviours and incentives of new entrants in Canadian telecommunications markets. ... a broad scope of mandated wholesale access would not in fact promote all forms of competition. Rather, it would promote only one form of entry (i.e. resale), thus perpetuating disincentives for new entrants to build facilities."⁶

However, ladder-based policy implications are still more dubious in the case of dual—copper and fibre—infrastructure. On the basis that the wholesale fibre access service in Canada for FTTN is a bitstream product, and that FTTP does not make use of copper access, it is hard to see how using copper access would act as a stepping stone to any investment in self-provision of fibre.

2.4 Summary on the efficiency effects of a reduction in copper loop prices

As far as *productive* efficiency is concerned, the biggest win available from copper pricing seems to be associated with reinforcing the incentives to migrate customers from copper to fibre based services, especially in areas where the incumbent copper network owner is also operating a fibre network. In geographic areas where fibre and copper networks compete, this competition may lead to greater pressure on the competing operators to search for

⁴ Cambini, C & Jiang, Y (2009), Broadband Regulation and Investment: A Literature Review, Telecommunications Policy.

⁵ Crandall, R. W., Eisenach, J, A, & Ingraham, A. T (2013), The Long-Run Effects of Copper Unbundling and the implications for Fibre, Telecommunications Policy, Volume 37 Issue 4-5, May, 2013.

⁶ TPR Panel Final Report, page 3-35.

efficiency, so that the benefits of optimally transitioning from copper to fibre are balanced against the benefits of extended rivalry.

Establishing *allocatively* efficient prices is difficult, if it is accepted that pricing ULL at the LRIC of a copper-based loop is now anachronistic.

As far as *dynamic* efficiency is concerned, it is hard to see how a cut in the price of ULL will not slow down the take up of fibre.

We have argued above that it is inappropriate or even illogical to set copper access prices (or in this instance to lower them) on the basis of the costs of replacing the existing copper network, when it is foreseeable that the copper network will itself be superseded by a fibre network. It does not promote productive efficiency when that goal is best served by limiting the period of dual operation of parallel networks in the same ownership; it does not promote allocative efficiency when there is no need for substantial further investment in copper, and hence copper's opportunity cost is no longer its replacement cost. And lowering copper prices fails to promote dynamic efficiency and maintain incentives to invest and innovate, since it impedes migration to fibre and puts additional pressure on local fibre companies.

In our opinion, whilst it is possible for the CRTC to pursue short-term goals of allocative efficiency, the negative effects of reducing the price of copper on productive and dynamic efficiency outweigh any gains in allocative efficiency.

The next section provides a brief overview of some of the more relevant recent academic work on the specific issue of copper pricing and investment incentives. It shows how relatively lower copper access prices undermine investment in NGAN and thus lead to productive and dynamic inefficiencies. In the following section we discuss relevant actions undertaken by policymakers outside North America in order to recapture the benefits of a timely and extensive fibre roll-out.

3 How regulated wholesale copper prices affect fibre investment incentives

The installation of fibre access networks requires substantial investments. Where the relevant firms are in private ownership it will require the agreement of the Boards of Directors to approve such investment plans. They will normally do so only if they expect them to enhance shareholder value.

In reality, the companies that deploy fibre are typically the ones maintaining copper networks. In a regulatory context in which fibre investment is not assured, the conflict between low copper prices and incentives to invest in fibre is an acute one.

As governments around the world are considering or implementing policies for promoting next generation access networks, both academics and policy makers have focused on how regulated prices for the copper access network affect the roll out of fibre to the premises and the interplay between the access regulations on the existing old network and on the new networks, in the context of new infrastructure investments.

There are numerous theoretical and empirical academic works on the impact of access regulation on the investment incentives, but not many of them have considered the question of access pricing in the context of transition to a new technology. This impact

of high/lower prices for wholesale copper services has only recently appeared as a topic of research in economic literature.

Unsurprisingly, studies uniformly show that higher access prices for copper access networks encourage new entrants, who use lease copper infrastructure, to invest in fibre networks. This can be referred to as the *Replacement effect*.

With respect to incumbent investment, the results are mixed. Inderst and Peitz (2012)⁷ show that, where both legacy and the new infrastructures are deployed, a higher (lower) price to access the CAN lowers (raises) the incumbent's incentive to invest in the NGAN, while it raises (lowers) the incentive of the new entrant. However, the authors do not consider the competitive pressure from a third infrastructure—cable. Bourreau, Cambini and Dogan (2011)⁸ also analyze the incentives of an incumbent and an entrant to migrate from an “old” technology to a “new” technology, but they consider investment spillover effects. That is to say they consider not only the direct effects of copper pricing, but also how the new entrant's investment decision impacts the incumbent's investment.

With respect to the incumbent incentives, they identify two contradictory effects:

- *Wholesale revenue effect*: the higher (lower) the price of copper the greater (less) the loss of revenues from the new entrant as it is more (less) likely to invest in the new technology and more (less) wholesale revenue is foregone; and
- *Business migration effect*: when the access price of the legacy network is low, the retail prices for the services on this network are low too, hence, in order to encourage customers to switch from the old network to the new network, operators should also offer low prices for the fibre services, reducing the profitability of the new technology infrastructure, and the incentives to invest in it.

Using simulations, the authors show that the socially optimal access charge to the legacy network depends on the degree of investment spillovers: If the degree of spillovers is relatively small, the regulator should set the legacy access price at marginal cost; conversely, when spillovers are strong, the access charge should increase proportionally with spillovers.

Here too, however, the authors did not consider the impact of competition of an independent wireline infrastructure provider (i.e. cable), which is a major factor in Canadian fibre deployment.

Finally, Wolfgang Briglauer et al (2011) explored the hypothesis that regulation of existing broadband access products will most likely create corresponding expectations about future regulation of next generation access products. In particular, they test the hypothesis that the stricter access regulation is, the lower next generation infrastructure investment will be. They find strong evidence in favor of this hypothesis and thus conclude that “... the expectations on strict cost-based future NGA-related regulation

⁷ R. Inderst and M. Peitz, Market Asymmetries and Investments in NGA. *Review of Network Economics*, 11(1), 2012.

⁸ Marc Bourreau, Carlo Cambini, Pinar Dogan, Access Pricing, Competition, and Incentives to Migrate From “Old” to “New” Technology, Harvard Kennedy School, Faculty Research Working Paper Series, 2011

outweigh potential dynamic efficiency gains via service-based competition.” The article demonstrates the *Regulatory risk effect* associated with establishing low copper prices.

In the table below we summarize these various effects of low pricing copper. The effect is unambiguously adverse for the new entrant’s incentive to invest. We note though that the impact may be theoretically ambiguous for the incumbent’s incentive to invest, on the basis that the wholesale revenue effect may be stronger than the business migration effect. This theoretical outcome does not seem likely for Canada as 1) wholesale revenues derived from copper accesses are much smaller than the associated retail revenues for incumbents (in contrast obviously to regimes where there has been structural separation) and 2) there is very limited evidence that copper-using wholesale customers will migrate away because they invest in new fibre technology. In our view, the business migration effect will prevail for an incumbent.

Table 1. Summary of Impact of Copper Prices on Incentive to Invest

Effect	Impact of lower copper prices on incentive to invest	
	Incumbent’s incentive	New entrant’s incentive
Replacement effect	--	Decreases
Wholesale revenue effect	Increases	--
Business migration effect	Decreases	Decreases
Regulatory risk effect	Decreases	Decreases

In summary, there is general consensus that high prices for legacy copper services encourage deployment of fibre networks. This is especially relevant for companies that are leasing copper services as well, but also for incumbents in contexts such as Canada. The business migration effect is key, as it complements the pressure that exists when trying to compete with cable providers.

4 Case Studies from Europe and New Zealand

4.1 The recent debate in Europe

The debate about the effect of this relationship on the incentive to invest in the next generation access network (NGAN) and what regulators should make of this relationship when setting copper access network (CAN) prices has most recently played out publicly in the context of the consultations on the pricing of access to broadband services in the European Union. In essence, the debate about the investment incentives is an argument about the relative strengths of the effects set out above.

Incumbent owners of the CANs have an incentive to get the most out of their existing assets

A much-discussed report by WIK-Consult⁹ for new entrants (ECTA) has argued that if incumbents earn a reasonable return on their investment in CAN, they will delay investing in fibre to the premises for as long as possible.

⁹ WIK-Consult (April 2011). *Wholesale pricing, NGA take-up and competition*.

Among the many results of the simulations run by WIK, one take-away is that not only the fibre access charges but also the access charges to legacy networks matter. While higher fibre access charges increase incentives for fibre investment as one would expect, lower access charges to legacy networks encourage incumbents to invest in NGANs, and thus allow a rapid switch-off of the copper network in places where fibre is already installed (to which the regulator must commit, of course). In contrast, a high access charge on the copper network reduces the incumbent's incentives for fibre investments, because moving access seekers' customers to fibre cannibalizes the incumbent's existing access products.

Hence, WIK-Consult have argued that a reduction in regulated prices on the copper network would make fibre investment by incumbents more attractive.

Part of this result derives from a view that current LRIC prices are too high. WIK-Consult argues that LRIC estimates that are based on an assumption of expansion (i.e. the next increment of investment) are not relevant in a declining market and overstate the appropriate price, which may be closer to short run incremental cost. In fact, the competitive price should decline following the decline of wholesale demand which flows from declining demand at the retail level.

However, in our view to the contrary, LRIC increases because fixed costs are distributed among a smaller number of users.

Lower prices for the CAN reduce the incentive for consumers to migrate to fibre-based services

Acting for incumbent operators (ETNO), Plum Consulting¹⁰ have argued that the effect of lower regulated CAN charges are damaging the business case for NGAN investment by

- making it less likely that customers will voluntarily migrate to more expensive products and/or result in lower NGA retail prices, thereby undermining the business case for NGA
- signalling to potential investors that once fibre investment is sunk the price of fibre might also be lowered—like copper—thereby deterring investment.

Plum argues that the copper price should be high in order to encourage fibre investment, and reject the suggestion that copper prices should be reduced in order to increase the relative attractiveness of investment in fibre. They also reject the proposition that lower copper prices will increase the broadband market—they recognise, however, that stimulating broadband by lowering copper prices increases the customer base that might transition to fibre. But this linkage is considered to be weak as there are important non-price barriers to broadband adoption. For example, incremental adoption is increasingly dominated by mobile broadband and existing non Internet users are unlikely to be willing to pay for fixed NGAN.

Finally they say lower copper prices will add to a perception of regulatory risk—lowering the price of copper may signal to potential investors that once fibre investment is sunk the price of fibre might also be lowered, thereby deterring investment.

Both the WIK and the Plum documents stress that the access charge for the legacy network has a major influence on the transition to NGANs, however, its impact is disputed.

¹⁰ Plum Consulting, Costing methodology and the transition to next generation access, A report for ETNO, 2011.

We note that these submissions to the European debate outlined above on the importance of the relative price of copper to fibre does not consider the competitive effect of cable networks—which are important in Canada—but a fixed line telecommunications operator will have to migrate to fibre because copper is not scalable enough to compete with cable access networks.

At the conclusion of the consultations, the European Commission announced that it did not see a reduction in copper prices as facilitating fibre investment (see Box 4.1). This conclusion, after reviewing the submissions made by stakeholders, was heavily influenced by the types of views submitted by Plum and tended to implicitly reject the conclusion of WIK.

Box 1: European Commission’s view on Relative Pricing

“The question whether a rise or fall of copper prices would spur NGA investment is complex. Different factors pull in different directions, and vary in relative strength: according to context and in their effect on alternative and incumbent operators. Last October we explored some ideas on how to reconcile these competing factors. NRAs were concerned that an approach linking the copper price to NGA investment commitments would be difficult to enforce in practice, and open to gaming.

But more importantly, after examining all the evidence, and 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. Indeed, we now see fibre investment progressing relatively well in some Member States where copper prices are around or above the EU average.”

Source: European Commission Memo, 12 July 2012. Enhancing the broadband investment environment – policy statement by Vice President Kroes, emphasis added.

Indeed, the European Commission has taken the position that the price incumbent network operators charge to competitors buying wholesale access to their copper networks should not be cut in general as it will not induce greater investment in high-speed broadband. The Commission issued a draft recommendation on 'consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment', which states as its objectives:

“(i) to ensure a level playing field through the application of stricter non-discrimination rules, (ii) to establish predictable and stable regulated wholesale copper access prices, as well as (iii) to increase certainty on the circumstances which should lead to the non-imposition of regulated wholesale access prices for NGA services. Increasing legal and regulatory predictability in this manner should further help to trigger the investment needed in the near to medium-term future.”

The recommendation supports a bottom-up LRIC plus mark-up costing, with the requirement that the calculation models for copper unbundling should be the current costs of deploying a modern efficient NGA network, not a copper network. On the methodological basis outlined in the recommendation, the EC has stated that the wholesale prices for access to the copper networks should be between €8-10. This effectively meant that existing copper prices would be maintained in many European countries and even increased in others. Thus, in recommending copper rates on the basis of fibre costs, the EU has effectively insisted at the same time that unduly low copper rates not undermine incentives to invest in fibre.

The European NRAs have generally been given the deadline of implementing this recommended costing methodology by 31 December 2016 at the latest unless the prices for access to copper already are contained within the recommended range.

4.2 Investor perspective: Case study from New Zealand

The case of New Zealand is a particularly relevant one as it shows in the various aspects of the interdependencies between copper access services and fibre services. In this section we begin by providing an overview of the current regulatory framework for access to copper services in New Zealand. This sets the context for recent price reviews of wholesale copper services by the regulator, the Commerce Commission, that have raised significant debate about the pricing approach in the transition to fibre and have led the Government, a major co-investor in the fibre network, to consider a number of proposals including legislative changes in order to protect its investment.

4.2.1 Policy and market context

The development of the fibre access network is being done through Crown Fibre Holdings (CFH), a government owned enterprise. CFH entered into public-private partnerships with local fibre companies (LFCs) in 33 areas. The Government's aim is to provide 100Mbps service to 75% of its citizens by 2019 through a FTTH network, and at least 1Mbps to rural areas. The Government provided significant up-front funding (NZ\$1.6 billion), helping finance about 50 percent of the total estimated investment costs. to a number of holders of competitively-allocated geographic fibre access network concessions in urban areas, with a competitively-allocated subsidy for the provision of fixed line and wireless-based rural broadband. The LFC will build, own, and operate their fibre networks, offering wholesale services at the passive layer on an open-access basis.

The agreement with CHF is designed to accelerate the migration of services from copper to fibre over and above that would otherwise have occurred when the CAN reached its useful life.

Chorus, the wholesale telecom operator spun off from incumbent Telecom New Zealand in 2011, was successful in a competitive tendering process in winning 70% (by area covered and funding) of the contracts available. Hence, in our view, the objective of the UFB policy was to bring forward the timing of private investment in fibre, and it also solved the investment incentive problem for fibre rollout through the UFB tender.¹¹

The contracts require the chosen operator to roll out fibre over the period to 2019, and impose penalties for failure to do so. The services which Chorus (and other successful tenderers) must provide and the prices they can charge for them are set out in the contract. The contract is premised on fibre being prioritised – which precludes Chorus from making further investment in copper, but the contract contains no specific requirements for migration from copper to fibre. Nor does it contain provisions for or restrictions on the switch-off of the copper network.

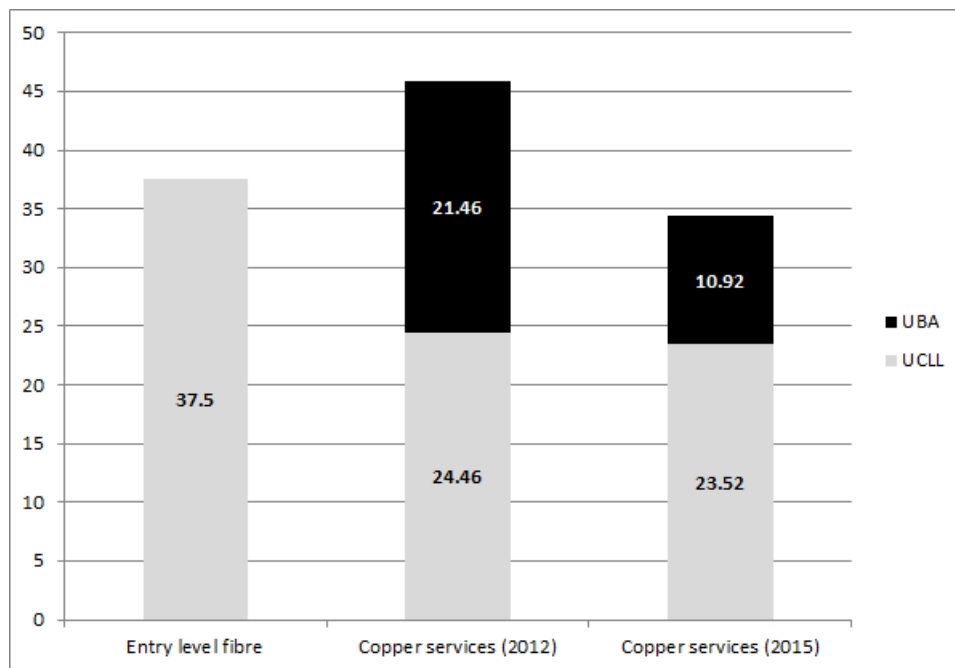
The Government also reset the regulatory regime, through legislative changes in 2011, in order to ensure the fibre deployment could be a success. There were legislative changes to a range of copper services, which are regulated by Commerce Commission, including fully unbundled copper loops and bitstream access.

¹¹ Chorus, as a separate wholesale access company, combines both the copper local access network and the fibre local access network. Chorus owns both copper and fibre to the cabinet (FTTC) networks, including DSLAMs, exchanges, cabinets and some regional backhaul networks. It provides both bitstream and unbundled local loop services.

However, the New Zealand model of setting fibre prices in contract with CFH (certain until 2020) and legacy services in Commerce Commission determinations (highly uncertain) is unique and has led to extensive regulatory and debate in the last year, prompted by the Commerce Commission review of ULL¹² Service and Unbundled Bitstream Access (UBA) prices.

The diagram below illustrates wholesale prices for the copper regulated services and the comparable fibre service¹³ determined by the Commerce Commission in 2013¹⁴. The Commission’s pricing approach, under Initial Pricing Principles, is to rely on international benchmarking from markets that follow principles of forward looking efficient costs. Hence the 2015 prices set by the Commission are outcome of benchmarks. These benchmarks, in turn, typically follow a MEA approach to copper networks.

Figure 4.1: Comparison of Fibre and Copper based Wholesale Services (NZ\$ per line per month)



¹² The ULL service in New Zealand is termed Unbundled Copper Local Loop (UCLL).

¹³ Telecommunication companies can just pay the ULL price, and install their own electronic equipment (to avoid paying the UBA), or they can pay both the ULL and UBA prices for access to both the copper lines and the electronics. For equivalent fibre services, such companies pay a single price for access to both fibre lines and electronics.

¹⁴ In applying the pricing methodology, the New Zealand Telecommunications Act provides for a two-stage process. Firstly, the initial pricing principle (IPP) involves establishing a price by benchmarking cost-based prices for similar services in comparable jurisdictions. The initial pricing principle seeks to establish a proxy for a forward-looking cost based price. Typically, the price setting process does not go beyond this point. Secondly, in the event that the Commission is requested to undertake a pricing review of the price it has set through benchmarking, a final pricing principle (FPP) will be applied – that is, the Commission will apply the designated pricing methodology (e.g. TSLRIC) itself. This involves a more detailed examination of the likely forward-looking costs of supplying the access, usually through developing a cost model.

4.2.2 Government response to Commerce Commission price changes

The pricing outcome explained above was not expected by the Government when it reset the regulatory framework in 2011 to facilitate the rollout of the UFB. It is particularly interesting for two reasons. Firstly, the 2015 copper prices are set by the Commerce Commission relatively close to market determined fibre prices. Secondly, and more importantly, the Government believes that they are too low and below prices projected under the CFH contract at NZ\$37.50.

As a result, the Government began an aggressive campaign to review the regulatory regime. Under the Act, the Minister is required to review the regulatory settings established by the Act by 2016. However, in light of what it perceived as negative regulatory developments, it has brought forward this review and released a discussion document in August 2013.

The primary focus of this discussion document is on potential changes to the wholesale copper pricing methodology – an unambiguous rebuke of the Commerce Commission pricing decisions.

The Government is concerned that 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.

The rest of this section summarises the key issues and options put forward by the Government.

What did the Government expect from the changes to the regulatory framework in 2011

It had expected the outcome of those changes to be as follows:

- Fibre and copper prices would be set at broadly comparable levels because it was expected that new section 18(2A) of the Act would be a clear signpost for the Commission to set copper prices in a way that facilitated investment in the replacement of the copper network by fibre over time.
- These prices would be set quickly, giving early and enduring certainty over the UFB build period for network investors, retail service providers (RSPs)¹⁵ and customers. The expected timings were that the Commission would average existing UCLL prices by late 2011 and then complete the UBA price by the end of 2012.
- Migration from copper to fibre would be customer-driven – that is customers would migrate from copper to fibre over time on the basis of the value they perceived in fibre-based offerings.

Why is Government considering further changes to the regulatory framework

The implementation of the 2011 reforms has not delivered on the policy intent of the Government. From the Government's perspective:

¹⁵ Chorus is a dedicated wholesale access network and access seekers must buy the access service from Chorus to provide a retail service to customers.

- Prices for regulated copper services have, at least at the benchmarking stage of the process, been set at prices well below UFB fibre prices. In particular, the Commission has found that the Act, notwithstanding section 18(2A), does not allow it to set benchmarked prices on the basis of relativities between copper and fibre prices.
- The process is taking longer than anticipated. As well as averaging ULL prices the Commission elected to also reset underlying ULL prices. The subsequent UCLL prices based on benchmarking are now being reviewed. This review could take several years to complete meaning certainty over copper prices is unlikely to be achieved until mid-2015 (it has taken more than two years to complete the benchmarking stage). If the UBA prices set using initial pricing principles are appealed, then this timeframe for finalising copper prices could extend into 2016. This means an extended period of detailed cost modelling with considerable uncertainty over the outcome and timing (modelling is particularly difficult during a transition period when one network is gradually replacing another). This will divert industry focus and resources into regulatory hearings and away from competing and innovating.
- Uncertainty is impacting the industry's plans for fibre migration. Network investors are looking for certainty over cash flows to fund the considerable investments being made in fibre networks. RSPs need certainty over the relativities between copper and fibre to plan their own investment in new services and investment in copper-based services. The net effect is that there is not a stable environment for a customer driven migration from copper to fibre.

What if the Government took no action

The Government believes that the risks of a large gap between legacy and replacement network access prices are:

- Fibre revenues for LFCs will be lower than expected (because of the slower uptake of fibre and fibre-based services) affecting expected returns and putting at risk the long-term viability of the firms
- The development of new services and innovative applications could be deferred, as RSPs remain on the legacy network. The lack of such services and applications will then provide a further disincentive to migrate.
- As users and RSPs may have reduced incentives to migrate to fibre because of lower copper prices, the period of time where two access networks are operating will be prolonged, resulting in inefficient duplication of network infrastructure
- As the owner of the copper network, Chorus will be directly affected by both lower copper revenue and slower migration to fibre which will affect its ability to fund the roll-out of fibre in the areas where it is contracted to do so.

We believe that the Government's concern is real – it is relying on Chorus to build 75% of the UFB network. Taxpayers are footing close to NZ\$1 billion, or about half of the total build costs. If Chorus is unable to achieve a sufficient return on its copper network, Chorus will be unable to complete the UFB network build.

This in turn jeopardises the Government's investment.

What is the government proposing to do

The New Zealand government invited submissions on the first phase of the policy review of the *Telecommunications Act 2001*. The first phase of the review will examine whether the current regulatory framework is adequate for New Zealand's migration from legacy copper infrastructure to fibre networks and discuss pricing components of the current regulatory framework.

The New Zealand government is proposing to rewrite the country's telecommunications regulatory framework to allow it to set, or by directing the regulator, the wholesale price for access to the legacy copper network.

It is proposing to keep the access cost for copper at the same level as new fibre to the home (FTTH) broadband connections currently being deployed nationwide. This would result in a much smaller cost reduction for access seekers instead of the larger reduction decided by the Commerce Commission. Fundamentally, all the options identified by the Government ensure that prices to access the Chorus copper network during the transition phase of the UFB build period be set with reference to UFB prices for fibre. The main legislative changes will be 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.

At this time, Chorus has appealed the decision of the Commerce Commission, and simultaneously has asked the Commission to determine prices using final pricing principles. The Government has to date taken no action but retains the flexibility to do in line with its proposals.

5 Summary and Conclusions

The 'price of copper' has always been a key issue in telecommunications regulation, especially where unbundling has been a significant vehicle for the provision of fixed voice and data services. In such circumstances, regulating the price of an unbundled loop, together with the linked decision about how to price bitstream access, is essentially a proxy for retail price control for broadband.

The emergence of a fibre access network which rivals the copper network has added further complexity to the role of pricing copper in the market. This complexity essentially arises because it is inevitable, or at the very least highly likely, that fibre in some geographies will progressively but ultimately fully supersede copper.

In light of this, we have not tried to demonstrate to the CRTC what is the "right" price for copper. Rather our focus has been on why, in the presence of decreasing demand for copper services, reductions in regulated copper prices will hamper fibre investment. As a result, the CRTC should be very cautious in pursuing any further reductions in legacy wholesale copper prices.

We have shown that there is a relationship between regulated CAN prices and the consumers' demand for NGAN and this is not controversial. CAN and NGAN services are, to a significant degree, substitutes. There should be no surprise that the demand for the quality increment available from NGAN depends on the relative prices of the two access networks.

This relationship is not straightforward and can vary depending on market structure, existing fibre coverage, demand and supply elasticities, and so on. Recent economic literature shows that although the impact may be ambiguous for the incumbent's incentive to invest, it is unambiguously adverse for the new entrant's incentive to invest.

Furthermore, in the Canadian context, the dominant driver for incumbent investment in fibre networks is platform competition, though the regulatory environment also affects incentives to invest. The regulator need not fear that higher copper access prices will discourage incumbent investment in NGAN.

Hence, our report also shows that it is inappropriate or even illogical to lower copper access prices when it is foreseeable that the copper network will itself be superseded by a fibre network. It does not promote productive efficiency when that goal is best served by limiting the period of dual operation of parallel networks in the same ownership; it does not promote allocative efficiency when there is no need for substantial further investment in copper, and hence copper's opportunity cost is no longer its replacement cost. And lowering copper prices fails to promote dynamic efficiency and maintain incentives to invest and innovate, since it impedes migration to fibre and puts additional pressure on local fibre companies.

Our case studies have showed the play of these considerations in practice. The debate in Europe has been about the relative strength of different effects. Both the WIK and the Plum documents stress that the access charge for the legacy network has a major influence on the transition to NGANs, however, its impact is disputed. As a result, a key lesson from the European debate is that copper pricing cannot and should not be considered in isolation of the effects on fibre investment and fibre pricing.

The case study from New Zealand demonstrates that the damage caused by lowering copper prices could not be more evident. The result of these regulated rate reductions has led the Government, a major co-investor in the fibre network, to consider a number of proposals including legislative changes in order to protect its investment.

Annex: About the Authors

Erik Whitlock

Dr. Whitlock is principal and founder of Cline Consulting Group, which provides economic advisory services to telecommunications companies, regulators and financial investors globally. Erik has over 20 years of experience in regulation, valuation and economic analysis in the telecoms sector.

From 2008 to 2012, Erik was a director within PricewaterhouseCoopers' strategy and valuation practice. He was based in the Middle East and worked with PwC's global telecoms practice out of region.

Before joining PwC in 2008, Erik held senior positions at Cable & Wireless plc Group (C&W), the last of which was Vice President of Regulatory Affairs and Finance with C&W Americas within the C&W plc Group, where he ran a team of economists, business analysts and lawyers providing strategic advice, rolling out cost and pricing models, conducting demand analyses and ensuring regulatory compliance and advocacy for C&W fixed and mobile businesses in the Americas region.

Usman Saadat

Mr. Usman Saadat is an associate of Cline Consulting Group. Until recently he was Director of Telecoms with economics and finance infrastructure advisory firm, Castalia Strategic Advisors.

He brings over 17 years' experience in the telecommunications industry, gained with economic consulting firms, incumbent telecom operators and a regulatory authority. He served initially as Director of Policy and regulation, and then as CEO, of the Utilities Regulation and Competition authority in the Bahamas. He has held several key executive positions within Cable & Wireless plc and served as the Regulatory Economist for its emerging markets division, Regional Businesses. He is skilled in investment appraisal, business operations and regulation in developing countries, UK, Europe, and Asia-Pacific.

Mr. Saadat's recent relevant experience includes advising Chorus, the local fibre access company in New Zealand, on pricing and regulation of wholesale services and preparation of an expert report for Telstra in support of its application for exemption from downstream telecoms access regulation in areas where effective infrastructure competition exists.