**Equivalence and non-discrimination in New Zealand telecommunications markets: The case of Layer 1 unbundled access to fibre networks**

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## Executive Summary

### I. Task

As requested by the Commerce Commission this report provides an analysis of and advice on a set of questions related to:

- *The interpretation of 'equivalence', as defined in section 156AB of the Telecommunications Act 2001 (the Act), and in particular as it applies to the level of the price for the unbundled product; and*
- *The interpretation of non-discrimination, as defined in section 156AB of the Act, as it applies to pricing practices*

The report in Section 2 starts out with an interpretation of "Equivalence" as consisting of Equivalence of Inputs (EoI) and of Equivalence of Prices (EoP) and "Non-Discrimination" (ND) as the most important concepts contained in the questions. Section 3 addresses some economic issues associated with EoI, EoP and ND, followed by Section 4 on the relevant pricing methods that would be consistent with equivalence and non-discrimination when applied to the unbundled product pricing. Since a large array of interconnected questions have to be answered in this report, using an economic approach Section 5 provides answers one by one with some overlap. Section 6 concludes.

The advice in this report is focussed on the interpretation of 'equivalence' and 'non-discrimination' in Part 4AA of the Act as it relates to the UFB Fibre Deeds. However, it is my understanding that the definitions of equivalence and non-discrimination found in other parts of the Act, such as Part 2A for the Copper Deeds, as well as in the UFB Fibre Deeds and the RBI Deeds are substantively the same. To the extent that the relevant definitions and purposes are the same, the advice in this report would also apply to other undertakings under the Act.

### II. Basic concepts

Equivalence concerns both input qualities and availabilities (EoI) and prices (EoP). EoP in particular is controversial, because it can in principle be measured based on Baumol's concept of "opportunity costs" or based on resource costs. The two concepts lead to identical results if all relevant inputs are available in competitive input markets. However, the results differ in the presence of common and sunk costs.

The ND requirement concerns price structures charged to the various access seekers (including the incumbent). Price discrimination may be justified as being reasonable, for example because it is cost based, but in addition it must not be obstructing competition.

A violation of equivalence often takes the form of a price squeeze, which customarily is defined by the notion that either the incumbent or a reasonably efficient entrant could not make a profit downstream if confronted with the upstream access price. The choice between these two approaches is one between promoting competition or saving resource costs and supporting the incumbents' investments in new generation networks. A reasonably efficient entrant is mostly assumed to have a 15-20% market share. Bundling of multiple Layer 2 (L2) products can involve price squeeze and can be a violation of the ND requirement in that it resembles quantity discounts.

The various pricing methods for the unbundled product fall into two groups, one being (resource) cost-based prices and the other one using a (L2) price-based approach. Both have their advantages and drawbacks. The choice between the two approaches therefore depends on the circumstances. In particular, resource cost-based pricing may better reflect the equivalence and ND requirements if L2 prices are above cost, while the price-based approach may be preferable when L2 prices are at or below costs. Because of sunk costs a margin from the L2 price based on the efficient component pricing rule (ECPR) using a clean margin rule would strangle unbundled entry. In contrast, basing the ECPR on the downstream cost of a reasonably efficient rival would favor entrants. The latter can be efficient if it leads to product differentiation, though.

The presence of multiple L2 services can lead to severe adverse selection and moral hazard problems for unbundling that are hard to avoid, both under ECPR and under pricing based on resource costs.

## III. Answers to the Commission's questions on equivalence

For the purposes of specifying an upper bound for a level of the L1 price that could be presumed to satisfy EoP, the stand-alone price of the L1 product (i.e. after the avoidable costs of L2 have been excluded from the L2 price) is a good upper bound for the L1 price if L2 prices are sufficiently low. This may no longer hold if L2 prices increase well above costs. It may in this case be preferable, in order to better give effect to the purposes in s 156AC of the Act, to switch to the average resource cost of L1 as a new upper bound for the L1 price. This would automatically also constrain the L2 price not to exceed resource cost by too much. Combining the two approaches, the upper bound could be set as the smaller of the resource cost and the stand-alone price.

While I understand that the Commission does not have the authority to set prices for the L1 product under Part 4AA of the Act,[1] in its role as an enforcer of the Fibre Deeds the Commission may have to determine whether the L1 prices offered by Chorus and the LFCs are compliant with EoP and non-discrimination. Evaluating whether a price or price range for the unbundled product fulfils the legal requirements concerns (a) potentially tighter upper bounds and (b) potential lower bounds for the L1 price.

The first task is to determine a price or price range satisfying both the equivalence and ND requirements. The resulting price or price range has to be checked for consistency with the dual purpose of s156AC(a) and (c).

s156AC(a): In the context of pricing of unbundled L1 services, "promoting competition" can refer to (i) the market for L1 services, (ii) the market for L2 services, and (iii) the market(s) for retail services generated with L1/L2 services as inputs. Promoting competition is here taken to refer to moving in the direction of effective or workable competition that is efficient. This limits the extent that discrimination can be justified, and it favours an ECPR that is based on the downstream cost of a reasonably efficient entrant. It is only compatible with a resource cost based L1 price if the L2 price is sufficiently high.

s156AC(c): The use of a resource cost based approach to intermediate input pricing in contrast to a retail-minus approach is often justified with the argument that it provides the correct investment incentives. This is not true in its generality and in particular not with respect to L1 unbundling. Most relevant for this investment decision is the achievable downstream margin, not the relationship between upstream price and upstream cost. Thus, while ECPR pricing will generally lead to efficient L1 investment, LRIC pricing generally will not. LRIC pricing will only do so if the L2 price is sufficiently high. A similar argument holds for efficient L2 access seekers and their investment choices. Furthermore, any inefficient LFC and bypass investment will be due to the distorted L2 price, not to the ECPR L1 price.

Finding a safe harbour range for L1 prices fulfilling the legal requirements would be desirable. It means that the regulated firm can choose any price in this range and can be sure that it complies with the ND and EoP requirements, as those requirements are interpreted in light of the Part 4AA purpose contained in s156AC. The task here is to find a set that is in the intersection of two sets of prices, each one defined by one of the requirements just discussed. Unless these two sets overlap, such set will be empty.

Thus, if a pricing method is incompatible with either of the requirements it is excluded, while if there is more than one compatible method then they can create a price range to choose from. A

[1] I understand that the Commission may have authority to recommend a price for incorporation in regulations made by the relevant Minister under s 229 of the Act, but not until 2025.

safe harbour would then either mean this range or the one method that best achieves the Part 4AA purpose.

For a given interpretation of EoP there is likely to be only one *theoretical* price level for L1 services that satisfies the EoP rule. *Empirically*, however, for each pricing method there may exist a range of measured prices depending on assumptions about items, such as asset lives, or measurement issues, such as determining the WACC. Then the question is if the method or measurement range also satisfies the ND rule.

How does the evaluation of the different pricing methods for L1 depend on whether the L2 price is below, at or above the L2 cost?

If one can characterize the below-cost L2 pricing as "penetration pricing" the question is if this deserves special treatment from the L1 pricing perspective. Unbundling can in this case only be certain to survive under retail-minus rules with a discount based on either a reasonably efficient entrant or an (adjusted for scale) equally efficient entrant, but not at a resource cost based unbundled price.

If the L2 price is sufficiently high a resource cost based L1 price may be preferable to an ECPR based price, because that improves competitive outcomes downstream. Since one does not know above which L2 price this preference switch occurs (because it depends on the avoidable cost definition and on other variables), I therefore suggest for the time after penetration pricing is over an optional approach such that the L1 price is the lower of the cost-based price and the ECPR price. This option encourages unbundled L1 take-up and prevents the incumbent from excessive or foreclosing L2 charging.

## IV. Answers to the Commission's ND questions

In contrast to a component-based price for the unbundled (PONFAS) service a blended price is compatible with the EoP concept, and is non-discriminatory. Nevertheless, a blended price per connection can lead to severe adverse selection problems and inefficient additional investments and excess capacities for the incumbent. Such severe adverse selection problems will not occur under PONFAS pricing which sets a single price for the sum of all L1 elements; however, such pricing will likely exclude all but the largest unbundlers and in less dense areas, it will even exclude those. Thus, some compromise between a fully blended price and some split by components needs to be found that does not exclude reasonably efficient entrants and does not lead to adverse selection and moral hazard issues.

It is well known that two-part tariffs for intermediate inputs favour large buyers and, in particular, favour the regulated firm that is typically its own largest buyer. Thus, a large up-front payment is not compatible with equivalence nor with ND. While all deviations from a 'single' price to access seekers can in principle be discriminatory, those de minimis deviations that

cannot be deemed to exclude or burden any (efficient) access seeker should not be presumed discriminatory and therefore would not have to be evaluated on a case-by-case basis.

To satisfy equivalence one has to base the L1 prices on the revenue that could be earned at L2 given current take-up. Again, an adjustment for a "reasonably efficient" competitor may have to be made. This would imply regular revisions of L1 prices (even in the absence of changes to the L2 prices) in line with take-up. This is a slightly different question from the 'scale' question that arises between the 'equally efficient' vs 'reasonably efficient' test discussed before.

High fixed charges are likely to be discriminating in favour of the incumbent. A safe approach would be very small or no fixed charges, no quantity rebates, and no pricing by component. One could define such a tariff by a maximum fixed charge that amounts to less than x% of the tariff for a buyer with y% market share. If the actual fixed charge exceeds that level the incumbent can justify it as being productively more efficient and furthermore that it may prevent inefficient entry.

## V. Conclusions

The method best used for unbundled L1 pricing in order to fulfil the EoP and ND requirements in a way that gives effect to the purpose at s 156AC largely comes down to the choice between a resource cost based and an ECPR based approach. The resource cost-based approach has internationally been the dominant method of choice for providing wholesale network access in a pure monopoly regime. In contrast, the ECPR was largely criticized for being unable to constrain the downstream market power of a vertically integrated monopolist and therefore was deemed to require downstream price regulation in addition. However, if, as currently is the case for L2 services in New Zealand, the downstream market is subject to price-quality (PQ) regulation or (as may be the case for the other LFCs) subject to competition, then the ECPR is preferable to LRIC (or other cost) based pricing. Only if there is clear evidence that an incumbent faces loss-making L2 prices under the Deeds can a clean margin rule based on the incumbent's average cost of contraction be recommended. This will likely be different after January 1, 2022 and until L2 prices are subject to cost-based pricing, in particular for Chorus. This potential change is where my suggestion for a two-way 'safe-harbour' pricing option comes from. Since one does not really know beforehand which downstream pricing scenario one is in, the lower of the LRIC price and the ECPR price should generally be appropriate.

Once a pricing method is selected, there would be a single EoP price (for a given set of assumptions under the pricing methodology), but a number of pricing methods are available to the incumbent and the regulator that would satisfy equivalence (and thus, other considerations such as the Act's purposes at s 156AC could come into play).

My considerations on pricing that fulfils the ND requirement showed that there can be tensions with efficiency so that a violation of ND, for example in favor of component based pricing may

be justified. In such cases a compromise needs to be found that does not exclude efficient entrants in order to best give effect to the Part 4AA purpose.

**Equivalence and non-discrimination in New Zealand telecommunications markets: The case of Layer 1 unbundled access to fibre networks**

1. The task set by the Commerce Commission

The Commission seeks a written report that provides an analysis of and advice on the following questions related to:

1.1. *The interpretation of 'equivalence', as defined in Section 156AB of the Telecommunications Act 2001, and in particular as it applies to the level of the price for the unbundled product*:

1.1.1. Does the concept of 'equivalence' limit the prices for the unbundled product beyond a requirement that the price is below the stand-alone price of the L1 product (i.e. after the avoidable costs of L2 have been excluded)?

1.1.2. If we can use the purpose of Part 4AA of the Act at s 156AC to interpret the equivalence and non-discrimination obligations in the Fibre Deeds and thereby determine whether a price (or price range) is consistent with those obligations, what additional constraints would the dual purposes to promote competition in telecommunications markets (at s 156AC(a)) and facilitate efficient investment (at s 156AC(c)) introduce?

1.1.3. Is there a 'safe harbour' range for the price of the unbundled product that would satisfy the definitions of non-discrimination and equivalence in s 156AB and give effect to the Part 4AA purpose at s 156AC?

1.1.4. Under Part 6 of the Act, there is no requirement for the L2 prices to be cost-based, except the Commission has the power to recommend a cost-based price for the anchor product sold by Chorus from 2025. In this context:

1.1.4.1. What are the pros and cons of different methodologies for evaluating whether the prices of the unbundled product comply with equivalence?

1.1.4.2. Which approach (if there is a 'winner') would best give effect to the purpose at s 156AC, if we can assume that the L2 prices will be, in aggregate, above costs after 1 January 2022?

1.2. *The interpretation of non-discrimination, as defined in Section 156AB of the Act, as it applies to pricing practices*:

1.2.1. Is there a particular (non-discriminatory) price structure that would best promote competition, and thus best give effect to the purpose in s 156AC(a)?

1.2.2. Could a given price structure be considered discriminatory because it has different impact on different access seekers (even if exactly the same set of prices is offered to all access seekers)?

1.2.3. Given that s 156AB includes in its definition of non-discrimination a requirement that differential treatment 'does not harm, and is unlikely to harm, competition', would all proposed price structures have to be reviewed on a case-by-case basis or are there some structures that could be presumed to satisfy this requirement (conversely, are there other structures that are likely to automatically merit further review)?

1.2.4. How should we be taking into account (if at all) the scale of the access seeker relative to the scale of the LFC given the purpose to promote competition under s 156AC(a))?

### 1.3. Approach and structure of the report

In the following, Section 2 starts out with an interpretation of "Equivalence" as consisting of Equivalence of Inputs (EoI) and of Equivalence of Prices (EoP) and "Non-Discrimination" (ND) as the most important concepts contained in the questions. Section 3 addresses some economic issues associated with EoI, EoP and ND, followed by Section 4 on the relevant pricing methods that would be consistent with equivalence and non-discrimination when applied to L1 pricing. Since a large array of interconnected questions have to be answered in this report, using an economic approach I will in Section 5 try to answer them one by one with some overlap in the answers. Section 6 concludes.

The advice in this report is focussed on the interpretation of 'equivalence' and 'non-discrimination' in Part 4AA of the Act as it relates to the UFB Fibre Deeds. However, it is my understanding that the definitions of equivalence and non-discrimination found in other parts of the Act, such as Part 2A for the Copper Deeds, as well as in the UFB Fibre Deeds and the RBI Deeds are substantively the same. To the extent that the relevant definitions and purposes are the same, the advice in this report would also apply to other undertakings under the Act.

## 2. Interpretation of Equivalence and Non-Discrimination in the New Zealand context

### 2.1. Non-price equivalence (EoI)

"Equivalence", as defined in s 156AB of the Act, can mean both equivalence of inputs and equivalence of prices. EoI concerns the relationship between inputs used by the regulated firm for generating its own services and the inputs used for providing the services to an access seeker. An EoI stipulation typically arises if the regulated firm for technical reasons cannot just offer the access seeker exactly the same services it provides to itself.

Applied to the case of L1 services in New Zealand the Local Fibre Companies (LFCs)[2] seem to have actually duplicated some major network components in order to have sufficient capacity to offer L1 unbundled services. In that sense L1 access seekers would get the same major inputs as the LFCs. Even with the duplication of some network components, other services associated with L1 access, such as maintenance and repairs, would still have to meet the EoI standard.

### 2.2. Price equivalence (EoP)

Under the Act the equivalence stipulation also includes the price along with the physical inputs. Since the regulated firm typically does not charge itself internally any prices for the inputs it supplies to itself or, if it does, since these are typically not market prices, the prices for equivalence purposes have to be imputed.

In my opinion these imputed prices include what Baumol (1983) has called "opportunity costs". In economic terms "costs" and "opportunity costs" usually have the same meaning, which is the value one has to give up to produce an item. In the following, however, we differentiate between "resource costs", which refer to inputs purchased by a firm in the production process, and "opportunity costs", which refer to market opportunities in the form of foregone profits or quasi-rents given up by the firm for other outputs that are not sold because of the sale of access to a downstream competitor. Thus, the imputed prices in the sense of Baumol include the resource costs for the inputs plus/minus the profit or loss foregone by selling the access in question rather than selling an alternative product downstream. The imputed price therefore depends on the price of the downstream product. The imputed price is easiest to measure if (a) the downstream products of the regulated firm and of the access seekers are perfect substitutes, (b) the downstream price is either regulated or a competitive price, (c) the incumbent's[3] downstream costs are uniquely defined, and (d) there are fixed technical proportions between upstream and downstream outputs. Here "uniquely defined" refers to the issue that the incumbent may produce various products at potentially different costs with the input in question. "Fixed technical proportions" mean that there is a fixed ratio between the quantity of inputs in question and the downstream output quantity. We come back to some of these conditions when discussing the several ECPR options.

An alternative view of imputed prices is that the prices under equivalence have to equal the sum of the resource costs for all the inputs used to produce the EoI services. In principle this can also be a correct approach, provided the resource cost for each of the inputs is the opportunity cost for that input for the incumbent. This creates no problem for all those inputs that can easily be purchased in input markets in the right amount and quality. A major problem, however, arises for

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[2] The term "LFCs" as used in this report includes Chorus as well as the other LFCs - Enable Networks Limited, Northpower Fibre Limited, Northpower LFC2 Limited and Ultrafast Fibre Limited.

[3] In this report, I often use the generic terms "incumbent" for a bottleneck owner and "entrant" for an access seeker. I also use the term "regulated firm" to refer to any firm that is subject to the equivalence and ND requirements and not specifically to fibre suppliers.

(a) common inputs also used for services other than the input in question and (b) sunk assets for which the forward-looking costs to the incumbent are by definition zero (to the extent that they are truly sunk, which may only be a percentage of the replacement value). These common and sunk costs should be valued at their "opportunity cost", which represents the value they have for the incumbent in producing some valuable output. This opportunity cost is derived by deducting the easily measurable costs from the price of the downstream output, meaning that at the end one again arrives at the ECPR approach.[4]

The argument in favour of the ECPR approach is that it correctly answers the question, what would be the value of the incumbent's upstream network at the currently given downstream prices? Applied to L1 versus L2 pricing, given that the network is what it is (i.e., with sunkness) and that the LFCs are currently under a pricing constraint for L2 services, what costs can be imputed to the L1 services? The problem of the typical LRIC approach is that it uses original equipment values instead of sunk values, thereby overvaluing the values of sunk assets in case of loss-making operation. What happens if subsequently the L2 price goes up? Then the value of sunk equipment also goes up. It can in theory exceed the replacement value if downstream prices are sufficiently high and the sunk assets cannot easily be expanded.[5] In this case there exists a high option value in already owning the asset.

### 2.3. ND

Non-discrimination concerns the incumbent's price structure or pricing relationship between the regulated firm and the various access seekers. The common international requirement is for no unreasonable price discrimination, which means that the regulated firm can justify price discrimination by, for example, cost differences between different access seekers. In New Zealand, under the Fibre Deeds and the Copper Deeds, there is the additional requirement that an incumbent can only justify a violation of ND if it does not hurt or is unlikely to hurt competition.

Determining price discrimination is particularly tricky for non-homogeneous products. US antitrust law, for example, only covers potential price discrimination for goods and services "of like grade and quality", which has been interpreted in the economic sense of homogeneity. Under such an approach there can basically not exist price discrimination if the service is differentiated. In contrast, economists usually include different substitutable services under the definition of price discrimination so that different percentage markups on costs are viewed as price

[4] Theoretically, this could result in a negative number if the incumbent offers the downstream services at a loss and if the share of sunk costs is small relative to total costs. This should be of no concern for Chorus and the other LFCs, because (a) most of their assets are literally sunk and capital costs are a large fraction of total cost and (b) the commitments under the Deeds essentially force the companies to maintain their services and therefore also make other costs effectively sunk.

[5] Given that the LFCs are subject to BBM from 2022 onward, this would in theory be less of a concern. Specifically in the New Zealand context, this issue is further complicated because the regulatory asset base (RAB) will include accumulated losses (incl. going forward through wash-ups).

discrimination, even if the services are differentiated. Thus, the famous Ramsey pricing or inverse elasticity rule would represent price discrimination.

Economists further make the relevant distinction between 2nd and 3rd degree price discrimination. Under 2nd degree price discrimination (= horizontal) the firm gives price schedules (options) to every consumer and thereby uses self-selection to extract consumer surplus. In end-user markets for services 2nd degree price discrimination is common and generally efficient, but often favors large consumers over small ones. The same feature holds in intermediate input markets, where it can bias prices against small firms (Hoernig & Vogelsang, 2013). Thus, there emerges a tradeoff between the marginal price being closer to marginal cost and the exclusion of small firms. The latter could violate the requirement that discrimination should not hurt competition.

Under 3rd degree price discrimination (= vertical) the firm splits the market into groups, charging different prices to different groups. While generally 2nd degree discrimination is welfare improving, 3rd degree discrimination can only improve welfare if total quantity increases relative to the quantity sold under no discrimination.

Thus, in general ND can be efficient or inefficient, depending on the case.

While all deviations from a 'single' price to access seekers can in principle be discriminatory, those de minimis deviations that cannot be deemed to exclude or burden any (efficient) access seeker should not be presumed discriminatory and therefore would not have to be evaluated on a case-by-case basis (for the exemption based on being objectively-justifiable and not obstructing competition). One could address this de minimis issue either on a complaint basis by responding to access seekers complaining that they are excluded or harmed by the size of a fixed fee or by component-based pricing. Or, for the purposes of providing guidance on acceptable de minimis deviations from non-discrimination, one could set an administrative limit based on the effect of a fixed fee or of component-based pricing on the cost of an access seeker with a certain market share, say 5%. If the effect on the unit cost is more than, say 2%, the price structure would be deemed discriminatory. In that case the incumbent would have to show that the discrimination is justifiable, for example, that it is based on specific user-related costs. If it is justifiable, the price discrimination in addition must be found not to be obstructing competition and, once Part 6 of the Act comes into effect in 2022, it must be found not be in conflict with other parts of the Act, for example, with the geographic averaging requirement.

### 2.4. Interim conclusions

Equivalence concerns both input qualities and availabilities (EoI) and prices (EoP). EoP in particular is controversial, because it can in principle be measured based on Baumol's concept of "opportunity costs" or based on resource costs. The two concepts lead to identical results if all relevant inputs are available in competitive input markets. However, the results differ in the presence of common and sunk costs. The ND requirement concerns price structures charged to the various access seekers (including the incumbent). Price discrimination may be justified as

being reasonable, for example because it is cost based, but in addition must not be obstructing competition.

## 3. Economic issues associated with equivalence and ND

### 3.1. Price squeeze

Closely related to equivalence is the notion of a price squeeze, which can occur if the EoP is violated. In practice a price squeeze is usually defined in either of two ways. The first is that at the prices charged to the access seekers the regulated firm could not produce and sell the downstream service at a profit. The second is that at the prices charged by the regulated firm for access an efficient (or reasonably efficient) access seeker cannot make a profit downstream.

The two conventional definitions for a price squeeze lead to the same outcome if downstream costs and prices are the same for the incumbent and access seekers and if neither party has to bear additional costs for the access provision. These conditions are, however, rarely fulfilled, because: (i) downstream costs usually exhibit economies of scale and/or scope, and/or (ii) there are additional costs incurred by the access seekers for connecting to the regulated firm's network, and/or (iii) downstream prices may differ between entrant and incumbent because of the regulated firm's goodwill advantage[6] or because of product differentiation, and/or (iv) other efficiency differences exist between the firms. I am not aware of any regulators, who – in the first definition – make an allowance for sunk costs. Thus, regulators typically calculate the regulated firm's profits as if all costs were incurred *ex nunc*.[7]

The choice between the two conventional definitions (plus a third one respecting the incumbent's sunk costs) involves the tradeoff between enhancing access-based competition and saving resource costs. Most jurisdictions seem to favor a price squeeze definition based on the downstream costs of a reasonably efficient access seeker and include some allowance for access-related costs incurred by access seekers. The inclusion of access-related costs is then justified by the argument that such costs are necessary for providing a service that the legislator or regulator deems desirable, because it helps create downstream product differentiation and price competition. 'Reasonably efficient' is customarily taken to mean a firm with a 15-20% market share downstream and efficient operation (based on analytic cost models or incumbent's cost data adjusted for the efficient entrant's size, yielding long-run incremental costs). The reason for choosing this definition appears to be the belief that the other two definitions will lead to little or no access-based competition. This is usually combined with the belief that access-based competition will provide sufficiently large benefits via product differentiation and innovative services and delivery options. The 15-20% market share chosen for the size of a reasonably

[6] For example, L2 access seekers may rather buy from an LFC than from an L1 unbundler who competes with them downstream.

[7] Under clause 2 of Schedule 1 of the Act, the use of the Baumol-Willig rule for setting prices for the copper access products is specifically prohibited. My understanding is that this prohibition is not relevant in the fibre context.

efficient competitor is, to the best of my knowledge, not theoretically or econometrically derived but rather taken from the market shares that access seekers can actually achieve against incumbents with much larger market shares.

### 3.2. Bundling issues (multi-product)

Bundling refers to the sale of several services together, usually at a discount over the sum of prices of the individual services. Setting aside the L1 plus L2 (vertical) bundle, I understand that the LFCs do not currently sell any L2 services in a (horizontal) bundle (across geographies or different speeds, etc.). This includes mixed bundling. For example, there are no discounts for purchasing more than one L2 product or more than one type of L2 product. Bundling is not outright prohibited by the Act, so it is likely that LFCs would be free to introduce L2 bundles once the regime comes into force in 2022 (until 2022 they are limited by the Crown Infrastructure Partners-approved prices).

How would one test for equivalence from an L2 'bundle' price? The question is if, in order to pass price squeeze (and satisfy equivalence), the test should involve assigning the entire bundling discount to one product and testing for no price squeeze between the L2 'discounted' price and whatever the L1 price is, and then do the same for the other products in the bundle. In my view, the answer depends strongly on the presence of EoI. If the unbundler can with the L1 product fully mimic the incumbent's L2 bundle, an aggregate price squeeze test over the whole bundle should be presumed correct. Thus, the burden of proof that there should be a product by product price squeeze test should in this case be with the unbundler. It would in this case turn into a ND issue, because bundling in this respect resembles a quantity discount.

### 3.3. Interim conclusions

A violation of equivalence often takes the form of a price squeeze, which customarily is defined by the notion that either the incumbent or a reasonably efficient entrant could not make a profit downstream if confronted with the upstream access price. A reasonably efficient entrant is mostly assumed to have a 15-20% market share. Bundling can involve price squeeze and can be a violation of the ND requirement in that it resembles quantity discounts.

## 4. Potentially relevant pricing methods for establishing whether a price is consistent with EoP

### 4.1. LRIC pricing

Internationally the most common pricing method for telecommunications access products has been pricing at long-run (average) incremental cost (LRIC) of the input plus a (usually proportional) markup for common costs. The LRIC are mostly derived in cost models, which can be bottom-up or top-down. Given the constraints imposed on Chorus and the other LFCs and given that a building block model (BBM) is likely to be used for PQ regulation in New Zealand the top-down approach to LRIC pricing appears to be preferable to a bottom-up approach in the current context.

### 4.2. BBM pricing

BBM pricing is closely related to the top-down approach to LRIC pricing. The BBM approach to pricing is structurally similar to the traditional US model of rate of return regulation. However, it is more forward looking and uses benchmarks, which allow for efficiency incentives. To the extent that the BBM model is applied anyhow, for example for Chorus' PQ regulation, it would lend itself to either deriving the unbundled product prices to the extent that they are regulated in the future on a resource cost basis or for checking the validity of prices proposed by the LFCs even when those are derived by a different approach, including an approach such as top-down LRIC.

### 4.3. Constrained market pricing

Constrained market pricing is a method suggested by Baumol and Sidak (1994), under which the regulated firm is free to price between the incremental or marginal cost and the stand-alone cost of a service. By the conventional economic definition of cross subsidies (Faulhaber, 1975) such prices would be subsidy free, provided the regulated firm just covers its costs. For individual services that are produced with economies of scope the difference between incremental and stand-alone costs can be quite large. In particular, stand-alone costs can be very high, which is a major reason why the service cannot be offered competitively. Thus, constrained market pricing may in practice not be very constraining on the regulated firm and could lead to a price that does not satisfy equivalence.

### 4.4. Efficient Component Pricing Rule

The ECPR is closely related to the imputed costs discussed in Section 2.2 above. The basic idea behind the ECPR is to make the regulated firm indifferent between selling the regulated input to access seekers and selling the downstream product. In the simplest case the regulated firm loses one unit of downstream sales for every unit of the intermediate input that they sell to access seekers. In that case the ECPR calls for an access price equal to the resource cost of the access product plus the profit contribution foregone (= the private opportunity cost = downstream margin) by not selling the downstream product. This case is also known as the 'retail-minus' approach.

#### 4.4.1. Clean margin rule

The profit contribution foregone by not selling a unit of the downstream product equals the price of the downstream product minus the sum of the resource costs of the access product and the downstream resource cost. Thus, the ECPR price for the simplest case can also be written as the price of the downstream product minus the downstream resource cost. This is known as the simple margin rule.

What we call the "clean" margin rule takes as downstream costs only those costs that are actually saved by the regulated firm by not selling the downstream product. This means that, for example, sunk costs cannot be saved, because they are spent and cannot be recovered. Also, there is a difference for the relevant downstream cost between considering (i) a single unit of output (the marginal unit), (ii) the average of all units not sold, and (iii) the average of all downstream output (under the fiction that the regulated firm gives up its downstream business altogether). In the first of these approaches only variable costs are deducted, while in the second and third fixed costs that are not sunk will also be deducted. The last may be the correct approach under the equivalence requirement, because it includes both the units sold to access seekers and the units sold to the regulated firm's own downstream business.

#### 4.4.2. Armstrong-Doyle-Vickers (ADV) ECPR

Under idealized conditions the clean margin rule makes the incumbent indifferent between selling upstream or downstream. These conditions include (i) fixed technical proportions between the access product and the downstream product, (ii) competitive pricing downstream and (iii) homogeneity of the downstream product. The approach by Armstrong, Doyle and Vickers (ADV, 1996) addresses factors that violate these conditions and are likely to hold and be relevant in reality. They include, in particular, that the downstream outputs may be differentiated between those of the regulated firm and those of the access seekers and that therefore downstream competition will be imperfect. ADV also consider the possibility of bypass of the regulated firm's access and of technical substitution. In these cases the ECPR price is derived by multiplying the downstream margin that is added to the direct (or marginal) cost of access by the so-called displacement ratio $\delta$ (or business stealing effect), which captures the number of units the regulated firm has to give up downstream for selling a unit of the access product. Thus, $p_a = c_a + \delta(p_{dI} - c_a - c_{dI})$, where $p_a$ is the access price, $c_a$ is the per unit access cost, $p_{dI}$ is the incumbent's downstream price, and $c_{dI}$ is the incumbent's downstream cost.

Under the conditions of the clean margin rule we have by assumption $\delta = 1$. However, under product differentiation downstream one gets $\delta < 1$. In fact, in the ADV model the displacement ratio is the product of the separate effects of product differentiation, bypass and technological substitutability: $\delta = \delta_d \text{ X } \delta_b \text{ X } \delta_t$. Since each of these components is smaller than one, the total effect can reduce the ECPR mark-up substantially.

#### 4.4.3. Margin rule based on incumbent cost of expansion (fiction of vertical separation)

So far we have assumed that the "margin" in the margin rule is calculated based on the regulated firm's actual cost savings. Most jurisdictions around the world, however, apply a margin rule that essentially assumes that there are no sunk or common costs. In that case the regulated firm's costs of giving up the downstream business would be the same as those of starting the business from scratch, or the cost of output *reduction* would be the same as that of output *expansion*. This approach is usually justified by the fiction that the regulated firm's business can be divided into a

separate upstream business and a downstream business. While sunk costs are assumed away here, economies of scale and scope can still prevail. If they do, the incumbent would still be able to out-compete the access seekers downstream if the other conditions of the margin rule apply.

#### 4.4.4. Margin rule based on an efficient entrant's cost

A margin rule, where the incumbent's downstream costs are substituted by a (reasonably) efficient entrant's cost, will generally lead to lower upstream access prices than one either based on the incumbent's cost of expansion or of contraction. This provides for "economic space" between the incumbent's downstream price and the upstream price and is known as the "economic replicability test" (ERT). It does not follow the original ECPR idea but rather was designed to encourage entry by upstream access seekers.

In practice, in the application of ERT regulators often approximate the costs of a reasonably efficient entrant by adjusting the incumbent's (i.e. equally efficient) costs for the scale that an efficient access seeker can reasonably achieve against incumbents with much larger shares.

Further, it is usually impractical for regulators to actually calculate and apply the ADV displacement ratio adjustment for the retail-minus approach for product differentiation generated downstream by the access seekers. In other words, in practice the fact that the displacement ratio will be below one is not used. Since applying an ERT approach has a similar effect on the access price as lowering the displacement ratio, ERT may, in the case of L1 unbundling, also be justified on efficiency grounds.

#### 4.4.5. Problems for ECPR if the upstream and downstream services have different structures

There are two cases, where upstream services and downstream services are structured differently. The first happens, when there is only one upstream service but several downstream services. The problem here is that an upstream access seeker may produce one or several of the downstream services and not necessarily those or not in those proportions that the incumbent provides. In this case any aggregation of the downstream services for calculating, e.g., a margin rule is problematic. Creating a price index from the baskets of services may be feasible but any aggregation will run into selection problems in that the access seeker will buy at an average price and select to sell only the more profitable services. This can be done successfully because the access seekers as potential niche finders tend to be small relative to the incumbent. As a result the incumbent's downstream price structure may become unsustainable. The same issue holds for cost-based pricing of the unbundled access service. Generally there are two potential solutions to this problem, both not necessarily efficient. The first is to let the incumbent restructure its downstream prices in order to avoid unsustainability. This may lead to undifferentiated downstream prices. The second is to make the unbundler's access price depend on the mix of services the unbundler is offering. This may not work if the unbundler offers downstream services that differ from those of the incumbent.

The second case, treated next in Section 4.5, concerns upstream services consisting of different components that potentially justify a multi-part price structure, because resource cost-based pricing is used. In this case the problem is how to distribute the downstream price and avoidable costs to the upstream price components.

In the case of L1/L2 services both these cases potentially come together.

### 4.5. Pricing based on cost structures

It can be argued that, because EoI refers to equivalence for the various inputs of the upstream service, EoP should also refer to the pricing of the individual inputs. This essentially would split the service into different services that are priced separately but sold together as a bundle rather than as a single "unbundled" service. An example of such pricing is the interpretation of two-part tariffs as the two prices for the two services "access" and "usage" that are tied in a bundle. Since in the case of L1 the services cannot be purchased separately, this is a questionable approach. As argued below this holds in particular, because the pricing approach mimics two-part tariffs and therefore favors large L1 buyers over small L1 buyers and, in particular, favors the incumbent seller as buyer of its own input. If the relevant unit for the L1 product is linked to usage (e.g. connections), this pricing structure would in effect also lead to geographic differentiation if the use of individual components is higher in denser than in rural areas.

The alternative to pricing based on cost components is an aggregated price over all components in the form of a uniform connection charge. This would preserve the geographic consistency of prices and result in a single price for the L1 service, thereby avoiding discrimination. Combining the costs of all components into a single price for the L1 service may result in the L1 price being at a level that would only be accessible to access seekers that expect to reach a certain scale / market share. As such, this pricing approach might exclude small (and potentially inefficient) access seekers from the market. However, an alternative approach where the single price is linked to usage (e.g. per subscriber connected) could lead to complicated adverse selection problems in that small unbundlers would underutilize facilities that are meant for several connections and would pay a low price for that, while all unbundlers will face comparatively lower average prices in less dense areas and higher average prices in dense areas. As a result increased demand for these facilities would be associated with an overall decrease in utilization. Thus, the advantages and drawbacks of pricing by network component versus per service or per connection have to be carefully weighed against each other.

### 4.6. Interim conclusions

The various pricing methods that could be used to determine consistency with EoP fall into two groups, one being (resource) cost-based prices and the other one using a (downstream) price-based approach. Both have their advantages and drawbacks. The choice between the two approaches therefore depends on the circumstances. In particular, as explained in the next section, resource cost-based pricing may better reflect the equivalence and ND requirements if

L2 prices are above cost, while the price-based approach is preferable when L2 prices are at or below costs.

5. Answers to the Commission's questions
   5.1. Equivalence questions

*5.1.1. Does the concept of 'equivalence' limit the prices for the unbundled product beyond a requirement that the price is below the stand-alone price of the L1 product (i.e. after the avoidable costs of L2 have been excluded)?*

The boundary provided by the question as interpreted in parentheses corresponds to the ECPR, deducting from the unbundled product price only avoidable costs of the incumbent.

Avoidable costs here could be interpreted in several ways, as discussed above for the ECPR. The requirement that Chorus and the other LFCs have to offer full L2 coverage throughout their coverage areas and therefore incur all the sunk costs of the value added between L1 and L2 speaks in favour of an upper bound for the L1 price consistent with the concept of EoP based on the clean margin rule. One could argue that this will prevent most potential unbundlers from buying the services. However, in certain situations, for example, when the incumbent's downstream prices do not cover costs, it could well be lower than pricing based on resource cost.

Avoidable cost here could be interpreted as the costs avoided by the incumbent in reducing its L2 services by one unit instead of giving up L2 services altogether. However, as argued above in Section 4.4.1, the avoidable costs should rather be measured in relation to the incumbent giving up the downstream service quantity altogether and should therefore be measured against the incumbent's downstream average cost of reducing the downstream service to zero.

Assuming that the downstream services of L1 unbundlers are perfect substitutes for L2-based services by the incumbent this corresponds to the clean margin rule. At this boundary the LFCs make at least as much profit in selling L1 unbundled services as they do by selling L2 services. If the incumbent sells L1 services above this price boundary their L2 service would be cross-subsidized (Hausman & Tardiff, 1995). It does not in this case matter whether the incumbent makes losses selling L2 services, because the alternative to selling L1 services would be selling L2 services instead.[8] An interpretation of EoP based on the clean margin rule might be appropriate if there are no sunk costs and if there are no economies of scale and scope downstream. However, if this set of assumptions does not hold such an interpretation means that an L1 access seeker would generally not be able to afford buying the L1 access unless he is significantly more efficient than the incumbent or his services are highly differentiated.

[8] One consequence of an incumbent actually making losses when selling L2 services could mean that an LRIC- (or other cost-) based L1 price may be above the stipulated upper bound, if the upper bound for a price consistent with the concept of equivalence is defined by reference to the downstream margin (i.e. an ECPR approach).

Under the above assumption of the L2 services of the unbundler and the incumbent being "perfect substitutes" an unbundler, however, would generally not be able to make profits when faced with an L1 price at this upper bound, because the unbundlers generally have higher downstream costs (that is, costs incurred for the provision of L2) than the costs the incumbent avoids by giving up a unit of L2 services.

If "avoidable costs" refer to the incumbent giving up the L2 service altogether the result for the L1 price could in principle be quite different from the case where the incumbent only gives up part of the downstream service. Still, the incumbent's long-run avoidable costs, which are the costs saved by the incumbent when giving up the downstream business, are likely to be smaller than the costs of an unbundler for building the downstream business. This would hold if (a) the incumbent has incurred sunk costs downstream and (b) if there are sizable economies of scale downstream.

While the above-defined stand-alone price of the L1 product (i.e. after the avoidable costs of L2 have been excluded) is a good upper bound for an interpretation of EoP that would also be consistent with the purpose of Part 4AA at s 156AC if L2 prices are sufficiently low, this may no longer hold if L2 prices increase well above costs. In that case, with the upper bound constraint binding, both the L2 price and the L1 price would be above costs, which would not be compatible with workable competition. It may in this case be preferable to switch to the average resource cost of L1 as a new upper bound. This would automatically also constrain the L2 price not to exceed resource cost by too much. Combining the two approaches, the upper bound for an interpretation of EoP that would also be consistent with the purpose of Part 4AA at s 156AC could be set as the smaller of the resource cost and the stand-alone price.

An important question in determining an upper bound is also if the Commission believes that L2 services should remain viable (which could be violated when unbundlers sell only at the retail level and have the potential to squeeze out the L2 market altogether), for example, because they are specifically mentioned and treated in the Act. Keeping the L2 services viable may, for example, conflict with the ladder of investment approach. Under the ladder of investment approach entrants should be incentivized to move up investments towards owning more infrastructure, thus in the current case move from L2 to unbundled L1 services. This would be achieved via a larger spread in price between that of L2 services and L1 services, for example by relying on a retail minus approach to L1 pricing based on the downstream costs of a reasonably efficient entrant.

*5.1.2. If we can use the purpose of Part 4AA of the Act at s 156AC to interpret the equivalence and non-discrimination obligations in the Fibre Deeds and thereby determine whether a price (or price range) is consistent with those obligations, what additional constraints would the dual purposes to promote competition in telecommunications markets (at s 156AC(a)) and facilitate efficient investment (at s 156AC(c)) introduce?*

This question concerns (a) potentially tighter upper bounds and (b) potential lower bounds when determining whether the L1 price is consistent with EoP as interpreted in light of the purpose of Part 4AA.

The first task is to determine a price or price range satisfying both the EoP and ND requirements.

5.1.2.1. Prices fulfilling the equivalence requirement

Prices fulfilling the equivalence requirement have to equal those that the incumbent internally charges itself for the service. As explained above in Section 2.2 there are two quite different ways of determining the price that the incumbent charges itself that in principle can be made compatible but in practice will differ by the treatment of common and sunk costs. The first approach just takes the resource costs the incumbent incurs for those inputs and adds them up (including the WACC on capital inputs), resulting in an LRIC type or BBM price. The second approach imputes internal transfer prices by asking the question, what would the incumbent be willing to pay for this service to itself, given the profits it can generate downstream using this input? Again, in practice the equivalence price is often derived by deducting the incumbent's average incremental costs of expansion (rather than costs of contraction) from the downstream price.

In cases where an incumbent would be free to enter or exit the business and could freely charge the downstream price, constrained only by market forces, the second equivalence price would generally be higher than the first. This is one of the main reasons for controversies about the ECPR. This does not, however, necessarily hold for the current L1/L2 situation in New Zealand, where the current L2 price is constrained and potentially below cost. In this case, as argued above, the LRIC price can be higher than the ECPR price.

5.1.2.2. Prices fulfilling the ND requirement

What additional constraints are imposed by adding the ND requirement on top of the equivalence requirement? We here restrict the ND requirement to the sale of L1 services to the different unbundlers and the incumbent itself (rather than to the relationship between the prices of L1 unbundled PONFAS services and L2 services and potentially other services, such as DFAS). In my view, the only and very significant constraint added by ND is that the equivalence provision has to hold for each access seeker. This constraint would in particular not allow for any

quantity discounts (such as two-part tariffs) that would favour large over small buyers. L1 tariffs would therefore have to be linear or close to linear, as explained above in Section 2.3.

#### 5.1.2.3. Applying the purpose of Part 4AA of the Act

Considering whether the dual purpose of s156AC(a) and (c) could introduce additional constraints when evaluating whether a price satisfies the equivalence and ND requirements only makes sense if a range of prices rather than in a unique price were found to be consistent with EoP and ND. Such a range could, for example, be created by using different pricing methods when evaluating whether a price is consistent with equivalence and ND.

s156AC(a): In the context of pricing of unbundled L1 services "promoting competition" can refer to (i) the market for L1 services, (ii) the market for L2 services, and (iii) the market(s) for retail services generated with L1/L2 services as inputs. Promoting competition is here taken to refer to moving in the direction of effective or workable competition that is efficient. For example, a very low L1 price could vastly increase the amount of unbundled entry, but this would lead to inefficient and excessive entry, which would be associated with excessive and therefore inefficient investment by unbundlers. In addition, unbundlers can sell their services at the retail level or at the L2 level. If they sell only at retail and the L1 price is sufficiently low they might squeeze out the L2 market altogether. The LFCs can prevent this from happening and lower the L2 prices. So, there will be feedback effects that need to be taken into consideration and that can strongly change the first round effects. To the extent that competition by unbundlers is deemed desirable the most important concern would be to avoid price squeezes that foreclose efficient unbundlers. Such price squeezes can occur under resource cost based pricing if the L2 price is sufficiently low and under ECPR-type pricing if the avoidable costs are too low for efficient L1 unbundlers. The objective of promoting competition limits the extent to which discrimination can be justified and it favours an ECPR approach that is based on the downstream cost of a reasonably efficient entrant. This objective is only compatible with a resource cost based L1 price if the L2 price is sufficiently high.

s156AC(c): The use of a resource cost based approach to intermediate input pricing in contrast to a retail-minus approach is often justified with the argument that it provides the correct investment incentives. As explained below this is not true in its generality and in particular not with respect to L1 unbundling. Facilitating efficient investment here can concern (i) the unbundlers' investments in availing themselves of L1 services and downstream to produce L2 services competing with those of the incumbent, (ii) the L2 buyers' investments in their networks, (iii) the incumbent's investments in L1 and L2 services, and (iv) "bypass" investments in alternative infrastructures.

(i) The unbundlers' investments in availing themselves of L1 services and downstream to produce L2 services

Arguably, the unbundlers' investments are of prime importance for L1 pricing, because they determine the make-or-buy decisions of the unbundlers. Most relevant for this investment decision is the achievable downstream margin, not the relationship between upstream price and upstream cost. The yardstick for this margin is the relationship between the L1 price and the incumbent's downstream price, i.e. the price of L2. Potential unbundlers will invest in unbundling if their downstream costs and setup costs minus any product differentiation benefits are lower than the difference between L2 and L1 prices. Such investment will be efficient if (adjusted for a potential displacement ratio) the sum of unbundler's downstream costs and setup costs minus any product differentiation benefits is smaller than the cost difference between supplying L1 services and L2 services for the incumbent. Thus, if (again adjusted for the displacement ratio) the difference between L1 and L2 prices equals this last cost difference then potential unbundlers will make the efficient investment decisions. Efficiency here is taken to mean investing in unbundling relative to buying L2 services.

Alternatively, now consider L1 pricing at the incumbent's LRIC for generating that service. Note that the L2 price is given. Then potential unbundlers will only buy the L1 service and invest downstream if, based on the L1 price, the unbundler can compete successfully with the incumbent downstream. That will only be the case if the L1 price is sufficiently low relative to the L2 price. This, for example, would not be the case if the L2 prices are deemed not to be cost covering. Thus, while ECPR pricing will generally lead to efficient L2 investment by unbundlers, LRIC pricing generally will not. It will only do so if the L2 price is sufficiently high.

(ii) The L2 buyers' investments in their networks

Under the same rule that makes unbundling investments efficient L2 access seekers will also make efficient investment choices relative to investing in L1 unbundling. The remaining L2 access seekers will be those for whom the inequality in (i) is reversed. Thus, we get the same result as for the previous case.

(iii) The incumbent's investments in L1 and L2 services

The incumbent's investment in L1 and L2 services is primarily driven by the price level (as the quantity-weighted average) of both these services rather than by the relationship between these two prices. This holds, because the price level is most likely a prime determinant for the end-user quantity of UFB services demanded. If the price structure between L1 and L2 prices is distorted so that either L1 unbundling or L2 access is no longer demanded then the relatively lower price determines end-user demand. By relatively lower price I here mean the price of the service that continues to be demanded. Furthermore, the incumbents' investments will be determined by their ability to invest, which in turn depends on the price level of their services. If they offer L2 services below costs and L1 services at cost there will be almost no demand for L1 services,

meaning that the L2 price determines the relevant price level for investment decisions (in such a scenario the financial ability of the incumbent to invest may be reduced). At the same time the low price level will increase UFB take-up with the reverse effect on the financial ability to invest. This is the penetration pricing argument for low L2 prices. If L1 prices are sufficiently low (but not lower than ECPR based) there is likely to emerge demand for L1 services which under the product differentiation argument is likely to increase UFB take-up further than just with L2 services. Only if L1 prices are relatively lower than corresponding L2 prices can there be a negative effect from L1 prices on LFC investments. This case, for example, could hold for L1 pricing at resource costs and L2 pricing above cost.

(iv) "Bypass" investments in alternative infrastructures

For investments in alternative infrastructures the incumbent's overall price level is of prime importance. If that overall price level is below cost, alternative infrastructure investment will be discouraged in an inefficient way, while it may be encouraged in an inefficient way if the UFB price level is above cost.

Thus, any inefficient investment for the cases (iii) and (iv) will be due to the distorted L2 price, not due to an L1 price determined based on an ECPR approach.

*5.1.3. Is there a 'safe harbour' range for the price of the unbundled product that would satisfy the definitions of non-discrimination and equivalence in s 156AB and give effect to the Part 4AA purpose at s 156AC?*

A safe harbour range means that the regulated firm can choose any price in this range and can be sure that it complies with the ND and EoP requirements, as those requirements are interpreted in light of the Part 4AA purpose contained in s156AC. The task here is to find a set that is in the intersection of two sets of prices, each one defined by one of the requirements (ND and EoP) in a way that is also consistent with the purpose at s 156AC as discussed in answering the previous question. Unless these two sets overlap, such set will be empty.

In Section 5.1.1 above we created an upper bound for a price to fulfil the EoP requirement. This, however, does not mean that such a price if chosen by the LFCs also fulfils ND and is consistent with the Part 4AA purpose. For example, if L2 services are imperfect substitutes the equivalence price should actually be lower than the upper bound, because then the "opportunity cost" of the incumbent from selling an additional unit of L1 services is lower than stipulated by the upper bound. This holds because the incumbent is not going to lose one unit of L2 sales for every additional L1 sale. In other words, the displacement ratio in this case is going to be smaller than one.[9] This example shows that for a given interpretation of EoP there is likely to be only one

[9] While the displacement ratio is typically assumed to be smaller or equal to one, if the unbundled product is used to support alternative technologies a displacement ratio above one could hypothetically be possible.

*theoretical* price level for L1 services that satisfies the EoP rule. *Empirically*, however, for each pricing method there may exist a range of measured prices depending on assumptions about items, such as asset lives, or measurement issues, such as determining the WACC. Thus, one can get a range (a) based on different legitimate methods and (b) legitimate measurement outcomes for each method. Then the question is if the method or measurement range also satisfies the ND rule. If that is the case one has to find out if the approach adopted in determining the L1 price is consistent with the Part 4AA purpose.

As suggested in answering the previous question the Act's s156AC(a) and (c) purposes can be used in evaluating the extent to which a given L1 price (or a range for the L1 price) complies with the ND and EoP requirements in a way that is consistent with the legislative intent. Thus, if a pricing method is incompatible with one of the requirements it is excluded, while if there is more than one compatible method then they can create a price range to choose from. A safe harbour would then either mean this range or the one method that best achieves the Part 4AA purpose. A further question to be analysed is if the "winner(s)" fulfil the requirements in all situations or if the fulfilment is situation specific.

*5.1.4. Under Part 6 of the Act, there is no requirement for the L2 prices to be cost-based, except the Commission has the power to recommend a cost-based price for the anchor product sold by Chorus from 2025. In this context:*

*5.1.4.1. What are the pros and cons of different methodologies for evaluating whether the prices of the unbundled product comply with equivalence?*

The answer to this question is situation specific.

We can in this context distinguish between three situations. The first is that L2 prices are below cost (in aggregate or for specific services), while in the second situation they are above costs and in the third they are at a cost-based level.

If one can characterize the below cost pricing in the first situation as "penetration pricing" the question is if this deserves special treatment from the L1 pricing perspective. Penetration pricing is likely to be desirable from the New Zealand policy perspective that wants UFB to be spread and taken up quickly. Thus, this penetration pricing can be seen as part of the UFB initiative. In this case a clean margin rule based on the LFCs' average cost of contraction may be justified. This means that most L1 access seekers would effectively have to wait until the incumbent's penetration pricing is over, although they may also use penetration pricing for themselves. Furthermore, not all of the incumbent's L2 services will be unprofitable. Thus, potential unbundlers may be viable by choosing to specialize on offering substitutes to those (profitable) services downstream. Alternatively, one can argue that penetration pricing by the regulated firm should at least partially include L1 services, which by the product differentiation argument will also increase the penetration of UFB services.

An alternative view is that L2 pricing below cost is inefficient and that as a consequence L1 prices based on a retail minus approach will also be below cost and are therefore going to be inefficient as well. While this may be true, by the second-best argument it is not necessarily so. In particular, as argued above in Section 5.1.2, pricing L1 at resource cost in this situation would create a distortion in the incentives for L1 and L2 investments by access seekers.

If one remains with the retail-minus pricing approach in situations with cost-based or above cost downstream (L2) pricing, there is unlikely to emerge major L1 unbundling, because the L1 price would rise in tandem with the L2 price. Thus, if L1 take-up is desired after penetration pricing is over then a new pricing approach has to be considered. This can be a different retail minus approach or a resource cost based approach. As long as the L2 price is at or below the incumbent's cost, any resource cost based approach will not generate much L1 unbundled take-up, because the unbundlers have extra unbundling costs and less scale and scope economies than the incumbent. Thus, unless they can differentiate their product they will be at a disadvantage against the incumbent's L2 service. If the L2 price is well above the incumbent's cost the unbundlers will, however, prefer a resource cost based approach to L1 unbundling.

The retail-minus approach will lead to major unbundled L1 take-up if the avoidable costs are based on an efficient entrant's downstream costs. There could also be some take-up if the avoidable costs are based on the incumbent's downstream costs of expansion. In both cases the incumbent will be worse off than under a retail-minus approach based on its true avoided costs. For the time after penetration pricing is over I therefore suggest an optional approach to establishing a safe harbour for an L1 price consistent with the EoP requirement such that $p_{upstream} \leq \min (LRIC_{upstream}, p_{downstream} - C_{compdownstream})$, where $C_{compdownstream}$ is the downstream cost of an efficient competitor. This option encourages unbundled L1 take-up and prevents the incumbent from excessive or foreclosing L2 charging.

*5.1.4.2. Which approach (if there is a 'winner') would best give effect to the purpose at s 156AC, if we can assume that the L2 prices will be, in aggregate, above costs after 1 January 2022?*

I have already answered this question with the optional formula above.

5.2. ND questions

*5.2.1. Is there a particular (non-discriminatory) price structure that would best promote competition, and thus best give effect to the purpose at s 156AC(a)?*

Pricing by element creates several distinct problems. The first is that it is almost impossible to fit in with a retail-minus approach, because L2 prices are not by element. The same holds for PONFAS pricing at the other extreme, which sets a single price for the sum of all L1 elements. Again, it has no direct L2 equivalent on which a retail-minus approach could be based. The second is that pricing by element tastes like a way to get around the Act's prohibition of

geographic price discrimination, because it effectively means a low price per connection in high-density areas and a high price in low-density areas. This also holds for PONFAS pricing to a lesser extent, although in effect unbundlers will pay substantially more per connection in remote than in dense areas. Third, element-based pricing disadvantages the unbundlers, because their individual demand for the L1 service will always be below that used by the LFCs for deriving the imputed costs and they will therefore not exhaust economies of scale and scope and will therefore be at a cost disadvantage. Pricing by element simply is a misinterpretation of equivalence and is discriminatory. In contrast, a blended price per connection is compatible with retail minus and does not discriminate against smaller unbundlers. It therefore is compatible with the equivalence concept, and is non-discriminatory. Smaller unbundlers still face economies of scale problems when building out their networks to the L1 level. Nevertheless, as seen in Section 4.5 above, a blended price per connection can lead to severe adverse selection problems and inefficient additional investments and excess capacities for the incumbent. Such severe adverse selection problems will not occur under PONFAS pricing, which however likely excludes all but the largest unbundlers and will even exclude those in less dense areas.

Thus, some compromise between a fully blended price and some split by components needs to be found that does not exclude reasonably efficient entrants and does not lead to adverse selection and moral hazard issues.

#### *5.2.2. Could a given price structure be considered discriminatory because it has different impact on different access seekers (even if exactly the same set of prices is offered to all access seekers)?*

It is well known that two-part tariffs for intermediate inputs favour large buyers (for simulations see Hoernig and Vogelsang, 2013) and, in particular, favour the regulated firm that is typically its own largest buyer. Thus, a large up-front payment is not compatible with equivalence nor with ND.

If in setting the L1 prices, the LFCs assumed full capacity take-up this would have the effect of lowering the L1 price, thus making the total non-compensatory for the LFC. It is often assumed in analytic cost models but since New Zealand is likely to take a building block regulation approach, one would expect the LFCs' costs to be based on actual projected usage.

For the sake of argument let us assume that the price set by the LFCs for the L1 product (which currently comprises of different elements – for the feeder fibre, splitter, distribution fibre, installation, etc.) would pass a 'price squeeze' test (at least using 'equally efficient competitor' test) at full capacity – i.e. if each distribution fibre / splitter was connected to the maximum number of customers it will support. However, that may not mean that (a) any unbundlers can cover their costs and (b) even the LFCs can cover their costs at those prices, because they currently cannot fill out the full capacity yet. This means that to satisfy equivalence one has to base the L1 prices on the revenue that could be earned at L2 given current take-up. Again, an

adjustment for a "reasonably efficient" competitor may have to be made. This would imply regular revisions of L1 prices (even in the absence of changes to the L2 prices) in line with take-up. This is a slightly different question from the 'scale' question that arises between the 'equally efficient' vs 'reasonably efficient' test discussed before.

*5.2.3. Given that s 156AB includes in its definition of non-discrimination a requirement that differential treatment 'does not harm, and is unlikely to harm, competition', would all proposed price structures have to be reviewed on a case-by-case basis or are there some structures that could be presumed to satisfy this requirement (conversely, are there other structures that are likely to automatically merit further review)?*

As explained above, high fixed charges are likely to be discriminating in favour of the incumbent. A safe approach would be very small or no fixed charges, no quantity rebates, and no pricing by component. For the purposes of providing guidance on price structures that could be presumed to satisfy ND, one could define such a tariff by a maximum fixed charge that amounts to less than x% of the tariff for a buyer with y% market share. If the actual fixed charge exceeds that level the incumbent would have to provide evidence that such a pricing structure might be productively more efficient and might potentially prevent inefficient entry.

*5.2.4. How should we be taking into account (if at all) the scale of the access seeker relative to the scale of the LFC given the purpose to promote competition under s 156AC(a))?*

The most common international standard seems to be that of the scale of an efficient entrant, which, as explained above, is often equated with a 20% market share. If one uses all L1 deliveries including those to the LFCs themselves as the size of the L1 market then a 20% market share is indeed sufficiently high.

## 6. Conclusions

When evaluating whether an unbundled L1 price fulfils the EoP and ND requirements in a way that is also consistent with the purpose at s 156AC, the choice of pricing method largely comes down to the choice between a resource cost-based and an ECPR-based approach. The resource cost-based approach has internationally been the dominant method of choice for providing wholesale network access in a pure monopoly regime. In contrast, the ECPR has – with the exception of pure resale – had an unimpressive history under monopoly. ECPR was largely criticized for being unable to constrain the downstream market power of a vertically integrated monopolist and therefore was deemed to require downstream price regulation in addition. However, if, as currently is the case for L2 services in New Zealand, the downstream price is constrained by the CIP contracts and future PQ regulation or (as may be the case for the other LFCs) subject to competition, then the ECPR is preferable to LRIC (or other cost) based pricing. A clean margin rule based on the incumbent's average cost of contraction could be used under

desired penetration pricing. A different rule might be optimal after January 1, 2022 and until L2 prices are subject to cost-based pricing, in particular for Chorus. That potential change is where my suggestion for a two-way 'safe-harbour' pricing option comes from for any guidance that the Commission is considering. Since we do not really know beforehand which downstream pricing regime we are in, the lower of the LRIC price and the ECPR price should generally be appropriate.

The concept of equivalence does not specify a single price level to the extent that several pricing methods could yield equivalence. Once a pricing method is selected, there would be a single EoP price (for a given set of measurement assumptions under the pricing methodology), but a number of pricing methods are available to the incumbent and the regulator that would satisfy equivalence (and thus, other considerations such as the Act's purposes could come into play).

My considerations on pricing that fulfils the ND requirement showed that there can be tensions with efficiency so that a violation of ND, for example in favor of component- based pricing may be justified. In such cases a compromise needs to be found that does not exclude efficient entrants.

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