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# WACC uplift – asymmetric consequences of under-investment

A report for Chorus

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**Public version**

## Report authors

Greg Houston

Bronwyn McDonald

Daniel Young

Alyse Corcoran

Brydon McLeod

## Contact Us

**Sydney**
Level 40
161 Castlereagh Street
Sydney NSW 2000

Phone: +61 2 8880 4800

**Singapore**
8 Marina View
#15-10 Asia Square Tower 1
Singapore 018960

Phone: +65 6817 5010

## Disclaimer

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# Executive summary

Chorus Limited (Chorus) has requested that we prepare an expert report that reviews the Commerce Commission's (the Commission's) framework for assessing the case for a weighted average cost of capital (WACC) percentile above or below the central estimate and applying this framework to Chorus' fibre fixed line access services (FFLAS).[1]

## Framework for assessing a WACC uplift

An estimate above the midpoint WACC (often referred to as a 'WACC uplift') may be appropriate if there is expected to be a greater welfare cost associated with under-estimating the WACC, as compared to the welfare cost associated with over-estimating the WACC. The Commission has released a paper describing its emerging views (emerging views paper),[2] including that at this stage it does not consider there is a strong case for a WACC uplift.

In its recent decisions on the appropriateness of a WACC uplift, the focus of the Commission's analysis has been on the costs faced by end-users. A WACC uplift has previously been justified on the grounds that under-estimation of the WACC diminishes a service provider's incentives to undertake efficiency-enhancing investment. Such a case can only be made if there is a strong, direct link between the WACC and incentives for investment, and if the investment-related benefits from the higher WACC outweigh the costs of the higher prices to end-users (asymmetric consequences).[3]

Assessing the case for a WACC uplift on the basis of the consequences of under-investment therefore involves a two-part process, ie:

- is there a strong link between incentives for investment, and the regulatory WACC; and
- if so, are there asymmetric consequences of over- and under-investment for end-users of FFLAS?

## Link between investment and the WACC

The proposed regulation that will apply to FFLAS establishes a direct link between Chorus' incentives for investment and the regulatory WACC. Although the exact nature of the new regulatory system for fibre services has not yet crystallised, it is clear that the form of regulation faced by Chorus for FFLAS will include:

- price-quality regulation, whereby Chorus' maximum allowable revenue (MAR) is determined using a building blocks model;
- price caps for certain basic services (anchor services)[4]; and
- wash-up provisions for Chorus' revenue as compared to the MAR over the term of regulation.

New investment undertaken by Chorus will be rolled into the regulatory asset base (RAB), directly affecting its allowed revenues over the regulatory period. In addition, the presence of wash-up provisions for under-

[1] We have reviewed the framework for a WACC uplift under the circumstances faced by Chorus in particular, rather than all suppliers of FFLAS more generally. This is appropriate because the circumstances faced by Chorus are different from those of other local fibre companies (LFCs). We do not explicitly consider the case for a WACC uplift in respect of other FFLAS providers.

[2] Commerce Commission, *Fibre regulation emerging views*, 21 May 2019.

[3] Implicit in this statement is that there is not only a link between WACC and investment incentives, but also between the WACC and the prices the regulated service provider can charge.

[4] See section 2.7 of this report.

recovery against the MAR intensifies the link between investment incentives and the WACC, because it offers Chorus a buffer against year-by-year volatility.[5]

As such, Chorus is very likely to benefit from an incremental revenue allowance as a result of undertaking additional investment, providing a clear link between investment incentives and the WACC.[6]

## Asymmetric consequences of over- and under-investment

Ultimately, the decision to apply a WACC uplift comes down to a trade-off between two types of economic efficiency, being:

- dynamic efficiency in the form of incentivising investment in reliable, efficient infrastructure services and innovations in the supply of those services - dynamic efficiency is the most likely form of benefit from a WACC uplift; and
- static, allocative efficiency - allocative efficiency is negatively affected by a WACC uplift to the extent that it results in higher prices for the service.

In the telecommunications industry, the emphasis on dynamic efficiency is generally considered to be heightened because under-investment in new innovations may result in a continuation of lower-value services for customers. In addition, customers are using more data (as more video content is streamed over platforms like Netflix), and have increasingly high, 'anytime, anywhere' expectations for reliable, high speed internet.

To keep pace with the changing demand and market dynamics, Chorus must undertake substantial investments in its network.

## Chorus' investment program

Chorus undertakes investment activity across three broad categories of its business, ie:

- physical network – passive network elements including cables, ducts, poles, manholes, buildings, huts and associated facilities such as power and air conditioning plant;
- network electronics – active network components providing transmission and connectivity over physical media, encompassing electronic equipment, software and associated management systems; and
- information technology (IT) – information systems, applications, data centre equipment and integration of cloud-based services used to operate and manage Chorus network, services, operational processes, and enterprise functions.

Chorus' investment decisions are made against the backdrop of dynamic market conditions. The reliability of Chorus' fibre network is itself dynamic and depends on a number of factors, including:[7]

- the number of users per area: as the number of users increase over time, the resilience of the network decreases unless Chorus undertakes additional investments to increase resilience;
- the life of assets: Chorus' network will fail more often as the assets age, unless it invests sufficiently to replace equipment within their reasonable asset life;
- the extent of investment in capacity relative to the growth in users: if Chorus fails to invest adequately in capacity to meet growth, the network will become congested;

[5] There has been very little discussion of how the wash-up provisions will function. We assume that a provision for under-recovery of revenues would enable Chorus a greater likelihood of achieving its MAR over the life of the assets/of the regulatory period, although there remains a probability that Chorus will never derive its MAR, ie, recoup its costs.

[6] We also acknowledge that there may be a non-negligible probability that the MAR is never binding over the regulatory period. In that case, the link between investment incentives and the WACC is not clear.

[7] Chorus' internal information.

- investment in new equipment with an improved mean time between failures (MTBF) and mean time to failure (MTTF), to improve the resilience to failure;
- investment in tools and processes to monitor asset state, network performance and capacity, thus improving reliability;
- investment in developing service level agreements (SLAs) with operations and field force, so that these teams can fix assets more quickly; and
- investment in new features to aid resilience, eg diverse handover links to retail service providers (RSPs).

Taken together, if incentives to invest were low or absent (ie, if the true WACC is higher than the allowed, regulatory WACC), these investment decisions are unlikely to be limited to small scale effects on a limited number of customers. Instead, these investment decisions seem likely to have a long reach to customers across the fibre network.

## Costs of a WACC uplift

The discussion above has established a clear connection between a WACC uplift and the benefits of safe-guarding the network against the dynamic efficiency consequences of under-investment. The potential costs of under-investment must be weighed against the costs of over-estimating the WACC to determine whether the outcomes of mis-estimating the WACC are asymmetric.

The Commission's emerging view is that 'the framework illustrates the significant cost of the uplift'.[8] The Commission goes on to suggest that, under the framework, the direct costs of an uplift are estimated by multiplying the WACC uplift by the RAB over the relevant period.[9]

This approach does not appear to have sufficient regard to the interactions between various components of the proposed regulatory and legislative framework, including:

- the legislative price caps on anchor services;
- the wash-up provisions addressing any over- or under-recovery of revenues, for at least the initial regulatory period;[10]
- geographic consistency of prices; and
- the MAR.

The price caps on anchor services (and the constraints that these price caps impose on the pricing of similar services) mean that the consequences of a WACC uplift are unlikely to flow through to increased prices for those services.

As such, incremental revenues allowed under a WACC uplift are likely to be derived through targeting new or higher-value services, or extending the future time period over which unrecovered revenue under the MAR framework can be earned from FFLAS. Such incremental revenues do not reflect a direct cost of the WACC uplift in the manner envisaged by the Commission in its emerging views paper.

## Weighing the case for an uplift

In our opinion, there is a strong qualitative case for a WACC uplift.

[8] Commerce Commission, *Fibre regulation emerging views*: *technical paper,* 21 May 2019, p 122, para 552.

[9] Commerce Commission, *Fibre regulation emerging views*: *technical paper,* 21 May 2019, p 124, para 563.1.

[10] NZCC, *Fibre regulation emerging views*: *summary paper*, 21 May 2019, p 11; Commerce Commission, *New regulatory framework for fibre: Invitation to comment on our proposed approach*, 9 November 2018, p 109, para 7.119.2.

This report undertakes a close examination of the commercial reality faced by Chorus, and establishes that there are likely to be asymmetric consequences of under-estimating the WACC, driven by the long-term costs to end-users of under-investment.

In our opinion, the dynamic nature of the supply and demand for FFLAS distinguishes the circumstances of previous WACC percentile decisions in New Zealand. Chorus' investment decisions take place in a context of rapidly increasing demand for bandwidth, increasing consumer expectations for quality of service,

increasing population density, and dynamic parameters in relation to the costs of providing the service, including the optimal technology for that purpose.

Chorus' investment decisions are directly linked to its allowed cost of capital. However, other aspects of the regulatory regime, including the anchor services, shelter end-users of FFLAS from bearing the direct costs of an increase to Chorus' allowed cost of capital.

The outcome of under-estimating the WACC and, as a direct result, under-investment in FFLAS has a broad reach. Under-investment in reliability may lead to poor network performance, including higher incidence of congestion and outages. More generally, under-investment may result in certain groups around New Zealand failing to receive a fibre service within the optimal timeframe and may slow the introduction of new innovations in telecommunications.

## Commission's emerging view

In its emerging views technical paper, the Commission states that:[11]

> The framework illustrates the significant cost of the uplift. At this stage we do not consider the benefits from mitigating under-investment outweigh this cost, particularly given FFLAS are new networks and the availability of alternative technologies is likely to mitigate the impact of any outages on end-users.

The Commission goes on to suggest that under-investment in FFLAS is likely to be less hidden compared to the energy sector, and the quality manifestations of under-investment would show up in performance standards more quickly.[12]

The Commission's emerging view not to apply a WACC uplift appears to be supported by:

- a materially overstated view of the direct costs of a WACC uplift; and
- an understated picture of the benefits of a WACC uplift, having regard to the need for ongoing investments in reliability, innovation and expansion of the network.

In addition, the Commission's view that alternative technologies can mitigate the impact of outages on end-users is not borne out in reality. There are two facets to understanding why substitute technologies are unlikely to mitigate the impact to end-users of an outage on fibre. These are that:

- mobile services rely on FFLAS to provide their services, ie, FFLAS end-users are mobile customers; and
- partly related to the first bullet, these technologies are not close substitutes for FFLAS.

The upshot of these two effects is that, if a significant FFLAS fault were to occur, then there is a high likelihood that both fixed wireless access (FWA) and mobile would be affected in some manner.

Finally, in our review of Chorus' investment program we find no strong support for the Commission's view that the quality manifestations of under-investment would show up in performance standards more quickly than for energy businesses. Rather, some investments are preventative in the sense they reduce the

[11] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 122, para 552.

[12] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 123, para 553.

likelihood of failures occurring, and some seek to minimise the impact or duration of events when they occur – potentially to the point that they are not noticed by end users at all.

# 1. Introduction

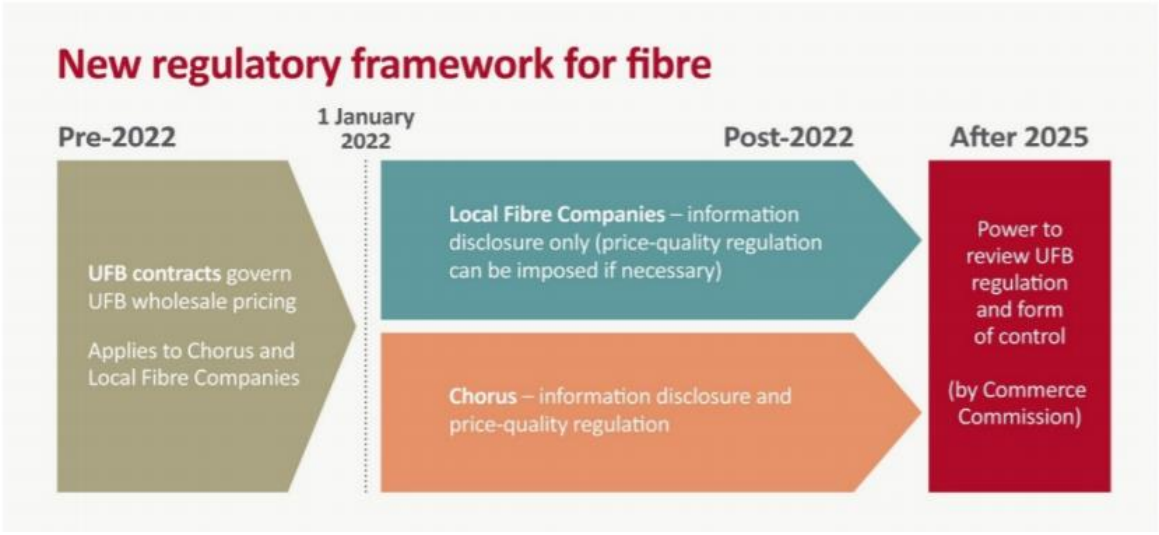
The Commerce Commission (the Commission) is currently developing input methodologies (IMs) that will underpin its regulation of Chorus Limited's (Chorus') fibre fixed-line access services (FFLAS) under Part 6 of the *Telecommunications Act 2001* (Part 6).

Following consultation on the framework, on 21 May 2019 the Commission released a paper describing its emerging views (emerging views paper) in relation to the fibre regulatory regime.[13] This included the Commission's emerging views on how it will estimate the allowed rate of return for Chorus and other local fibre companies (LFCs).

The allowed rate of return provides compensation for the risk of investments made in capital assets that are used to supply regulated services, in this case FFLAS. Since supplying FFLAS requires very large investments in long-lived assets, the allowed rate of return will be of considerable importance in determining the allowed annual revenue requirement that will apply under price-quality regulation. The Commission has indicated that only Chorus will be subject to price-quality regulation, while information disclosure regulation will be applied to both Chorus and the LFCs, in the period after implementation (the post-implementation period).[14]

Figure 1.1 below sets out an overview of the regulatory arrangements for fibre services, taken from the Commission's fibre regulation emerging views summary paper.

Figure 1.1 Commssion's framework for fibre regulation




*Source: Commerce Commission, Fibre regulation emerging views: summary paper, 21 May 2019, p 6.*

The Commission's normal practice is to estimate the allowed rate of return as a weighted average cost of capital (WACC). Its estimate of the WACC reflects the cost of debt and the cost of equity, and the respective proportion of each that is used to fund an investment.[15]

[13] Commerce Commission, *Fibre regulation emerging views*, 21 May 2019.

[14] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 149, para 771.

[15] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 90, para 392.

Chorus has asked us to provide expert advice on various matters relating to the allowed rate of return for FFLAS, with particular reference to the emerging views of the Commission and those of its advisors, on which it relies.

This report addresses one aspect of the allowed rate of return estimation process, being whether the central estimate for the WACC should be adopted for determining the allowed rate of return, or whether a higher or lower estimate should be adopted, through the use of a percentile estimate (WACC percentile).

An estimate above the midpoint WACC (WACC uplift) may be appropriate if there is a greater welfare cost associated with under-estimating the cost of capital, than the welfare cost associated with over-estimating the cost of capital.

Reflecting differences in circumstances between Chorus and other LFCs, including the nature of post-implementation regulation each will face, this report considers the case for a WACC uplift as it applies to Chorus' FFLAS only.

## 1.1 Our expert brief

Chorus has asked us to prepare an exert report that focuses on the Commission's framework for assessing asymmetric consequences of over and under-investment, and its relevance for determining a WACC percentile.

Chorus has requested that we address five key questions on this topic, each of which is informed by matters raised in the Commission's emerging views paper. These questions are:

1) Are potential outages on the fibre access network likely to affect a smaller number of end-users than for specific energy services, namely the electricity line distribution services and gas distribution services?
2) Is the Commission right or wrong in assuming that FFLAS have more potential for substitution by other services than is the case for specific energy services, and if so why?
3) Is under-investment in FFLAS less likely to be 'hidden' compared to the energy sector?
4) Can the existing approach to assessing the asymmetric consequences of under-investment be applied to FFLAS? If so, what evidence is available to inform the inputs to this approach?
5) How should the Commission assess the cost of any WACC uplift given the legislative framework for anchor services?

## 1.2 Report structure

This report is structured as follows:

- section two sets out the framework for assessing whether a WACC uplift should be applied;
- section three describes Chorus' FFLAS and other relevant context;
- section four applies the framework to Chorus' FFLAS to consider the case for a WACC uplift; and
- section five draws on the discussion throughout to respond to Chorus' questions.

# 2. WACC uplift framework

In this section we describe the framework that the Commission is applying to establish whether an uplift to the midpoint WACC estimate is appropriate for FFLAS.

## 2.1 Commission's approach to evaluating the case for a WACC percentile

Many of the parameters that feed into the WACC estimation framework are unobservable and highly uncertain. The regulatory WACC is therefore an estimate based on the available data. The Commission has previously developed a central estimate and a range for the true value of the WACC, including an estimate of the standard error of the WACC estimate. This approach enables calculation of different values in the distribution (eg, the 25$^{th}$ percentile WACC or the 67$^{th}$ percentile WACC) as well as the central estimate (mid-point WACC).

It follows from this framework that there is an inherent risk that any regulatory WACC will deviate from the relevant firm's true cost of capital by an indeterminate amount. If the regulatory WACC is set too high or too low (relative to the true, yet unobservable WACC), this can introduce significant costs. The approach that the Commission chooses to adopt in its IMs to address the consequences of potential error is ultimately at the Commission's discretion.[16]

If the costs associated with setting the regulatory WACC either too high or too low are symmetric, then it would be appropriate to set the WACC on the basis of an unbiased midpoint estimate of a firm's cost of capital. However, to the extent that the costs are asymmetric, it will appropriate for a prudent regulator to err on the side of caution and set the regulatory WACC either:

- higher than an unbiased midpoint estimate (also known as a WACC uplift), if the costs of setting the WACC too low are higher than those of setting it too high; or
- lower than an unbiased midpoint if the costs of setting the WACC too low are lower than those of setting it too high.

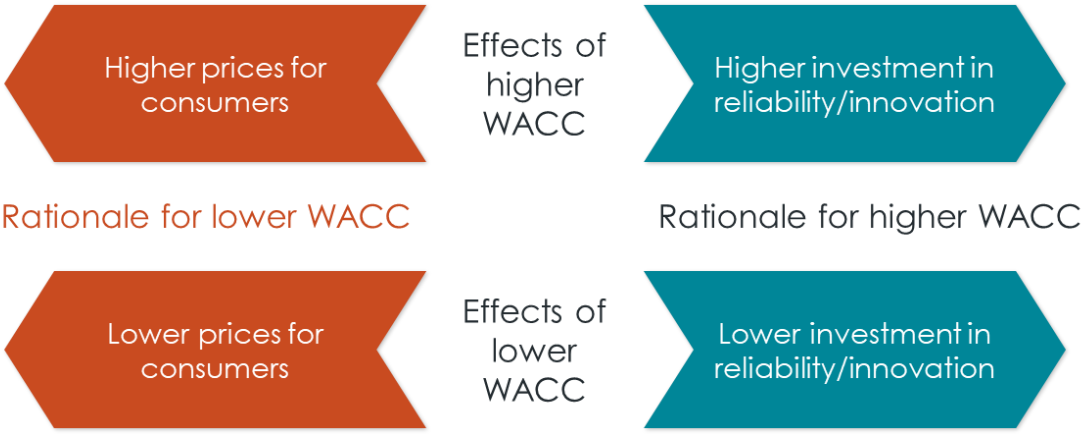
The focus of the Commission's framework is on the costs faced by end-users. In assessing the case for an allowed rate of return that is higher than the mid-point WACC, the Commission considers:

- whether a higher rate of return would give rise to higher prices for consumers; and
- whether a higher rate of return would give rise to higher investment in reliability or innovation, with better outcomes for consumers.

Figure 2.1 below illustrates the Commission's framework for considering whether an allowed rate of return that varies from the mid-point estimate of WACC is required.

[16] Commerce Commission, *Input methodologies (electricity distribution and gas pipeline services): reasons paper*, 22 December 2010, p 558, para H11.4.

Figure 2.1 Commission's framework for consideration of a WACC percentile




The choice of the point-estimate WACC from within its estimated range involves a degree of judgement as to how best to balance the relative costs and risks of under- and over-estimating the WACC.

To our knowledge, the Commission has not previously set an allowed rate of return below the mid-point WACC in any regulatory context. This would be regarded as being likely to have a chilling impact on investment and would generally imply that the regulated service provider is unable to derive a normal return. The potential for such an outcome is not considered further in this report.

Setting a WACC percentile above the central estimate does not reflect a decision to promote over-investment. Rather, a WACC percentile above or below the central estimate minimises the net costs associated with estimation risks if the consequences of estimation error (ie, of over- or under-estimation) are asymmetric.

### 2.1.1 Decision rule for WACC uplift

Figure 2.1 illustrates that the principal basis for a WACC uplift is to minimise the risk that the WACC underestimates the true cost of capital and, in doing so, diminishes a service provider's incentives to undertake efficiency-enhancing investment. Such a case can only be made if there is a strong, direct link between the WACC and incentives for investment.

Once such a relationship between the WACC and investment decisions is established, a case for an uplift may be justified if the benefits from the higher WACC (avoided dynamic efficiency losses) outweigh the costs of the higher prices to end-users.[17]

Assessing the case for a WACC uplift on the basis of the consequences of under-investment therefore involves a two-part process, ie:

- is there a strong link between incentives for investment, and the regulatory WACC; and
- if so, are there asymmetric consequences of over- and under-investment for end-users?

## 2.2 WACC percentiles in other regulatory frameworks

The Commission's consideration of the appropriate regulatory approach for FFLAS under Part 6 sits against the backdrop of its extensive body of work in relation to:

[17] Implicit in this statement is that there is not only a link between WACC and investment incentives, but also between the WACC and the prices the regulated service provider can charge.

- the regulation of electricity network, gas pipeline and specified airport services under Part 4 of the *Commerce Act 1986* (Part 4); and
- the regulation of unbundled copper local loop (UCLL) and universal bitstream access (UBA) services under, at that time, Part 2 of the *Telecommunications Act 2001*.

The relevance of this body of work arises because the Commission's approach to determining the case for a WACC percentile has been extensively canvassed in these other sectors.

In reaching recent decisions in both of these contexts, the Commission has engaged Oxera to quantify the costs of over- and under-estimating the WACC. We refer as shorthand in this report to the analytical approach put forward by Oxera and utilised by the Commission as 'the Oxera analytical framework', in each case to mean the analysis put forward by Oxera and accepted by the Commission.

In this report, we draw on the principles that the Commission applies (or has applied) to other sectors.

### Electricity line distribution and gas pipeline businesses

Under Part 4, non-exempt suppliers of electricity lines services and suppliers of gas pipeline services are subject to default/customised price and quality regulation.

In the context of electricity line distribution and gas distribution businesses, the Commission has concluded that the losses associated with setting the WACC too high will be lower than those associated with setting it too low, and so a WACC uplift is appropriate.

The input methodologies (IMs) were considered by the High Court in *Wellington International Airport Ltd & Ors v Commerce Commission*.[18] The High Court noted that the use of the 75th percentile of the WACC distribution involved the likelihood that regulated suppliers would earn excess returns. The Court considered whether this result was justified by fear of failure to achieve the outcome of providing regulated suppliers with incentives to invest and innovate. This question was considered within the context of what best promotes the long-term benefit of consumers, the overriding purpose of Part 4 of the Act.

The High Court noted the lack of supporting empirical analysis for the 75th percentile applied to energy businesses:[19]

> No supporting analysis was provided by the Commission. Indeed, the propositions advanced for choosing a point higher than the mid-point seemed to be considered almost axiomatic. This extended to a strongly expressed, but unsupported, view of the benefits of dynamic efficiencies deriving from investment, without apparent regard to the nature of the investment.

Ultimately, while noting that there were some in-principle reasoning that cast doubt on the Commission's position of adopting the 75th percentile, the High Court was not persuaded that applying another estimate, such as that of a mid-point WACC, would be materially better in meeting the purpose of Part 4. It noted that regulatory history should be taken into account, and in the face of the Parliamentary recognition of the importance of incentives to invest, it was understandable that in establishing the new regulatory regime the Commission would not wish to run the risk of deterring investment by providing too low a rate of return.

The Commission upheld its emphasis on dynamic over static efficiency in a subsequent review of the case for a WACC uplift, [20] and a WACC uplift for electricity line distribution and gas pipeline businesses was retained – albeit, reduced to the 67th percentile.

[18] *Wellington International Airport Ltd & Ors v Commerce Commission* NZHC 3289, 11 December 2013.

[19] *Wellington International Airport Ltd & Ors v Commerce Commission* NZHC 3289, 11 December 2013, para 1462.

[20] Commerce Commission, *Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: reasons paper*, 30 October 2014.

In its review of the WACC percentile for energy businesses,[21] the Commission also cites a study by Ian Dobbs, which provides support for setting the regulatory WACC above the midpoint under a very general set of assumptions. Dobbs' paper demonstrates that the value of an allowed rate of return that maximises economic welfare generally lies to the right of the mean of the WACC distribution, which is generally close to the midpoint, ie, median of the WACC distribution:[22]

> For both new non-deferrable and new deferrable investment, there is a strong case for uplift in AROR. This is for two reasons; firstly, because the [allowed rate of return (AROR)] that maximizes economic welfare is likely to be well in excess of the mean of the WACC distribution, and secondly, because there is inevitably uncertainty over the exact location of the optimum, and the errors that arise from setting the AROR too high are much less than those associated with setting it too low.

### Unbundled copper local loop and universal bitstream access services

Charges for UCLL and UBA services provided by Chorus were determined by the Commission in December 2015 under a total service long run incremental cost (TSLRIC) methodology. The TSLRIC approach sets charges to recover the costs of a hypothetical efficient operator providing the UCLL and UBA services. In principle, this pricing framework abstracts from the relevant firm's actual costs in providing the services, and re-optimises choices of network capacity, architecture or technology, notwithstanding whether those choices may have been efficient at the time.

Since charges under the TSLRIC framework are based on cost, there remains a straightforward relationship between the allowed rate of return and prices for consumers. Setting an allowed rate of return above the mid-point WACC will increase the return on capital, resulting in higher prices for consumers.

However, since the TSLRIC framework does not determine charges based on the service provider's costs, as a matter of principle there is no relationship between investments made by the service provider (in this case, Chorus) and the prices that it can charge. This means that the effect of any change in the allowed rate of return on the service provider's incentives to make new investments is much less direct than it is under the building block methodology for electricity network and gas pipeline services.

In its final decision on the allowed rate of return for UCLL and UBA services, the Commission noted the importance of this missing link:[23]

> In the TSLRIC context, there is no direct link between new investment in the UCLL/UBA services and higher regulated prices. In this situation, a WACC uplift is less likely to have a material impact on the service provider's investment incentives in respect of these services, relative to a [regulatory asset base (RAB)]-based approach. In turn, this means that a WACC uplift under TSLRIC is materially less likely to promote competition for the long-term benefit of end-users, through incentivising the incumbent supplier's investment.

The Commission's decision to set the allowed rate of return at the mid-point WACC reflects the potentially tenuous nature of the link between the allowed rate of return and investment, as compared to the much more direct link between the allowed return and prices.

### Specified airport services

Specified airport services at Auckland, Wellington and Christchurch airports are subject to a limited form of regulation known as information disclosure.

Under information disclosure regulation, the Commission requires airports to publish information about their performance, including profitability, expenditure and quality performance measures. Airports are also

[21] Commerce Commission, *Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: reasons paper*, 30 October 2014.

[22] Dobbs, I, *Modeling welfare loss asymmetries arising from uncertainty in the regulatory cost of finance*, Newcastle University Business School, 2011, p 4 and 33.

[23] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: final decision*, 15 December 2015, p 65, para 261.

required to disclose forward-looking information such as demand forecasts. The Commission describes the purpose of this form of regulation as:[24]

> …to provide sufficient information to interested persons so that they can assess whether the purpose of Part 4 is being met, including whether suppliers of specified airport services are limited in their ability to extract excessive profits.

The Commission approves a rate of return estimate for the purpose of information disclosure regulation, but this is not directly used to set prices for these services or to provide compensation for investments. Rather, airports themselves, in negotiation with airlines, determine the rate of return that is reflected in prices and the rate of return that is required for new investment to proceed.

In its decision on the WACC percentile for airports, the Commission agreed that there was likely to be some relationship between its rate of return estimate and incentives for airports to invest. If airports earn a rate of return that materially exceeds the Commission's rate, there is a potential threat of more invasive forms of regulation. However, the Commission did not accept that this relationship was as strong as for electricity network and gas pipeline regulation:[25]

> Under price-quality regulation there is a specific revenue allowance based on our estimate of the WACC. Airports are only subject to [information disclosure] – this means that the regulated WACC is not as strong a binding constraint on the airport's pricing and investment decisions.

Given the Commission's finding as to a relatively weak relationship between the allowed rate of return and investment, the subsequent question as to whether there may be any asymmetry in welfare outcomes from over- or under-investment on account of the allowed rate of return, again, does not arise. The magnitude of any asymmetric welfare implications will necessarily reflect (and be less than) the magnitude of any effects of the allowed rate of return on prices and investment. If the latter effects are small or negligible, so too will be the former.

## 2.3 Trade-off between dynamic and static efficiency

At its core, the decision to apply a WACC uplift in the context of the regulatory settings we describe in section 2.2 above comes down to a trade-off between:

- dynamic efficiency in the form of incentivising investment in reliable, efficient infrastructure services and innovations in the supply of those services; and
- static, allocative efficiency in the form of higher prices.

The Commission explained its rationale for selecting the 75$^{th}$ percentile for electricity distribution and gas pipeline services in its 2010 decision on electricity distribution businesses (EDBs), being to provide incentives for investment and innovation:[26]

> Incentives for dynamic efficiency can have significant benefits for consumers over the long term, so it is important to preserve incentives to invest and innovate. Accordingly, this consideration has been given greater weight than limiting suppliers' ability to extract excessive profits.

and:[27]

[24] Commerce Commission, *Input methodologies review decisions | Topic paper 6: WACC percentile for airports*, 20 December 2016, p 12, para 34.

[25] Commerce Commission, *Input methodologies review decisions | Topic paper 6: WACC percentile for airports*, 20 December 2016, p 32, para 136.

[26] Commerce Commission, *Input methodologies (electricity distribution and gas pipeline services): reasons paper*, 22 December 2010, p 168, para 6.7.12

[27] Commerce Commission, *Input methodologies (electricity distribution and gas pipeline services): reasons paper*, 22 December 2010, p 395, para H1.31

> The Commission is acknowledging that where there is potentially a trade-off between dynamic efficiency (i.e. incentives to invest) and static allocative efficiency (i.e. higher short-term pricing), the Commission will always favour outcomes that promote dynamic efficiency. The reason is that dynamic efficiency promotes investment over time and ensures the longer term supply of the service, which thereby promotes the long-term benefit of consumers (consistent with outcomes in workably competitive markets).

If the WACC is set too low, the dynamic efficiency cost is the reduction in consumer welfare associated with a lower quality of supply, or lower reliability of supply, offset to some extent by the lower prices implied by the deferred or avoided capital expenditure.

Table 2.1 summarises the potential allocative and dynamic efficiency costs associated with under- and over-estimating the WACC.

Table 2.1 Potential efficiency costs and benefits of under- and over-estimating the WACC

| Summary of costs and benefits | Under-estimating the WACC | Over-estimating the WACC |
|---|---|---|
| Allocative efficiency | Benefit to end-users from the potential for lower prices (lower MAR over the life of the project).<br><br>This benefit is mitigated by the price caps on anchor services. | Cost to end-users from the potential for lower prices (lower MAR over the life of the project).<br><br>This cost is mitigated by the price caps on anchor services. |
| Dynamic efficiency | Significant costs to end-users of under-investment. | Small benefit to end-users from additional investment. |

## 2.4 Link between allowed rate of return and investment incentives

Previous WACC percentile decisions in other regulatory contexts highlight that a pre-requisite for a WACC uplift is that there is a direct relationship between the allowed WACC and a service provider's incentives for efficient investment.

If such a link can be established, then a clear chain of reasoning can be drawn from the risk of under-estimating the WACC to the potential for negative consequences of under-investment borne by end-users.

In section 4.1, we show that it is likely that the maximum allowed revenue (MAR) set by regulation will become binding on Chorus' revenues at some point over the life of FFLAS, on account of the combination of MAR, anchor services and the wash-up provisions. As such, new investment will be rolled into the RAB, directly affecting future allowed revenues. Put simply, it is most likely that Chorus will directly benefit from an incremental revenue stream as a result of undertaking additional investment, thereby establishing a clear link between investment incentives and the regulatory WACC.

Since other LFCs are not subject to price-quality regulation in the post-implementation phase, it is unlikely that these entities face the requisite link between investment incentives and the regulatory WACC. Although we have not considered the case for other LFCs in any detail, our preliminary expectation is that the case for a WACC uplift is weaker in respect of these businesses' circumstances.

## 2.5 Other factors that may govern asymmetric outcomes

In this section we describe the other factors that may be relevant to the decision of whether or not a WACC uplift could be warranted.

### 2.5.1 Existence of substitute services

In relation to airports, the Commission has stated that the cost to consumers of airport services is likely to be lower than in the energy sector, because there is the potential for some users to adapt travel arrangements.[28] The Commission gave the example of customers' ability to alter timing or transport plans, which may involve diverting to a different airport for some customers.

In relation to FFLAS, the Commission has expressed an emerging view that the existence of potential substitute services could mitigate the costs to end-users of under-investment in the network, as compared to the lack of alternatives for consumers of energy services.

We explain in section 4.1 our finding that the Commission has over-estimated the extent to which potential substitute services are available to mitigate the costs of fibre outages.

### 2.5.2 Visibility of under-investment

If under-investment can be addressed through other aspects of the regulatory regime, such as through quality disclosures, then the Commission has expressed a view that the case for a WACC uplift is reduced.

We understand from clarification sought by Chorus during the present consultation process that, in respect of electricity, the Commission expressed a view that under-investment in physical infrastructure (eg, poles) would not be detected until the point of failure, eg, when poles fail. Conversely, the Commission has stated that under-investment in telecommunications infrastructure (eg, under-investment in capacity) would be quickly detected by RSPs. This view does not accurately reflect reality for Chorus.

We describe Chorus' investment program in section 3.3. Broadly speaking, Chorus' investment falls under three categories, ie:

- physical network – passive network elements including cables, ducts, poles, manholes, buildings, huts and associated facilities such as power and air conditioning plants;
- network electronics – active network components providing transmission and connectivity over physical media, encompassing electronic equipment, software and associated management systems; and
- information technology (IT) – Information systems, applications, data centre equipment and integration of cloud-based services used to operate and manage Chorus network, services, operational processes, and enterprise functions.

In all three areas, there is potential for hidden under-investment, and no reason to expect under-investment to be readily detected by RSPs. As is generally the case for investment in long-lived infrastructure assets, the consequences of investment take time to become apparent and are unlikely to affect performance metrics in the near term.

A simple counter-example is helpful to illustrate the point. One category of investment is in network resilience. Chorus invests in resilience through duplicating certain physical elements, often paired with geographic independence. If an element of the network fails, this planned redundancy mitigates the risk of outages.

Using the Commission's logic, if Chorus underinvested in physical resiliency relating to FFLAS, this would not be detected by RSPs until such point as an element that would otherwise have had sufficient redundancy fails – and would not necessarily be detected by RSPs before that point. As such, the investment is no 'less hidden' than for electricity.

[28] Commerce Commission, *Input methodologies review decisions: topic paper 6: WACC percentile for airports*, 20 December 2016, p 36, para 151.2.

In addition, the regulatory system must also ensure that new innovations are efficiently incentivised. In its 'new regulatory framework for fibre' paper, the Commission noted that the markets in question are dynamic, and so:[29]

> It is particularly important that our decisions do not unreasonably hinder or impede the supply of telecommunications services that use new and more efficient technologies.

These investments may be undertaken by Chorus, or by another party. By their nature, efforts towards such innovations are hidden, and under-investment in this type of innovation would not, and could not, be picked up by RSPs or by the regulator through quality reporting metrics.

We provide detailed descriptions of the types of investments that are required for Chorus to manage its business efficiently in section 3.3 below, and provide some commentary on the extent to which under-investment in each category would be visible or hidden.

### 2.5.3 Uncertainty of the true WACC

Because the true underlying WACC is unobservable, and the variables that determine the WACC are uncertain, this itself may be a reason to adopt a WACC uplift, to counteract such uncertainty.

In its decision to amend the WACC percentile from the 75$^{th}$ to the 67$^{th}$ percentile in the energy sector, the Commission stated that conservatism is appropriate in the face of asymmetric outcomes and the fundamental uncertainty of estimating the underlying, unobservable true WACC:[30]

> … our decision on the appropriate WACC percentile involves the exercise of judgement in light of the s 52A purpose and the evidence available to us. In exercising our judgement, we consider some conservatism in selecting the percentile (ie, erring on the high side) remains appropriate. Doing so recognises there is fundamental uncertainty regarding the appropriate WACC percentile, and that the long-term costs to consumers of under- and over-estimating the WACC are asymmetric. Therefore, erring on the high side is likely to be in consumers' interests. Doing so reflects otherwise unquantified (or unquantifiable) factors that are likely to result in greater benefits to consumers in the long term, in terms of efficient investment and innovation that meets current and future consumers' demands at the quality that they want.

This statement does not support a blanket case for a WACC uplift. However, it does offer support for applying a WACC uplift (ie, conservatism), once both the requisite link between the WACC and investment incentives, and asymmetric outcomes of mis-estimating the WACC have been established.

## 2.6 Commission's emerging views

In its emerging views technical paper,[31] the Commission states that:[32]

> The framework illustrates the significant cost of the uplift. At this stage we do not consider the benefits from mitigating under-investment outweigh this cost, particularly given FFLAS are new networks and the availability of alternative technologies is likely to mitigate the impact of any outages on end-users.

[29] Commerce Commission, *New regulatory framework for fibre: Invitation to comment on our proposed approach*, 9 November 2018, p 58, para 5.37.

[30] Commerce Commission, *Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services*, 30 October 2014, p 36, para 2.39.

[31] Commerce Commission, *Fibre regulation emerging views: summary paper*, 21 May 2019, p 27.

[32] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 122.

The Commission goes on to suggest that under-investment in FFLAS is likely to be less hidden compared to the energy sector, and the quality manifestations of under-investment would show up in performance standards more quickly.[33]

## 2.7 Other relevant aspects of the regulatory regime

In applying the framework for assessing the case for a WACC percentile above or below the central estimate to Chorus' FFLAS, several other aspects of the regulatory regime are relevant, as below.

### 2.7.1 Anchor services

Anchor services are intended to ensure that baseband equivalent voice and basic broadband services are available to end-users at reasonable prices and to act as an appropriate constraint on the price and quality of other FFLAS variants. These objectives are set out in the purpose statement contained in s 206(7) of the Telecommunications Act.

Anchor service terms are to be set by the Governor-General, by Order in Council made on the recommendation of the Minister for Business, Innovation and Employment in the first instance. The parameters of the anchor services are therefore out of scope for the IMs – however, they have important implications for how the regulatory system for FFLAS will work in practice.

We understand there will be two forms of anchor services prescribed in regulations – a basic fibre broadband service, which is expected to be 100 megabits per second (Mbps) downstream and 20 Mbps upstream, and a fibre-based voice service.

### 2.7.2 Maximum allowable revenue (MAR)

The MAR is calculated using a building blocks model to calculate the cost of providing FFLAS over a regulatory period of three to five years.

### 2.7.3 Wash-up mechanism for any over- and under-recovery of revenue

There is some uncertainty as to how the wash-up provisions for over- and under-recovery of revenue under the new Part 6 regulations are intended to operate. At a minimum, however, the effect of a wash-up provision is likely to be to allow Chorus to offset an under-recovery in some years with over-recovery in other years.

### 2.7.4 Geographically consistent pricing requirements

Prices charged by a supplier subject to price-quality regulation for various FFLAS are required to be geographically consistent.

### 2.7.5 Interpretation of end-user in Part 6

The Commission's technical paper discusses the interpretation of the term 'end-user' as adopted in Part 6.

Given the definition of FFLAS, end-users of FFLAS include not only UFB customers but also fixed wireless access (FWA) and mobile users, which rely on FFLAS for these networks.

Section 162 of the Act states that the purpose of Part 6 is to promote the long-term benefit of end-users in markets for FFLAS. Given the explicit reference to 'long-term', it is reasonable to assume that end-users is a reference not only to current end-users of FFLAS services but also to end-users long into the future, which may include areas that have not yet migrated to fibre.

[33] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 123, para 553.

# 3. Chorus' fibre network / context

This section sets out some key information regarding Chorus' fibre network, FFLAS and Chorus' investment program. We present this information since it is relevant to an assessment of the Commission's preliminary view that a WACC uplift is not justified, in part because FFLAS are new networks, reducing the potential benefits of inducing investment.[34]

## 3.1 Chorus' fibre network

The ultra-fast broadband network has been built under the Network Infrastructure Project Agreement (NIPA) with Crown Infrastructure Partners. Chorus operates a fibre network using assets that are shared, and so may be used to provide a combination of regulated and unregulated services, and may be used to provide different services over time. Because of this complexity, it is challenging to identify the underlying assets used to deliver FFLAS.

The scope of services and assets covered by FFLAS regulation has not yet been settled. FFLAS comprises telecommunications services that enable access to, and interconnection with, a regulated fibre service provider's fibre network. Where fibre access services are used for mobile backhaul,[35] they may still fall within the scope of FFLAS regulation. However, Chorus' backhaul services could also be out of scope as they provide transmission capacity between defined points beyond the handover of the access service.

There is an explicit exclusion of services provided in part over a copper line (including fibre feeder for UBA) other than a part located within an end-user's premises.[36]

### 3.1.1 Geographic areas

Chorus operates its fibre network across three commercially distinct geographical areas around New Zealand:

- Chorus' UFB areas;
- other LFCs' areas; and
- rest of New Zealand.

## 3.2 New Zealanders' increased reliance on broadband technologies

High speed internet access is increasingly considered an essential part of New Zealanders' lifestyle and businesses. Customer attitude to broadband has shifted from a 'reasonable endeavours' service (with a degree of acceptance and tolerance of quality issues such as some congestion, particularly at peak times) to an essential utility (with limited tolerance for anything less than reliable, high speed internet with an 'anytime, anywhere' mindset).[37]

[34] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 122 para 552 and p 126, para 572.

[35] Backhaul is the intermediary link in a telecommunications network between the edge of the network (eg mobile sites) to the core network (eg internet gateways and content provision). It transports traffic between the two parts of the network. Generally, backhaul is provided over fibre, but wireless technologies can be used, eg in high-cost, remote areas. See: Commerce Commission, *Section 9A Backhaul services study,* 11 June 2019, p 2, para 1.8.

[36] *Telecommunications Act 2001*, section 5.

[37] See, for eg, World Economic Forum, *How companies can win the race to meet customer expectations*, 2016, available: http://reports.weforum.org/digital-transformation/the-race-to-meet-customer-expectations/, accessed 9 July 2019.

Increased expectations and demand for internet services has coincided with the rapid up-take of platforms and over-the-top services such as Netflix.[38] In simple terms, customers are using more data and have higher expectations for increasing reliability, availability and speed.

At the same time as expectations for speed and reliability are increasing, the volume of customers in a given area is increasing. For example, residential intensification in large cities is taking place as a solution to housing affordability, particularly in large cities.[39] The impact of high-density housing projects is to place additional demands on infrastructure assets (such as internet access) for a given geographic area.

To keep pace with the changing demand and expectations for broadband, Chorus must undertake substantial investments in its network. The remainder of this section describes the efforts that Chorus undertakes to maintain the reliability, capacity and resilience of its network.

## 3.3 Chorus' investment program

Chorus undertakes investment activity across three broad categories of its business, ie:

- physical network – passive network elements including cables, ducts, poles, manholes, buildings, huts and associated facilities such as power and air conditioning plant;
- network electronics – active network components providing transmission and connectivity over physical media, encompassing electronic equipment, software and associated management systems; and
- information technology (IT) – information systems, applications, data centre equipment and integration of cloud-based services used to operate and manage Chorus' network, services, operational processes, and enterprise functions.

These investment streams are described in more detail below.

### 3.3.1 Physical network investment

Chorus has planned to invest [redacted].

The nature of physical network investment can itself be broken down into three areas:

- capacity expansion, which makes up around [redacted] of total planned investment spend;
- lifecycle investment, including asset renewal and rehabilitation [redacted] of total planned investment spend; and
- improved resilience [redacted] of total planned investment spend.

#### Capacity expansion

Chorus adopts a 'congestion-free network' strategy. This is consistent with obligations under the UFB contract with the Crown. The congestion-free network strategy involves ensuring that link utilisation does not exceed specified levels on certain parts of the network.

The benefits to end-users of a congestion-free network strategy include a consistent user experience, minimising delays on the network and ensuring that network capacity pre-empts demand growth and actual utilisation. Given the high growth rates in demand for fibre services, Chorus' perspective is that the cost of this strategy that arising from the need to bring forward the timing of investments which would often be required within months.

[38] Bureau of Communications and Arts Research, Department of Communications and the Arts: Demand for fixed-line broadband in Australia, February 2018, p iv.

[39] MDH website, https://www.mdh.org.nz/what-is-mdh/mdh-market-and-demographics/, accessed 5 July 2019.

Capacity expansion is required to meet demand as customers migrate from copper to fibre, to meet increased demand requirements over an existing UFB area as the density of dwellings increase (referred to as 'infill demand'), and to extend service coverage to new developments (greenfields) and upgraded or redeveloped areas (brownfields) areas outside the UFB footprint. Infill demand is a particularly challenging issue, as it is often unpredictable and can result in dwelling densities that are multiples of those for which the UFB network was originally designed.

Under-investment in capacity expansion will become apparent through increasing service provisioning times for new connections.

Delays to investment can result in inefficient allocation of available resources (eg allocating fibres on longer, more costly routes that have unused capacity available) which creates greater complexity and causes congestion in adjacent parts of the network, increasing the cost of eventual capacity expansion and subsequent reconfiguration of the network.

### Lifecycle investment

Given the complexities associated with the construction of a fibre to the home (FTTH) network (eg, the need to provide services simultaneously, the large scale), it is inevitable that the initial build will have shortcomings, which may have been identified during deployment or may take time to become apparent. Therefore, further investment will be required to address these problems.

### Resilience

Network resilience refers to the network's ability to plan for and respond to outages at minimal impact to end-users. Chorus' network is designed to limit the impact of service outages, using resilience in the event that an element should fail.

Chorus manages its network reliability requirements by means of:

- targeted redundancy, being physical duplication of a part of the network, necessary to protect against failure of a single component such as equipment, cable or a power system – [redacted];
- geographic separation, which is important where failures would affect large numbers of customers;[40]
- limiting the scale of impact of individual failures, and build; and
- practices which reduce the occurrence of accidental damage to the network.

[redacted]

The NIPA states that a single element failure (element includes a fibre sheath not a duct line) cannot affect more than 3,000 FFLAS customers,[41] where a customer may also be a connection to a mobile site, from which the mobile site may serve hundreds of end-users of mobile services and FWA customers. [redacted.]

Alongside the commercial target set under the NIPA of 3,000 FFLAS customers, Chorus' internal strategies also focus on areas where an element failure can affect [redacted]

[40] Redundancy and geographic separation may be implemented together in parts of the network where failure would impact large numbers of customers, while redundancy without geographic separation may be implemented where fewer customers are impacted, and neither may be implemented for those parts of the network where failure would impact few customers.

[41] It is important to note that a customer in this context is not the same as an end-user. One 'customer' may be a single connection to a mobile site using DFAS for mobile backhaul services.

Supposing that a single element failure affected [ ] FFLAS end-users, the total number of consumers affected could be around [ ] that. This is because a single FFLAS connection may represent a mobile network operator's backhaul service connection and, on average, there are more than [ ] mobile users per mobile site.[42] A single element outage could therefore affect the [ ] FFLAS end-users, and an additional [ ] mobile users from three mobile network operators each covering the affected area with their respective mobile sites.

As at 10 June 2019, [ ]

[ ]

[ ]

To illustrate the cumulative reach of network outages relating to FFLAS, Chorus has shared some information on the recent reliability performance of the fibre network over the period January – May 2019.

[ ] According to Chorus, a key factor for customers is the duration of the outage. Chorus observes that:

- fibre repairs are often difficult to locate in remote areas;
- delays to repairing an outage are often caused by health and safety considerations, especially when caused by natural events like high winds, land slippage and river washouts; and
- delays are also caused by the need for traffic management when they are located in proximity to other infrastructure like roads and bridges.

Investing in diversity therefore generates substantial benefits to Chorus, as redundancy enables Chorus to maintain service to customers, business and mobile coverage while undertaking safe and permanent repairs.

[ ]

### 3.3.2 Network electronics system investment

Investment in electronics for Chorus' fibre network similarly comprises:

- capacity expansion, which often involves replacement of older, lower capacity equipment;
- lifecycle investment; and
- improved resilience.

[42] Information provided by Chorus.

[43] [ ]

[44] [ ]

[45] [ ]

#### Capacity expansion

The majority of investment in network electronics is undertaken to meet growth in demand for connections or bandwidth. Under-investment to meet demand will quickly become apparent in service performance metrics relating to sampled end user experience and link congestion statistics.

However, there are two aspects of investment in network electronics for which under-investment does not become apparent in the near term, ie:

- periodic software upgrades for both network elements and associated management systems; and
- deployment of a new generation of equipment to meet capacity growth.

Both types of investment affect Chorus' ability to exploit new equipment types, which may provide either additional functionality that supports new service capabilities or may improve the efficiency and performance of existing services, or which provide the same capabilities at lower unit cost.

Bandwidth demand has grown rapidly in recent years and is expected to continue to increase. If the unit cost of bandwidth (cost per bit) does not decline, bandwidth costs will also grow rapidly. Investment in new generation, lower cost-per-bit equipment is required to manage this issue.

However, in order to take advantage of the new, lower cost-per-bit equipment, the equipment chassis and common equipment, network element software, and management systems must be sufficiently up to date to support that newer equipment. Thus, reducing the cost per bit requires periodic upgrade of network equipment, software and management systems.

Under-investment in such periodic upgrades is associated with two effects, ie:

- rising total cost of meeting growing bandwidth demand as the cost-per-bit remains constant; and
- increasing the future cost and risk of changes and upgrades;
  - the longer software and equipment upgrades are deferred, the more complex any eventual upgrade becomes as upgrades across multiple equipment and software types have to be coordinated to ensure the system as a whole remains functional. This not only increases costs, but also increases the risks associated with the change.

#### Lifecycle investment

Unlike the physical network, the fibre network electronics system has been deployed specifically to support UFB rollout and subsequent customer migration. However, network electronics systems have much shorter asset lives than physical networks. The network electronics system deployed early in the UFB programme is now approaching end of life.

Without replacement, Chorus anticipates increasing fault rates from such equipment. The impact of deferred investment is likely to be small but could quickly grow, reflecting the profile of fibre service demand over the last eight years.

#### Resilience

Investment in resilience of network electronics includes investment in, for example, upgrading to equipment that has higher mean time between failure (MTBF).

According to Chorus, similar drivers and consequences of under-investment apply to network electronics as apply to physical network investment.

### 3.3.3 IT Investment

Investment in electronics for Chorus' fibre network similarly comprises:

- capability development
- lifecycle investment; and
- investment driven by growing capacity.

### Capability development

Investment in IT provides new capabilities to support new service requirements, Chorus' customer business operations, and improvements in efficiency and performance of business processes.

According to Chorus, under-investment is unlikely to affect performance metrics in the near term but will result in lost efficiencies in Chorus' operating costs and reduced operational performance experienced by its RSP customers. This may also result in Chorus providing fewer capabilities that allow its RSP customers to improve their service performance.

### Lifecycle investment

Deferral of some IT lifecycle investment by Chorus represents deferral of investment that supports critical business processes and affects end-users. For example, a failure to replace service provisioning, billing or assurance systems before expiry of vendor support contracts could result in extended outages in the event of a system failure.

## 3.4 Network reliability requirements under the UFB

Standards for new networks have generally been established to provide comparable reliability to existing services. Chorus' primary consideration in any quality planning regarding its fibre network is its UFB agreements with Crown Infrastructure Partners (CIP).

The UFB agreements establish network reliability requirements, including availability at layer 1 and 2, average downtime per end user, and fault restoration times for residential and business users.

Specifically, the UFB agreements establish the following network reliability requirements:

- availability:
  - layer 1 service level measures faults in the layer 1 service between the premises and the fibre distribution frame at the central office over the shorter of the preceding 12 months or the period since the service level was last failed (availability period);
  - the CIP layer 1 availability service level requires that the average downtime per end user in a candidate area (UFB1) or a POI area (UFB2) during the availability period (can be no more than two hours) and;
  - the layer 2 service level requires that the average downtime per end user in a candidate area (UFB1) or a POI Area (UFB2) during the availability period can be no more than 30 minutes; and
- fault restoration: for both layer 1 and 2, Chorus must ensure that:
  - residential services are restored by the end of the day following the day on which downtime is reported; and
  - business services for which downtime is reported before midday are restored by 7pm on that day, or if after midday, restored within 24 hours.

Within the constraints imposed by the UFB agreements, there are still opportunities for Chorus to make decisions about the network and services that affect the quality of service and end-user experience.[46]

[46] [redacted]

### 3.4.1 Summary

Chorus manages its network reliability requirements by means of:

- targeted redundancy: physical duplication of a part of the network, necessary to protect against failure of a single component such as equipment, cable or a power system – [redacted]
- geographic separation: important where failures would impact large numbers of customers;[47]
- limiting the scale of impact of individual failures, and build; and
- practices which reduce the occurrence of accidental damage to the network.

Physical fibre resilience efforts are focused on areas where a fibre outage can affect [redacted], as determined under Chorus' internal governance policies.

### 3.4.2 Expected changes to network reliability over time

The reliability of Chorus' fibre network is dynamic and depends on a number of factors, including:[48]

- the number of users per area: as the number of users increase over time, the resilience of the network decreases unless Chorus undertakes additional investments to increase resilience;
- the life of assets: Chorus' network will fail more often as the assets age, unless it invests sufficiently to replace equipment within their reasonable asset life;
- the extent of investment in capacity relative to the growth in users: if Chorus fails to invest in capacity to meet growth, the network will become congested;
- investment in new equipment with better MTBF and mean time to failure (MTTF), to improve the resilience to failure;
- investment in tools and processes to monitor asset state, network performance and capacity, thus improving reliability;
- investment in developing service level agreements (SLAs) with operations and field force, so that these teams can fix assets more quickly; and
- investment in new features to aid resilience, eg, diverse handover links to RSPs.

Many of the factors that affect the reliability of the network over time are closely related to investment decisions. Taken together, if incentives to invest were low or absent (ie, if the true WACC is higher than the allowed, regulatory WACC), these investment decisions are unlikely to be limited to small scale impacts on a limited number of customers.

Rather, persistent under-investment could have wide potential reach and scale. While individual outages may be local in nature, in the sense that the total number of premises affected by any one element failure is targeted to be capped, the sum of all outages in the event of under-investment is likely to be substantial, particularly when translated from end-users to consumers or premises.[49]

When planning physical network infrastructure, Chorus' network planners consider routes that achieve improved network resilience from existing routes and avoid, to the extent possible, areas that could present a hazard to the infrastructure, such as areas of land slips and erosion. These types of hazards may change over time, making existing assets more prone to failure as conditions change relative to when the infrastructure was planned. Replacement on a different route or at a different location may then become

[47] Redundancy and geographic separation may be implemented together in parts of the network where failure would impact large numbers of customers, while redundancy without geographic separation may be implemented where fewer customers are impacted, and neither may be implemented for those parts of the network where failure would impact few customers.

[48] Chorus' internal information.

[49] See the discussion in section 3.3.1 on the relationship between a single 'customer', which could be a mobile site that on-serves several thousand end-users, and a single 'end-user'.

necessary to achieve desired network resilience, eg, a cable route may become prone to slips and erosion as surrounding land use changes.

Chorus has observed that patterns of use have changed, with customers actively using services for longer periods (hours, rather than minutes per day). At these heightened levels of use, customers are more likely to notice an outage. This has led to the revision of reliability standards.

When deploying new equipment, configurations which are more reliable will be favoured unless doing so drives significant lifetime cost or would drive further expenditure to realise the benefits.

Other factors influencing choices to implement more reliable configurations include:

- existing standards applying to comparable equipment and applications;
- use of standardised configurations to reduce operational complexity, so redundancy may be employed even where the full benefit cannot be realised;
- duplication may be provisioned where it will be required in future for capacity reasons - the economic affect is therefore only a modest advancing of expenditure, rather than the full cost of duplication;
- quantified availability analysis;
- local geographic, network topology or demand conditions; and
- subject matter expertise of relevant network equipment and plant, failure modes and operational practices.

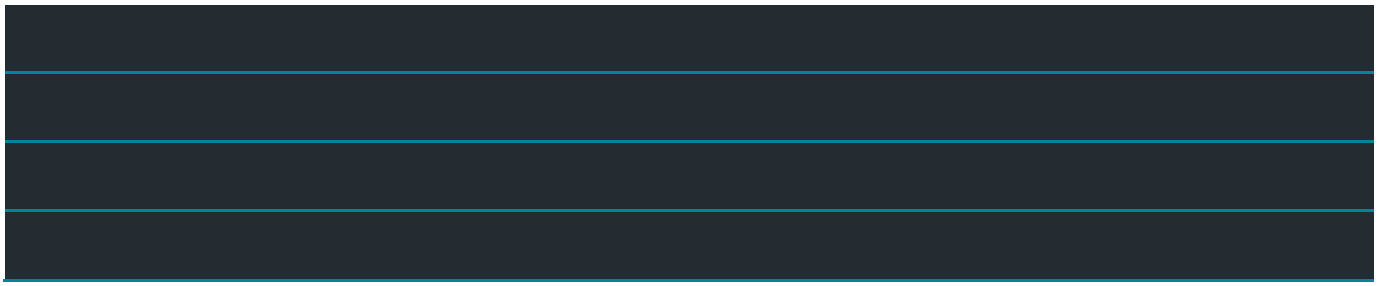
### 3.4.3 Chorus network failure scenarios

The nature of reliability failures range from individual optical network terminal (ONT) failure, affecting a single user until the ONT is replaced, to link congestion affecting up to [[redacted]] users, or core node failure, which could affect up to [[redacted]] users.

Table 3.1 below describes the failure scenarios on the UFB network. We understand from Chorus that the mitigation strategies below are mostly discretionary, ie, not strictly required under the UFB contracts with CIP. These investment decisions affect the likelihood, and speed of mitigation, of individual outages in the sense they reduce the likelihood of failures occurring, and some seek to minimise the impact or duration of events when they occur – potentially to the point that they are not noticed by end users at all.

Table 3.1 Chorus network fibre outage scenarios

[redacted]



*Source: Chorus*

# 4. Application of WACC uplift framework to FFLAS

In section 2, we established that assessing the case for a WACC uplift on the basis of the consequences of under-investment follows a two-part process, ie:

- is there a strong link between incentives for investment, and the regulatory WACC; and
- if so, are the consequences of over- and under-investment for end-users asymmetric?

This section explores the case for a WACC uplift for FFLAS against these two key questions.

## 4.1 Link between incentives to invest and the WACC

Although the exact nature of the new regulatory system for fibre services has not yet crystallised, it is clear that the form of regulation faced by Chorus for FFLAS will include:

- price-quality regulation, whereby Chorus' MAR is determined using a building blocks model;
- price caps for anchor services; and
- wash-up provisions for Chorus' revenue, as compared to the MAR over the term of regulation.

New investment undertaken by Chorus will be rolled into the RAB, directly affecting its allowed revenues over the regulatory period. In addition, the presence of wash-up provisions for under-recovery against the MAR intensifies the link between investment incentives and the WACC, because it is likely to offer Chorus a buffer against year-by-year volatility.[50]

As such, Chorus is very likely to benefit from an incremental revenue stream as a result of undertaking additional investment, providing a clear link between investment incentives and the WACC.[51]

## 4.2 Consequences of under-investment

The regulatory system for FFLAS must support incentives for ongoing investment in, and sustainability of, the UFB network. Such investment includes to bringing forward and encouraging ongoing investment in significant network capability, reliability and new innovations, each across the entire network.

The two main investment categories for considering the effect of under- and over-estimation of WACC that have been the focus of previous WACC uplift decisions are:[52]

- investment in maintaining and upgrading Chorus' network, ie, reliability; and
- investment in new telecommunications services, either by Chorus or by other parties, ie, innovation.[53]

### 4.2.1 Reliability

Business customers increasingly rely on high speed internet to underpin their operations. A Colmar Brunton study[54] undertaken for Chorus in April 2018 found that the majority of medium to large businesses in New Zealand use fibre to connect to the internet, run shared applications, and use the cloud and fixed voice

[50] There has been very little discussion of how the wash-up provisions will function. We assume that a provision for under-recovery of revenues would enable Chorus a greater likelihood of achieving its MAR over the life of the assets/of the regulatory period.

[51] We also acknowledge that there may be a non-negligible probability that the MAR is never binding over the regulatory period. In that case, the link between investment incentives and the WACC is not clear.

[52] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: final decision*, 15 December 2015, p 63, para 254.

[53] We have also included in this category investment in expanding the geographic boundaries of the network.

[54] Colmar Brunton, Business connectivity segmentation report, May 2018, p 4.

services. For these customers, network reliability issues are likely to be reflected in reduced production (and revenues) and increased costs. One obvious example of such an effect is for RSPS. [redacted].

The cost of network reliability issues for residential customers is likely to be the reduced value to the consumer of lower quality service. Other costs to residential customers may include productivity and financial costs where residential customers work remotely.

In section 3.4.2 we established the likelihood that persistent under-investment could have wide potential reach and scale. Therefore, while individual outages may be local in nature, in the sense that the total number of premises affected by any one element failure is targeted to be capped, the sum of all outages in the event of under-investment is likely to be substantial, particularly when translated from end-users to consumers or premises.[56]

### 4.2.2 Availability of substitutes

The Commission has observed that the availability of substitute technologies can mitigate the effect of an outage on fibre network, unlike a large service energy outage for which there is no substitute technology.

There are two facets to understanding why substitute technologies are not likely to mitigate the effect on end-users of an outage on fibre. These are that:

- mobile services rely on FFLAS to provide their services, ie, FFLAS end-users are mobile customers; and
- partly related to the first bullet, these technologies are not closely substitutable for FFLAS.

The upshot of these two effects is that, if a significant FFLAS fault were to occur, then there is a high likelihood that both FWA and mobile would be affected in some manner.

#### Mobile services rely on FFLAS

Because mobile services rely on FFLAS for backhaul, mobile customers are FFLAS end-users by definition. Over half of mobile sites rely on Chorus fibre network for mobile backhaul. This means that in certain areas, or for certain mobile network operators, the effect of an outage may be significant across both mobile and fixed services.

#### Congestion and capacity issues in mobile networks

For the remaining mobile services that are not directly cut off in the event of an outage on FFLAS, due to the loss of mobile backhaul, it is very likely that congestion on the network would occur due to end-users attempting to use mobile connectivity during a fibre outage. When certain mobile sites lose backhaul connectivity and go off air, neighbouring mobile sites will try to take on the additional traffic. However, significantly higher than normal mobile traffic is likely to lead to degraded performance on mobile broadband.

#### Consumer demand

It is generally accepted that fibre is a superior broadband technology and so has limited competition from substitution to FWA or mobile in the medium or long term.

[55] [redacted]

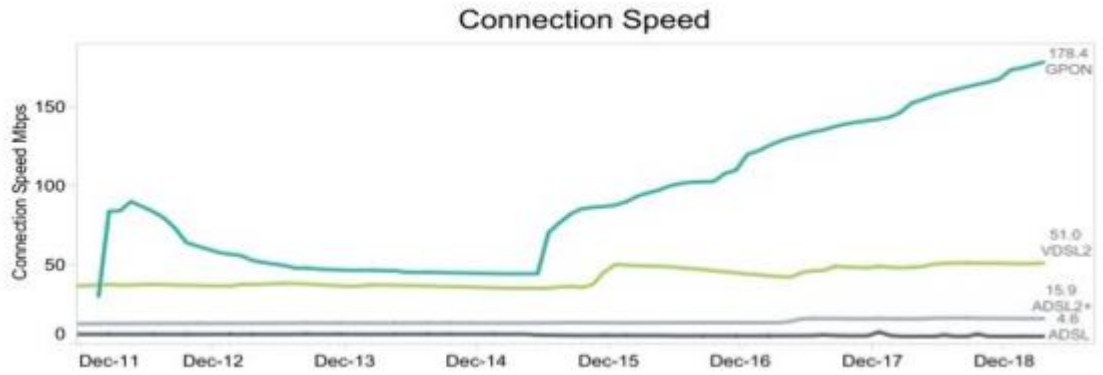
[56] See the discussion in section 3.3.1 on the relationship between a single customer, which could be a mobile site that on-serves several thousand end-users, and end-user.

Fibre speeds and data usage are widely forecast to entrench fibre as the premier access technology, with FWA and mobile services less closely substitutable. The Commission has acknowledged this in its emerging views technical paper, stating that:[57]

> FFLAS arguably have less potential for substitution by other services, given the high-speed nature of the service.

The divergence in fibre and copper speeds is highlighted in figure 4.1 below, which utilises Chorus' data on connection speeds across different technologies.

Figure 4.1 Chorus data: connection speeds by technology




*Note: GPON refers to fibre technology; VDSL2 and ADSL are copper technologies. Source: Chorus.*

Homes and businesses are becoming increasingly dependent on reliable FFLAS.[58] While FWA and mobile services may offer a degree of substitution, the much-increased service quality and speed of fibre services, and the pricing structure of mobile broadband services, means that mobile services are not a consistent, effective substitute.

The imperfect nature of substitutability between fibre and other technologies has also been observed by the Commission in the context of its Measuring Broadband New Zealand reports. The report states that fibre materially outperforms other technologies:[59]

> Fibre plans perform the best, being able to deliver 4k video streaming from Netflix over 99% of the time. […] for households with multiple people streaming, downloading files, or gaming at the same time, fibre plans will give the best results.

### 5G mobile and fixed wireless access

The extent to which 5G mobile and FWA services could be viewed as substitutes or complements for fibre fixed broadband in the future remains to be seen. At a minimum, 5G FWA may make sense in high-cost and/or rural areas where physical infrastructure for fibre broadband is unsuitable.[60]

[57] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 126, para 570.2.

[58] This statement is non-controversial and accepted by the Commission. See, for eg, Commerce Commission, *New regulatory framework for fibre: Invitation to comment on our proposed approach*, 9 November 2018, p 14, para 2.4

[59] Commerce Commission, *NZ broadband is delivering a great video streaming experience for consumers*, Media release No 155, 13 June 2019.

[60] Analysys Mason, *5G fixed-wireless access: the market opportunity for operators and vendors*, March 2019, p 6

#### Waiheke outage – case study

A recent outage relating to the cable connecting Waiheke Island in the Auckland region to the mainland fibre network provides an insightful case study on the inability of other technologies to mitigate the effect of a fibre outage for end-users.

Waiheke Island was connected to the UFB in 2016, with more than 5,600 local homes and businesses since connected.[61]

In April 2019, damage to the Howick-Waiheke cable connecting Waiheke Island to Chorus' fibre network resulted in the Island being without broadband or copper services from around 3pm on Monday 8 April 2019 to 2.30am on Tuesday 9 April 2019.

As well as the outage to Chorus' fibre network, the following other services were affected:

- Chorus' copper broadband services were completely down, since very high speed digital subscriber line (VDSL) and asymmetric digital subscriber line (ADSL) rely on the same fibre network to the nearest exchange;
- Spark lost over 80 per cent of its mobile services, because Spark uses the fibre network for mobile backhaul to connect cell towers on the island to its main network; and
- the extent to which Vodafone's or 2degrees' mobile services were affected do not appear to have been reported.

According to Business.Scoop,[62] around 4,000 households and businesses were affected by the outage.

The cable that was damaged is in scope for FFLAS services. [[ ].

### 4.2.3 'Hidden' under-investment?

In section 3, we described in detail a wide range of investments that Chorus undertakes to manage its network. Many of these investments have a long lead-time and would only be observed by the Commission (or by RSPs) at the point of failure. There is no reason to consider that FFLAS under-investment would be 'less hidden' compared to the energy sector, or that the quality manifestations of under-investment would show up in performance standards more quickly.[63]

### 4.2.4 Innovation

The question of whether a WACC uplift could incentivise innovation in the telecommunications industry was addressed in the context of the UCLL and UBA decision. In that decision, the Commission stated that:[64]

> Applying a WACC uplift for UCLL and UBA could potentially send a signal to investors in such new innovative services that the risk of under-estimation of the allowed WACC is reduced (relative to the situation where no uplift was applied) which, in turn, could lead to a lower risk of delayed deployment of new telecommunications services in New Zealand.

[61] Chris Keall, *Broadband restored on Waiheke after cable fault found on land,* NZ Herald, 9 April 2019, available: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12220441, accessed 9 July 2019.

[62] Business Scoop website, available: http://business.scoop.co.nz/2019/04/08/loss-of-broadband-services-on-waiheke/, accessed 1 July 2019.

[63] Noting the Commission's view, available: Commerce Commission, *Fibre regulation emerging views*, *technical paper*, 21 May 2019, p 123, para 553.

[64] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: final decision*, 15 December 2015, p 53, paras 222.1-222.2.

> The impact of delayed deployment of new telecommunications services could be significant, particularly where these new services offer material benefits to consumers that will not otherwise be realised.

In the FFLAS context, the case of a WACC uplift as a means of incentivising innovation therefore turns on establishing a direct link between the timing of investment in innovative new services and a WACC uplift. The Commission concluded that such a link was not established for UCLL/UBA.[65]

However, unlike the regulatory context for UCLL/UBA, for FFLAS the link between investment and the potential for new innovation, as well as the pace of that innovation, has been established. It is likely that a WACC uplift could have a positive effect on the level of innovation and the pace of adoption of new technologies, which in turn have the potential to bring material benefits to end-users.

The level of the allowed return for FFLAS would not only affect Chorus' investment incentives, but also is likely to send a clear signal to other firms of the regulatory commitment to promote and reward investment.

#### Response to layer 2 competition arguments

In its emerging views technical paper, the Commission notes that Vodafone suggested that competition will provide more appropriate investment incentives than would a WACC uplift.[66] Vodafone states that:[67]

> If unbundling is viable then competition will provide a more accurate incentive to maintain and increase quality. It also mitigates the risk for end-users.

This contention mis-understands the framework for a WACC uplift as being one that incentivises investment, rather than one that accounts for the uncertainty in estimating the WACC and adjusts the WACC to minimise the risk of under-investment. Although the outcomes of these two ideologies may look and feel very similar, they are distinct concepts.

If the WACC is under-estimated and Chorus is not able to derive a normal return on investment, this problem is not resolved via competition at layer 2. If Chorus is unable to recover its efficient costs through the regulatory framework, then it will be sub-optimally placed to compete against rivals at layer 2. Over time, the persistent inability to recover costs could have a range of negative outcomes including, at an immediate level, the inability to deliver optimal service across the network. More generally, any compromise to the prospect of cost recovery may send a signal to investors in existing and potential companies in regulated industries across New Zealand that the Commission will not reward innovation and investment.

### 4.2.5 Age of network assets

The Commission has suggested that the fibre network is new and already providing significant quality of service to users, so that any potential benefits of inducing further/investment innovation are low.

This view does not appear to take into account that the network is dynamic, and the required investment in reliability, for example, change as the number of connections increases, and the density of living areas increases. In addition, as discussed at section 3.3.1, [redacted]. As such, the benefits of further investment appear to be high, not low, at least in certain parts of the network.

Further, the Commission's observation does not take into account the incentives for investment in innovation, which is not necessarily correlated to the age of the network.

[65] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: final decision*, 15 December 2015, p 102, para 402.

[66] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 126, para 569.2.

[67] Vodafone, *New regulatory Framework for fibre: Submission on Commission's proposed approach*, 21 December 2018, p 26, para 78.2.

### 4.2.6 Expanding the UFB footprint

We understand from Chorus that there are some areas and communities in proximity to the UFB areas, that are likely to have strong demand for fibre broadband. The timing of the expansion by Chorus into these areas will be affected by its incentives to invest and expand, and are likely to be delayed if the Commission under-estimates the true WACC.

Although these areas are currently well-served by VDSL2,[68] it is unlikely that they will continue to be satisfied with VDSL2 in the medium term, in light of fast-changing consumer demands for high-speed internet. Further, it is likely that no other technology potentially available in these areas will be able to provide a reasonable substitute to fibre broadband in the future.

Since fibre is an emerging technology, and because consumer demand is dynamic, investment decisions are also dynamic, ie, what was the optimal, efficient investment decision at one point in time may not represent optimal investment at a later stage. This includes investment in the geographic reach of the network.

A forward-looking regulatory system should promote efficient investment in light of these moving parameters, including investment in the reach of the service. Under-estimating the WACC is likely to delay the roll-out of the UFB in those areas, if Chorus does not have efficient incentives to expand its network as demand and cost conditions change.

The net costs of additional investments not made, or 'future under-investment in the geographic reach of the network' are likely to be asymmetric because:

- efficient expansion of the network to groups that would value the higher-quality service is likely to increase consumer surplus (given the controls over FFLAS pricing relative to VDSL);
- investments in expanding the network to areas that are adjacent to existing fibre areas would have low backhaul costs;
- costs (of a WACC uplift to increase the probability of efficient investment taking place) to existing and new FFLAS end-users is mitigated by anchor services;
- costs per premises passed depend on the circumstances but cost per bit are generally decreasing
- there are social benefits of having more of New Zealand connected to the network that accrue to New Zealand as a whole, not just to the new FFLAS end-users reached by an expansion - these positive externalities include increased measures of digital inclusion;[69]
- there are direct network effects associated with 'any-to-any' connectivity, meaning that if Chorus expanded its UFB footprint beyond the areas for which it has been contracted to deliver fibre, there would be benefits to existing users of the network; and
- while the Rural Broadband Initiative phase two (RBI2) is undertaking efforts to improve broadband connection speeds for areas with the poorest connection, this initiative is not likely to include those areas that are currently well-served by VDSL2 and are considered by Chorus to be marginal investments that may be delayed due to capital constraints.

## 4.3 Consequences of over-estimating the WACC

The consequences of over-estimating the WACC are twofold, as described below.

[68] VDSL2 is an enhancement to VDSL.

[69] Digital inclusion refers to the extent to which a population is able to connect to online communities, information and other services. As data and speed demand continues to increase, digital inclusion is likely to increasingly depend not only on whether or not an individual has access, but on the speed and quality of access.

### 4.3.1 Allocative efficiency costs

The Commission's emerging view is that 'the framework illustrates the significant cost of the uplift'.[70] The Commission goes on to suggest that, under the framework, the direct costs of an uplift are estimated by multiplying the WACC uplift by the RAB over the relevant period.[71]

In our opinion, this approach does not have sufficient regard to the interactions between various components of the proposed regulatory and legislative framework, including:

- the legislative price caps on anchor services;
- the wash-up provisions addressing any over- or under-recovery of revenues, for at least the initial regulatory period; [72]
- geographic consistency of prices; and
- the MAR.

There is some uncertainty as to how the wash-up provisions for over- and under-recovery of revenue under the new Part 6 regulations will work. However, we expect that the effect of a wash-up provision is likely to be to allow Chorus to offset an under-recovery in some years with over-recovery in other years. As a consequence, the revenue cap is most likely to be binding over the life of the project.[73]

The price caps on anchor services (and the constraints that these price caps impose on the pricing of similar services) mean that the consequences of a WACC uplift are unlikely to flow through to increased prices for those services.

As such, incremental revenues allowed under a WACC uplift are likely to be derived through targeting new or higher-value services, or extending the future time period over which unrecovered revenue under the MAR framework can be earned from FFLAS services. Such incremental revenues do not reflect a direct cost of the WACC uplift in the manner envisaged by the Commission in its emerging views paper.

### 4.3.2 Dynamic efficiency costs

The dynamic efficiency costs associated with setting the WACC too high primarily relate to the value of additional resources committed to 'excess' investment, offset partially by the additional benefits to end-users of these additional investments.

There are strong qualitative arguments to suggest that the dynamic efficiency cost of over-investment in the network is smaller than the equivalent dynamic efficiency cost of under-investment.

The asymmetric nature of investment outcomes is well established. In addition to the discussion on this point in sections 2.2, 2.3 and 4.2 above, the Chairman of the Australian Energy Regulator (AER) has said:[74]

> It is recognised that the economic cost of under-investment in services is greater than the economic cost of a small over-investment. This asymmetry is well understood in regulatory economics and is key to the deliberations of regulators. Again, this asymmetry is something that the AER has explicitly acknowledged and addressed as part of our rule change proposal

[70] Commerce Commission, *Fibre regulation emerging views: technical paper*, 21 May 2019, p 122, para 552.

[71] Commerce Commission, *Fibre regulation emerging views*: *technical paper,* 21 May 2019, p 124, para 563.1.

[72] NZCC, *Fibre regulation emerging views,* Summary Paper, May 2019, p 11; Commerce Commission, *New regulatory framework for fibre: Invitation to comment on our proposed approach*, 9 November 2018, p 109, para 7.119.2.

[73] As noted in an earlier footnote, we also acknowledge that there may be a non-negligible probability that the MAR is never binding over the regulatory period. In that case, the link between investment incentives and the WACC is not clear. However, if the MAR is never binding on Chorus, then there would only be a non-zero direct cost of a WACC uplift if the MAR would have been binding in the absence of an uplift.

[74] Reeves, A, *Promoting efficient investment – protecting consumers from paying more than necessary*, AER Chairman's address, AER Public Forum, 23 November 2011.

## 4.4 Weighing the case for an uplift

In the time available to prepare this report, we have not made any attempt to quantify the costs associated with under- and over-estimating the WACC for FFLAS services.

However, on a close examination of the commercial reality faced by Chorus, this report has established that there are likely to be asymmetric consequences of under-investment, and that there is a strong qualitative case for a WACC uplift in respect of Chorus' FFLAS services.

In particular, we have found that the dynamic efficiency costs associated with under-investment are likely to be very large.

The dynamic nature of the supply and demand for FFLAS distinguishes the circumstances of previous WACC percentile decisions in New Zealand. Chorus' investment decisions take place in a context of rapidly increasing bandwidth demand, increasing consumer expectations for quality of service, increasing population density, and dynamic parameters in relation to the costs of providing the service, including the optimal technology to employ to do so.

Chorus' investment decisions are directly linked to its allowed cost of capital. However, other aspects of the regulatory regime, including the anchor services, shelter end-users of FFLAS from bearing the direct costs of an increase to Chorus' allowed cost of capital.

The outcome of under-estimating the WACC and as a direct result, under-investment in FFLAS has a broad reach. Under-investment in reliability may lead to poor network performance including higher incidence of congestion and outages, while under-investment more generally may result in certain groups around New Zealand failing to receive a fibre service within the optimal timeframe, and more generally may slow innovations in telecommunications. The expected dynamic efficiency costs of such under-investment is likely to be very large.

| **Summary of costs and benefits** | Under-estimating the WACC | Over-estimating the WACC |
|---|---|---|
| Allocative efficiency | Benefit to end-users from the potential for lower prices (lower MAR over the life of the project).<br><br>This benefit is mitigated by the price caps on anchor services. | Cost to end-users from the potential for lower prices (lower MAR over the life of the project).<br><br>This cost is mitigated by the price caps on anchor services. |
| Dynamic efficiency | Significant costs to end-users of under-investment. | Small benefit to end-users from additional investment. |

# 5. Response to Chorus' briefing questions

## 5.1 Are potential outages on the fibre access network likely to affect a smaller number of end-users than for specific energy services, namely the electricity line distribution services and gas distribution services?

In its report on WACC percentile for electricity transmission and distribution for the Commission, Oxera assumed a value of $1-$3 billion as an indicative range for the scale of the cost of network outages that could occur as a result of underinvestment.[75] Oxera uses a range of international academic and organisational studies that examine the equivalent annualised effect (ie, cumulative costs of material outages that arise from under-investment measured over a year) and one-off extreme incidents of network failure. The wide range for the estimated cost reflects its indicative nature, which serves as a 'reference point for the Commission'.

Oxera then extrapolates this range to suggest that the estimate is:

> likely to represent an estimate of the scale of the annualised impact of such underinvestment, should it lead to increased network outages, or the potential size of a severe one-off effect.

As Oxera acknowledges, this approach is not designed to be a precise estimate, but simply a reference point for understanding the potential gross scale of the effect of under-investment. It does not make any attempt to connect the probability of underinvestment in electricity lines or gas pipelines to the likelihood of a network-wide failure, and it offers no support for equating the cost of one severe outage to the cost of multiple smaller failures.

Quality outcomes of under-investment in FFLAS differ from electricity line distribution and gas pipeline businesses. Unlike electricity, where outcomes of reliability are primarily limited to 'on/off', fibre broadband outcomes relate to speed and bandwidth as well as simply 'on/off' binary outcomes. It follows that the total cost of fibre quality issues extend beyond the sum of the social cost of each outage, but also include the social costs of services delivered at less than optimal bandwidth and speed. As customer expectations for high-speed reliable internet continue to increase, the social costs of these quality outcomes are also increasing.

The investments that may be compromised by under-estimation of the WACC have the potential for broad reach across Chorus' fibre network. This means that if the risk of under-estimating the WACC is realised, with the direct consequence of under-investment in FFLAS by Chorus, then:

- it is reasonable to expect that the number of reliability issues across the network will be higher than those that would be expected under workably competitive outcomes;
- while individual outages may be local in nature, the sum of these over a period (such as a financial year) are likely to be significant; and
- congestion and other quality-related considerations must be added to the balancing task of weighing the costs of under- and over-investment in light of changing customer expectations for service, a problem faced to a much lesser extent by the energy sector.

Importantly, we note that the framework for assessing the case for a WACC percentile is not designed to be relative to electricity line distribution services and gas distribution services.

We explain in section 4.3.1 that the direct cost of over-estimating the WACC is also likely to be lower than for electricity line distribution and gas distribution services because of the presence of anchor services. The

[75] Oxera, *Input methodologies: review of the '75th percentile' approach*, 23 June 2014, p 44.

framework requires the balancing of net risks of under- and over-estimation of the allowed return for FFLAS, rather than focusing on the absolute value of gross costs and risks.

## 5.2 Is the Commission right or wrong in assuming that FFLAS have more potential for substitution by other services than is the case for specific energy services, and if so why?

The extent to which other technologies are available to mitigate the costs to end-users of outages appears to be overstated by the Commission in its emerging views paper.

This is because, for mobile networks:

- mobile backhaul is carried on the fibre network, meaning that an FFLAS outage may also affect mobile services;
- if mobile networks are not affected by an FFLAS outage, then the network may be able to support a small scale outage, but for larger areas these networks will reach capacity quickly and are likely to suffer from congestion issues; and
- customers' mobile plans are not designed to support the use of internet in the manner that fibre broadband is used.

## 5.3 Is under-investment in FFLAS less likely to be 'hidden' compared to the energy sector?

In the context of WACC percentile decisions, 'investment' has been divided into two key sub-categories, being:

- investment in maintaining and upgrading Chorus' existing network (investment in reliability); and
- investment in new telecommunications services, either by Chorus or by other parties (investment in innovation).

### Hidden investment in reliability?

Although the Commission has opined on the likelihood that under-investment in FFLAS is less likely to be hidden compared to energy, the investment to which it refers relates only to the first type of investment.

We understand that the IM will likely set out the specific quality dimensions and metrics that the Commission would set under the price-quality and information disclosure regimes, including in relation to ordering, provisioning, switching, faults, availability and performance.[76]

### Hidden investment in innovation?

Under-investment in developing and introducing new innovation cannot be detected through quality metrics.

In addition, Oxera noted that technological innovation is especially relevant in the telecommunications sector:[77]

> Although technological innovation might be less relevant in the electricity distribution and transmission sectors than in other sectors, notably telecommunications, there are also risks around not making any allowance for investment in new technology.

[76] Commerce Commission, *Fibre regulation emerging views: technical paper,* 21 May 2019, p 162, para 754.

[77] Oxera, *Input methodologies: review of the '75th percentile' approach,* 23 June 2014, p 46.

In its review of the case for a WACC uplift for UCLL and UBA, Oxera analysed the potential that a regulatory regime which promotes innovation (through a WACC uplift) could accelerate the process of innovation, so that a new technology is introduced in New Zealand earlier if a WACC uplift is applied.

If New Zealand is slow to roll-out a new technology that is observed in other countries, such a lag is not hidden, but the extent to which a slow roll-out is less than optimal is not visible.

Similarly, delays to efficient investment in expanding the geographic reach of the fibre broadband network would also be hidden in the sense that decisions to delay marginal investments are made internally.

## 5.4 Can the existing approach to assessing the asymmetric consequences of under-investment be applied to FFLAS? If so, what evidence is available to inform the inputs to this approach?

The Commission states that the framework requires two specific inputs, being:

- the annual net loss from any under-investment (as a proportion of the size of the RAB); and
- a margin of error term, ie, how far below the true WACC would the regulatory WACC need to be, before under-investment actually occurs.

In our opinion, the existing approach can be used to assess the asymmetric consequences of under-investment – although we would observe that the framework is likely to have substantively underestimated the degree of complexity, uncertainty and informational intensity such analysis will necessarily involve in order for it to be meaningful and informative.[78]

It follows that we would urge the Commission to have regard to the following observations in undertaking such an analysis:

- our impression is that, since the High Court judgment, the WACC percentile debate has shifted towards empirical, quantitative evidence – despite the increased appetite for quantitative rigour, the perceived rigour of an empirical evaluation remains heavily reliant on a range of estimates and assumptions;
- the intrinsic dependency of any dynamic efficiency assessment on estimates and assumptions implies that expectations of outcomes of any quantitative analysis must be realistic, as previously noted by Oxera;
- there is a strong qualitative case for a WACC uplift, particularly in light of the dynamic nature of telecommunications markets; and
- the direct costs of a WACC uplift are likely to be much lower than for other regulated industries, due to the anchor service price caps.

### Commission's approach

The Commission's approach seeks to minimise the following costs:

- the direct costs to end-users from applying a WACC uplift;
- the potential additional costs to users from applying a WACC uplift to new investment;
- the potential forgone benefits from investment in new technology being delayed or not occurring.

The Commission has indicated that the direct costs of an uplift will be estimated as follows:[79]

$$Direct\ cost = RAB(w - w_0),$$

[78] See: NERA, Determining the appropriate percentile for setting the regulatory WACC: a report for Power, 30 April 2014, p 26.

[79] EV para 563 p 124.

Where RAB is the regulatory asset base, $w$ is the allowed WACC, and $w_0$ is the mid-point WACC.

However, this equation materially overstates the direct costs of a WACC uplift in the presence of anchor services. We understand from Chorus that around [redacted] of FFLAS end-users use anchor services and so would not face the direct costs of a WACC uplift.

Any estimate of the direct costs to end-users of a WACC uplift should be discounted by the proportion of end-users using anchor services over the period. One simple approach would be to revise the direct costs as follows:

$$Revised\ direct\ cost = RAB(w - w_0)(1 - a),$$

Where $a$ is the best estimate of the proportion of users that would demand an anchor service at the prices that would prevail under $w_0$.[80]

### Annual net loss

Annual net loss to users of under-investment includes:

- social costs of outages, congestion, faults and other reductions in quality that would have been avoided if Chorus had invested in the optimal amount of reliability/resilience – we noted in section 5.1 above that, unlike electricity, the social costs of under-investment are not restricted to binary 'on/off' outcomes; and
- social costs of under-investment in new technologies, including in bringing forward the roll-out of technologies and innovations implemented in other areas, and expansions to the geographic reach of the network.

We are not aware of any robust attempts to estimate these costs. We expect that efforts to quantify these costs would represent an order-of-magnitude indicator only, as was the case in Oxera's analytical framework by using an $1-$3 billion estimate of the size of potential outages in electricity.

### Margin of error

In principle, companies will undertake only those investments that have a positive NPV, ie, where the expected rate of return is higher than the cost of capital. Projects are required to meet a certain hurdle rate that obtains a minimum level of return for an investment/project to proceed.[81]

Notwithstanding the above, we note that, in the context of Part 4 decisions for electricity and gas, the Commission has made an allowance for a 'margin of error' between the allowed WACC and the true cost of capital, before which there would be no effect of under-estimating the WACC on investment decisions. [82] For example, under the assumption of an one per cent margin of error, 'the allowed WACC needs to be approximately one per cent below the WACC predicted by the model for an under-investment problem to occur'.[83] In the context of decisions for electricity and gas, the Commission assumed that a sustained differential of 0.5 – 1 per cent between the true cost of capital and the allowed WACC could trigger a material under-investment problem.[84]

Oxera described this logic as follows:[85]

> it is not necessarily the case that companies would stop carrying out all investment necessary to maintain service levels and reduce the risk of network outages as soon as the allowed WACC was

[80] This accounts for distortions created by customers that switch to the anchor service in the event of higher prices for non-anchor services under a WACC uplift.

[81] Damodaran, A, *Investment valuation*, John Wiley and Sons, United States, 2012, p 781.

[82] Commerce Commission, *Input Methodologies – Topic paper 6: WACC percentile for airports*, 20 December 2016, para 149.

[83] Commerce Commission, *Agenda and topics for the conference on the UCLL and UBA pricing reviews*, 2 April 2015, para 112.

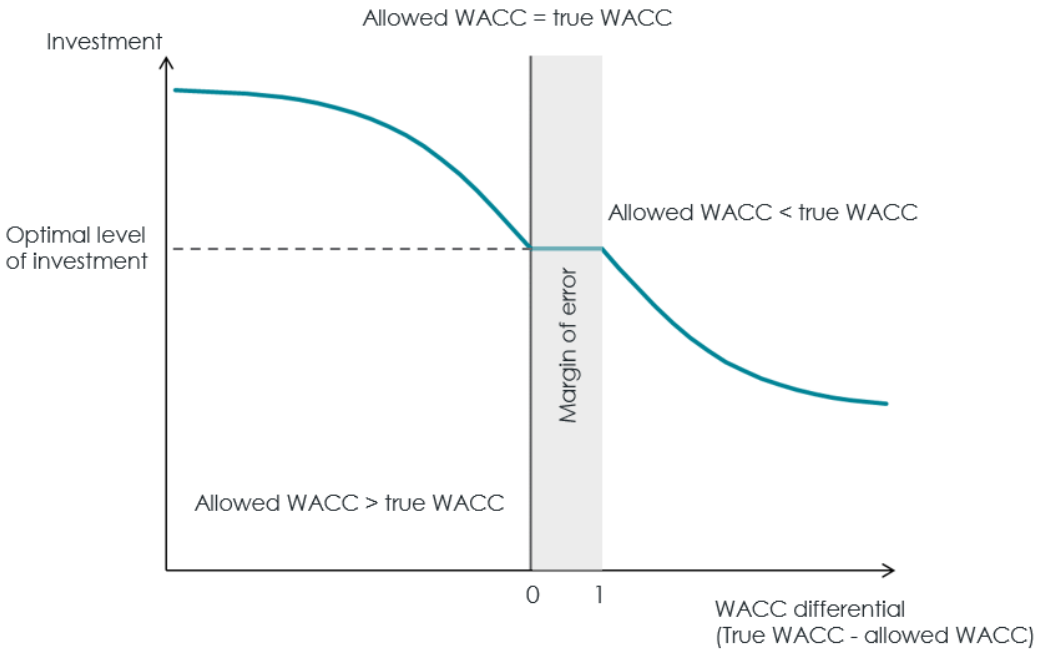
[84] Oxera, *Is a WACC uplift appropriate for UCLL and UBA?* June 2015, p 31.

[85] Oxera, *Is a WACC uplift appropriate for UCLL and UBA?* June 2015, p 31.

> expected to be below the true WACC. Rather, there needed to be a sustained margin between the allowed WACC and the true WACC for the under-investment problem to be triggered

Figure 5.1 demonstrates the assumed nature of the relationship between the WACC differential and investment under the Commission's margin of error framework, assuming an one per cent margin of error.

Figure 5.1 Assumed relationship between WACC differential and investment with an one per cent margin of error




*Source: HoustonKemp interpretation of Oxera/Commission margin of error framework. Notes: that this is a stylized representation for illustrative purposes only. Oxera did not state any assumptions about the slope of the curve in the area for which the allowed WACC exceeds the true WACC.*

We are not aware of any evidence underpinning the estimated size of the margin of error. Rather, in the context of energy businesses, this was an assumption made in the Oxera analytical framework, without any empirical or factual support. This concern has been raised by commentators to previous WACC decisions. For example, Sapere stated that:[86]

> Oxera provide no evidence to support their contention that setting a regulatory WACC up to 0.5 per cent below actual WACC would have no impact on investment. The Commission offers no explanation as to why it adopts Oxera's instinctive approach and drops its presumption to date that setting the regulatory WACC below the actual WACC would have adverse incentives for investment.

HoustonKemp has previously provided comments on the margin of error in the context of electricity lines services and gas pipeline services.[87] We stated that while a general relationship between the magnitude of the impact on investment decisions would increase with the differential in allowed and true WACC, the true relationship between under-investment and a WACC differential is likely to be more complex than that which the Oxera analytical framework proposes.[88]

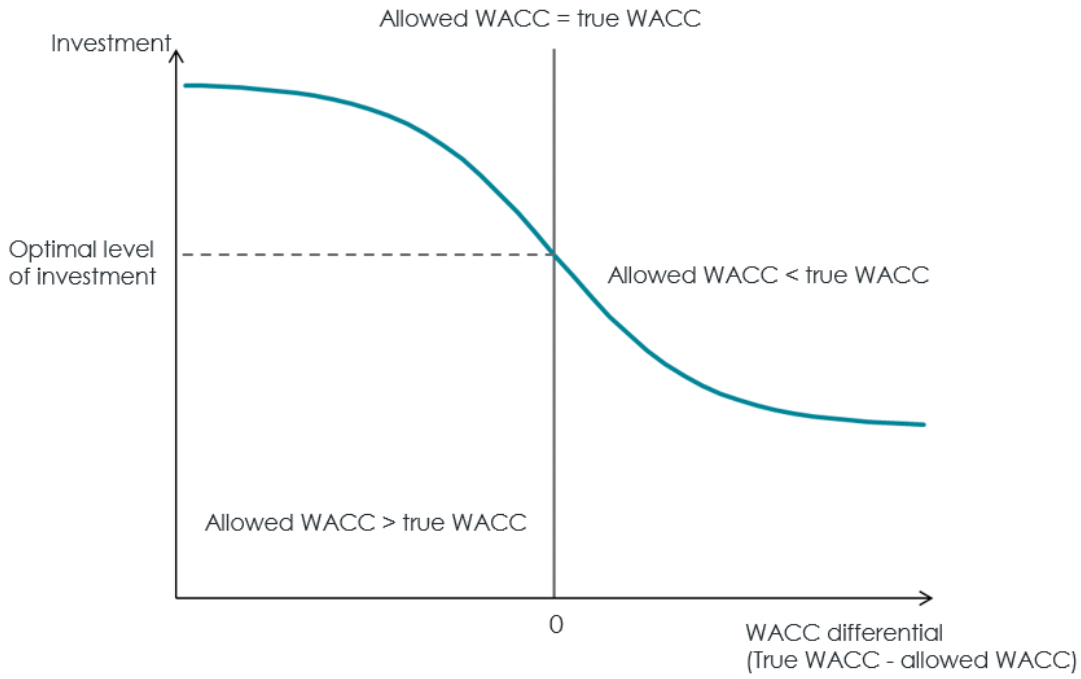
[86] Sapere, *Proposed amendment to the WACC percentile - Commerce Commission's draft decision*, 29 August 2014, pp 18-19.

[87] HoustonKemp, *Comment on the Commerce Commission's Proposed WACC Percentile Amendment*, August 2014, pp 22-25.

[88] HoustonKemp, *Comment on the Commerce Commission's Proposed WACC Percentile Amendment*, August 2014, p 22.

Figure 5.2 provides what may be a more appropriate depiction of the relationship between the WACC differential and investment (with no margin of error).

Figure 5.2 Postulated relationship between WACC differential and investment




We are not aware of any persuasive logic or evidence to suggest that there would be a material margin of error in Chorus' investment decisions. This is primarily because:

- unlike airports, Chorus does not derive material revenue streams through complementary services that would incentivise investment; and
- where an asset base is developing, ie, not all the investment has yet been sunk, there is a strong reason to expect that the firm is closely tuned in to the margin for discretionary investment (relative to investments in maintaining a sunk, fixed asset).

As such, we believe that Chorus would be cognisant of their true WACC and highly sensitive to any WACC differential. There does not appear to be any strong support for the presence or quantum of such a 'margin of error'.

## 5.5 How should the Commission assess the cost of any WACC uplift given the legislative framework for anchor services?

Anchor services are designed to ensure that basic broadband services are available to end-users at reasonable prices, and to act as an appropriate constraint on the price and quality of other FFLAS.[89] We explain above that the presence of anchor services mitigates the direct cost of a WACC uplift to end-users, and reduces the likelihood that Chorus will be able to recover the MAR through the price of FFLAS.

Given this consideration, there is a likelihood that a WACC uplift would serve to incentivise further investment in the short-term, in exchange for increasing Chorus' ability to recover revenue in the future. This

[89] *Telecommunications Act 2001*, s 208(7).

trade-off differs from other recent WACC uplift decisions, and the Commission's assessment of the cost of a WACC uplift must have regard to these circumstances.

Table 2.1 in section 2.3 and reproduced below illustrates the effect that anchor services has on the weighing of costs associated with under-estimating the WACC and over-estimating the WACC, making the case for a WACC uplift much clearer by mitigating the allocative efficiency considerations involved in the trade-off between different potential costs of a WACC uplift.

| **Summary of costs and benefits** | Under-estimating the WACC | Over-estimating the WACC |
|---|---|---|
| Allocative efficiency | Benefit to end-users from the potential for lower prices (lower MAR over the life of the project).<br><br>**This benefit is mitigated by the price caps on anchor services.** | Cost to end-users from the potential for lower prices (lower MAR over the life of the project).<br><br>**This cost is mitigated by the price caps on anchor services.** |
| Dynamic efficiency | Significant costs to end-users of under-investment. | Small benefit to end-users from additional investment. |

HOUSTONKEMP
Economists

**Sydney**
Level 40
161 Castlereagh Street
Sydney NSW 2000

Phone: +61 2 8880 4800

**Singapore**
8 Marina View
#15-10 Asia Square Tower 1
Singapore 018960

Phone: +65 6817 5010