Final report for Spark New Zealand and Vodafone New Zealand

Commerce Commission Draft Determination for UCLL and UBA

A review of key issues

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NETWORK STRATEGIES
• Telecommunications Strategy •

0 Executive summary

The Commerce Commission aims to develop a mid-point estimate of the true TSLRIC (Total Service Long Run Incremental Cost) cost of providing UCLL (Unbundled Copper Local Loop) and UBA (Unbundled Bitstream Access) services for its FPP (Final Pricing Principle) price review. As such it has developed a techno-economic model of a hypothetical efficient operator (HEO) deploying a Modern Equivalent Asset (MEA) network. The model encompasses a number of key assumptions based on the Commission's decisions regarding the local conditions or environment that the HEO encounters in present day New Zealand.

Our review of the Commission's key model assumptions indicates that the calculated point estimates in fact approach an upper bound, and we have provided recommendations to rectify this in order that the Commission may achieve its stated objective of a mid-point estimate.

Conservative and unrealistic constant demand assumption	The Commission should modify its model to incorporate short- and medium-term demographic trends. As it stands the Commission has not considered the impact of population growth or the availability of fibre services over the relatively long five-year regulatory period. Consequently estimated costs per line may be inflated by around 9%.
Conservative Fixed Wireless Access footprint	The Commission should remove the RBI (Rural Broadband Initiative) as a reference point for the modelled FWA footprint. The Commission admits its approach in this respect is conservative but fears that to do otherwise may lead to inconsistencies with observed network deployment in New Zealand. However consistency with

observed network deployment in New Zealand would require consideration of real world subsidies, given that Government funding initiatives have driven both Ultra Fast Broadband (UFB) and RBI deployment.

Inefficient fibre deployment within the RBI boundary

The HEO in the Commission's model does not deploy solely FWA within the RBI boundary, but an inefficient mix of FWA and fibre. The Commission should either amend its approach or ensure that an appropriate subsidy is applied to such deployment

Uneconomic extent of HEO's fibre footprint

The Commission characterises the HEO as a rational profit maximiser, yet it is clear that such an entity would not deploy a fibre network to the extent assumed in the Commission's model without some form of subsidy. We recommend that an appropriate subsidy is accommodated within the model if the Commission is to retain its proposed fibre footprint. We estimate this should be approximately $813 million to achieve the fibre footprint of the Commission's draft model.

Underestimate of RBI subsidy

While the Commission's model does include an allowance for RBI funding, these calculations should be revised. Given that Chorus' total RBI funding is $236 million (with the possibility of an extension of up to $150 million), arguably the Commission should allow in its model significantly more than it has already if it continues to assume fibre is deployed in RBI areas.

Inclusion of inefficient trenching costs

Trenching costs and trends should be modified to ensure accuracy and efficiency. An HEO deploying a nationwide network would be expected to achieve volume and / or scale discounts for trenching costs, yet empirically observable discounts of 20% have not been included in the Commission's analysis. In addition, the price trend for trenching has been inflated, and the impact of short-term market distortions on trenching contractor supply appear to have been included.

WACC does not represent a mid-point estimate

Some WACC parameters should be reconsidered to avoid an over-estimate as a result of:

- the inclusion of a weighting for the asset beta sample observations from the five years to 2009
- lack of matching of regulatory period with the debt premium term
- an over-estimate of the debt premium.

Reliance on Chorus' accounting asset lives

The Commission should eliminate its reliance on Chorus' accounting values for asset lives, as it is not necessary to incorporate any allowance in the model for the risk of asset stranding. We know of no precedent for this in models of this type, and the TSO precedent cited by the Commission appears to be inappropriate.

Although we believe that implementation of our recommendations will to a certain extent remedy the upward bias of the Commission's model results, there are two further assumptions which we assume are unlikely to be changed at this stage and therefore will ensure that the final estimate remains conservative. These are:

- the use of Optimised Replacement Cost (ORC) for asset valuation – the Commission's own expert states that the Commission's approach will result in a higher price than would have been the case had it adopted the methodology recommended by the European Commission
- the modelled technology assumptions – the Commission selected a higher cost P2P rather than GPON technology for its fibre MEA.

In addition to the above recommendations, we have made a number of suggestions to improve the accuracy of the Commission's model, including assumptions regarding aerial deployment, sharing and price trends.

Finally, we recommend that the Commission disregards the alternative model submitted by Chorus as it does not reflect the efficient deployment of an HEO's MEA network.

Commerce Commission Draft Determination for UCLL and UBA

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1 Introduction

The Commerce Commission simultaneously published its Draft Determinations for the Unbundled Local Loop (UCLL)[1] and Unbundled Bitstream Access (UBA)[2] pricing reviews on 2 December 2014, accompanied by a techno-economic model and documentation by TERA Consultants[3]. The Commission also published its draft decision on the cost of capital for the pricing reviews[4], together with supporting consultant reports[5], and its tax model[6]. An additional consultant report was provided relating to the cost of trenching and

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1 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014.

2 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled bitstream access service*, 2 December 2014.

3 TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Model reference paper, November 2014; TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Model specification, November 2014 and TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Model documentation, November 2014 and TERA Consultants (2014).

4 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014.

5 Lally (2014), *Review of responses to review of submissions on the cost of debt and the TAMRP for UCLL and UBA services*, 20 August 2014; Oxera (2014), *Review of expert submissions on the WACC for UCLL/UBA*, 4 November 2014; Vogelsang (2014), *Report on several submissions in the FPP proceeding for UCLL,* 6 November 2014 and Vogelsang (2014), *Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand,* 25 November 2014.

6 Commerce Commission (2014), *Formula to model tax in the TSLRIC model*, 2 December 2014.

ducting in New Zealand[7]. In addition presentations related to the documents released by the Commission and TERA Consultants were also published.[8]

Network Strategies has reviewed selected aspects of the Commission's Draft Determinations and associated material on behalf of Spark New Zealand (Spark) and Vodafone New Zealand (Vodafone).

Our team has had the benefit of access to confidential information (CI) and restricted information (RI) used in the modelling process. In keeping with our confidentiality undertakings any CI and RI quoted in this report is marked as such with square brackets. The report also includes Vodafone confidential data which is marked VCI.

1.1 Background

As described in the Draft Determinations, the Commission has developed a TSLRIC model of the network of a hypothetical efficient operator (HEO) that delivers UCLL and UBA services.

The model is intended to be forward-looking and based on modern equivalent assets (MEAs). The Commission states that the network is not based on Chorus' network and it is:

> …a hypothetical efficient network that replaces the copper network and the LFC [Local Fibre Companies] fibre networks currently being rolled out.[9]

7 Beca (2014), *FPP corridor cost analysis of trenching and ducting rates in NZ – Final Issue Nov14*, 25 November 2014.

8 Commerce Commission (2014), *Draft final pricing principle determination of UCLL and UBA prices*, 2 December 2014 and TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Presentation of the UCLL and UBA TSLRIC models, 2 December 2014.

9 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, page 11.

The Commission's model delivers the UCLL service via fibre-to-the-home (FTTH) and, in the areas of the RBI footprint, fixed wireless access (FWA). The modelled UBA service is delivered via a fibre-to-the-node (FTTN) network that resembles Chorus' actual network[10].

1.2 Structure of report

This report reviews the following aspects of the Commission's Draft Determinations:

- demand (Section 2)
- subsidies (Section 3)
- trenching and terrain (Section 4)
- aerial deployment (Section 5)
- price trends (Section 6)
- financial parameters (Section 7)

Chorus has commissioned its own consultants to develop a cost model. This model and associated documentation has also been made available to Network Strategies, and we provide our comments on this in Section 8.

In Section 9 we provide brief comments on a number of other issues that have not been addressed elsewhere, and finally in Section 10 we summarise our conclusions and recommendations.

The Annex contains details of our methodology for quantification of subsidies for fibre deployment beyond commercially attractive areas.

It should be noted that in a separate report[11] Network Strategies has also reviewed the Commission's approach to Fixed Wireless Access (FWA) modelling, and provided detailed recommendations to strengthen the Commission's analysis.

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10 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled bitstream access service*, 2 December 2014, paragraphs 263-264.

11 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015.

Although this report was commissioned by Spark and Vodafone the views expressed here are entirely our own.

2 Demand

2.1 Network footprint

The Commission defines a network footprint, outside which it considers that the HEO is unlikely to deploy network without a capital contribution. This footprint takes as a starting point the coverage of Telecommunications Service Obligation (TSO) services – that is, network coverage as at 2001:

> We establish a TSO-derived boundary based on the area defined in the TSLRIC model used for TSO. Each segment within the road network model was tagged with a TSO value of 'True' if 50% or more of its spatial definition fell within one or more of the convex polygons we calculated based on (December 2001) data about the extent of Telecom's network, otherwise the segment's TSO value was set at false. The convex polygons were derived from the historic customer locations for each exchange area which were grouped into clusters.[12]

Thus the TSO-derived boundary, or investment boundary, encompasses a slightly larger area than that bounded by TSO services.

We sought to clarify the treatment of the costs associated with the Commission's current demand via the following flowchart (Exhibit 2.1). For connections outside the investment boundary – comprising around 6.4% of total connections[13] – the demand and operating

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12 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, footnote 167.

13 *Ibid*, paragraph 322.

costs are included within the model, but the capital costs are excluded. These capital costs for the HEO are assumed to be fully offset by a capital contribution by the end-user. This also appears to be the approached taken within the model itself.

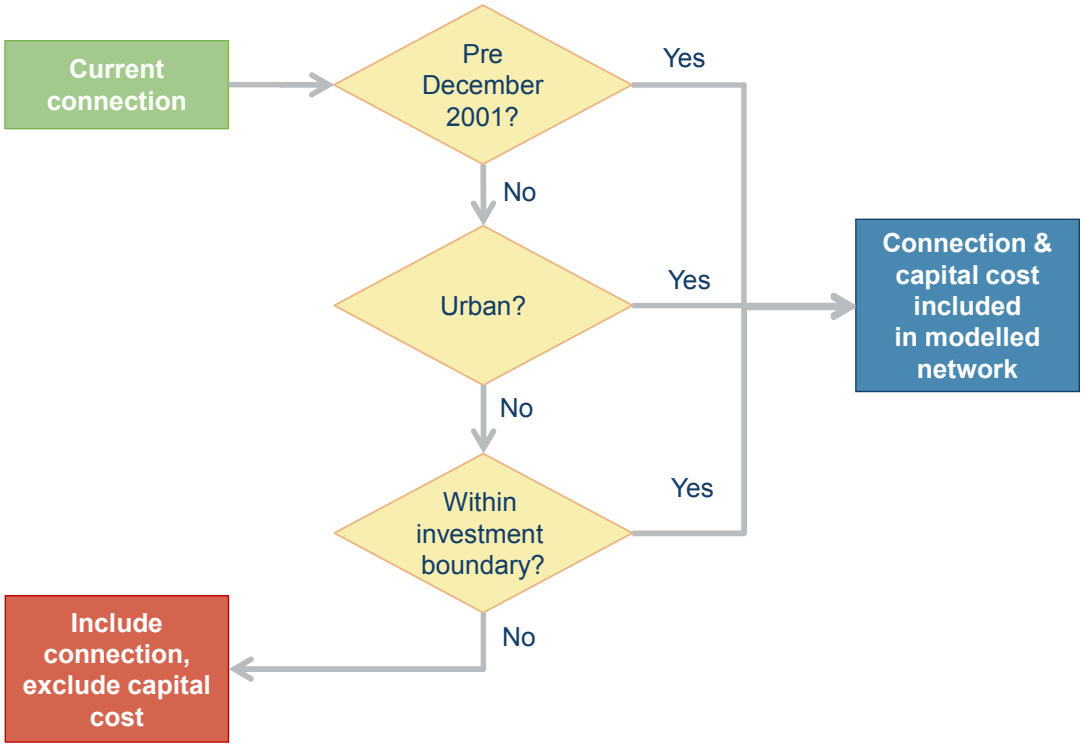

Exhibit 2.1: *Commission's approach to defining the network footprint [Source: Network Strategies]*

However the Model Reference Paper differs with regard to this definition of the network footprint, as it claims:

> In the base case scenario, only the areas inside the TSO-derived boundary are taken into account to calculate the results.

> The scope of the cost modelling can be extended to the areas outside the TSO-derived boundary. In such scenario, the FWA coverage areas are based on the actual coverage, including the areas outside the TSO-derived boundary.[14]

Thus there appears to be a mismatch between the model documentation and the model. This apparent contradiction – stating that some areas outside the TSO boundaries may be included, while in the same document that for the base case only areas inside the TSO boundaries are included – needs to be clarified further to avoid any confusion over the model scope.

2.2 Alternative services and demand migration

Given a network footprint, the next step for the Commission is to establish the demand within that footprint that will be assigned to the HEO.

UFB Ultra-Fast Broadband (UFB) demand is included within demand for the HEO, as the Commission considers quite rightly that the HEO's network deployment will eliminate the need for the UFB.

HFC Demand for HFC services is excluded from the cost allocation process. There may be inactive connections to premises that are active HFC subscribers, however the Commission states the cost of these must be borne by active connections.

We agree with this approach. This was discussed in more detail in our cross-submission on the FPP regulatory framework:

> For the purposes of dimensioning an access network and estimating the total costs, the modeller must incorporate forecasts for premises passed. Premises passed will define the footprint of

[14] TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services: Model Specification*, page 77.

> the hypothetical efficient operator's network and as such will represent its addressable market…
>
> … The second type of demand required for modelling is required for the allocation of the total costs of the hypothetical network operator to the services that utilise its network assets. In simple terms, total costs must be divided by the number of [active] services to obtain a cost per unit demand.
>
> Clearly, these services will include some proportion of the hypothetical efficient operator's addressable market for access services – it will not be 100% as there are alternative network providers in some areas (HFC and non-Chorus LFCs).[15]

However we disagree with the Commission's view that migration will not occur. Wholesale and retail providers will seek to grow market share and maximise returns on assets, and will devise a range of packages to attract various market segments. Hence there will be some migration between HFC and the HEO. We suggest that for the purposes of regulatory modelling an appropriate assumption would be zero net migration and that the Commission notes the possibility of some churn occurring between HFC and the HEO.

FWA RBI

Demand for FWA RBI is included within UCLL demand, but is excluded from UBA demand. This is a direct result of the Commission's decision to assume that Chorus' copper network is a given for UBA services.

Effectively, this means that the analysis for UBA is based on a different network base than for UCLL.

15 Network Strategies Limited (2014), *Cross-submission for consultation on UCLL and UBA FPP regulatory framework*, 20 August 2014, Section 3.1.

Mobile and non-RBI fixed wireless

The Commission states that it has not included mobile or non-RBI FWA substitution, however as is outlined in more detail below, the Commission's assumption of constant demand for UCLL and UBA in effect is directly equivalent to projecting significant increases in fixed-mobile substitution.

Hence the Commission is incorrect in its claim that mobile or non-RBI FWA substitution has not been included.

In our view, fixed-mobile substitution should be explicitly addressed, rather than simply being a by-product of various other modelling assumptions.

2.3 Demand projections

UCLL

The Commission, in its Draft Determination, characterises demand for the HEO as:

- instant take-up of demand on the network
- a fully-loaded network
- constant demand during the five-year regulatory period.

Demand for fixed services is influenced by:

- changes in the number of premises, typically in response to population growth and economic conditions
- affordability of the fixed service
- migration to alternative services, such as fixed-mobile substitution.

Fixed line connections have remained stable for a number of years (Exhibit 2.2). During that same period the number of fixed broadband connections has increased steadily and by 2013 comprised over 71% of all fixed lines. Note that we have not been able to find any definition of the precise point in time that specifies the Commission's "constant demand".

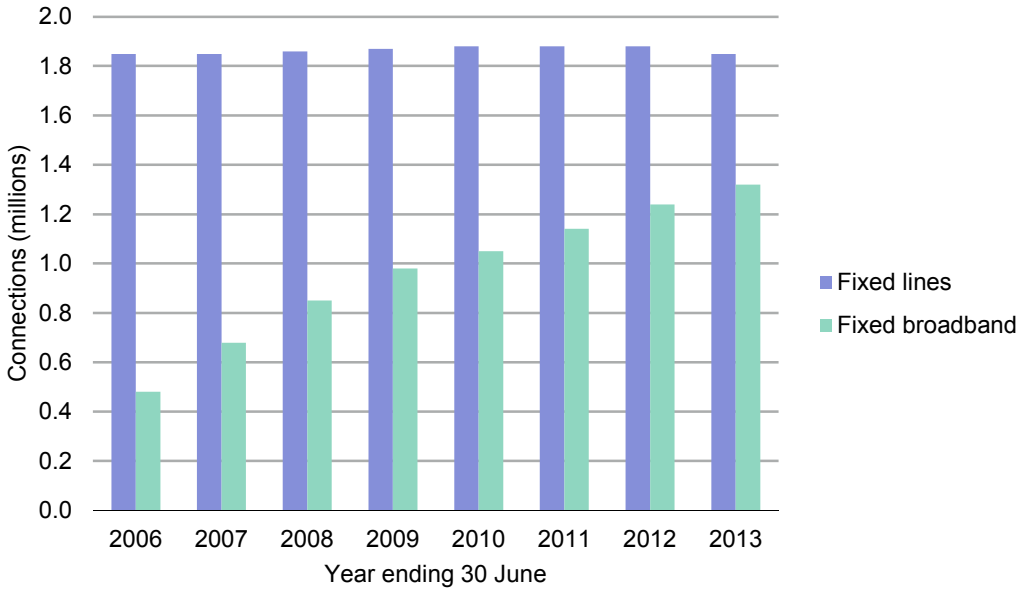

Exhibit 2.2: *Demand for fixed lines and fixed broadband connections, 2006 to 2013 [Source: Commerce Commission]*

According to the Commerce Commission[16], the number of fixed lines has been stable since the late 1990s. Over the period 1999 until 2014, the number of households has increased by 272 500[17], or 19.5%. Clearly, given the long term slow decline in household size, the communications needs of a significant proportion of the population are being met solely by mobile services rather than the traditional fixed line.

In the latest population projections from Statistics New Zealand[18], it is expected that there will be an additional 312 900 people gained over the period from 2014 to 2020, which is equivalent to slightly more than the current combined population of Wellington and Lower

16 Commerce Commission (2010), *Annual Telecommunications Monitoring Report 2009*, April 2010. See Figure 5.

17 Statistics New Zealand (2015) *Dwelling and Household Estimates: December 2014 quarter*, 9 January 2015.

18 Statistics New Zealand (2014), *National Population Projections: 2014 (base) – 2068*, 28 November 2014. Our analysis is based on the median projection.

Hutt. This will translate into more than 115 000 households, if we assume a constant household size.[19]

So what are the implications of the constant demand assumption in terms of the New Zealand market? In effect the Commission is stating that there will be ongoing growth in mobile-only[20] households, with these to comprise well over one-fifth of all households[21] by 2020. Note that the proportion of households without a fixed line has increased from 8.4% in 2006 to 14.5% in 2013.[22]

Furthermore, this assumption implies that the availability of fibre will have little or no effect on the decision to retain or acquire a fixed line connection. While we recognise that the fixed line market has been stable for many years, the deployment of fibre combined with the increasing popularity of high bandwidth applications and in particular cloud services could be expected to stimulate demand for fixed line connections over the regulatory period.

We note the difficulty of incorporating population growth – or more precisely, growth in dwellings and commercial buildings – in a detailed geospatial model such as that constructed by TERA. To accommodate population increases the model would need to specify the locations where growth was to occur in order for costs to be determined. This is certainly a non-trivial task.

We can therefore understand that a pragmatic decision would be to assume constant demand. However this is associated with the risk that demand will be under-estimated, and the resultant price – or cost per unit demand – over-stated.

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19 In fact, household size is decreasing gradually, so our estimate in the increase in households is conservative.

20 Mobile-only does not include households with FWA connections.

21 This is based on Statistics New Zealand population projections and our estimate of the increase in households from 1999 to 2020.

22 Statistics New Zealand (2015), *2013 Census QuickStats about transport and communications*, February 2015. Statistics New Zealand did not report on mobile-only households.

Even testing the model's sensitivity to demand (in terms of the number of connections) would be problematic, and so it may not be possible to quantify the effect of the Commission's constant demand assumption.

A constant demand scenario also ignores the recent trend for population growth in urban areas to be addressed via infill housing and medium density developments in business areas. This is particularly pronounced in Auckland, which is home to more than one-third of New Zealand's people[23]. In its proposed Auckland Unitary Plan, Auckland Council states:

> As Auckland continues to grow, intensification will occur in both existing and new areas. The quality of this more compact development is critical to good public and private amenity. Intensification must also make the best use of resources, integrate with networks and services, and provide for safe and healthy lifestyles. In support of this, the plan defines Auckland's Rural Urban Boundary (RUB) which targets development in appropriate locations, rather than enabling continuous outward urban growth.[24]

Furthermore:

> Opportunities for growth around all edges of the urban area are limited. Auckland's geography limits our supply of suitable greenfield land. The coastline and significant park areas in the Waitākere and Hunua ranges constrain the expansion of the existing metropolitan area in a number of areas. Development must also optimise the investment of infrastructure and utilities, and not cause the need for ineffective or less cost effective forms of development.[25]

Thus the over-arching premise of the Auckland Unitary Plan is the necessity for Auckland to develop as a "well-located and designed compact urban form":

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23 Statistics New Zealand (2014), *Subnational Population Estimates: at 30 June 2014*, 22 October 2014.

24 Auckland Council (2013), *The Proposed Auckland Unitary Plan*, 30 September 2013, Part 1, Chapter A, Section 1.4.

25 *Ibid*, Part 1, Chapter B, Section 1.1.

> The objectives and policies recognise the need to focus residential intensification within the metropolitan area 2010 and within centres. The benefit of this policy approach is that it provides for more efficient use of existing infrastructure and services and enables people to be closer to employment opportunities.
>
> The policy approach focuses urban activities to identified areas, rather than urban activities developing in an ad hoc manner in the rural environment. It also focuses infrastructure investment in identified locations and supports the development of identified growth areas or existing towns and serviced villages.[26]

A more concrete objective of the Plan[27] is that up to 70% of new dwellings by 2040 will be within metropolitan area 2010[28]. Consistent with the premise of the compact urban form, the Plan also seeks to encourage commercial intensification in the city centre, metropolitan and town centres, as well as identified growth corridors.[29]

While the thirty-year scope of the Auckland Unitary Plan is far longer than the Commission's five-year regulatory period, there will still be a material effect on Auckland's population and population density over the remainder of this decade. Auckland's population is growing faster than the national total, and given its geographic constraints the projected increase in population over the next five years will translate into greater density.

In an interview on National Radio's morning report on 19 January 2015, Auckland Mayor Len Brown stated, given the number of building consents recently issued in Auckland, that:

> I would expect we'd be over 10 or 11,000 houses and units built this year.

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26 *Ibid*, Part 1, Chapter B, Section 2.1.

27 *Ibid*, Part 1, Chapter B, Section 2.3.

28 This is defined as "An area identified on the Planning Maps showing the urban areas of metropolitan Auckland, including Orewa and Whangaparaoa and Waiheke Island, as at 2010. 2010 provides a baseline for monitoring future urban growth that will be either inside or outside this area." *Ibid*, Part 4 – Definitions.

29 *Ibid*, Part 1, Chapter B, Section 3.1.

Between the Census years of 2006 and 2013 almost half (47%) of New Zealand's population increase was in the Auckland region. Furthermore almost half (47%) of the increase in Auckland households was located in just 30 of its 437 areas (Exhibit 2.3). Note that only half of these areas are characterised by greenfields developments – the remainder are established areas that have absorbed this growth through infill and medium or high density developments.

Rank	*Area*	*Households*			*Characteristics*
		2006	*2013*	*Increase*	
1	Auckland Central West	3735	5367	1632	High density apartments
2	Auckland Central East	3252	4548	1296	High density apartments
3	Ormiston	255	1317	1062	Greenfields (Flat Bush)
4	Auckland Harbourside	1299	2094	795	High/medium density
5	Stonefields	75	744	669	Greenfields
6	Baverstock Oaks	1179	1812	633	Greenfields (Flat Bush)
7	Orewa	3213	3843	630	Infill/medium density, with some Greenfields also*
8	Mission Heights	15	624	609	Greenfields (Flat Bush)
9	North Harbour West	849	1446	597	Greenfields
10	Greenhithe	2022	2574	552	Established area
11	Pukekohe North	2412	2931	519	Established area
12	Beachlands-Maraetai	1809	2313	504	Greenfields
13	Fairview	450	948	498	Greenfields
14	Newmarket	663	1161	498	Medium density
15	Donegal Park	1470	1920	450	Greenfields*
16	Northcross	1113	1545	432	Established area
17	Pukekohe West	2166	2592	426	Established area
18	Silverdale Central	192	558	366	Greenfields*
19	Takanini South	1131	1491	360	Greenfields (Addison)
20	Mt Wellington West	837	1185	348	Established area
21	Hingaia	225	552	327	Greenfields*
22	Albany	765	1083	318	Greenfields*
23	Pinehill	765	1080	315	Established area
24	Sturges North	1812	2127	315	Greenfields
25	Westlake	1782	2091	309	Established area
26	Totara Heights	1485	1794	309	Established area
27	Eden Terrace	846	1110	264	Infill
28	Warkworth	1308	1566	258	Established area
29	Tauhoa-Puhoi	1428	1686	258	Greenfields
30	Mcleod	1821	2079	258	Infill/medium density**

* Centre for Housing Research Aotearoa New Zealand (2010), Auckland region housing market assessment, available at http://www.chranz.co.nz/pdfs/auckland-region-housing-market-assessment-report.pdf.

** BRANZ (2014), Trends in new residential construction in Auckland, available at http://www.branz.co.nz/cms_show_download.php?id=933b142299b28c52da17492f80a6689fdc40d287.

Exhibit 2.3: *Top 30 Auckland areas based on increase in households from 2006 to 2013 [Source: Statistics New Zealand, Network Strategies]*

Building consents in the Auckland region have increased steadily from the low in 2009, with over 6900 consents over the year to November 2014 (Exhibit 2.4). Note that 26% of these consents are for apartments (which are defined as ten or more dwellings on a single site).

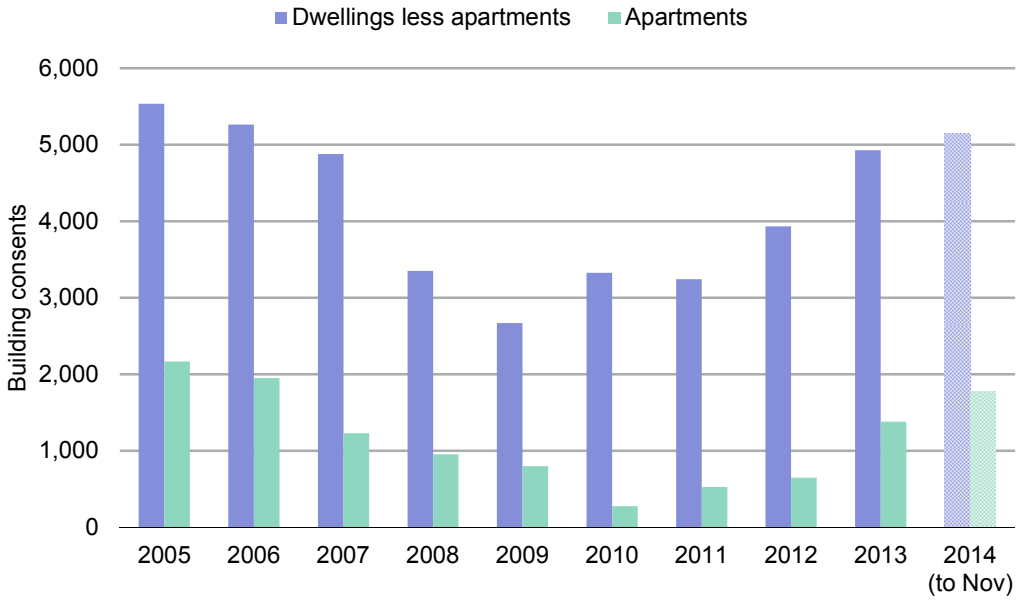

Exhibit 2.4: *Building consents in the Auckland region, 2005 to 2014 [Source: Statistics New Zealand]*

Based on this information we can only conclude that with increasing densification in Auckland over the regulatory period there will be significant growth in demand for fixed lines in areas where there is existing network. This growth may well exceed that in greenfields areas, as opportunities for such developments become more limited.

The aim of a compact city with increased densification is not restricted to Auckland. Wellington, already a compact city due to geographical constraints, is expected to become more densely populated. Wellington City Council notes:

> Since 2007, there have been more new central city apartments, medium-density (townhouse and smaller apartment complexes) and infill housing built, than traditional stand-alone

(greenfield) housing. This trend is expected to continue and we expect 25 percent of new housing to be low-density; 35 percent medium-density; and 40 percent high-density.[30]

A key input to the TERA model is the CoreLogic address database, which is used by the model to estimate the location of buildings. This database was current as at 4 April 2014[31], so will be almost 18 months old by the time of the final determination. By the end of the regulatory period, it will be over six years old. With the increases in population density in the major urban areas over this period, the address database will not be a realistic representation of New Zealand line density.

UBA

If the model assumed non-constant demand projections for UCLL, it would then be necessary for the Commission to consider how this would affect demand for UBA for the hypothetical operator. In this instance, constant UBA demand may not be appropriate. To achieve the Commission's objective of an efficient outcome, an increasing UBA demand may be required.

However given the difficulties in incorporating non-constant UCLL demand within the model, the Commission may need to continue with the constant demand assumption for both UBA and UCLL.

Independent projections

Market analysts IDC publish detailed forecasts for the New Zealand market. While it predicts fixed line voice connections will continue to decline over the period 2013-18 (with an annual average decrease of 5.6%), broadband connections are expected to increase, with a compound average growth rate (CAGR) of 3.0%.[32]

30 Wellington City Council (2014), *Wellington Urban Growth Plan 2014 – 2043*, draft.

31 Commerce Commission (2015), communication with Network Strategies.

32 IDC (2014), *New Zealand Telecommunications Forecast 2013-2018*.

While annual growth of 3.0% appears extremely modest, this translates into an increase of 223 000 broadband connections, or 16%, over this period (Exhibit 2.5). It should be noted that IDC's projections are based on a more modest growth rate for population than the latest projections from Statistics New Zealand[33].

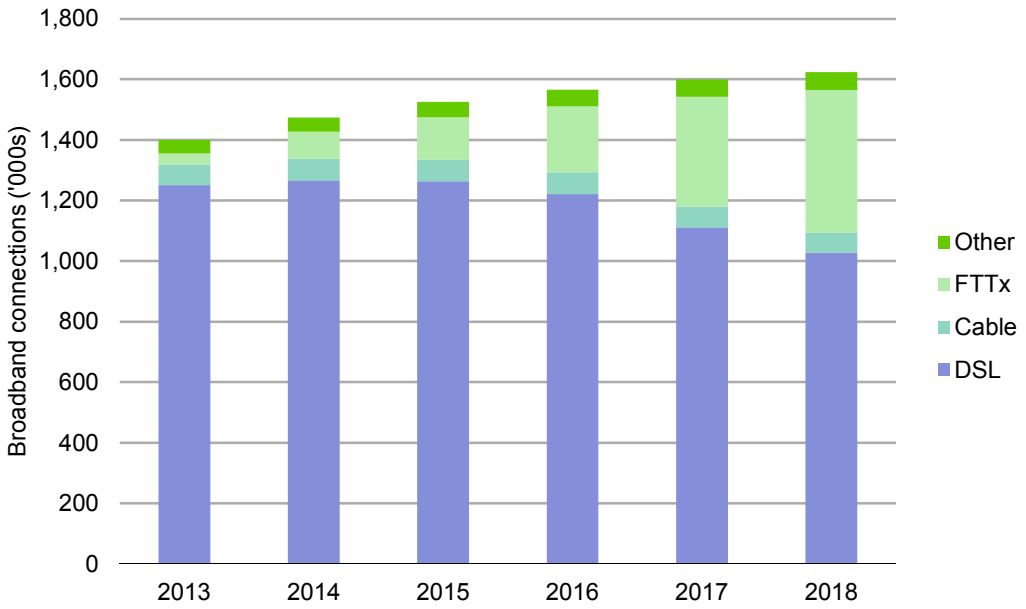

Exhibit 2.5: *Projections for broadband connections, New Zealand, 2013 to 2018 [Source: IDC]*

2.4 Christchurch Red Zone

The Draft Determination states that buildings located in the Christchurch Red Zone will be omitted from the modelling.[34] This applies to around 8000 premises. There will be no demand for telecommunications services within the regulatory period, and thus the HEO would not deploy network in that area.

33 Statistics New Zealand (2014), *National Population Projections: 2014(base)–2068*, 28 November 2014.

34 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014,paragraph 516.

The CoreLogic address database – current as at April 2004 – would include relocation of earthquake-affected Christchurch residents; however we note that Christchurch still has a relatively high number of unoccupied buildings, even outside the Red Zone.

The Christchurch Earthquake Temporary Accommodation Service continues to offer accommodation to earthquake-affected residents while their homes are repaired or rebuilt. Temporary villages have been set up in Kaiapoi, Rawhiti and Linwood, and there is also temporary accommodation available from private landlords.

The use of such temporary accommodation, coupled with the number of unoccupied buildings outside the Red Zone, may have some distortionary effect on the address locations, and hence the resultant costs.

2.5 Summary

We believe that the Commission's justification for its constant demand assumption is flawed. Application of the TSLRIC methodology in a situation of declining demand results in allocative inefficiencies, which then is the reasoning behind the assumption of constant demand.

However in this particular instance the hypothetical operator has a fibre network, with demand being the aggregate of current copper and fibre demand. This situation differs from that of modelling a copper network in a market with competing fibre, and thus Professor Vogelsang's analysis[35] may not apply, except perhaps in LFC areas.

The Commission's assumptions with regard to demand in essence establish a New Zealand market frozen as at April 2014. There is no consideration of the effect of either population growth or the availability of fibre services over the five year regulatory period. In essence the hypothetical universe of the HEO will diverge markedly over time from the real New Zealand.

35 Vogelsang, I. (2014), *Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand*, 8 September 2014, paragraph 10.

Within this hypothetical universe:

- mobile-only households will comprise more than one-fifth of all households by 2020
- any population growth will be absorbed by greenfields developments
- there will be no further high or medium density developments, or infill projects, in established areas over the period 2014 to 2020, and thus population (and line) density will remain static
- the increasing popularity of high bandwidth applications and cloud services will have no effect on demand for fibre/UFB services

While a constant demand scenario may be appropriate for the typical regulatory model spanning a period of one or two years, as the Commission's timeframe is considerably longer we recommend that the Commission develop more appropriate demand forecasts for the New Zealand environment.

The methodology adopted by the TERA model is such that it would be extremely difficult to incorporate changes in population or increasing densification. This is generally not an issue if the model timeframe is relatively short (one to two years) or if the population is relatively static. However this exercise is for a five-year timeframe, during which the population is expected to increase by 312 900, with much of this increase expected to be absorbed through greater densification of urban areas. This will result in greater line density in urban areas, which would decrease the unit cost per line.

Greenfields areas will absorb the remaining population growth, and the associated deployment costs for an HEO would be comparable to those of suburban / urban fringe areas (Zones 1 and 2). In general, high cost rural areas beyond the existing network footprint would have minimal population growth, and so would not become any more attractive to the HEO for potential network deployment.

Given these factors, we would expect that the costs per line for the HEO would be lower over the five-year regulatory period than those of a network held frozen as at 2014. Thus prices derived from a constant demand scenario will be over-stated.

So is it possible to quantify the impact on the model results? If we assume annual growth in demand of 1.5% (noting that Statistics New Zealand estimated population growth of 1.6-2% for 2015, and 1.1-1.6% for 2016[36]), then over the period to 2020 there will be a 9.3% increase in lines from the 2014 level. To set a lower bound, if we assume costs are constant (which is obviously not appropriate), then with this very modest increase in demand the cost per line would decline by 8.5% by 2020. If we assume annual growth in demand of 2% (which given the economic situation is not unreasonable), then the cost per line would decline by 11.2% by 2020. Clearly if we relax the assumption of constant costs the true decline would be lower, but on the other hand these estimates do not consider the possibility of fibre stimulating greater demand. Thus we can conclude that a ballpark estimate would be a decrease in cost per line of around 9%.

36 Statistics New Zealand (2014), *National Population Projections: 2014(base)–2068*, 28 November 2014.

3 Subsidies

3.1 Implicit subsidies in the Commission's model

In its selection of the appropriate MEA the Commission considers that observed operator strategy in New Zealand is relevant, particularly the technological choices made by Government for its UFB and RBI initiatives.

> TERA recommended that, based on observed operator behaviour, FTTH is likely to be the MEA for copper in most areas, while FWA is more likely in some rural areas. TERA noted that FTTH had been chosen by the Government for its UFB programme, while FWA technology had been preferred in very remote areas.
>
> … We note that the Government, through the RBI policy, has decided that FWA is likely to best meet the needs of end-users in rural areas. Accordingly, our view is that operator strategy provides relevant insight into the considerations a hypothetical efficient operator is likely to make in deploying its network.[37]

While we agree that FTTH and FWA are appropriate forward-looking technologies for the TSLRIC modelling, the UFB and RBI initiatives in fact are not indicative of the extent to which an HEO would deploy these technologies in the absence of Government intervention.

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37 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, paragraphs 545 to 548.

The Commission has also characterised the UFB network as a replacement to the legacy copper network, which implies that the HEO's network also replaces UFB.

> We consider UFB networks to be more akin to a replacement, rather than a competitor, to the existing copper network. We have determined that within all UFB regions the MEA for UCLL is fibre. It logically follows that if deployed, the hypothetical efficient operator's network would negate the need for the UFB roll-out.[38]

Thus the Commission, abstracting from the existence of the UFB initiative, assumes that the HEO deploys fibre across (and beyond) all of the Chorus UFB and LFC areas in New Zealand. In our view the Commission is compelled to assume that the UFB does not exist as the existing copper footprint encompasses all LFC areas, and moreover, as the Commission admits 'an efficient operator wouldn't deploy/compete with *[sic]* subsidised fibre network (without regulated duct access)'[39].

At the same time the Commission distinguishes circumstances with respect to fibre deployment in New Zealand from those in Europe as follows:

> …in New Zealand, UFB investment is assured by contract and subsidies received by UFB investors, while in Europe investment in next generation networks is incentivised, not assured.[40]

The Commission then takes account of this difference in the modelling by rejecting the use of the Depreciated Optimised Replacement Cost (DORC) methodology, recently endorsed by the European Commission (EC), on the grounds that this is a means of incentivising fibre investment which is inappropriate in the New Zealand context where fibre investment is achieved through Government subsidies. It logically follows that this assertion by the Commission implies that the HEO – who is replacing the incumbent – is the recipient of subsidies to support fibre deployment to areas that would otherwise be uneconomic (where

38 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. Section 271.2.

39 *Ibid*, footnote 180.

40 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. Section 682.2.

the HEO as an efficient operator would be deploying more cost-effective technology such as FWA):

- the DORC methodology is used in Europe to incentivise fibre
- the Commission states that DORC is not necessary as there are subsidies which are sufficiently incentivising
- the HEO is using fibre
- hence the HEO must be receiving subsidies (as the Commission is not using DORC).

It is important to note that the Commission characterises the HEO as a rational profit maximiser.

> We assume that our hypothetical efficient operator is a rational, profit maximising business. Accordingly, there may be circumstances in which decisions made by other rational, profit-maximising businesses in the real world provide an indicator as to the hypothetical efficient operator's likely response to the same issues.[41]

So, to what extent would a rational profit maximising HEO deploy a wired fibre network in New Zealand, absent the UFB and RBI initiatives? The answer would depend on the economics of the new venture, but we would expect that the fibre footprint would at a minimum cover those areas already served by fibre prior to the UFB, and extend to the more densely populated cities and towns (and some surrounding areas). Ultimately the footprint would not extend as far as the UFB boundaries since Government subsidisation is required to reach 75% of the population and the HEO does not have the benefit of those government subsidies. So the HEO's fibre network would be less extensive than the UFB network, and thus it would seek to connect remaining customers via more economical alternative technologies.

However the Commission's model has the HEO deploying fibre more extensively than the UFB footprint with no subsidisation. While Chorus has in fact deployed fibre to schools and hospitals in Zone 4 (rural) areas, this only occurred through subsidies from the Rural Broadband Initiative (RBI).

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41 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled bitstream access service*, 2 December 2014, paragraph 128.

Capital contributions in the Commission's model

The Commission does consider whether the HEO would require inducements or contributions from end-users to build the hypothetical UCLL network[42] or provide the UBA service[43] and in this regard considers RBI experience relevant.

> There are some capital costs which a hypothetical efficient operator would not expect to recover in the standard price it receives for its services. This may be because the additional capital cost of extending its network to additional end-users would be so high that it would not expect to be able to charge and receive a price for the service that could recoup that cost. This occurs in practice where, for example, a subsidy is needed under the Government's RBI to extend the broadband capability of Chorus' network to more remote areas.[44]

For UCLL the Commission defines a boundary for efficient capital expenditure derived from TSO areas, and assumes that end-user capital contributions would be required by the HEO outside the boundary. This leads to the exclusion of capital expenditure for 6.4% of the address points in the model, although operating expenditure for these addresses is included in model costs. As evidence to support its approach the Commission cites the copper network's historical deployment.

For UBA the Commission adopts an approach which appears to be aimed at removing implicit RBI subsidies:

> We consider that the hypothetical efficient operator would be unlikely to provide bitstream in RBI areas without a capital contribution. Accordingly, we have accounted for the cost of providing bitstream in RBI areas by removing the modelled TSLRIC costs relating to the number of DSLAMs and active cabinets deployed by Chorus under the RBI initiative.

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42 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, Attachment J: Exclusion of certain capital costs.

43 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled bitstream access service*, 2 December 2014, Attachment H, Exclusion of certain capital costs.

44 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, paragraph 809.

> However, because there are no DSLAM IDs in the model, we could not remove the specific individual DSLAMs in RBI areas. Instead, we:
>
> - removed the capital costs of the number of DSLAMs related to the RBI; and
> - removed the capital costs of active cabinets related to the DSLAMs in RBI areas.
>
> Operating expenditure, such as power consumption for the DSLAMs in RBI areas, remains in the model because we are only removing the capital costs that we consider a hypothetical efficient operator would receive a capital contribution for. The cost of the feeders also remains, as we have assumed that there would have already been passive cabinets at those locations before the RBI.[45]

TERA states that in the absence of government subsidies such as those of the RBI program an HEO would not deploy network in rural areas.

> Chorus has received some subsidies as part of the RBI program in order to roll-out DSLAM in rural areas. A hypothetical efficient operator building a network in these areas, and so building these DSLAMs, would also receive a government subsidy that would cover the cost of the RBI DSLAMs. Otherwise, it would not deploy any network.
>
> The cost of the DSLAMs included in the RBI program should therefore not be recovered through UBA.[46]

Although in reality there is no direct subsidy for DSLAMs paid through the RBI[47], we interpret TERA's statements as explaining how it has captured the implied RBI subsidy. The model dimensions the DSLAM assets for the whole network based on geographical data provided by Chorus – demand distribution by cabinet and ESA. Cabinets and ESAs

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45 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled bitstream access service*, 2 December 2014., paragraphs 645 to 646.

46 TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Model reference paper, November 2014, Section 3.1.3.

47 DSL equipment is classed in the RBI agreement between Chorus and the Ministry of Business, Innovation and Employment (MBIE) as 'non-grantable assets' although DSL capable cabinets are 'grantable assets'. See Section 5 of the RBI agreement, available at http://www.med.govt.nz/sectors-industries/technology-communication/pdf-docs-library/communications/broadband-policy/rbi-contracts/mbie-chorus-updated-agreement-2.7-mb-pdf.

which are part of the RBI are identified and then the respective DSLAM assets are excluded from the cost calculations. The list of RBI cabinets is coincident with the information publically available on the Chorus website.[48] Out of the total of 5 496 cabinets and 738 ESAs included in the model, 900 and 64 are classified as part of the RBI, respectively. This represents around 890 (cabinet-based) and 63 (exchange-based) DSLAMs, the cost of which is assumed to be covered by the government contribution.

We have compared TERA's model results with and without the RBI contribution and found an annual difference ranging from $13.7 million in 2019 to $15.8 million in 2015 (Exhibit 3.1) which may be interpreted as the allowance that has been removed from capital cost estimates in view of Government RBI grants. We note that there is no detailed funding breakdown in published RBI contracts so it is not possible to confirm the TERA estimate. However Chorus is receiving the bulk of the $300 million RBI funding – that is, approximately $236 million from 2011 to 2016[49]. This funds the deployment of rural links and cabinets to connect priority users (mainly schools and hospitals)[50], including funding for fibre cable, ducts, sub ducts, and joining pits.

($, millions)	2015	2016	2017	2018	2019
DSLAM investment					
- with contribution	159.7	155.8	152.1	148.7	145.5
- without contribution	175.5	171.0	166.8	162.9	159.2
Difference	15.8	15.2	14.7	14.2	13.7

Exhibit 3.1: *Total DSLAM investment with and without RBI contribution (NZD, millions) [Source: TERA Consultants, Network Strategies]*

48 Chorus (2014), *About the Rural Broadband Initiative - Shapefiles*, available at https://www.chorus.co.nz/rural-broadband-initiative.

49 Chorus (2014), *Annual Report*, 24 August 2014, page 59.

50 The project scope is described in Schedule 2 of Chorus' RBI Agreement, available at: http://www.med.govt.nz/sectors-industries/technology-communication/pdf-docs-library/communications/broadband-policy/rbi-contracts/mbie-chorus-updated-agreement-2.7-mb-pdf.

Note also that the Government announced in August 2014 a three year extension (2016 to 2019) to the RBI at a cost of $150 million[51] although the details are yet to be finalised.

Chorus acknowledges the capital contributions it has received through the RBI and it is clear that in the absence of RBI subsidies the extension of broadband services encompassing 72 000 rural lines as at the end of the 2014 financial year would not have occurred.

> Chorus is now well past the halfway mark in its rollout of fibre and high speed broadband cabinets for the Rural Broadband Initiative (RBI). At 30 June 2014, a total of about 3,100km of fibre had been laid for the programme, with fibre extended to 951 schools. The rollout had also brought new or upgraded broadband coverage within reach of 72,000 rural lines and broadband uptake was approximately 80%.
>
> Chorus' overall fixed line broadband footprint at 30 June 2014 extended to 97% of lines nationwide. When the RBI rollout is completed in 2016, Chorus will have upgraded or installed about 1,200 broadband cabinets, making high-speed broadband available to more than 90% of lines nationwide. The Government is funding the majority of the rollout through an industry levy, which Chorus is a significant contributor to, with Chorus also directly providing approximately 15-20% of the investment required to fund its fixed line portion of the rollout.[52]

By Chorus' own admission it is evident that RBI funding is the cornerstone of extending fibre broadband deployment to rural areas of New Zealand. Given that Chorus' total RBI funding is $236 million (with the possibility of an extension of up to $150 million), arguably the Commission should count as a capital contribution (or subsidy available to the HEO) in its model significantly more than it has already if it continues to assume fibre is deployed in RBI areas.

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51 https://www.national.org.nz/news/news/media-releases/detail/2014/08/26/$150-million-boost-for-rural-broadband-initiative.

52 Chorus (2014), *Annual Report*, 24 August 2014, page 6.

Implications

With respect to some of the more rural and remote areas of New Zealand the Commission and its consultants recognise that the HEO would not deploy without a subsidy or contribution, referring to the RBI. On the other hand the need for any subsidy in more populated areas is ignored although in reality absent the UFB initiative a HEO would require some incentives to achieve fibre coverage to match the UFB footprint. Alternatively it would deploy alternative technologies rather than fibre.

As the UFB and RBI programs are entirely driven by Government policy, the Commission cannot rely heavily upon these for guidance as to the behaviour of the rational profit maximising HEO unless it believes that the HEO's assumed operating environment is the same or very similar. However this would imply that subsidies are available to the HEO. Thus if the Commission is to adopt a consistent approach in characterising the HEO it appears that there are two choices:

- Abstract entirely from the existence of UFB and RBI and adopt a purely economic basis for defining the extent of the fibre footprint with alternative technologies supplying the remainder of customers within the TSO boundary
- Use the UFB and RBI as reference points and impute subsidies that would be available to the HEO to achieve Government targets that a rational profit maximising HEO would otherwise not pursue.

While we believe that the first option is the more economically sound approach, the Commission may find it more practical to adopt the second option. As TERA has already implemented an RBI subsidy in the modelling, it may be straightforward to adopt a similar approach in implementing a UFB-style subsidy.

3.2 Development of a consistent approach to subsidies

The Chorus UFB contract provides for the design and build of a fibre network for 24 of the 33 UFB areas, including Auckland, the eastern and southern parts of the North Island and much of the South Island. Government investment for this will amount to approximately

$929 million by 31 December 2019. At completion the network should pass about 830 900 premises.

The remainder of the UFB areas are the subject of separate contracts with LFCs, and the financial terms of these contracts differ from that of Chorus. Given that the Chorus contract covers the majority of UFB areas and funding we suggest that the Commission assumes that the HEO would obtain a similar agreement as did Chorus.

The UFB funding per premise passed obtained by Chorus is $1118[53]. In return Chorus issues debt and equity securities.

> The equity and debt securities issued by Chorus have an issue price of $1 and are issued on a 50:50 basis. For each premises passed, $559 of equity securities and $559 of debt securities are issued by Chorus for which Chorus receives $1,118 funding in return. CFH warrants are issued for nil value. The total committed funding available for Chorus over the period of UFB network construction is expected to be $929 million.[54]

We note that the way in which Chorus has structured its Crown funding for accounting purposes is irrelevant to the HEO. However it is relevant that during the regulatory period no interest or dividends are payable in relation to these securities. In fact dividends do not become payable until 2025 and debt repayments (at face value) are due from 2025 to 2036. Given these extremely favourable terms and the fact that associated liabilities are very long-term, for the purposes of the regulatory modelling we may assume that the funding contribution obtained by the HEO is in fact a grant.

It should also be noted that in September 2014 the Government announced plans to extend UFB to a further 200 000 inhabitants at an estimated cost of $152 million to $210 million. Although the details were not finalised at the time of writing this report, the Minister provided an indication of the towns that are being considered.

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53 Chorus (2014), *Annual Report*, 24 August 2014, see Note 4.

54 *Ibid*.

> The list of additional towns to receive fibre to the home, and the order of roll-out, will be determined following a competitive bid process, which will take into account the cost of deployment, strength of consumer demand, and regulatory and other assistance from local authorities.
>
> However, based on the methodology used for the original roll-out, this could see a number of towns be strong contenders for inclusion in the UFB extension, including: Te Puke, Motueka, Morrinsville, Kerikeri, Huntly, Thames, Matamata, Ōtaki, Kawerau, Waitara, Kaitaia, Dannevirke, Alexandra, Stratford, Whitianga, Cromwell, Taumarunui, Picton, Foxton, Kaikohe, Marton, Te Kuiti, Katikati, Temuka, Waihi, Waipukurau, Warkworth, Carterton, Dargaville, Opotiki, Snells Beach, Te Aroha, Wairoa, Paeroa and Westport.[55]

The Government's cost estimate for the UFB extension implies that it will pay between $760 and $1050 per premise passed.

In the Commission's model all 35 towns listed above are served by fibre with only a few dwellings within each town served by FWA. By way of example, the following maps show the model results for two of these cities: Kerikeri (Exhibit 3.2) and Thames (Exhibit 3.3). Note that fibre-served dwellings are coloured red and FWA blue.

55 See https://www.national.org.nz/news/news/media-releases/detail/2014/09/04/ultra-fast-broadband-to-be-expanded-to-80-of-new-zealanders.

[

]CCNZRI

Exhibit 3.2: *Map of model deployment for Kerikeri [Source: Network Strategies]*

[

]CCNZRI

Exhibit 3.3: *Map of model deployment for Thames [Source: Network Strategies]*

3.3 Estimating the impact

How much subsidy would the HEO receive? A subsidy would affect the business case for the HEO, enabling it to extend its fibre footprint to areas that would be otherwise uneconomic. So in estimating the potential amount of the subsidy, it is necessary to establish the HEO's fibre footprint in the absence of a subsidy.

Our methodology for estimating the potential subsidy for the HEO is based upon a fairly broad-brush approach. Ideally an economic approach should be used – as would an HEO in developing its own business case – however the focus of an HEO is likely to be on areas with greater population densities than the more lightly populated small towns and rural areas. We have therefore assumed that without any subsidies, the HEO would deploy fibre

only to the 13 largest cities and towns, including in the LFC areas. These cities and towns comprise just under 65% of the New Zealand population[56], and include every city of more than 40,000 people. By comparison the UFB subsidy aims to extend fibre to 75% of the population. Our methodology is described in more detail in Annex A.

We estimate the potential subsidy for the HEO to be $813 million, to extend fibre from a baseline coverage (in the absence of the subsidy) to the fibre coverage of the Commission's model, and assuming that the HEO would receive a similar subsidy ($1118 per premise passed) to that of Chorus.

3.4 Conclusions

The Commission should adopt a consistent approach to subsidies in its model. As it stands the model makes some real world subsidies available to the HEO (via its capital contribution assumptions) while others are ignored. In real world New Zealand the Government's UFB and RBI initiatives exist and provide subsidies for investment in fibre deployment where commercial investment would otherwise not occur.

We examined the extent to which a rational profit maximising HEO would deploy fibre in New Zealand in the absence of subsidies, and found that its commercial investment would cover almost 65% of the population, in contrast to the 75% coverage of the UFB. As the Commission's model currently extends beyond our estimated commercial threshold, the Commission should consider the following two options:

- continue with the existing methodology but extend subsidy allowances, by continuing to use the UFB and RBI as reference points
  - incorporating a subsidy for the HEO of $813 million, to extend fibre from a baseline coverage (in the absence of the subsidy) to the fibre coverage of the draft version of the model
  - incorporating the whole of the RBI subsidy that is available to Chorus
- amend its methodology to abstract entirely from the existence of UFB and RBI and adopt a purely economic basis for defining the extent of the fibre footprint with

56 Based on the Statistics New Zealand 2013 Census.

alternative technologies supplying the remainder of customers within the TSO boundary.

4 Trenching and terrain

The Commission engaged Beca Limited to undertake a trenching cost analysis to serve as an input to the modelling[57]. The Beca study includes:

- a definition of soil and rock material categories in New Zealand, and the specification of appropriate trenching techniques for these categories
- estimates of local rates for the cost of trenching and ducting work.

In selecting a local engineering firm it is clear that the Commission seeks to ensure that this important analysis captures key local characteristics which may not be reflected in overseas benchmarking approaches.

In this section we review Beca's terrain classifications (Section 4.1), and whether Beca's trenching cost estimates reflect efficient prices (Section 4.2).

4.1 Terrain assessment

Beca applies the soil and rock categories established by David Bell and Ranald Ducat (Bell-Ducat) in the context of the TSO. Beca finds it appropriate to apply the Bell-Ducat system of classification as it was the result of both a sound theoretical analysis and robust field studies[58]. We agree entirely with Beca's assessment, and we are aware of no other relevant superior classification.

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57 Beca (2014), *FPP corridor cost analysis of trenching and ducting rates in NZ – Final Issue Nov14*, 25 November 2014.

58 *Ibid*, Appendix 1, Rock and Soil Classification Method and Data, Section 2.3.

As the Bell-Ducat method was developed in the context of the TSO its main focus was the more rural areas of the country. Beca notes that further work would be necessary to extend the classifications to urban and suburban areas, and in the absence of this work has made a blanket assumption for urban areas.

> As this assessment has not yet taken place we are uncomfortable applying a specific soil or rock category to city and major suburban areas. As a result we have created a sixth category "Urban" with the assumption that these areas are predominantly either imported or redistributed and compacted fill of the type generally used for development.[59]

Clearly it would have been preferable to undertake work extending the Bell-Ducat study to cover the more urban areas. While we recognise that Beca has in the absence of such work adopted a pragmatic assumption, the sweeping assumption that has been applied increases the margin of error for the analysis.

Beca has then mapped the defined soil categories to Landcare New Zealand classifications, and mapped trenching techniques to the terrain categories. We have not attempted to reproduce Beca's application of the Bell-Ducat system to the Land Resource Information System (LRIS).

4.2 Are trenching costs efficient?

The Commission states:

> TERA notes that trenching costs, which is one of the main cost categories of a fixed network, is difficult to benchmark due to its country specific nature. TERA has determined the efficient unit cost for trenching based on the efficient costs provided by Beca.[60]

TERA has indeed determined the cost for trenching and ducting based on the costs provided by Beca. Trenching unit costs are provided by Beca for six soil types and for a

59 *Ibid*, page 4.

60 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, paragraph 338.

large set of sizes (driven by the number of ducts). Based on these cost inputs and the 'geotype length per ESA' the model performs calculations to obtain a specific trenching cost for each ESA.

We reviewed Beca's description of its pricing assumptions and found that it is unlikely that these reflect the costs of an efficient operator. Of particular concern is Beca's statement that:

> … during our conversations with contractors the issue of working under contract for Chorus was raised as being influential on rates. Being such a large telco they do manage to negotiate lower prices with their subcontractors in return for the promise of regular on-going work. In the opinion of one directional drilling contractor we spoke to the negotiated rates could be as much as 20% lower than their normal tender pricing. We wish to emphasise that this discount has not been taken into account within our pricing.[61]

The HEO is deploying a nationwide network and therefore would have a similar scale to Chorus. As such it would be able to negotiate similar discounts to those achieved by Chorus. Accordingly Beca should have taken the 20% discount into account in its pricing assumptions on the basis that an efficient operator would be able to obtain this discount.

We also note that in deriving its trenching cost estimates Beca has used historical pricing information. For example, Beca notes that the underlying information for open trenching, directional drilling and thrust boring is drawn from four tenders in the Wellington region during the period 2008 to 2014[62]. The extent to which data from 2008 is relevant to forward-looking costs is questionable.

Beca derives average nationwide trenching and ducting rates, and also provides regional price variances – that is, lower and upper ranges in relation to the nationwide rate[63]. We note that the range is lower than the nationwide rate in Northland, Auckland, the Bay of Plenty and the Eastern North Island, and higher than the nationwide rate in Wellington /

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61 Beca (2014), *FPP corridor cost analysis of trenching and ducting rates in NZ – Final Issue Nov14*, 25 November 2014, page 9.

62 *Ibid*, page 11.

63 *Ibid*, Appendix 2.

Horowhenua, the Upper South Island, and Christchurch / Ashburton. The greatest divergence from the nationwide rates occurs in Christchurch / Ashburton: +15% to +20%.

Given this result and the fact that Beca states that the effect of the Christchurch re-build has put a premium on labour rates in the South and lower North Islands[64], it is clear that Beca's calculated rates include the impact of the Christchurch earthquakes. In other words, the resource constraints driven by the re-build are reflected in Beca's estimates, and this has had an upward impact on the results. We do not believe that the HEO should face such a resource constraint, and it is apparent that the Commission also views this as inappropriate. For example, the Commission has stated that as the TSLRIC modelling is a hypothetical exercise it is not necessary to capture:

> … all the realities of the "real world" that a business would face if it was actually building a new network. For example, we can assume that there are no resource constraints, and the hypothetical operator has ready access to labour, capital and other resources (such as pole sharing with the local electricity distribution business for aerial roll-out) required to build and operate the network.[65]

This implies that the approach taken by Beca is inconsistent with the Commission's assumptions about the environment in which the HEO operates.

4.3 Conclusions

We find that Beca's terrain methodology is sound, however its estimates of trenching costs do not appear to be those of an efficient operator. We recommend that the Commission:

- adjusts trenching cost estimates for volume / scale discounts that would be achieved by the HEO of around 20%
- removes the distortionary impact of the Christchurch re-build on resource availability and pricing

64 *Ibid*, page 8.

65 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, paragraph 157.

- reviews the impact on cost estimates of very old historical data which is unlikely to reflect forward-looking costs
  - in particular for open trenching, directional drilling and thrust boring Beca relies on data drawn from only four tenders in the Wellington region during the period 2008 to 2014.

5 Aerial deployment

The Commission's estimates of aerial deployment in its cost model draw extensively on electricity distribution business (EDB) network information. The Commission has clearly acknowledged the importance and relevance of EDB information by stating:

> EDBs' existing aerial infrastructure is likely to provide a good proxy for where a hypothetical efficient operator would seek to deploy its network aerially. [66]

We agree with the Commission that the network deployment of EDBs should be taken into account while determining the extent of aerial deployment by the HEO. Indeed, in our earlier cross submission[67] we examined the network deployment of several EDBs in New Zealand and found that it is dominated by aerial infrastructure:

> Clearly aerial deployment is a popular choice for distribution networks, with average deployment of over 70%. We expect that the existing infrastructure of distribution companies would certainly be an important consideration for a hypothetical operator deploying an efficient network to suit New Zealand's local conditions.[68]

The Commission has also used Chorus data for some calculations but we believe that Chorus data is not reflective of the whole country and hence these calculations need to be reviewed.

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66 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 610.

67 Network Strategies (2014), *Cross-submission for consultation on UCLL and UBA FPP regulatory framework*, 25 August 2014.

68 *Ibid,see Section 2.*

5.1 Aerial deployment assumptions

The Commission's model makes two main assumptions for aerial deployment – the first is for distribution cables which uses data from EDBs as well as Chorus and the second is for service lead-ins which only uses EDB information:

> We have considered modelling aerially only in areas where there is existing electricity distribution business (EDB) aerial infrastructure. Having considered the proportion of aerial deployment by network operators in New Zealand and their differing constraints, we consider it reasonable that a hypothetical efficient operator would target deployment of aerial network within that range…
>
> Regarding the percentage of service lead-ins to model aerially, we note that Chorus has not been able to provide information on the number of premises served aerially.
>
> Therefore, we have approximated the number of premises served by aerial lead-ins based on EDB data. To do so we have calculated a weighted average percentage of end-users served by aerial lead-ins across the EDB areas…[69]

The values for aerial deployment used in the Commission's access model[70] are

- 49% of service lead-ins use aerial infrastructure
- 36% of distribution cables use aerial infrastructure.

The Commission calculates the value of 49% for service lead-ins as a 'national weighted average percentage' of EDB customers that are served by overhead/aerial infrastructure.[71] We have been able to successfully replicate the Commission's calculations using relevant

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69 Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 295-297.

70 Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 597.

71 Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 618.

data from Information Disclosures[72] submitted by the EDBs and some missing values directly from the Commission.

In addition the value 36% for distribution cables is selected within a range which is defined by:

- Chorus' target of 20% aerial deployment in its UFB areas as the lower limit
- the percentage of existing EDB low voltage networks that are deployed using aerial infrastructure – calculated to be 51% – as the upper limit. [73]

As part of its approach to estimate the percentage of distribution cables using aerial infrastructure, the Commission has also stated that 'EDB distribution networks are likely to follow similar routes to the modelled network' and 'a hypothetical efficient operator would consider deploying its network aerially on 51% of routes'.[74] We agree with this logic of the Commission and have successfully replicated this result for the percentage of low voltage EDB aerial networks. However we have not found any details as to how the value of 36% was derived. It appears that the Commission has calculated 36% as the average of Chorus' target and the EDB figure. The Commission has also stated that it has 'considered information provided by Northpower and Ultrafast Fibre regarding their UFB aerial deployment' but there are no details on how it was used.[75] For example, we understand that Northpower's UFB deployment is 60% aerial[76] but it is unclear how this has been incorporated into the Commission's calculations.

So is it appropriate to use the Chorus target in the Commission's range? We note that the Commission has acknowledged that 'Chorus' UFB deployment is limited to urban areas

72 http://www.comcom.govt.nz/regulated-industries/electricity/electricity-information-disclosure/.

73 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 615.

74 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 611.

75 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 615.

76 http://www.nbr.co.nz/opinion/chris-keall/as-first-crown-fibre-laid-northpower-talks-costs-and-partnerships.

only' and hence cannot represent the aerial deployment for rural areas.[77] In fact we also previously discussed several international examples in our cross submission[78] which illustrate that the percentage of aerial deployment in rural areas can be significantly higher than urban areas. Hence Chorus' percentage of 20% for urban areas is certainly not a proxy for the whole country. However if the Commission is minded to use Chorus' value as a reference point, it should also explicitly consider aerial deployment of other LFCs – including Northpower – which indicate that a higher aerial percentage is feasible. The Commission could possibly consider the Northpower value of 60% as a ceiling if Chorus's value is to be taken as the floor.

An alternative approach is to consider only EDB data and apply the national weighted average value of 51% as the aerial percentage assumption for distribution cables. This advantage of this approach is that EDBs are also utility companies delivering services to local areas throughout New Zealand and hence their information is reflective of the whole country, unlike the Chorus UFB build. In addition this approach will also ensure consistency in the Commission's calculations as values of aerial percentages for both distribution cables and service lead-ins will be based on data from EDBs only.

5.2 Benchmarking from overseas jurisdictions

Although local conditions play a major role in determining the modelling assumptions it is always informative to consider overseas examples. We have already provided a number of benchmarks in our cross submission[79]. This includes the LRIC model created by Deloitte Business Consulting to calculate the costs for LLU in Romania[80] which assumes the percentage of aerial deployment to vary from 65% to 80% for the distribution network and from 95% to 100% for drop wire. Also the study performed by WIK Consult for ECTA for determining access charges assumes the proportion of aerial deployment to be 0–40% in

77 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 615.

78 Network Strategies (2014), *Cross-submission for consultation on UCLL and UBA FPP regulatory framework*, 25 August 2014.

79 Network Strategies (2014), *Cross-submission for consultation on UCLL and UBA FPP regulatory framework*, 25 August 2014.

80 Deloitte Business Consulting (2010), *LRIC Model for Local Loop Unbundling and Operator Access Links services in Romania*, February 2010.

urban and suburban areas and 60% in rural areas.[81] We have also discussed the Eastern Caribbean Telecommunications Authority's (ECTEL's) fixed LRIC Model for Member States which assumes the percentage of aerial cable to be about 60%.[82] ECTEL's Manual[83] states that 'a new build would most likely have a greater proportion of aerial cables to underground cables than the existing incumbent has in practice'.

We have suggested that EDB data alone should be used to determine aerial percentages in Commission's model. This is consistent with a rational profit maximising HEO that would be expected to not only deploy its distribution network based on the electricity network but would likely share resources and infrastructure with EDBs.

The recent example of the 100% fibre-to-the-building deployment project in Ireland illustrates that fibre deployment can make extensive use of the existing infrastructure of electricity networks. The EUR450 million project is a joint venture between ESB and Vodafone Ireland to deploy a 'broadband network offering speeds from 200 Mbps to 1000 Mbps, propelling Ireland into the ranks of the world's fastest broadband countries'.[84] ESB, a leading Irish sustainable energy company, began a tender process in 2012 to deploy a fibre network and selected Vodafone as the preferred bidder in 2013.[85] The 50:50 joint venture project started after approval from the European Commission in 2014[86] and is utilising ESB's nationwide electrical infrastructure:

> Ireland will also become the first country in Europe to utilise existing electricity infrastructure on a nationwide basis to deploy fibre directly into homes and businesses, initially reaching 500,000 premises in 50 towns. The fibre will be deployed on ESB's existing overhead and underground infrastructure, ensuring a fast and cost efficient roll-out to every county in Ireland and reversing the digital divide between the capital and regional

81 WIK-Consult (2011), *Wholesale pricing, NGA take-up and competition*, 7 April 2011.

82 Eastern Caribbean Telecommunications Authority, *Bottom up Fixed LRIC Model*, available at http://www.ectel.int/.

83 Eastern Caribbean Telecommunications Authority (2008), *Draft Manual for the LRIC Models of the Fixed and Mobile Telecommunications Networks for the ECTEL Member States*, June 2008.

84 http://www.esb.ie/main/press/pressreleaseWS.jsp?id=4074.

85 http://www.cellular-news.com/story/Operators/66484.php.

86 http://www.vodafone.com/content/index/about/about-us/policy/news-releases/esb-vodafone-ecapproval.html.

> towns…This fibre infrastructure will use ESB's existing electricity infrastructure, maximising the use of state assets to the benefit of Irish society.[87]

Along with using electricity poles and line routes[88], ESB and Vodafone intend to deploy a cost efficient fibre network by:

- deploying central offices for the fibre network at ESB's existing medium voltage stations for its electricity network
- collocating fibre street cabinets with medium to low voltage electricity transformers
- using electricity distribution points as distribution points for fibre to the premises
- utilising approximately **[%]VCI** of existing electricity lines infrastructure (aerial and ducted) to deploy the fibre cables.

Hence fibre deployment can not only use the electricity overhead and underground infrastructure to provide a cost effective network but can also extend the benefits by sharing other resources and collocating equipment on sites of electricity network providers.

The Commission has assumed:

> …that there are no resource constraints, and the hypothetical operator has ready access to labour, capital and other resources (such as pole sharing with the local electricity distribution business for aerial roll-out) required to build and operate the network.[89]

Although the Commission's model includes infrastructure sharing with utility networks – 50% for overhead and 0% for underground infrastructure[90] – it should also incorporate collocation and sharing of other resources which can be practically implemented (as seen in the case of Ireland). This will also reduce the costs significantly and model a network that truly corresponds to a network deployed by an efficient operator.

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87 http://www.esb.ie/main/press/pressreleaseWS.jsp?id=4074.

88 http://www.esb.ie/main/press/pr-4074.jsp.

89 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 157.

90 TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Model specification, November 2014, page 44.

There are existing fibre deployments with significantly higher percentages for aerial deployment than assumed by the Commission. For example Japan has superfast Internet coverage which is available to around 95% of premises.[91] Two companies under the Nippon Telegraph and Telephone (NTT) Group – NTT East and NTT West – dominate the market and provide unbundled line and hardware services in Japan. According to the Japanese Ministry of Information and Communications (MIC), 83% of total fibre installations in NTT's network is aerial whereas only 17% is underground (Exhibit 5.1).

	Actual length (km)		*Percentage*	
	Aerial	*Underground*	*Aerial*	*Underground*
NTT East	509 900	79 700	86%	14%
NTT West	241 300	74 700	76%	24%
Total	751 200	154 400	83%	17%

Exhibit 5.1: *Aerial and underground deployment in NTT's network [Source: Ministry of Information and Communications]*

5.3 Summary

Although we agree with the Commission's approach of using EDB data for estimating the proportion of aerial deployment, we believe that EDB data alone should be used. The Commission is currently using information from EDBs and Chorus for distribution cables and only EDB information for service lead-ins. Since EDBs are utility companies delivering services to local areas throughout New Zealand their deployment represents the whole country. On the other hand data from Chorus' UFB build only reflects urban areas. Apart from ensuring national coverage, the other advantage of using EDB data alone is that it will establish consistency in the Commission's calculations as aerial percentages for both distribution cables and service lead-ins will be based on the same approach. However if the Commission must use Chorus' value, it should also explicitly consider aerial deployment of other LFCs – including Northpower – which indicate that a higher aerial percentage is feasible even in UFB areas.

91 Analysys Mason (2013), *International benchmark of superfast broadband*, 27 November 2013 and Chorus (2013), *Benchmarking Broadband,* September 2013.

In addition, the Commission's model should also incorporate sharing of resources – with electricity network providers – to reduce the costs and model a network that truly corresponds to a network deployed by an HEO. The example of Ireland illustrates that fibre deployment can not only use the electricity aerial and underground infrastructure to provide a cost effective network but can also obtain additional benefits by sharing other resources and collocating equipment on sites of electricity providers.

6 Price trends

With a five-year regulatory period, the Commission is obliged to have a view on how prices may change over that time. Furthermore, as cost information for some assets is based on international prices, it is also necessary to consider how the relative exchange rates may vary over the regulatory period.

The Commission's draft approach for both UCLL[92] and UBA[93] price trends depends on the type of asset and cost:

- capex for active assets – price trends based on international benchmarks
- capex for passive assets – price trends determined by a so-called 'cost escalation' approach using the Consumer Price Index (CPI)
- labour-related opex – price trends determined by a cost escalation approach using the Labour Cost Index (LCI)
- non-labour related opex – assumed to be constant over the regulatory period
- currency conversion using purchasing power parity (PPP) rates, assumed to be constant over the regulatory period.

92 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, Attachment H.

93 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled bitstream access service*, 2 December 2014, Attachment F.

6.1 Benchmark approach

The Commission uses the benchmark approach for price trends of assets such as DSLAMs and switches. These assets are considered likely to be purchased from international suppliers and are thus less dependent upon domestic conditions than assets such as trenches.

The relevant assets are:

- FWA base stations (active)
- DWDM links (active part)
- DSLAM (card/subrack/rack)
- switches/routers (card/subrack/rack/SFP)
- power equipment
- airconditioning equipment.

TERA's benchmarks are averages from publicly available TSLRIC models for Australia, Denmark, Sweden, France and Norway.[94] The price trends for all countries except for Australia are relatively similar, however we note that the Australian model is now over five years old and thus those trends may not reflect current views of future prices. For this reason, we suggest that the Australian data be omitted from the benchmarks.

Our preferred approach for calculating benchmark estimates is to use the median rather than the average. This will reduce the impact of extreme values. Using the median has a small effect on the price trends, with the trend increasing slightly for power, remaining the same for FWA and reducing slightly for all other assets (Exhibit 6.1).

94 TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services: Model Specification*, confidential version, November 2014, page 61.

Price trend	*Average*	*Median*
FWA	-5.0%	-5.0%
DSLAM	-4.8%	-5.0%
Switches	-5.0%	-6.0%
Power	+0.8%	+1.0%
Airconditioning	+0.5%	0.0%
DWDM	-4.8%	-5.0%

Exhibit 6.1: *Benchmark based on averages and medians [Source: TERA, Network Strategies]*

Benchmark data for some of these asset types – DSLAM, switches and power – from France and Norway is provided at a sub-type level. For example, there are separate DSLAM price trends for cards and racks. TERA derived a weighted average price trend for these categories based on assumed weights, however these assumed weights are very different to the share of costs in the Commission's model (Exhibit 6.2) and thus are not representative of the New Zealand environment. We recommend that these weights be adjusted to reflect more accurately the split of costs in the Commission's model. For DSLAMs and switches the price trend would then be declining more gradually (that is, costs would not reduce as quickly).

	Benchmark assumption		*Core model*
DSLAM			
Card	50%	59%[1]	85%[2]
Rack	50%	41%[1]	15%[2]
Switch			
Card	75%		92%
Rack	25%		8%

1 DSLAM at cabinet

2 DSLAM at exchange

Exhibit 6.2: *Share of costs for DSLAM and switches [Source: TERA, Network Strategies]*

The Norwegian benchmark data used by TERA is stated to be sourced from NPT's core network model, version 1.6. A more recent version of this model – version 2.0 – was

released in May 2014[95], however there has been no changes to the price trend assumptions since the earlier version.

Similarly, in the case of Sweden, TERA has used benchmark data from two older versions of the PTS model[96]: versions 8.1 and 7.0 (released in May 2011 and September 2009 respectively). According to the PTS website[97], the latest version of its hybrid model is v10.1 which was released in December 2013.

It is also unclear why TERA did not use any Swedish benchmark data for power and airconditioning. In version 10.1 of the PTS model, these both have price trends of +2% per annum. Inclusion of this information would increase the average price trend for power from 0.8% to 1.0% and for airconditioning from 0.5% to 0.8%.

6.2 Cost escalation approach

The cost escalation approach was originally proposed by Chorus[98] to be used in cases where there were no independent and verifiable forecasts for the price trends of network elements. It assumes that the cost of a network element can be disaggregated into the costs of various inputs, for which there are independent and verifiable forecasts of price trends or future prices. A price trend for the network element can then be determined via appropriate weightings of the individual input price trends.

We have previously noted[99] that the term 'cost escalation' for this approach is misleading as it implies that the end result will be increasing prices. Given that the costs of the

95 See http://www.nkom.no/marked/markedsregulering-smp/kostnadsmodeller/lric-fastnett-kjerne, accessed on 7 January 2015.

96 See CI_ComCom-Price trends v5.xlsx, sheet Core PT benchmark, cell G7.

97 http://pts.se/sv/Bransch/Telefoni/SMP---Prisreglering/Kalkylarbete-fasta-natet/Gallande-prisreglering/, accessed on 7 January 2015.

98 Chorus (2014), *Submission in response to the Commerce Commission's Consultation paper outlining its proposed view on the regulatory framework and modelling approach for UBA and UCLL services (9 July 2014)*, 6 August 2014, paragraph 134.

99 Network Strategies (2014), *Cross-submission for consultation on UCLL and UBA FPP regulatory framework - A review of selected issues in submissions on the Commission's consultation paper of 9 July 2014*, final report for Spark New Zealand and Vodafone New Zealand, pp29.

network elements depend on multiple inputs, which may have increasing, decreasing or stable price trends, the net result across all inputs cannot be assumed to be costs that increase over time. We will however use the term 'cost escalation' in this report to avoid confusion.

Furthermore we have raised our concerns with this approach, particularly in regard to uncertainty and the risk of error, with the end result being unlikely to reflect the costs of an efficient operator.[100]

Subsequently, the Commission has:

> …decided to use this approach only where independent and reliable data is available, and price trends are dependent on local circumstances – that is, where an international benchmark approach would not be appropriate.[101]

For use in its cost escalation approach, the Commission obtained independent forecasts from NZIER for:

- CPI
- LCI
- aluminium sheeting
- fabricated steel.

However, TERA does not use these forecasts within its modelling. Instead, the model calculates a compound annual growth rate (CAGR) for a given time period that ends in either 2013 or 2014, which is then used for calculating the price trends of the network elements.

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100 Network Strategies (2014), *Cross-submission for consultation on UCLL and UBA FPP regulatory framework - A review of selected issues in submissions on the Commission's consultation paper of 9 July 2014*, final report for Spark New Zealand and Vodafone New Zealand, pp30-31.

101 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014, paragraph 757.

In other words, the price trends are based on historical data, not the NZIER forecasts for the regulatory period. This directly contradicts the Commission's statements that historical trends were only used as a cross-check, and that the cost escalation approach is based on forecasts.[102]

We agree with the Commission, that forecasts should be used for future price trends, and that historical data should only be used as a cross-check or if no other information is available.

There are some differences between the historical growth rates and those based on the NZIER forecasts (Exhibit 6.3). In two instances – aluminium sheeting and copper – the forecast growth rate differs significantly from the historical growth rate, while for the remaining indicators the difference is relatively small.

102 *Ibid*, paragraphs 766 and 769-771.

	Source	*Start point*	*End point*	*CAGR (%)*
Population	TERA	2000	2014	1.09%
	Network Strategies	2014	2019	0.88%
Buildings	TERA	2006	2014	1.90%[1]
	Network Strategies	2014	2019	1.22%
CPI	TERA	1994	2014	2.18%
	Network Strategies	2014	2018	2.07%[2]
LCI	TERA	-	-	2.58%[3]
	Network Strategies	2014	2019	2.20%[4]
GDP	TERA	1994	2014	2.44%
	Network Strategies	2014	2018	2.69%[2]
Aluminium sheeting	TERA	1995	2014	0.09%
	Network Strategies	2014	2019	5.79%[2]
Fabricated steel	TERA	1995	2014	1.43%
	Network Strategies	2014	2019	1.44%[2]
Copper	TERA	1995	2014	4.56%
	Network Strategies	2014	2019	0.53%[2]

1 Error in calculation – uses incorrect data.

2 Based on December quarter data.

3 Error in calculation – does not reflect the stated start and end points,

4 Based on March quarter data.

Exhibit 6.3: *Comparison of historical growth rates used in the model with forecast growth rates [Source: TERA Consultants, Network Strategies]*

What is the effect of using TERA's estimates? Aluminium sheeting does not appear to be an input for any network element, however copper is an input for copper cables, and so the price for this network element will be overstated. The cost of any network element with a labour component, or uses the default CPI as its price trend, will also be overstated.

There are a few other problems with the calculation of the CAGRs:

- For both CPI and GDP, TERA uses the December CPI figures for the start point and September 2014 for the end point – the same quarter should be used for both start and end points in the calculation of annual growth rates.

- The calculation for the LCI CAGR is incorrect – TERA assumes a start point of 1994, but the datapoint is actually December 1995, and its endpoint is assumed to be 2014 however the datapoint is the March 2019 forecast. This also means that the growth rate is calculated over 20 years, but the data is spread over a longer period, which has the effect of overstating the annual growth rate.

Fibre optic cabling

No forecasts are available for fibre optic cabling, and so TERA has used historical data over the period 1996 to 2013 for the "insulated wire and cable; optical fibres cables" component of the capital goods price index (CGPI) as a proxy.

We note that this particular series has experienced considerable volatility over that period. Copper cable would be included within this component, and thus behaviour of the data series would be influenced by copper prices, which are extremely volatile. We therefore do not believe that this would be an appropriate proxy for fibre optic cabling, and indeed the price trend for fibre should not be influenced by copper price trends as the relevant inputs are very different.

Note that other models – such as the Danish, Norwegian and Swedish models – have a decreasing price trend for fibre optic cables. In this instance, we suggest that benchmark data be used. The Australian model also has a decreasing price trend for fibre, although as noted above it may not reflect current views. This information suggests that the increasing price trend (+4.19%) within the TERA model is out-of-step with current thinking.

Population and buildings

The spreadsheet that estimates price trends also estimates CAGR for population and buildings, which do not appear to be used within the model. In both instances the historical growth rates are used instead of the forecast growth rates. Population forecasts are stated to be from NZIER, while the buildings forecasts – actually household forecasts – are sourced from Statistics New Zealand.

The historical growth rate results in a 2019 population 60 000 higher than if the forecast growth rate was used.

There appears to be an error in TERA's calculation of the building growth rate – the figure used is the total of households for Southland region, North Island, South Island and New Zealand, so is more than double the actual number of New Zealand households. Note that the Statistics New Zealand data is only provided in five year intervals, from 2006 to 2031 – TERA has interpolated the series for the intervening years, which is a reasonable approach.

6.3 Currency conversion

The projections for aluminium sheeting, steel and copper supplied by NZIER are in US dollars (USD). TERA converts these to New Zealand dollars (NZD) using the OECD's PPP rates, with the 2013 rate being held constant for future years.

For many years we have endorsed the use of PPP rates instead of the 'blended' rates that incorporate both the PPP and the market exchange rates that have previously been used by the Commission.

We note that previously the Commission has sourced PPP rates from the World Bank rather than the OECD – there are only minor differences in the two sets of data, due to the OECD data being rounded to two decimal places, while the World Bank presents the data to nine decimal places. We do not consider that this difference is material, given the degree of accuracy for the various model inputs.

Within the Price Trends spreadsheet (CI_ComCom-Price trends v5.xlsx) the sheets Aliminium_Sheeting [*sic*], Steel and Copper – which we assume were sourced directly from NZIER – convert the USD prices to NZD using a 'blended' exchange rate that is calculated in the sheet Converting_exchange_rates – which we also assume was not sourced from TERA. This latter sheet calculates the blended exchange rate using PPP rates from the World Bank, however these are actually the PPP conversion rates divided by the market exchange rates, and thus are not comparable to the OECD rates (in sheet OECD PPP). This information is not used elsewhere.

6.4 Price trends for ducts and trenches

In the case of ducts and trenches, the model uses price trends that are sourced from Beca.[103] The Commission states that these network elements are "highly influenced by local circumstances" and thus it is important to incorporate local knowledge.

We agree with the Commission that price trends for these network elements must consider local conditions, however we believe that Beca's inflation forecasts may be over-stated, especially in comparison with other New Zealand information sourced by the Commission for use in the modelling.

It is unclear how Beca arrived at its inflation forecast of 3.0%. It appears to have considered the overall CGPI as well as several of its components, namely:

- non-residential building
- civil construction, disaggregated into:
  - transport ways
  - pipelines
  - electrical works
  - earthmoving and site works.

Beca's estimate appears to be highly weighted towards the annual growth as at June 2014 for earthmoving and site works. We suggest that the much lower growth for transport ways and pipelines should perhaps have a greater influence than is given by Beca.

Beca also claims that there is an upward trend in the CGPI, however this trend has only been in evidence for the past two years after three years of relatively modest growth (Exhibit 6.4).

103 Beca (2014), *FPP Corridor Cost Analysis of Trenching and Ducting Rates in NZ – Final Issue Nov14*, 25 November 2014, pp8-9.

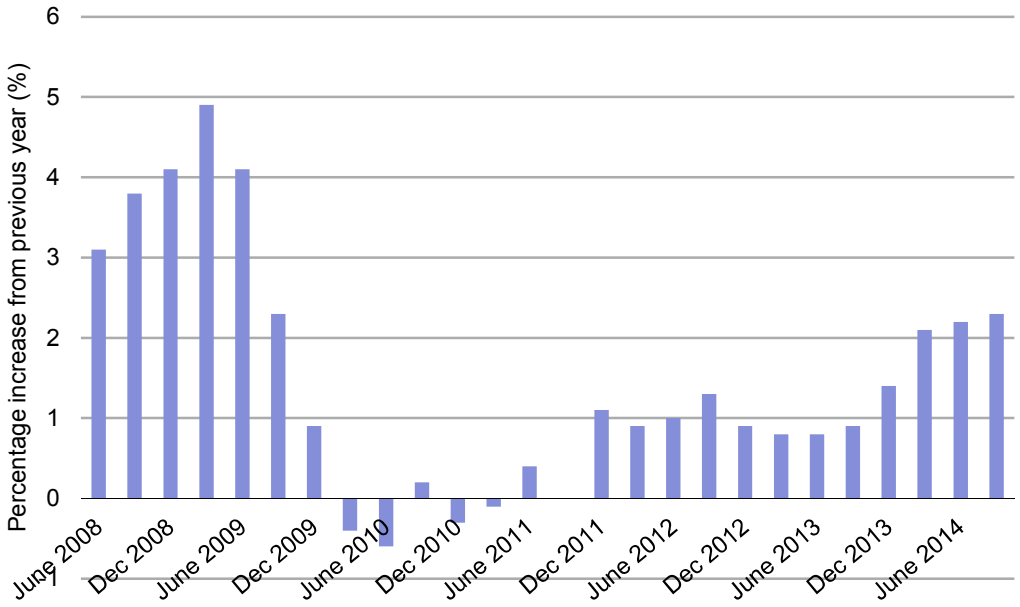

Exhibit 6.4: *Percentage change in CGPI from previous year, June 2008 to September 2014 [Source: Statistics New Zealand]*

As we have noted previously, historical data does not always provide good guidance for future time periods, and so it is important to consider other available information.

TERA's view is that the trend for trenching costs is 90% labour/wages and 10% for CPI.[104] This tends to suggest that the price trend for labour may have a more significant effect on trenching than CGPI. We would therefore suggest that the trenching price trend should be closer to the forecast LCI rather than using Beca's forecast.

According to Beca:

> It is worth noting here the impact that the Christchurch re-build which has had, and continues to have on labour rates in the south and lower north islands. There is a premium being paid in Canterbury for most trades, and the activity there has created a high demand for machinery.

104 In CI_ComCom-Price trends v5.xlsx, sheet Analysis, row 89.

This suggests that the Christchurch re-build has had an inflationary effect on the CGPI. In the Draft Determination, the Commission is silent on the issue of higher costs as a result of the Christchurch re-build. Note that we have discussed this issue in Section 4.2.

6.5 Summary

The assumptions relating to price trends must be reviewed and revised. Calculation errors need to be corrected, and the Commission must ensure that the price trends utilise reliable independent forecasts, where available.

7 Financial parameters

7.1 WACC

The Commission has estimated a draft forward-looking post-tax WACC of 6.47% for UCLL and UBA services[105] using data as at 1 August 2014. The value of the WACC applicable to the Final Determination is likely to alter slightly as the Commission will update the risk-free rate and debt premium based on data as at a date 'as close as practicable to the date of the final decision'[106].

The Commission has provided its workings for determining the draft WACC[107]. We have reviewed both the data and calculations and found have been able to replicate the calculations based on the Commission's inputs and assumptions.

The cost of debt

In estimating the cost of debt the Commission has:

- matched the risk-free rate to the regulatory period of five years and applied current interest rates in the form of the observed market yield to maturity of NZD denominated Government bonds

105 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014.

106 *Ibid*, paragraph 19.

107 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews, WACC spreadsheet*, 2 December 2014.

- estimated the debt premium at 1.85% using a seven year term for publicly traded NZD denominated bonds with a BBB+ S&P credit rating
- included an allowance for debt issuance costs of 0.25%
- included its estimate of swap costs of four basis points.

As noted by the Commission, Network Strategies has in an earlier submission supported the matching of the risk-free rate to the regulatory period[108]. We also noted that the Commission has previously – in the context of the Telecommunications Service Obligation (TSO) – adopted a practice of estimating the debt margin as the sum of the debt premium, annualised debt issuance costs and swap costs[109]. As we consider this approach preferable to the proposed introduction of a Term Credit Spread Differential (TCSD), we support the Commission's decision to maintain the general approach it adopted for the TSO. However the Commission has assumed a term for the debt premium that exceeds the regulatory period. This is a point of departure from both the Commission's TSO practice and the cost of capital Input Methodologies (IM). As regards the latter the Commission notes[110]:

> In the IMs we were unwilling to set a term for the debt premium which was longer than the regulatory period when most firms were not incurring the additional cost of longer-term debt. If we had used a longer term of the debt premium, we would have compensated regulated suppliers for a cost most were not incurring.

For the regulated UCLL and UBA services the Commission has selected a debt premium term two years longer than the regulatory period on the grounds that an HEO would issue long-term debt, and that empirically in New Zealand a seven year average is observable for airports and energy utilities. These empirical findings are based on a confidential debt survey undertaken by the Commission in 2010 which has not been made available to us.

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108 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014. See paragraph 60.

109 Commerce Commission (2009) *Final TSO Cost Calculation Determination for TSO Instrument for Local Residential Telephone Service for period between 1 July 2006 and 30 June 2007*.

110 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014. See paragraph 89.

We recommend that the Commission assumes a term that matches the regulatory period rather than exceeds it. This option avoids the inconsistencies inherent is selecting different time-periods for the two key components of the cost of debt. In addition it is a more conservative (or mid-point) option which recognises that as the WACC will be re-set at the end of the regulatory period a risk avoidance strategy for providers of regulated UCLL / UBA services would involve aligning debt as closely as possible with the regulatory term. Thus setting a term for the debt premium in excess of the regulatory period simply may lead to windfall gains, as highlighted by the Commission's statement in relation to the IMs.

We also consider that the Commission's approach embodies a significant margin of error. We accept the general principle that the efficient term of debt for a single HEO is difficult to judge and that indicative data from relevant New Zealand comparators provides very useful guidance. However we have concerns that the average actual tenor of observable debt for regulated infrastructure suppliers in 2010 may not be an appropriate proxy for an HEO in 2015.

Efficient debt practices may change over time, and in reaction to particular financial conditions (for example, the global financial crisis of 2008 to 2009). Consequently the Commission should consider updating its survey after such a long period of time to ensure the results are relevant for a forward-looking WACC estimate in 2015.

The Commission does not explain exactly how it estimated the debt premium as 1.85%, although it states that 'further details on this calculation are provided in the spreadsheet released with this draft decision'[111]. The spreadsheet contains a table with the heading 'Corporate bonds used to estimate debt premium for UCLL and UBA (7 year term to maturity as at 1 August 2014)' which implies that all of the bonds listed have been taken into account in the Commission's calculation. However only one bond matches exactly the Commission's requirements (BBB+, 7 years) – namely, CIAL with a debt premium of 1.70%. As regards the remaining bonds:

- Three (Genesis Energy, Meridian and MRP) are regarded by the Commission as 'anomalous' hence we assume that these have been disregarded

111 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014. See paragraph 110.

- Four (AIAL, Spark, Telstra, and Transpower) and have a rating higher than BBB+ and a term less than 7 years, hence the Commission indicates that the debt premium for BBB+ and 7 years would be higher than for these bonds. Note that the range of quoted values ranges from 1.17% to 1.61%.
- Two (Contact and PowerCo) have a rating lower than BBB+ and a term less than 7 years – for these the Commission notes that the debt premium would be lower with a BBB+ rating and higher with a 7 year timeframe. The quoted values are 1.78% and 1.87%.
- One (Fonterra) has an A+ rating and a 7 year term, and the Commission notes that for BBB+ the debt premium would be higher (than the quoted value of 1.34%).
- One (WIAL) has a BBB+ rating and a 6.8 year term. The Commission notes that for a 7 year term the debt premium would be higher than the quoted value of 1.71%, and further that this bond provides the lower bound for its estimate.

In using the WIAL value as the floor we infer, then, that the Commission has referred only to Contact (1.78%) and PowerCo (1.87%) in deriving its estimate, since:

- AIAL, Spark, Telstra, Transpower, CIAL and Fonterra all have quoted values of less than the WIAL value
- the three anomalous bonds have presumably been excluded from consideration.

However the Commission stated that the direction of the 'adjustment' required for these two bonds is unclear, therefore it is not transparent how the Commission reached its final estimate of 1.85%. The only other bonds it could possibly have considered in its calculation are two of the three 'anomalous' bonds (Genesis Energy at 1.96% and MRP at 1.99%).

So what WIAL figure is the Commission using as a lower bound? The Commission appears to consider 1.71, however this is the debt premium for the term ending on 15/5/2021. If the Commission were to extrapolate the trend derived from the two WIAL bonds (similar to the interpolation for the other bonds) to the same end date (31/7/2021), then the WIAL debt premium would be lower – 1.68.

We recommend that the Commission include WIAL within an average calculation (within the small sample of BBB+ bonds, namely CIAL, Genesis Energy and MRP) – but using the

extrapolated figure above. This gives a debt premium of 1.83. As Genesis Energy and MRP are likely to be inflated, the inclusion of WIAL would be offset to some degree. Alternatively the median could be used which is also 1.83%.

The cost of equity

The Commission has assumed an asset beta of 0.40 and a notional leverage of 43% using a sample of comparator firms (Oxera's 'refined comparator sample'). Network Strategies has previously supported the use of the refined comparator sample, with some recommended amendments[112]. In particular we considered that:

- Oxera should adopt the median rather than the mean as the appropriate measure of central tendency
- Deutsche Telekom should be excluded from the sample, mainly due to the extent of its international activities.

We note that while Oxera has considered both recommendations[113] neither have been implemented. Oxera characterises Deutsche Telekom as a 'borderline case' but opts to retain it in the sample as 'it provides an example of a business largely dominated by its incumbent position'[114] and, furthermore, in practical terms the exclusion of this company does not have a major impact on the results. On balance our view is that the feature of the business highlighted by Oxera is insufficient to support its inclusion in the sample given the extent of the international businesses operated by the company.

With respect to the issue of the median versus the mean, Oxera considers that it has already undertaken a process of systematic elimination in defining the relevant comparator sample:

> As a result, it is not clear that any further exclusion of data points through the use of the median is warranted. Among the remaining firms, each was considered to be relevant to the

112 Network Strategies (2014), *Expert reports on WACC for UCLL and UBA FPP*, 21 July 2014.

113 Oxera (2014), *Review of expert submissions on the WACC for UCLL / UBA*, 4 November 2014.

114 *Ibid*, page 10.

> analysis irrespective of the magnitude of the beta value. Given the context, the mean would serve as a more inclusive measure for summarising the data[115].

Even when carefully selecting data observations that comply with well-defined criteria, the data analyst would not be surprised to obtain some variation within the data. We would support the use of the average from sufficiently large samples, however if the sample is small, then we cannot be as confident that the data points are an accurate representation of the variation that would be observed in a larger sample, and thus any extreme values may have a distortionary effect on the result. Such data points are called 'influential' observations and in effect are more important to the result than any other data point within the sample. It is simple to determine whether a data point is influential – calculate the average both including and excluding that data point. If there is a significant difference, then it is clear that the result is strongly influenced by that single data point. As we do not wish to assign a higher weighting to particular data points, for that reason in small samples we prefer the use of the median.

In reaching a decision on the estimate of the asset beta the Commission considered average asset betas for the five years to 2009 and the five years to 2014, calculated using both monthly data and weekly data. The Commission notes that the estimates from the earlier period are significantly higher than those from the later period, and concludes that it should place more weight on the later estimates but at the same time take into account the results from the earlier period.

> Given the absence of a simple explanation for these differences between adjacent time periods, if we were to simply adopt the most recent estimate, we might be using an asset beta that was too low.[116]

In our view the results from the earlier period are likely to have been distorted by the global financial crisis, and as such there is a case that this period should not be considered at all by the Commission.

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115 *Ibid*, page 13.

116 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014. See paragraph 161.

Selection of mid-point estimate

The Commission has decided that no uplift will be applied to its mid-point WACC estimate. We agree that it is inappropriate to apply any uplift, and have previously submitted on this issue[117] on behalf of Vodafone. While the Commission acknowledges our submission and the submissions of other parties that did not support an uplift, the Commission indicates that its reasoning differs from these submissions[118]. In particular the Commission notes:

- its concern to avoid potential adverse impacts of setting a price too low is likely to be addressed through modelling choices that err on the high side (although it did not intend to do so), such as:
  - the use of optimised replacement cost (ORC) for re-usable assets
  - the omission of any performance adjustment in relation to the FTTH MEA.

- considerations relevant to suppliers regulated under Part 4 of the Commerce Act (where an uplift to WACC is applied) are less relevant in the UCLL / UBA context – for example, risks associated with potential under-investment and outages would have more severe consequences with respect to electricity supply where there are fewer substitutes available compared to fixed-line telecoms. In addition the Commission notes that Chorus has incentives to maintain its copper network via TSO obligations.

- a WACC uplift is not warranted in order to support innovative investment in new services, including access seeker investment. The Commission acknowledges that in the current New Zealand context (that is, in view of the UFB initiative) it is 'not seeking to actively promote unbundling when setting UCLL and UBA prices under the

117 Network Strategies (2014), *Commission consultation on WACC for UCLL and UBA services*, 27 March 2014.

118 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014. See paragraph 246.

FPP'[119] and as such 'remaining at the mid-point WACC estimate will avoid additional impacts on access seekers' investment incentives'[120].

With respect to the latter two issues, we agree with the Commission that sectoral differences render adoption of the WACC uplift applied for Part 4 regulation inappropriate in the present context, and that undesirable investment distortions may result from an uplift.

We also agree with the Commission that its key modelling choices will have an upward impact on modelled costs. As such, if the Commission is minded to err on the high side, then such choices will support its goal. However, we also note that in arriving at its WACC estimate the Commission appears to have adopted conservative choices in deriving some of the parameters – that is, choices that err on the high side rather than the low side or even the mid-point of the low-high range. As we have already discussed the following choices are indicative of an approach that errs on the high side:

- the inclusion of a weighting for the asset beta sample observations from the five years to 2009
- the lack of matching of regulatory period with the debt premium term

We thus recommend that the Commission ensures that for every WACC parameter (where relevant) it has established both a low and high estimate and in each case has selected the mid-point estimate. To do otherwise would be to introduce an unwarranted further upward bias, given the Commission's LRIC modelling choices.

119 Commerce Commission (2014), *Cost of capital for the UCLL and UBA pricing reviews - draft decision*, 2 December 2014. See paragraph 232.

120 *Ibid*.

7.2 Taxation

Tax-adjusted annuity factor

The Commission's documentation[121] defines the real capital recovery factor with the following equation:

$a_{it} = \text{PMT}(WACC_{real}, n) \times Adjustment_i$

where:

- a_i is the tax adjusted tilted annuity factor for the ith asset type
- PMT() is the payment function in Microsoft Excel
- n is asset life
- $WACC_{real}$ is the real post-tax cost of capital
- $Adjustment_i$ is the adjustment to the pre-tax annuity factor

We note that the Excel PMT() function has a minimum of three parameters – interest rate, the number of periods and the present value – yet the Commission's equation does not specify what is being used for the present value.

Some more detail is provided by the Commission[122], however we believe that this explanation could be improved to increase transparency of this complex calculation. For example, the term L is not defined (although its meaning can be imputed).

The Commission uses a present value of -1 in the PMT() function. We believe this may represent a unit loan amount of $1, which would be appropriate for application of the real capital recovery factor to varying costs. It would increase the transparency of this calculation if the Commission clarifies its reasoning.

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121 Commerce Commission (2014), *Formula to model tax in the TSLRIC model,* 30 September 2014.

122 *Ibid*, Attachment K, Box 1.

7.3 Conclusions

We have reviewed the Commission's calculations in estimating WACC and we are able to reproduce its results. However we found that the Commission had over-estimated the debt premium and we have provided recommendations on improving accuracy based on the bond sample it has available.

We agree with the Commission that it should not consider a higher percentile than the mid-point.

As regards the values of the components of the WACC that the Commission has selected we find in general that these are robust estimates although we recommend that the Commission considers:

- excluding a weighting for the asset beta sample observations from the five years to 2009
- matching the regulatory period with the debt premium term.

The approach that the Commission has adopted in respect of these two parameters would tend to have an upward impact, and as such the WACC is likely to err on the high side. Thus we recommend that the Commission ensures it has selected the mid-point estimate for each component of the WACC.

8 Chorus models: are they suitable for TSLRIC pricing?

Chorus commissioned consultants Analysys Mason to develop UCLL[123] and UBA[124] models of its network. We have undertaken a high-level review of these models to consider whether the Chorus model complies with the Commission's criteria and principles for TSLRIC modelling (discussed further in Section 8.1 and Section 8.2).

8.1 Inappropriate model assumptions

Based on the results of consultation with interested parties the Commission's consultants have listed[125] 62 criteria or principles for the TSLRIC-based FPP cost modelling. In an examination of the extent of Chorus' departure from TSLRIC principles we compared the Chorus models against key criteria. The comparison revealed substantive differences. While some differences relate simply to alternative values of inputs and assumptions to those used by the Commission, others are more serious in nature as they are contrary to the fundamental principles of TSLRIC modelling and as such fail to comply with the requirements of the FPP process.

123 Analysys Mason (2014), *Model user guide for UCLL hybrid bottom-up model*, Ref: 38598-475, 28 November 2014.

124 Analysys Mason (2014), *Model user guide for UBA model*, Ref: 38598-482, 28 November 2014.

125 TERA Consultants (2014), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services*, Model reference paper, November 2014. See the appendix for a summarised list of the criteria.

In essence, as the Chorus models represent Chorus' actual network, they contravene the requirement that a TSLRIC model be of an economically efficient operator, utilising modern equivalent assets (MEA).

A summary of the criteria that the Chorus model fails to meet is provided in Exhibit 8.1. These are discussed in further detail below.

Criterion	
7	The MEA of the UCLL is the cost-efficient way of providing the UCLL service.
8	The MEA of the UCLL is based on a mix between a point-to-point fibre network and an FWA network.
9	The cost of the MEA should be adjusted to reflect the cost difference between the MEA network and the copper network.
10	In order to compute the cost-adjustment, a copper access network and a fibre + FWA network should be modelled. The adjusted cost of the MEA network is the cheapest network selected at the national level between the two scenarios identified.
12	The fibre network should be a PTP network.
13	The FWA sites should be the RBI sites.
14	The FWA sites should be connected to the nearest exchange. Customers located on the way from the FWA sites to the exchanges should be connected by the FTTH network.
15	The FWA should use the LTE technology.
16	The FWA coverage should be Vodafone's RBI coverage.
22	The UCLL demand should be constant.
23	The modified scorched node approach should be modelled (for UCLL).
25	The length-based optimisation approach should be followed for the modelling of the copper network.
26	The length-based optimisation approach should be followed for the modelling of the fibre network.
39	The UBA demand should be constant.
48	The modified scorched node approach should be modelled (for UBA).
58	Operating costs should be calculated using opex from the accounts with efficiency adjustments, real bottom-up assessment should be performed for energy and square meters costs.
59	A tax adjusted annuity should be used to derive the annual costs.

Exhibit 8.1: *Modelling criteria that are not satisfied by the Chorus model [Source: Network Strategies]*

Inefficient historic network design

One of the key requirements of a TSLRIC model is that it represents an efficient network utilising modern efficient assets (MEA) as deployed by a hypothetical efficient operator. The Chorus models are not that of a modern efficient network, but reflect Chorus' actual network.

In the case of UCLL:

> The model is based on actual asset counts, where available, as Chorus' actual investment decisions are taken as a proxy for an efficient operator given the real-world constraints encountered in New Zealand.[126]

The UBA model:

> …combines a bottom-up model for electronics with actual asset counts for civil works (km of digging/km of fibre) and actual numbers of nodes (number of customer sites, cabinets and exchanges)[127]

A fundamental characteristic of Chorus' network is that it was developed over many years, and thus deployment decisions were made based on various factors such as technology and demand that were relevant at that time. However the TSLRIC methodology requires the HEO's network to reflect deployment decisions that would be made at the present time – that is, decisions that are not influenced by the past.

These decisions encompass:

Technology choice The Commission has specified that the MEA to be used for the network is a mix of point-to-point fibre and FWA.

126 Analysys Mason (2014), *Model user guide for UCLL hybrid bottom-up model,* Ref: 38598-475, 28 November 2014, p4.

127 Analysys Mason (2014), *Model user guide for UBA hybrid bottom-up model,* Ref: 38598-482, 28 November 2014, p1.

The model of Chorus's historical access network has very little fibre. Any fibre is largely in the feeder network with none in the distribution network. The model does not include any FWA technology.

Network optimisation

The Commission has elected to adopt a modified scorched node approach, however the Chorus model has no node optimisation, reflecting the legacy development of the network.

Similarly, Chorus' model is not optimised in terms of path, duct and cable lengths, again reflecting the legacy nature of its actual network. Length-based optimisation – used in the Commission's model – would result in shorter path, duct and cable lengths than in Chorus' network.

No efficiency adjustments for operating costs

Operating costs within a TSLRIC model must reflect those of the HEO. While these may be based on actual costs, typically regulators require an efficiency adjustment.

Analysys Mason claims that within the Chorus models opex has been obtained from several sources, but primarily the Chorus General Ledger.[128,129] The other sources are not identified, and so we are unable to comment on their suitability for use in a New Zealand environment.

These costs appear to be entirely historical (the unidentified sources notwithstanding), and do not include any subsequent adjustments for efficiency.

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128 Analysys Mason, *Model user guide for UBA hybrid bottom-up model*, Ref: 38598-482, 28 November 2014, page 9.

129 Analysys Mason, *Model user guide for UCLL hybrid bottom-up model*, Ref: 38598-475, 28 November 2014, page 8.

Increasing asset counts with constant service demand

In the Commission's model, demand is assumed to be constant over the regulatory period, however the Chorus UCLL model has increasing asset numbers over this period despite service demand remaining constant. These assets include:[130]

- feeder manholes, to active cabinets, fibre (asset IDs 137–144)
- feeder cable route, trench, to active cabinets, fibre (asset IDs 177, 181)
- feeder fibre cables (asset IDs 353–362).

It is notable that in the Chorus UCLL model the asset count is not driven by service demand – instead there are input asset deployment drivers which are unrelated to service demand. In most cases these drivers are constant over the regulatory period, set to the 2013 level, but in the case of the above assets the deployment driver is such that the number of assets more than **[ ]CCNZCI** over the regulatory period. Clearly, these assets are all fibre-related – such a trend may be appropriate if Chorus was modelling a transition from copper to fibre, however as the number of copper assets remains constant over the regulatory period (and thus generating operating expenditure) it is clear that such a transition is not occurring.

The effect of this will be to inflate costs, and thus the resultant price will be overstated.

Declining service demand for UBA

In contrast to Chorus' UCLL model, its UBA model does have a direct relationship between service demand and asset counts, however Chorus assumes that the service demand will change over time.

The UBA model incorporates the various types of bitstream – BUBA and EUBA – as well as a number of other services that share the relevant network assets. In the case of bitstream, demand is assumed to decline; in the case of BUBA demand declines

130 See the UCLL model, "FullNw" sheet.

dramatically over the regulatory period. For some of the other services within the model, demand increases.

As service demand changes, the number of certain assets also change. These assets include:[131]

- DSLAM chassis (asset ID 10)
- DSLAM cards (asset IDs 14–18)
- aggregation switch cards (asset IDs 35, 37)
- aggregation switch optics modules (asset IDs 41–48)
- OFDF (asset IDs 78–82)
- Service management system, line card software (asset ID 117)
- various other network cost elements (asset IDs 380–387).

Clearly this represents a very different scenario to the Commission's constant demand assumption.

Annuity is not tax adjusted

The Chorus models use modified tilted annuity calculations.[132,133] Unlike the Commission's model no adjustment for tax is included.[134]

8.2 Unknown aspects of the Chorus models

It is not clear whether or not the models are consistent with several of the modelling criteria (Exhibit 8.2).

131 See the UBA model, "FullNw" sheet.

132 Analysys Mason (2014), *Model user guide for UBA hybrid bottom-up model*, Ref: 38598-482, 28 November 2014, page 18.

133 Analysys Mason (2014), *Model user guide for UCLL hybrid bottom-up model*, Ref: 38598-475, 28 November 2014, page 10.

134 See the "MTAD" sheet of the models.

Criterion	
6	The red zones in the Christchurch area should be disregarded.
17	The capital cost of the access network should be computed within the Commission's TSO-derived boundary. However, the cost of connections outside the boundary for the part of those connections that is within the boundary should also be included. It is assumed that the capital contributions cover exactly the cost outside the boundary. The operating costs of the access network should however be computed over a nationwide network.
33	The cost of the DSLAM included in the RBI program should not be recovered by Chorus through UBA.
61	The price control period is the 2015-2019 period.

Exhibit 8.2: *Modelling criteria that are not satisfied by the Chorus model [Source: Network Strategies]*

We note that RBI is mentioned as a separate (included) service in the UCLL documentation,[135] however we can find no reference in the UBA model and documentation to RBI. It is unclear as to whether DSLAMs associated with the RBI program are included within the UBA model. Furthermore, we note that the Chorus model includes as a cost 'regulatory levies' consisting of 'payments to the Government for the TDL [Telecommunications Development Levy] and the Commerce Commission's fees'[136]. Thus it appears that the model both calculates a cost for RBI services, and additionally includes as a cost levies that fund the RBI (through the TDL). It remains uncertain how or where any allowances are made for subsidies that Chorus acknowledges it receives in its Annual Report[137].

The model results appear to be for a single year only, with the default value being 2014.

8.3 Summary

We found that the Chorus models are not suitable for the TSLRIC modelling that the Commission is required to perform for its FPP pricing review. In particular, it was apparent

135 Analysys Mason (2014), *Model user guide for UCLL hybrid bottom-up model*, Ref: 38598-475, 28 November 2014, page 5.

136 *Ibid*, page 8.

137 See Section 3.1 of this report.

in a number of key aspects the Chorus' models are contrary to the fundamental principles of TSLRIC modelling and therefore fail to comply with the requirements of the FPP process.

As such the Chorus model results should be disregarded by the Commission.

9 Other issues

There are a number of additional issues which are likely to have a substantive impact on the outcome of the Commission's modelling, including the Commission's choice of technology (Section 9.1), its use of the ORC approach to asset valuation (Section 9.2), and its consideration of asset stranding (Section 9.3). All of these issues have been addressed in some detail in WIK-Consult's submission on behalf of Spark and Vodafone. Therefore we provide below only a high-level summary of our views on these issues.

9.1 Technology choice

For its fibre MEA the Commission selected Point-to-Point (P2P) rather than Gigabit Passive Optical Network (GPON) technology. The Commission states that its decision was based on the ability of P2P technology to permit unbundling at Layer 1[138]. P2P is generally the most expensive FTTP option, with the additional costs coming from a significant increase in the fibre feeder cables, compared to alternatives.

Prior to the UFB initiative Network Strategies undertook cost modelling of alternative technology options for deploying high speed broadband in New Zealand, on behalf of InternetNZ. We discussed the cost implications of the alternatives and rejected P2P on the basis of its high cost[139]. We did, however, model a GPON architecture for provision of Layer 1 services. It still remains the case today that GPON is a cheaper alternative than P2P, and it may be unbundled.

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138 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 283.

139 Network Strategies (2008), *Broadband Strategy Options for New Zealand*, 2 December 2008. See Section 6.

9.2 Use of Optimised Replacement Cost

The Commission considers that it is inappropriate to apply an alternative asset valuation methodology, despite the recent recommendations of the European Commission on this issue.

We have previously described current best practice as regards asset valuation for costing fixed access and noted that we could find no specific New Zealand conditions that would indicate that the Commission should not adopt best practice recommendations in this respect[140].

We note also that the Commission's expert, Professor Vogelsang, states that the Commission's approach will result in a higher price than would have been the case had it adopted the methodology recommended by the European Commission[141].

9.3 Allowance for asset stranding

The Commission considers that it is appropriate to include in its model an *ex ante* allowance for asset stranding due to technological change.

> … we recognise the greater level of technological change in the telecommunications sector and, on balance, agree with Chorus that there may be some asymmetric risk of asset stranding which requires ex ante compensation.[142]

As such the Commission favours Chorus' values for asset lives since these 'incorporate the likelihood of the assets becoming obsolete as a result of technological advances'[143] and refers to its previous TSO practices as regards allowances for asset stranding, as well as a

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140 Network Strategies (2014), *Key issues in modelling UBA and UCLL services*, 6 August 2014. See Section 2.4.

141 Vogelsang (2014), *Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand,* 25 November 2014. See paragraph 188.

142 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 716.

143 *Ibid*, paragraph 720.

report by Plum Consulting for ETNO (the European Telecommunications Network Operators)[144]. Accordingly the Commission has relied extensively on Chorus' accounting values[145] for asset lives, as the means of incorporating an allowance in the model for the risk of asset stranding[146].

We know of no regulatory precedents for the Commission's proposed approach. Moreover the Commission's unorthodox proposal is very surprising considering the judgement in the 2011 TSO Court Case[147] in which the Court noted that it was not legitimate for Telecom to expect a return on the hypothetical asset base modelled by the Commission[148].

> The Commission has committed a second error of law … by declining to change its model to include mobile technology because of its belief that it would then need to allow compensation to Telecom for the effect of the change, namely the stranding of some legacy assets. The Commission declined to introduce the mobile technology because Telecom would not then receive the return on and of its legacy assets which it could expect to get under the Commission's model. But, as those assets had been overvalued, Telecom had no case for compensation.[149]

The possibility (or otherwise) of stranded assets is irrelevant in a forward-looking model. It simply has no place in decisions regarding future pricing. The potential risk posed by new and competing technologies (bringing early obsolescence to existing sunk assets) is an investment risk that is typically considered part of the inherent risks of infrastructure investment in a dynamic market.

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144 Plum Consulting (2011), *Costing methodology and the transition to next generation access*, March 2011.

145 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 718.

146 *Ibid*, paragraphs 718 to 721.

147 *Vodafone New Zealand Limited* v *Telecom New Zealand Limited,* SC 4/2010 [17 November 2011].

148 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014., paragraph 71.

149 *Ibid*, paragraph 75.

Furthermore, the Commission in making such an allowance implicitly is assuming that the regulated firm has not already recovered investment costs (or may not be able to recover these in the future). In Chorus' case many of its copper assets are already fully depreciated, and so it is difficult to justify the Commission's decision on this basis.

It should be noted that Plum Consulting's recommendations on this issue are made with respect to incentives for the transition from copper to fibre in Europe, and in this context Plum is unconcerned about the potential for over-recovery of copper costs.

> There is a case for basing charges on an assumption that assets are not fully depreciated i.e. reflecting these costs in the price. While this may raise concerns about over-recovery of copper costs, the trade off in terms of improved investment incentives may offer higher ultimate benefits to consumers[150].

However the Commission states that understated economic lives for assets would result in the HEO being over-compensated[151] and conversely overstated economic lives would result in under-compensation. Thus we assume that it is not the intention of the Commission to over-compensate the HEO and therefore it is important that the Commission ensures that economic lives are not understated.

9.4 Conclusions

The Commission has not selected the least cost available technology for its modelling, and its assumptions regarding the use of ORC and asset stranding are likely to over-compensate the HEO. As a result of the inclusion of these assumptions the outcome of the

150 Plum Consulting (2011), *Costing methodology and the transition to next generation access*, March 2011, Section 5.3.

151 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 733.

Commission's model is unlikely to be a mid-point estimate but tend towards the higher end of the possible range of results.

10 Conclusions and recommendations

10.1 Developing a mid-point estimate of true cost

The Commission states that its model provides:

> … a central estimate of the 'true' TSLRIC cost for the UCLL and SLU services, from which we might determine a range with an upper and lower bound. Although the model is conceptually capable of expressing a range, we have not done so in this draft pricing review determination.[152]

We assume that the Commission means that it aims to deliver a mid-point estimate of the true TSLRIC cost. However the Commission has in its modelling approach adopted a number of conservative assumptions, the combined effect of which implies that the calculated point estimates in fact approach an upper bound.

No consideration of impact of population growth or availability of fibre services over regulatory period

The implications of the Commission's conservative constant demand assumption combined with the relatively long regulatory period (five years) are unrealistic. In particular the Commission is implicitly assuming:

- mobile-only households will comprise more than one-fifth of all households by 2020

152 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraphs 210 to 211.

- any population growth will be absorbed by greenfields developments
- no further high or medium density developments, or infill projects, in established areas over the period 2014 to 2020, and thus population (and line) density will remain static
- increasing popularity of high bandwidth applications and cloud services will have no effect on demand for fibre/UFB services.

We have estimated that this will inflate costs by around 9%.

Use of Optimised Replacement Cost

The Commission considers that it is inappropriate to apply an alternative asset valuation methodology, despite the recent recommendations of the European Commission on this issue. The Commission's own expert, Professor Vogelsang, states that the Commission's approach will result in a higher price than would have been the case had it adopted the methodology recommended by the European Commission[153].

P2P technology preferred to GPON

The Commission selected a higher cost P2P rather than GPON technology for its fibre MEA, basing its choice on the ability of P2P technology to permit unbundling at Layer 1[154]. P2P is generally the more expensive FTTP option, with the additional costs coming from a significant increase in the fibre feeder cables, compared to alternatives, and we have demonstrated that it is possible to unbundle GPON technologies.

153 Vogelsang (2014), *Current academic thinking about how best to implement TSLRIC in pricing telecommunications network services and the implications for pricing UCLL in New Zealand,* 25 November 2014. See paragraph 188.

154 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 283.

FWA boundary based on RBI	The Commission admits that in using the RBI footprint as the boundary for the FWA footprint it has taken 'a conservative approach to the extent of FWA in the modelled network'[155]. It justifies this on the grounds that to do otherwise may lead to inconsistencies with observed network deployment in New Zealand.
Fibre deployment within the RBI boundary	The HEO in the Commission's model does not deploy solely FWA within the RBI boundary, but a mix of FWA and fibre. Although this practice could potentially deliver a mid-point estimate should the model deliver an efficient technology mix for rural geo-types, we have shown that this is not the case[156].
Inclusion of inefficient trenching costs	Trenching costs represent a significant contribution to overall costs in access modelling. An HEO deploying a nationwide network would be expected to achieve volume and / or scale discounts for trenching costs, yet empirically observable discounts of 20% have not been included. Furthermore, the price trend for trenching has been inflated. Finally, the impact of short-term market distortions on trenching contractor supply appear to have been included.
Uneconomic extent of HEO's fibre footprint	The Commission characterises the HEO as a rational profit maximiser (cost minimiser), yet it is clear that such an entity would not deploy a fibre network to the extent assumed in the Commission's model without some form of subsidy. Assuming the fibre footprint of the Commission's draft model, we estimate that the required subsidy would be $813 million, and this is not accommodated within the model.
Underestimate of RBI subsidy	The Commission's model underestimates the extent of RBI funding that should be made available to the HEO by way of a capital contribution or subsidy. Given that Chorus' total RBI funding is

155 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 285.

156 Network Strategies (2015), *Modelling Fixed Wireless Access*, February 2015.

$236 million (with the possibility of an extension of up to $150 million), arguably the Commission should allow in its model significantly more than it has already if it continues to assume fibre is deployed in RBI areas.

Chorus' accounting asset lives preferred to economic lives

For asset lifetimes the Commission considers that Chorus' values 'incorporate the likelihood of the assets becoming obsolete as a result of technological advances'[157]. As such the Commission has relied extensively on Chorus' accounting values[158] for asset lives, apparently in an attempt to incorporate an allowance in the model for the risk of asset stranding[159].

We know of no precedent for this in models of this type, and the TSO precedent cited by the Commission appears to be inappropriate.

A reliance on incumbent accounting values for asset lifetimes would have an upward impact on the results.

WACC does not represent a mid-point estimate

The WACC is likely to be an over-estimate as a result of:

- the inclusion of a weighting for the asset beta sample observations from the five years to 2009
- the lack of matching of regulatory period with the debt premium term.

It is clear that the Commission has specified a number of conservative assumptions in this modelling exercise with the result that the Commission has not achieved its stated aim of

157 *Ibid*, paragraph 720.

158 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop service*, 2 December 2014. See paragraph 718.

159 *Ibid*, paragraphs 718 to 721.

developing a central estimate of the true TSLRIC cost. In order to rectify this we recommend the following:

Commission assumption	*Network Strategies' recommendation*
Constant demand	Modify model to incorporate short- and medium-term demographic trends
Use of ORC	Assuming the Commission will retain this, note that this will deliver a conservative result
Use of P2P	Assuming the Commission will retain this, note that this will deliver a conservative result
FWA boundary based on RBI	Remove the RBI as a reference point for FWA deployment
Fibre deployed within RBI area	Either remove this assumption or ensure that full subsidy is applied to such deployment
Inefficient trenching costs	Modify cost and trend analysis
Uneconomic extent of HEO fibre footprint	Introduce subsidy (capital contribution)
Underestimated RBI subsidy	Revise capital contribution calculations
Asset stranding	Eliminate reliance on Chorus accounting asset lives information
WACC	Ensure all parameters represent central estimates.

Exhibit 10.1: *Summary of recommendations regarding the Commission's assumptions [Source: Network Strategies]*

It should be noted that as we believe that two of the Commission's assumptions are unlikely to be changed – that is, the ORC and P2P assumptions – even if all the other issues are addressed the final estimate will remain conservative.

10.2 Summary of other recommendations

In addition to the above recommendations, we consider that the accuracy of the Commission's model could be improved as follows:

- EDB data alone should be used to develop assumptions regarding aerial deployment

- If the Commission does refer to Chorus' actual aerial deployment value, it should also explicitly consider aerial deployment of other LFCs – including Northpower – which indicate that a higher aerial percentage is feasible even in UFB areas

- The Commission's model should incorporate more sharing of resources – with electricity network providers – as is observed in practice

- Assumptions relating to price trends must be reviewed and revised. Calculation errors need to be corrected, and the Commission must ensure that the price trends utilise reliable independent forecasts, where available.

- The Commission's estimate of the debt premium should be revised and corrected.

Finally, we recommend that the Commission disregards the Chorus model as it does not reflect the efficient deployment of an HEO's MEA network.

Annex A: Quantifying the subsidy

We have assumed that the HEO would deploy fibre to the 13 largest cities and towns, which encompasses just under 65% of the New Zealand population. Further, we assume that fibre will be supplied to all commercial premises, and multi-dwelling developments (that is, apartments and units). However, the fibre deployment would exclude the semi-rural fringes where population densities are lower, and dwellings are separate houses. Premises passed can then be estimated from Statistics New Zealand census data for occupied and unoccupied dwellings, together with the CoreLogic database. Auckland (Exhibit A.1) was modelled at the local board area level while the other urban areas were modelled at the city level (Exhibit A.2).

Note that this methodology could readily be extended to other towns, if required.

Local board area	*% separate houses in fibre footprint*	*% commercial and multi-dwelling developments in fibre footprint*	*Premises passed*
Rodney Local Board Area	70%	100%	18,628
Hibiscus and Bays Local Board Area	100%	100%	36,063
Upper Harbour Local Board Area	100%	100%	18,649
Kaipatiki Local Board Area	100%	100%	29,067
Devonport-Takapuna Local Board Area	100%	100%	20,490
Henderson-Massey Local Board Area	100%	100%	36,479
Waitakere Ranges Local Board Area	70%	100%	13,567
Great Barrier Local Board Area	0%	0%	0
Waiheke Local Board Area	90%	100%	5,852
Waitemata Local Board Area	100%	100%	18,181
Whau Local Board Area	100%	100%	25,340
Albert-Eden Local Board Area	100%	100%	30,233
Puketapapa Local Board Area	100%	100%	17,510
Orakei Local Board Area	100%	100%	29,474
Maungakiekie-Tamaki Local Board Area	100%	100%	27,447
Howick Local Board Area	100%	100%	42,724
Mangere-Otahuhu Local Board Area	100%	100%	18,683
Otara-Papatoetoe Local Board Area	100%	100%	19,822
Manurewa Local Board Area	100%	100%	23,716
Papakura Local Board Area	100%	100%	18,065
Franklin Local Board Area	70%	100%	19,779
Total Auckland			469,769

Exhibit A.1: *Estimated premises within the unsubsidised fibre footprint, Auckland [Source: Network Strategies]*

City	*% separate houses in fibre footprint*	*% commercial and multi-dwelling developments in fibre footprint*	*Premises passed*
Auckland			469,769
Christchurch	95%	100%	151,104
Wellington	95%	100%	63,386
Hamilton	95%	100%	54,515
Dunedin	95%	100%	51,766
Tauranga	95%	100%	48,365
Lower Hutt	95%	100%	38,570
Palmerston North	95%	100%	33,411
Napier	95%	100%	25,420
Porirua	95%	100%	18,262
Invercargill	95%	100%	24,058
Nelson	95%	100%	20,117
Upper Hutt	95%	100%	15,729
Total New Zealand			1,014,472

Exhibit A.2: *Estimated premises within the unsubsidised fibre footprint, nationwide [Source: Network Strategies]*

The subsidy is calculated by subtracting our estimated premises passed (1,014,472) from the premises passed by fibre in the Commission's model (1,741,699). This difference is then multiplied by the per-premise passed subsidy ($1118) to obtain the estimated total subsidy of $813 million.

As our approach is based only on Census data and the CoreLogic database – that is, actual data – it does not include forecasts of premises passed. With population growth and urban development, premises passed would be greater than the above estimate. Nonetheless our approach is comparable with the Commission's model which assumes constant demand.

We have noted elsewhere[160] that due to the nature of its modelling of FWA the Commission's model over-estimates the number of premises passed by fibre. Addressing this problem would reduce the fibred premises, and thus the subsidy amount.

160 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015.