Final report for Spark New Zealand and Vodafone New Zealand

Revised draft determination for the UCLL and UBA price review

UCLL and UBA Final Pricing Principle

PUBLIC

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0 Executive summary

The Commerce Commission's revised pricing review draft determination for UCLL (Unbundled Copper Local Loop) and UBA (Unbundled Bitstream Access) services seeks to address important cost model shortcomings, however it is clear that further modifications are necessary to ensure an efficient outcome. As it stands the model encompasses inefficiencies that prevent the Commission from achieving its objective – that is, a mid-point estimate of the true TSLRIC cost. Our review indicates that the calculated point in fact is beyond an upper bound estimate as it is does not reflect efficient MEA (Modern Equivalent Asset) costs. This must be remedied as there is no demonstrable evidence that any uplift (either implicit or explicit) to a mid-point estimate is warranted in order to better promote competition for the long-term benefit of end-users.

FWA as the MEA where costs are high and unbundling unlikely

The Commission appears unaccountably perplexed as to how it should identify where Fixed Wireless Access (FWA) should be deployed and how to choose which end-users should receive it. To solve this problem the Commission proposes a completely unorthodox and unrealistic method which assumes that the modelled operator will deploy fibre or FWA based on one factor only – distance from the exchange. The assumed distance seems to signify an adjustment for the performance of the copper network while neglecting the implications of geotypes and costs.

Rather than adopting efficient assumptions, the Commission attempts to mitigate 'topology and other factors' using the inappropriate coverage areas of Rural Broadband Initiative (RBI) sites designed for 3G technology in 900MHz in place of appropriate assumptions for forward-looking LTE technology in the 700MHz band. Furthermore, the Commission's model unrealistically assumes that existing RBI sites serve customers in single Exchange Service Areas (ESAs) rather than efficiently serving customers across multiple ESAs. This approach delivers an inefficient outcome with an over-designed network, under-utilised FWA infrastructure, and inefficiently high costs attributed to lines.

In New Zealand almost 20% of copper access lines are located in very low density areas and remote locations where terrain is typically highly challenging for the cost-effective provision of broadband services. Government has sought to address this problem via the subsidies of the RBI which cover 250 000 end-users. In contrast, the Commission's model seeks to build a state-of-the-art fibre network to **[ ]CNZCI** of premises in New Zealand with only 40 833 premises to be served by FWA. The modelled fibre extends to locations where it would be completely inefficient to deploy such a technology. These are areas where, as the Commission itself states, costs are particularly high and unbundling is unlikely.

The Commission is required under the Act to use economic criteria for this pricing review. A TSLRIC estimate of efficient costs inherently requires the choice of modern technology to be made on economic criteria, using as a yardstick the decisions that an efficient operator would make. The Commission explains its reluctance to adopt the requisite cost-based criteria for technology choice, on the grounds of potential model complexity.

On the one hand, the Commission claims that New Zealand's physical characteristics drive higher costs than other jurisdictions, but on the other hand the Commission rejects the fairly standard practice in TSLRIC modelling of capturing varying demographic, geographic and / or topographic features of a country using geotypes as too complex. However the Commission's model must accurately reflect efficient costs even if the correct approach seems 'complex'.

The Commission claims that no workable solutions are available. This is not the case, as demonstrated by the Network Strategies' FWA model which is based on actual terrain and propagation conditions in New Zealand, using an approach that is consistent with standard practice in TSLRIC modelling. It is not necessary to model the whole country, as the Commission fears, since sample area results from different geotypes may be applied to other areas. It is simply a matter of defining a realistic boundary beyond which fibre deployment does not extend.

Contrary to the Commission's assertions, we have provided a full justification for our recommendation that the FWA footprint should encompass locations where it is economical and feasible to deploy FWA in areas from Zones 3 and 4, either not currently or not likely to be unbundled. The Commission itself notes that in such circumstances FWA would be the appropriate technology choice.

Flawed benchmarking does not justify FPP model estimates

The Commission has claimed that other regulators' price determinations do not provide any evidence that the Final Pricing Principle (FPP) model is producing unreasonable cost estimates. We are puzzled by this claim. The benchmarking analysis conducted by the Commission's consultant is demonstrably deficient yet regardless the Commission makes its conclusion based on this obviously flawed research. We and our colleagues at WIK-Consult have identified numerous instances where the modelled operator is opting for inefficient choices – in comparison with international practices – which suggests that in the Commission's view a New Zealand operator must be excused from employing efficient methods, with no explanation of why this may be justified.

Improve model accuracy

A number of key model assumptions should be reviewed and corrected, and inconsistencies between the Commission's stated approach and the model must be addressed. In particular we recommend:

- modification of price trends
- revision of asset beta, notional leverage and interest rate swap estimates for the WACC
- including allowances for multiple connections at single address points
- correcting aerial assumptions
- ensuring consistent reasoning in the application of subsidy allowances in the model
- rectifying errors identified by our Geographic Information Systems (GIS) analysis.

Allow for demand growth

Given the Commission's constant demand assumption coupled with the very long regulatory period, we have identified a significant risk that prices will be based on a level of demand that bears no relationship to actual market demand. Demand drivers for the fixed line market are currently undergoing significant changes, and a forward-looking model should reflect this in order to avoid overstatement of unit costs with a loss in economic welfare as consumers become locked into high prices. We recommend that the Commission considers options for reducing the risk of an outcome that would be detrimental to New Zealand consumers. One option could be to adjust the forecasts to allow for growth. Another option would be to review the assumptions during the regulatory period.

Backdating will not deliver end-user benefits

With respect to backdating, our analysis could not find any demonstrable evidence that this would deliver any benefit to end-users, nor would it have any material impact on future investment by Chorus. However, should the FPP price exceed the Initial Pricing Principle (IPP) price, the implied wealth transfer is likely to impose a considerable unanticipated financial burden on Retail Service Providers (RSPs), and potentially have an impact on both RSP prices and investment to the detriment of consumer welfare.

Revised draft determination for the UCLL and UBA price review

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Contents

1 Introduction

The Commerce Commission has revised its December draft determination for the pricing review for unbundled copper local loop (UCLL)[1] and unbundled bitstream access (UBA)[2]. Although the estimated prices are very similar to the December estimates, the Commission has implemented many changes in its modelling approach and assumptions. Of particular note is the complete replacement of the Commission's earlier methodology for the inclusion of Fixed Wireless Access (FWA) technology in the model.

We have been asked by Spark New Zealand (Spark) and Vodafone New Zealand (Vodafone) to review a number of key issues and assumptions in the revised draft determination. Accordingly, this report encompasses:

- a review of the Commission's revised approach for modelling FWA (Section 2)
- identification of TSO boundary issues (Section 3)
- our comments on demand issues (Section 4)
- our assessment of the Commission's changes relating to aerial infrastructure (Section 5)
- an analysis of proposed changes to price trends (Section 6)
- a consideration of capital contributions (Section 7)
- our views on issues relating to the cost of capital (Section 8)
- a short review of new information relating to uplift (Section 9)

1 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015.

2 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled bitstream access service*, 2 July 2015.

- our evaluation of the benchmarking performed by the Commission's consultants (Section 10)
- an examination of the implications of backdating (Section 11)
- our conclusions and recommendations (Section 12).

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. Vodafone New Zealand CI is marked **VNZCI**, Ultrafast Fibre CI is marked **UFFCI** and Commerce Commission CI and RI is marked **CNZCI** and **CNZRI** respectively.

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

2 Fixed Wireless Access

In its revised draft determination the Commission proposes a new approach to the inclusion of an FWA Modern Equivalent Asset (MEA). The Commission has not undertaken any physical modelling of FWA sites, but has *ex ante* identified a subset of customers based on distance from the exchange to which FWA costs are applied. Current RBI coverage areas are then used to derive the costs of deploying FWA, and these costs are applied to the identified categories of end-users across the whole network.

FWA analysis in the Commission's earlier draft determination assumed that a subset of customers located in the RBI coverage areas would be served by FWA. The subset was calculated based on the assumed capacity of RBI base station sites and using the logic that 'the most expensive "lines" within their coverage areas are covered by FWA, the less expensive being served by fibre'[3]. While the approach modelled FWA in some rural geographical areas of New Zealand and the connection type was based on cost, it did not reflect the deployment of a hypothetical efficient operator (HEO) due to inappropriate assumptions and inaccuracies.

The Commission's revised draft determination assumes that customers across the whole country will be served by FWA if they are a fixed distance away from the exchange and all the remaining customers will be served by fibre. The assumed distance seems to signify an adjustment for the performance of the copper network (which degrades with distance from the exchange). The Commission's revised approach assumes that irrespective of the

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3 TERA Consultants (2014), *TSLRIC price review determination for the UCLL and UBA services – Model specification*, November 2014, section 6.2.

regions, terrain and customer density, the efficient HEO will provide fibre access to customers within a certain distance from the exchange.

This section presents:

- a review of the Commission's revised approach (Section 2.1)
- an examination of the main assumptions in the Commission's model (Section 2.2)
- an analysis of key issues in Commission's modelling approach and assumptions (Section 2.3)
- a discussion as to why our FWA model should be used by the Commission (Section 2.4)
- our recommendations (Section 2.5).

2.1 Revised approach

In the Commission's earlier draft determination the access network was dimensioned as a whole considering both FTTH and FWA simultaneously, and the existing locations and coverage of Vodafone's RBI sites were used to model the FWA network. A cost-based decision was used to identify which buildings / dwellings located within the Vodafone actual RBI coverage areas would be connected to the FWA network.

As stated in the model specification the new approach consists of:[4]

- determining the cost per Mbit/s of the FWA network
- applying the cost per Mbit/s to the actual coverage.

The FWA coverage is based on the distance to nodes in the copper network – active cabinet or MDF. The model identifies three categories of end-users:

- voice-only – fed by more than 6km of copper

4 TERA Consultants (2015), *TSLRIC price review determination for the UCLL and UBA services – Model Documentation*, June 2015, section 5.3.2.2, page 108.

- low speed – over 5.3km but less than 6km of copper
- full speed – the remaining end-users.

It is then assumed that all premises further than 5.3km from the closest active node are to be connected through FWA – according to the Commission these are voice-only and low-speed end-users which number 40 833 end-user lines.[5] As in the December version of the model, premises outside the TSO areas are to be excluded from FWA coverage. Premises built after 2001 are also excluded and not served by FWA.

Determining the cost of the FWA network

Consistent with the previous version of the model, the locations of Vodafone's sites are the starting point for modelling the FWA network. The model assumes sites are used at their full capacity (22Mbit/s per cell).

The total capital cost of the FWA network comprises base stations and backhaul from base stations to exchanges. The total capital cost is then divided by the cumulated peak throughput of the FWA network in the RBI areas to infer a cost per Mbit/s.

Throughput is assumed to differ for the categories of end-users defined. For determining throughput in RBI areas the model assumes for:

- voice-only end-users: 150kbit/s of throughput assuming no growth
- low-speed end-users: 1Mbit/s of throughput, starting at 150kbit/s and growing at the normal rate of 50% per annum for five years
- full speed end-users: 1.9Mbit/s, starting at 259kbit/s and growing at the normal rate of 50% per annum for five years.

5 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 345.

This determines the total FWA throughput demand in the RBI areas which is then used to derive a cost per Mbit/s. The cost of the FWA network for each exchange area is then the total throughput demand multiplied by the cost per Mbit/s.

The total throughput demand is calculated according to an assumed demand distribution (Exhibit 2.1). We note that the addition of FWA, FTTH and non TSO end users represents only 99.5% of the total of **[ ]CNZCI** end users assumed in the model. TERA's calculations therefore need to be reviewed to address this issue.

	Number of end-users	*% of model total*
Voice-only (FWA)	[ ]**CNZCI**	1.7%
Low-speed (FWA)	[ ]**CNZCI**	0.4%
Full speed (FTTH)	[ ]**CNZCI**	91.1%
Non TSO	[ ]**CNZCI**	6.4%
Total	[ ]**CNZCI**	99.5%
Total in model	[ ]**CNZCI**	

Exhibit 2.1: *Number of FTTH and FWA lines in the fibre scenario [Source: TERA]*

It appears that TERA has underestimated the number of low capacity users. The Government stated in 2011 that 252 000 rural households were unable to access broadband services[6]. If we compare this figure to TERA's FWA plus non-TSO end-users [( )]**CNZCI** then [ ]**CNZCI** lines have been either omitted from the FWA category or counted as full speed lines. Furthermore, we note that Chorus states on its website that as at 31 December 2015 it had, through the RBI initiative, 'brought new or upgraded broadband coverage within reach of 81 000 rural lines'[7]. It is inappropriate to exclude these upgraded lines from the Commission's set of low capacity users, unless the Commission makes an explicit allowance in the model for the RBI subsidy that made the upgrade possible.

6 Steven Joyce (2011), *Rural Broadband Initiative underway*, 20 April 2011, available at http://www.beehive.govt.nz/release/rural-broadband-initiative-underway.

7 Chorus (2015), *Chorus Half Year Result, FY15*, 23 February 2015, page 14.

2.2 Assumptions

We note that some, but not all, of the assumptions previously applied by the Commission to estimate FWA costs have been revised in response to Network Strategies' earlier critique.

Throughput

We previously noted that the Commission's approach was extremely conservative when establishing the maximum of premises served per base station:[8]

> The Commission's cap of 67 users has been calculated assuming a peak throughput (per FWA sector) of 16 666kbit/s. However this is a very conservative assumption as LTE/LTE-A sites are capable of achieving much higher throughputs, especially for stationary users. Our analysis shows that LTE sites (with two or three sectors) are capable of connecting around 260 customers while the theoretical maximum is over 300.

The Commission subsequently increased the throughput assumptions to 22 000kbit/s, resulting in a cap of 88 users per sector (264 users for a site with three sectors). Although the Commission's revised assumption is realistic, the implementation of FWA in the Commission's model still underutilises this capacity significantly (discussed in Section 2.3.1).

Spectrum fee

The Commission accepted our critique of the assumptions for the spectrum fee for FWA services in which we noted:[9]

8 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015, Report Number 34020, section 2.2.3.

9 *Ibid*, section 2.2.10.

> …the Commission's proposed approach overestimates the spectrum cost to be allocated to FWA services.
>
> …A more realistic spectrum cost – given the absence of revenue from cellular mobile services and the use of spectrum only in less densely populated areas – must be captured by the model.

In the revised version of the model the spectrum cost is scaled according to the number of end-users which are served by FWA.

Coverage

In regards to the coverage assumptions we noted that the Commission's original approach was conservative for a network to be deployed using technologies over the 700MHz band:[10]

> Vodafone's actual RBI sites were designed for 3G technology and spectrum bands higher than 700MHz and hence the assumed coverage is too conservative for LTE technology in the 700MHz band (which is capable of achieving superior coverage).

The Commission accepted our position but has decided to opt for a conservative coverage range:[11]

> …we agree that using the 700 MHz band would increase the coverage area compared to the 900 MHz band that Vodafone uses. We are also aware that topology and other factors can reduce coverage within existing coverage areas. We chose a conservative range to mitigate this factor.

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10 *Ibid*, section 2.2.2.

11 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1132.

We note that Vodafone's RBI network is not designed for maximum coverage and already accounts for topology and other factors. Hence we believe that the Commission should consider an improved coverage for the 700MHz band.

In addition it appears the model implements FWA by considering sites in each MDF area or ESA separately and consequently the actual coverage of the sites is not addressed. This is discussed in Section 2.3.1.

Number of premises

In the revised draft determination the Commission stated that 'the number of customers fed by RBI felt about right'[12] for FWA coverage, however the Commission has subsequently assumed that significantly fewer customers will be served by FWA. The Commission's model assigns end-users to the FWA network based on the distance to nodes in the copper network, with users beyond 6km (voice-only users) and between 5.3km and 6km (low speed users) being served by FWA.[13] The remaining users (assumed to be full speed users) are served by the fibre network. We strongly believe that the Commission has underestimated the number of FWA end-users in the model – a more detailed analysis is presented in Section 2.3.2.

Backhaul

As in the previous version of the model, the Commission assumes that optical fibre is the modern equivalent asset (MEA) choice for backhaul, hence microwave is not considered as an option. According to the Commission:[14]

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12 *Ibid*, paragraph 1132.

13 *Ibid*, paragraph 1130.

14 *Ibid*. paragraph 1132.

> …the use of microwave backhaul is not forward-looking. Vodafone advised us that it is progressively replacing its microwave backhaul with optical fibre. For these reasons, we consider optical fibre to be the preferable choice of MEA.

We do not accept the Commission's assumptions about microwave backhaul and we further elaborate on this issue in Section 2.3.5.

Demand

In our analysis of the December version of the model we discovered that the methodology delivered results which were inconsistent with the Commission's stated approach which was to exclude capex of the network outside the TSO derived boundary from the full network TSLRIC cost.[15] We demonstrated that FWA end-users located outside the TSO areas should be excluded from the dimensioning of the network. The Commission subsequently confirmed that this is the appropriate approach:[16]

> Demand assumptions: we agree that end-users outside the TSO area should not have been served by FWA.

However our analysis of the model's results indicates that this issue has not been addressed in the revised version of the model. Further details are provided in Section 3.2.

15 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015, Report Number 34020, section 2.2.8.

16 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1132.

2.3 Key issues

2.3.1 Capacity and coverage implementation

The Commission's revised assumption of 66 000kbit/s capacity per FWA site represents a realistic scenario for LTE deployment and aligns with the recommendations in our FWA report[17].

However we believe that there are a number of problems associated with the implementation of FWA capacity and coverage in the model:

- Although TERA states[18] that the new FWA approach consists of determining the cost per Mbit/s and then applying it to the total demand to estimate deployment costs, it is unclear how the model calculates cost per Mbit/s and what the resultant value is. The fundamental problem is that the model calculations do not seem to match the documentation:
  - the documentation states that the total cost (including site and fibre backhaul costs) is divided by the cumulated peak throughput to estimate the cost per Mbit/s[19]
  - the costs for sites and fibre backhaul are given in the model but we have not been able to find how these were used to calculate the cost per Mbit/s. In fact the site and backhaul costs have been applied directly to calculate deployment.

- The Commission has stated that the model estimates the number of base stations required per MDF and then divides it by the actual number of RBI base stations to perform a cost adjustment.[20] However the purpose and calculations of cost adjustment are unclear:

17 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015, Report Number 34020, section 2.2.3.

18 TERA Consultants (2015), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services: Model Specification*, 2 July 2015, page 62.

19 TERA Consultants (2015), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services: Model Specification*, 2 July 2015, page 44.

20 Commerce Commission (2015), *FPP further draft model questions – 4 August 2015*.

   - we do not understand why a cost adjustment is being performed in the model when TERA's documentation[21] states that cost per Mbit/s was calculated using the RBI network and then directly multiplied by the total throughput demand to estimate the FWA cost
   - the model calculations do not appear to match the Commission's description. Although the model calculates the number of base stations required per MDF, it then multiplies it by the total number of RBI base stations located in the MDF[22].

- The current calculations in the model appear to focus on demand and cost in each MDF. This means FWA analysis and base station signals are being restricted to MDF or ESA boundaries. The RBI sites (used in the model) were not designed by Vodafone to serve customers in a single ESA and can serve customers across multiple ESAs. Hence considering sites in each ESA separately will over-design the network and attribute inefficiently high costs to lines.

- The Commission states that it has used the conservative coverage area of RBI sites designed for 3G technology in 900MHz to mitigate topology and other factors.[23] However Vodafone's RBI sites were not designed for maximum theoretical coverage and already take topology and other factors into account. As discussed in our earlier submission[24] the Commission's model is based on LTE technology in 700MHz which can provide greater coverage and hence will require fewer base stations than those planned for RBI. Hence the Commission has (again) made a simplification that leads to an inefficient result:

  The impact of upgraded technology and lower spectrum bands has not been captured in the Commission's model. It appears that the reason for assuming existing RBI sites and

21 TERA Consultants (2015), *TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services: Model Specification*, 2 July 2015, pages 44-45.

22 This calculation is performed in rows 1901 and 2344 of 'Inventory' sheet of 'Access network cost model'.

23 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1132.

24 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015, Report Number 34020, section 2.2.2.

> coverage is purely convenience. However this assumption compromises the quality of the results as it does not reflect an efficient LTE deployment.
>
> The only way to capture the features of the superior technology – namely, LTE in the 700MHz band – is by performing a proper radio analysis to identify appropriate site locations and accurate coverage areas.

In summary, the Commission’s model appears to be based on inefficient FWA design criteria. This situation is similar to the problems introduced into the Commission’s Telecommunications Service Obligation (TSO) modelling, which were caused by the Commission’s judgement that, since it had adopted a ‘scorched node’ approach, normal wireless planning and design procedures could not be used. This led to a situation where each exchange area was modelled with its own base station (even though one base station could have readily served multiple exchange areas), thus inflating the total costs unnecessarily. The key point was that the Commission’s strict definition of scorched node delivered inefficient outcomes that would not occur in practice. Similarly the Commission’s FWA model does not reflect reality: real world operators serve regions comprising multiple ESAs using a single radio infrastructure. This, together with the Commission’s conservative approach of assuming a deployment on 900MHz spectrum rather than 700MHz, delivers results for an inefficient FWA design, which does not represent a network deployed by an HEO.

2.3.2 Number of premises served by FWA capped conservatively

We estimated that **[ ]CNZRI** buildings were served by FWA in the Commission’s earlier model, including **[ ]CNZRI** buildings (representing **[ ]CNZRI** dwellings) that were outside the TSO boundaries. If we exclude those buildings outside the TSO boundaries then the HEO served **[ ]CNZRI** buildings with FWA in the Commission’s first draft determination, which represents substantially more end-users than the revised version’s 40 833. This in turn implies that over **[ ]CNZRI** end-users that were previously served by FWA are now being served by the fibre solution.

Furthermore, when comparing the Commission’s model calculations against the actual planned coverage for Vodafone’s RBI network, we find that the 40 833 end users represent only 16% of the projected 250 000 homes to be served by Vodafone's RBI network.[25] It would be illogical for the HEO to serve only 40 833 users, with its decision based on distance from the node rather than economic costs. The Commission should implement what it stated – that is, 'FWA should be used for lines where costs are particularly high and unbundling is unlikely'[26]. This is consistent with our own recommendation: namely, that the Commission should consider FWA for users in Zones 3 and 4 areas where there is no current unbundling and future unbundling is unlikely.

Exhibit 2.2 and Exhibit 2.3 show examples of how the Commission's model approach delivers results which are unrealistic from a network planning perspective and cannot represent efficient deployment of an HEO when the capacity of the sites is being underutilised. Both examples show that the RBI sites in the model are only serving a reduced number of the users which are located more than 5.3km away from the exchange. It can be seen that some fibre-served buildings are in the midst of FWA-served buildings – this cannot represent efficient deployment by the HEO.

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25 *Ibid.*

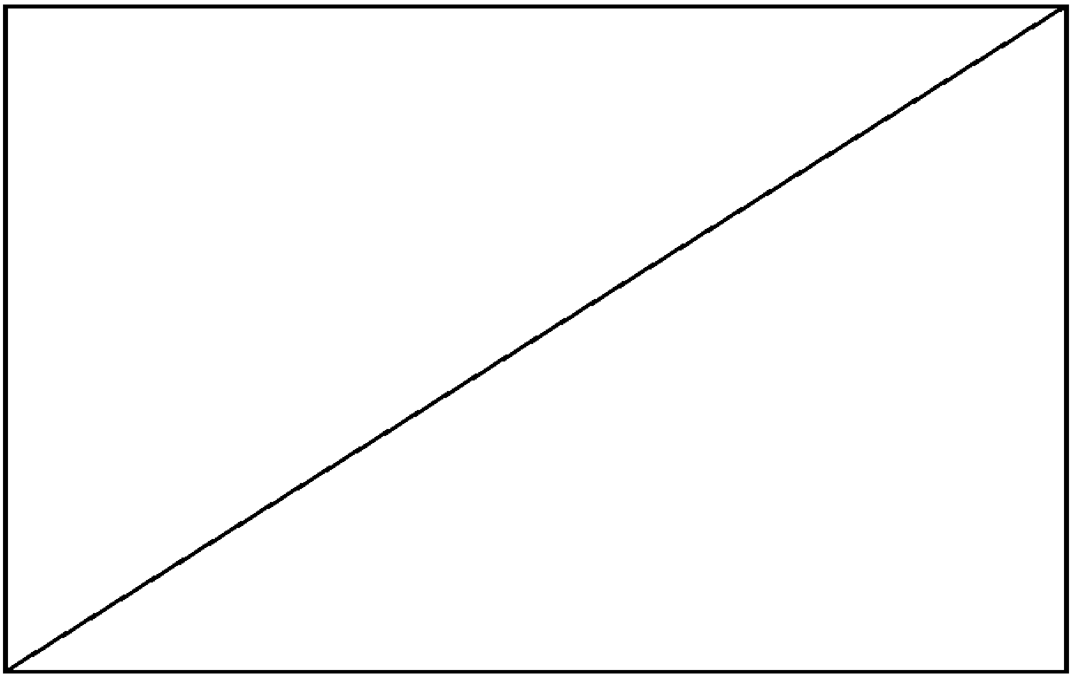
26 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1132.

[

VNZCI and CNZRI]

Exhibit 2.2: *Fibre/FWA modelling results – Hokitika, South Island [Source: Network Strategies]*

[



VNZCI and **CNZRI]**

Exhibit 2.3: *Fibre/FWA modelling results – Onere Point, North Island [Source: Network Strategies]*

2.3.3 Results for FWA assignment are not consistent with the defined approach

The revised model approach claims that all premises located further than 5.3km from the closest active node are to be connected through FWA. However, an analysis undertaken regarding the location of Chorus' copper cabinets deployed as at March 2015 indicates that this is incorrect. Of the **[ ]CNZRI** buildings which are served by FWA, **[ ]CNZRI** are located within a radius of 5.3km from the closest cabinet.[27] Exhibit 2.4 and Exhibit 2.5 are two examples which illustrate FWA-served buildings that are within the 5.3km radius.

27 Even though the 5.3km radius defined – which assumes straight line distance – does not exactly reproduce the modelled distance between the premises and the exchange / cabinet (copper section length) it is a valid proxy for analysing TERA's model results.

[

VNZCI and CNZRI]

Exhibit 2.4: *FWA served buildings – Mossburn / Lumsden, South Island [Source: Network Strategies]*

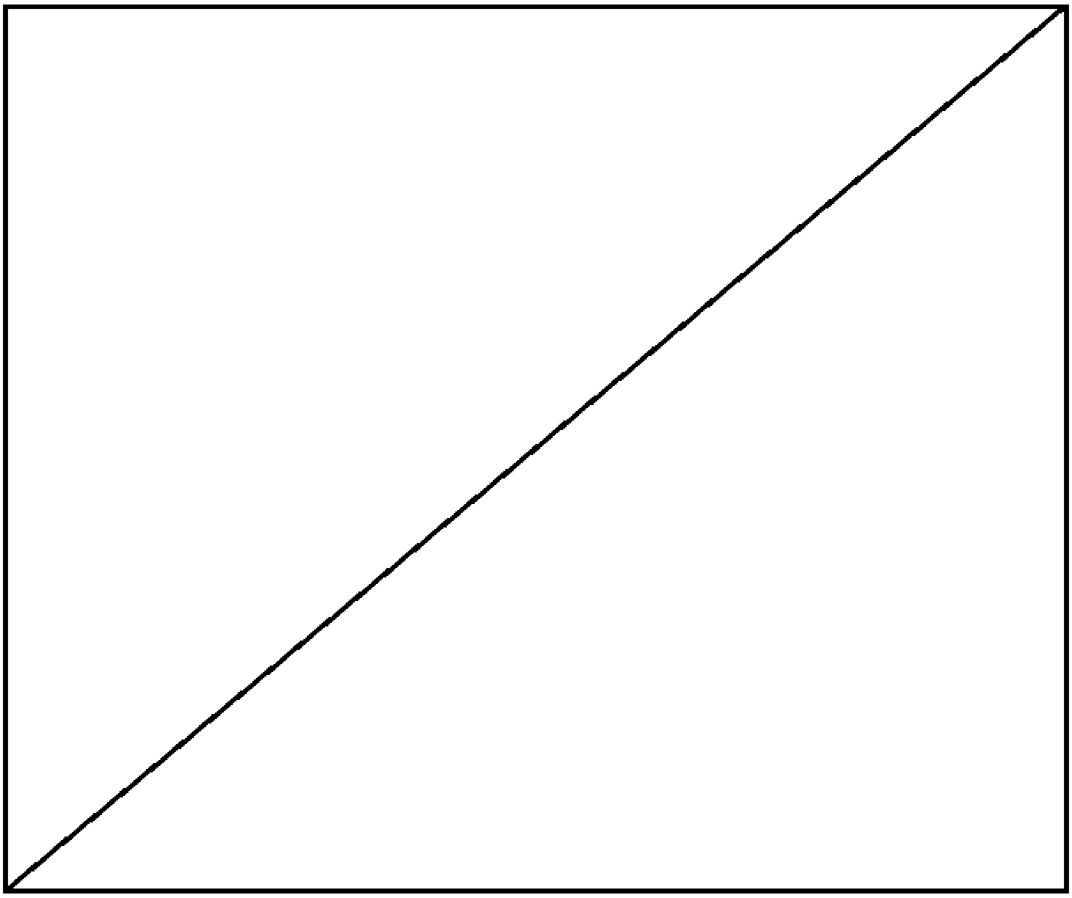
[

VNZCI and **CNZRI]**

Exhibit 2.5: *FWA served buildings – Te Akau, North Island [Source: Network Strategies]*

It could be claimed that the location and number of Chorus's copper cabinets differ from the actual location and quantities which result from TERA network modelling. However, if we undertake the same analysis over the exchange locations instead – which is coincident with those used in TERA's model – similar results are obtained. Of the [ ]**CNZRI** FWA served buildings, **[**]**CNZRI** are located within a radius of 5.3km from the closest exchange. This is illustrated in the following examples (Exhibit 2.6 and Exhibit 2.7).

[



CNZRI]

Exhibit 2.6: *FWA served buildings – Dargaville, North Island [Source: Network Strategies]*

[

CNZRI]

Exhibit 2.7: *FWA served buildings – Taumarunui, North Island [Source: Network Strategies]*

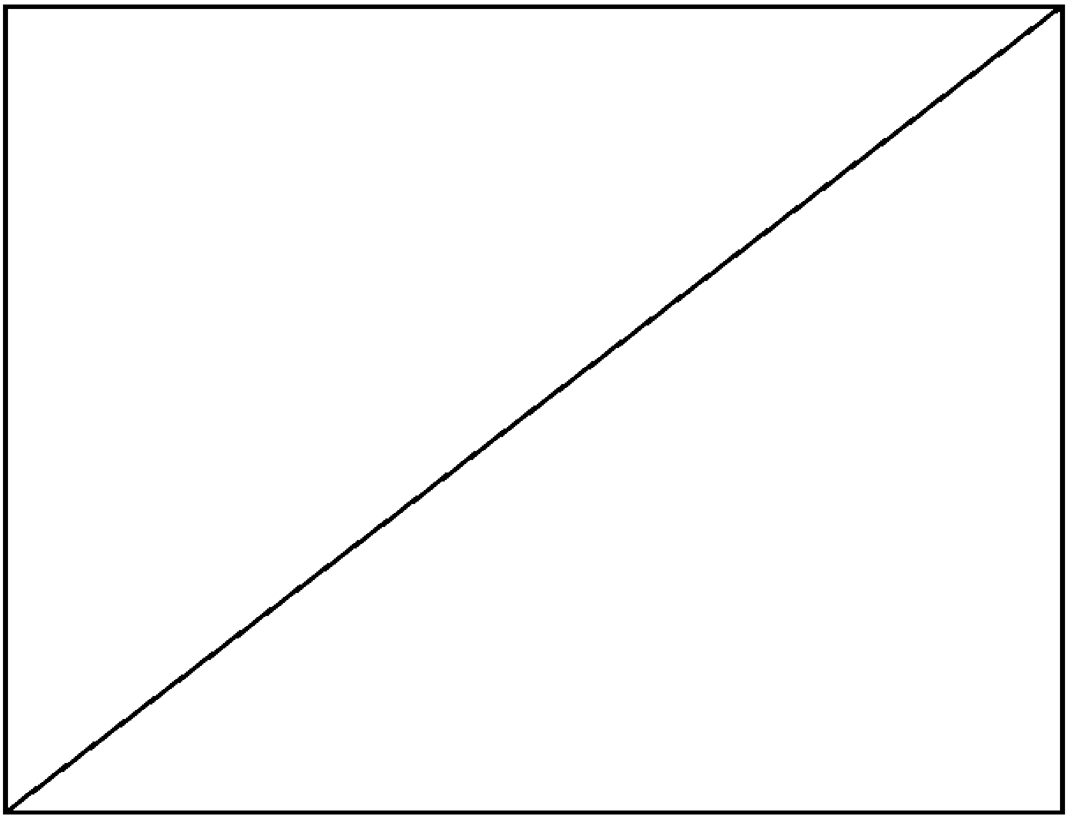
Furthermore, when analysing the location of premises which are served by fibre we can find examples of buildings located further than 5.3km from the closest cabinet / exchange, as illustrated in Exhibit 2.8 and Exhibit 2.9.

[

VNZCI and CNZRI]

Exhibit 2.8: *FWA and fibre served buildings – Mokai, North Island [Source: Network Strategies]*

[



VNZCI and CNZRI]

Exhibit 2.9: *FWA and fibre served buildings – Victoria Valley, North Island [Source: Network Strategies]*

We conclude that the model is producing results which are not consistent with the Commission's stated approach, namely:[28]

> We have identified three categories of end-users: voice-only (fed by more than 6 km of copper), low speed (capable of less than 1 Mbps, over 5300 m but less than 6 km of copper), and full speed (the rest).

28 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1130.

All premises further than 5.3 km to the closest active node (active cabinet or MDF) are to be connected through FWA.

Furthermore, the model's costs do not align with the assumptions, as premises that are further than 5.3km away from the closest cabinet / exchange are being served by fibre instead of FWA.

2.3.4 UCLL rural results based on SLUBH

The Commission's model provides results for UCLL services for national, urban and rural areas. The UCLL cost for national and urban is the cost of the ULL plus the cost of the Sub-loop UCLL Backhaul (SLUBH). However, in the case of rural areas the UCLL monthly cost is equal to the cost of the SLUBH (Exhibit 2.10). Furthermore for rural the SLUBH monthly cost is higher than the UCLL, resulting in a negative SLU monthly cost (SLU is calculated as UCLL minus SLUBH).

	Monthly unit cost
UCLL	
National*	26.74
Urban*	[ ]**CNZCI**
Rural	[ ]**CNZCI**
SLUBH	
National	[ ]**CNZCI**
Urban	[ ]**CNZCI**
Rural*	[ ]**CNZCI**
SLU	
National	11.66
Urban	[ ]**CNZCI**
Rural	[ ]**CNZCI**

* TERA model main results for UCLL

Exhibit 2.10: *TERA model results 2016 [Source: TERA]*

NETWORK STRATEGIES

The Commission's price determination is based on the model's results at the national level hence this issue does not affect the final results. However, it raises concerns about the model's approach and calculations.

2.3.5 No use of microwave backhaul

The Commission has assumed that all FWA sites are using fibre backhaul, with no microwave backhaul present in the network. According to the Commission, Vodafone is progressively replacing its microwave backhaul with optical fibre hence the use of microwave backhaul for modelling purposes is not forward-looking.[29] However Vodafone has confirmed that its cell-sites are currently using microwave backhaul, particularly in remote/rural areas and there are no plans to replace microwave backhaul completely. While Vodafone is replacing some microwave, this is only in areas where fibre is becoming available, namely urban areas and many RBI areas. It is important for the Commission to note that Vodafone is replacing the backhaul on RBI sites because of government funding to support fibre backhaul. However that is not the situation of the HEO modelled by the Commission as the HEO is expected to cover the costs of deploying the FWA network without subsidy.

When an operator (such as Vodafone or the HEO) deploys a new site (in the absence of government funding), its choice of backhaul is determined on the basis of capacity, reliability and costs. However the Commission performs no analysis to consider the advantages and disadvantages of backhaul options for the FWA sites and has simply chosen fibre backhaul. This is an unrealistic assumption for the HEO because a comparison of the two options reveals microwave backhaul is more suitable for rural areas:

- **Capacity** – Vodafone's network has several sites with microwave backhaul which have been dimensioned to not only meet current demand but also requirements in the foreseeable future. Currently the capacity that can be provided by a microwave link in Vodafone's network is around [ ]**VNZCI** and this can be easily increased by adding additional links. Vodafone is also working on technology upgrades to provide

29 *Ibid*. paragraph 1132.

advanced multipath features and link capacities greater than [ ]**VNZCI**. Consequently there is no need to assume fibre backhaul in the model to meet the requirements of FWA users as microwave backhaul can provide sufficient capacity.

- **Reliability** – Although microwave links are affected by path degradation, sophisticated designs and link duplications can ensure high reliability. On the other hand fibre backhaul in rural areas may be damaged by animals (for example, rats) or local contractors working in the area. It is also worth noting that it is cheaper to protect microwave links by adding more links but that is not the case for fibre lines due to the high costs of duplicating long fibre lines in rural areas.

- **Cost –** An efficient operator will consider cost to be an important factor if microwave and fibre are both capable of servicing the required demand (which is the case for rural areas modelled by the Commission). The difficult terrain in rural areas and the location of sites on high hills means it may not be practical for operators to deploy fibre backhaul for some sites. As we indicated in our previous submission opting for microwave instead of fibre will have an impact on the model's results.[30] Analysis of the cost inputs provided by Vodafone indicates that the total annual cost of microwave backhaul is significantly lower than the cost of fibre backhaul. Vodafone procures its fibre backhaul as a managed service from Chorus and the annual cost per site is [ ]**VNZCI** higher than the cost incurred by microwave radio link (single hop).

We have investigated the HEO's backhaul choice by using a recent and relevant example which considers the local conditions in New Zealand and does not take RBI funding into account. Under the digital dividend agreement with MBIE (as part of the 700MHz auction) Vodafone is committed to build five new sites every year. Vodafone has considered both microwave and fibre backhaul for the new sites to decide the most economical option as both are capable of providing the required capacity. It is important to note that if Vodafone was replacing its microwave with fibre then it would only deploy fibre backhaul for new sites. However that is certainly not the case as of the five recent sites planned by Vodafone, [ ]**VNZCI** are based on microwave backhaul as the costs of deploying and managing fibre are significantly higher than microwave (Exhibit 2.11). We also note that capacity has

30 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015, Report Number 34020, section 2.2.6.

not been a limiting factor for backhaul choice – one of the sites has been designed with a backhaul capacity of only [ ]**VNZCI** as it is sufficient to meet the demand requirements (even though microwave backhaul is capable of providing much higher capacity).

Of the five new sites, [ ]**VNZCI** site(s) is(are) based on fibre backhaul because fibre is present on site thus it is more economical to connect than deploying microwave backhaul. Hence cost is the major deciding factor for backhaul deployment as both options are capable of delivering sufficient capacity in rural areas. The HEO's network will face similar geographical conditions and it is not realistic to assume that the HEO will deploy fibre backhaul on all sites. In fact the Commission should assume the least cost backhaul option for each site as that would reflect an efficient deployment.

[

Exhibit 2.11: *Backhaul costs for Vodafone's new sites planned under digital dividend agreement [Source: Vodafone]*

]VNZCI

There are a number of sites in Vodafone's existing network which do not have fibre backhaul. We assumed four different geotypes for our FWA model (corresponding to those used in the wireless cap analysis for the TSO[31]), namely:

[31] Commerce Commission (2005), *Draft Determination for TSO Instrument for Local Residential Service for period between 1 July 2003 and 30 June 2004,* 23 December 2005. See Table 8.

- flat, highly populated rural countryside (geotype A)
- less dense rural areas with rolling hills (geotype B)
- sparsely populated rural areas with hilly terrain (geotype C)
- very sparsely populated areas of extreme isolation or extremely difficult terrain (geotype D).

Exhibit 2.12 to Exhibit 2.15 show examples of sites serving users in the sample areas (in our FWA model) which represent the four geotypes. It is observed that there are existing sites within all four geotypes that have microwave backhaul. In fact several sites are deployed in difficult terrain and on high hills where the cost of fibre backhaul can be much higher than that of microwave. Consequently it is totally unrealistic to assume that the HEO will deploy fibre to all its FWA network's sites.

[

Exhibit 2.12: *Site in sample area representing geotype A [Source: Vodafone and GoogleEarth]*

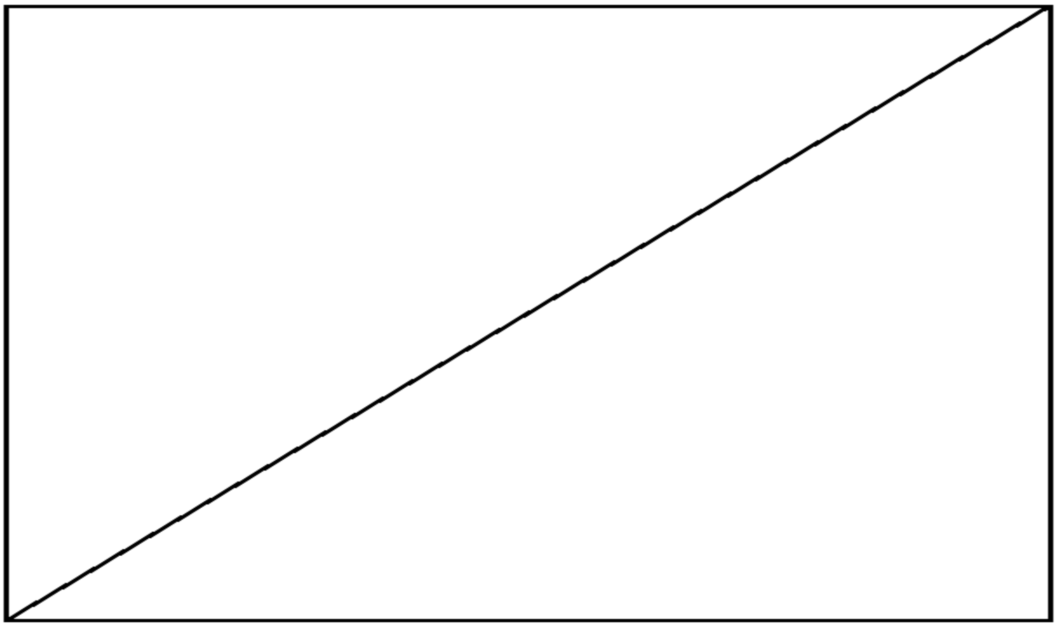


Exhibit 2.13: *Site in sample area representing geotype B [Source: Vodafone and GoogleEarth]*

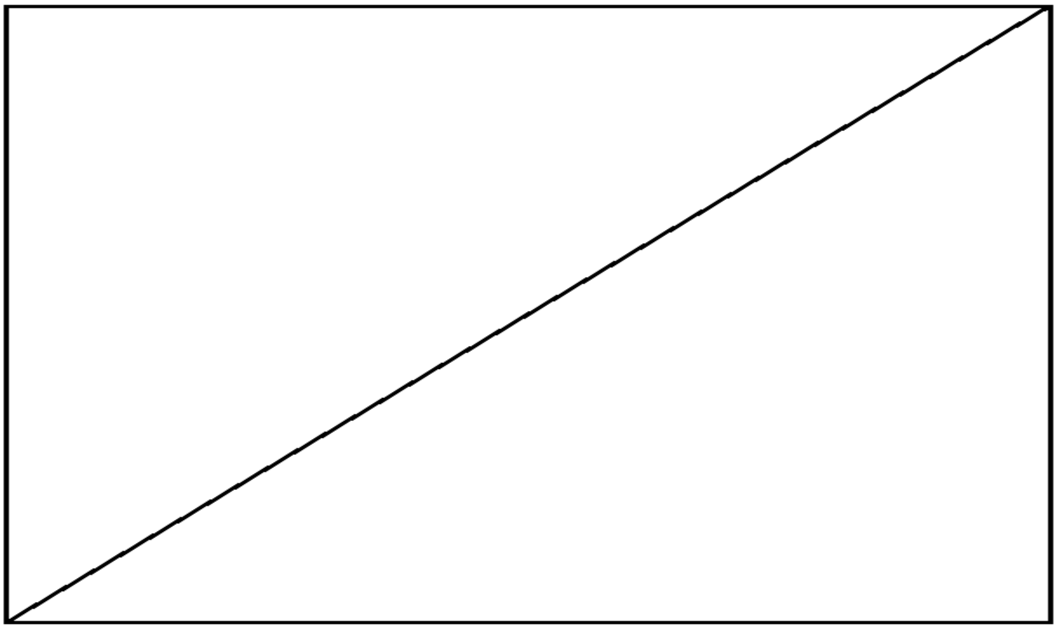


Exhibit 2.14: *Site in sample area representing geotype C [Source: Vodafone and GoogleEarth]*

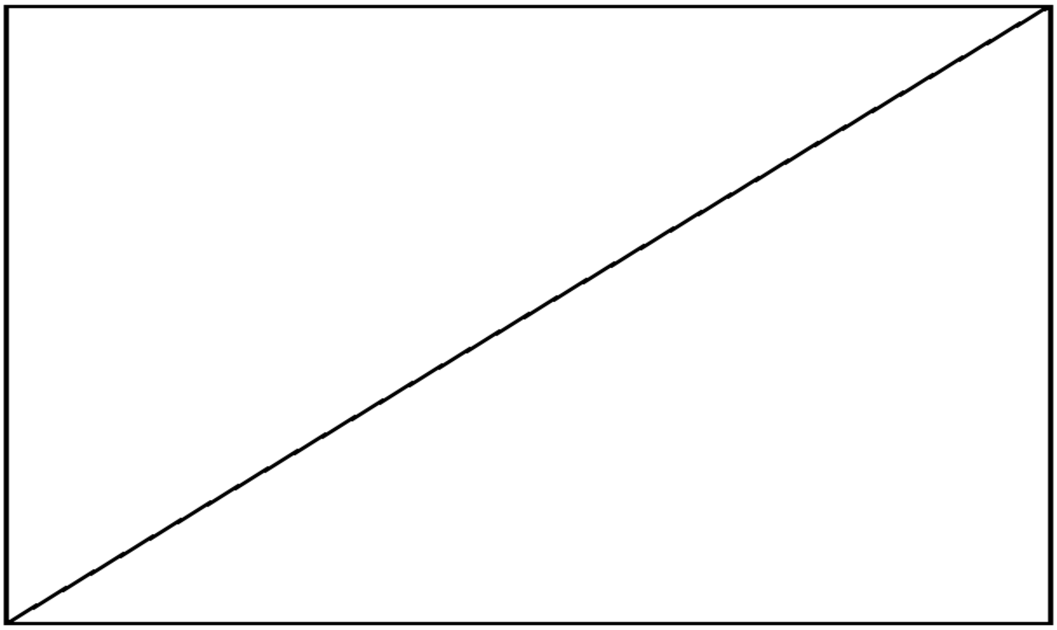


Exhibit 2.15: *Site in sample area representing geotype D [Source: Vodafone and GoogleEarth]*

]VNZCI

We note that microwave backhaul is also a popular option for sites globally and is expected to remain so to serve 4G/LTE technologies.[32] Ericsson's 2014 report[33] on microwave backhaul emphasises its importance and presence by stating:

> Today, microwave transmission dominates mobile backhaul, where it connects some 60 percent of all macro base stations. Even as the total number of connections grows, microwave's share of the market will remain fairly constant. By 2019, it will still account for around 50 percent of all base stations.
>
> There will also be geographical differences, with densely populated urban areas having higher fiber penetration than less populated suburban and rural areas, where microwave will prevail for both short-haul and long-haul links.

32 Alcatel Lucent, *Microwave Transmission*, available at https://www.alcatel-lucent.com/solutions/microwave-transmission.

33 Ericsson (2014), *Microwave towards 2020*, page 7.

Hence it is unrealistic for the Commission to assume that the HEO's rural sites will have no microwave backhaul and will only be connected with fibre.

We conclude that microwave radio must be considered as an option for modelling FWA backhaul for the HEO – this technology is currently used by Vodafone for its rural sites in New Zealand and by operators worldwide. Microwave backhaul can provide sufficient capacity for rural demand and is significantly more cost efficient than fibre backhaul.

2.4 Network Strategies' FWA approach should be used

The Commission has stated that the FWA solutions recommended in submissions were considered to decide the 'two-step' FWA modelling approach but concludes that the submissions did not provide a workable solution which can be applied to the whole country:[34]

> … we note that developing an approach to modelling how the hypothetical efficient operator would deploy FWA is a two-step process. First, how do we identify the areas where FWA should be deployed? Second, once that area has been defined, how do we choose which end-users in those areas should be served by FWA?
>
> Turning to the first step, we note that it very difficult to develop a workable and sensible solution short of modelling the entire country. Unfortunately, submissions did not provide us with a more workable solution that we considered was fit for purpose.

We are puzzled as to why the Commission does not consider that our comprehensive FWA model provides a workable solution which can be extended to the whole country (without modelling the whole country). We used actual radiofrequency (RF) planning performed by Vodafone for sample areas in four different geotypes. The geotypes were considered to ensure diverse rural terrains and propagation conditions were included. This approach can be used to estimate FWA costs for all rural areas in New Zealand. In fact the Commission

34 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraphs 1124-1125.

has summarised our FWA modelling approach and clearly acknowledged that we have suggested how to apply the results to different areas in New Zealand:[35]

> There were a number of key components and assumptions underpinning the Network Strategies model including the following:
>
> The cost was calculated by identifying suitably mixed areas, engineering the FWA service in detail for each specific area, thus calculating the cost per customer in each sample area…
>
> Network Strategies recommended that the costs derived from the engineered sample areas should then be applied to end-users in zones 3 and 4 in ESAs that had not yet been unbundled.

A similar approach – detailed modelling of FWA in sample zones which was then extended to other areas – is also used by the Swedish regulator in its LRIC model.[36]

The Commission has claimed that our modelling approach has not provided adequate reasons for our proposed FWA areas:[37]

> Network Strategies' approach was to model the cost of providing FWA to the parts of Chorus' Zones 3 and 4 (the rural zones) yet to be unbundled. Network Strategies provided no justification for choosing Zones 3 and 4 in its submission beyond pointing out that this focus is "outside dense urban areas (that is, Chorus' Zone 1 and 2)".

However our FWA model does not consider all Zones 3 and 4 areas and we provided detailed reasons for choosing our proposed FWA areas within these zones. We did not consider Zones 1 and 2 as fibre is likely to be the most cost-efficient technology in dense

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35 *Ibid*, paragraph 1121.

36 Post- och telestyrelsen (2013), *Hybridmodell version 10.1,* 16 December 2013.

37 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1126.

urban areas. Our submission clearly specifies that we have considered Zones 3 and 4 ESAs which currently have no unbundled lines and elaborates the reasons for doing so:[38]

> We also assumed that there would be no further unbundling during the model timeframe. We believe this is a reasonable assumption since the impact of the introduction of geographical averaging for UCLL prices is uncertain, and furthermore the Commission is not actively seeking to encourage unbundling in this review…
>
> While it is impossible to predict with absolute certainty the impact of the outcome of this price review on further unbundling, on the balance of probabilities it is unlikely to increase given interested service providers' public statements on the issue. Moreover the decrease in rural prices as a result of geographic de-averaging may not be sufficient to support a business case for further unbundling in rural areas, particularly in current circumstances in which the Government is extending RBI funding. In addition we note that the Commission's constant demand assumption effectively precludes the possibility of further unbundling.

Consequently we also find the Commission’s reasons for not developing a comprehensive model inadequate. The Commission states that (according to TERA) a comprehensive FWA model will be complex or infeasible to apply while unbundle-ability is subjective/difficult to measure:[39]

> We could also have sought to develop a more comprehensive “green fields” model. However, to do this, we would need to quantify the value that end-users place on the ability to unbundle at layer 1, as well as contend with the large number of material issues that would arise in a “green fields” context. Many of these issues arise from the need to identify the optimum position for the nodes, and the likely cost of providing access, power, and the like, since these costs depend on variables which are not being modelled.

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38 Network Strategies (2015), *Modelling Fixed Wireless Access*, 20 February 2015, Report Number 34020, section 3.2.

39 Commerce Commission (2015), *Further draft pricing review determination for Chorus’ unbundled copper local loop services*, 2 July 2015, paragraphs 1127-1128.

> Indeed, TERA has advised us that such an approach would be complex to the point of being infeasible to apply, while the development of a value for unbundle-ability would be very subjective and difficult to measure. Taken together, we consider that this would compromise any gained accuracy.

We do not understand the reasons for this difficulty. In our view it should simply be a matter of excluding a larger area than the current (non-TSO) exclusion, applying FWA costing to the excluded areas and aggregating the two results.

It is important that the Commission's model accurately reflects efficient costs even if the correct approach seems 'complex'. In fact, it is fairly standard practice in TSLRIC modelling to consider different geo-types which reflect the varying demographic, geographic and / or topographic features of a country. An examination of other access cost models reveals that geotypes and sample areas are used to estimate efficient costs which are then applied to the all areas:

- The Swedish model[40] divides the total geographical area into 7546 zones and classifies them into six geotypes (which are chosen based on density of subscribers). A sample of 50 zones is selected in the model to estimate the costs.
- The Australian model[41] also uses the geotype approach by classifying a total of 5070 areas into 16 geotypes. The geotypes are defined based on density and spread of subscribers and average road distance between locations/subscribers. A sample of 200 areas is modelled to find the costs.
- The Commerce Commission's TSO wireless cap model for New Zealand selected 14 ESAs and classified them into four geotypes to represent the range of conditions encountered by network planners in New Zealand.

It is surprising that the Commission considers the standard practice (of using geotypes) too complex and proposes a method which assumes that the operator will deploy fibre or FWA

40 Post- och telestyrelsen (2013), *Hybridmodell version 10.1,* 16 December 2013.

41 Australian Competition and Consumer Commission (2010), *Analysys fixed network cost model – October 2010*, available at http://www.accc.gov.au/regulated-infrastructure/communications/fixed-line-services/fixed-line-wholesale-services-pricing-review-2009-2010/consultant-report.

based on one factor only – distance from the exchange. The assumed distance seems to signify an adjustment for the performance of the copper network while neglecting the implications of geotypes and costs.

Geotypes are generally classified to represent different regions, terrain and customer densities. These factors affect deployment costs and more importantly the decision of an operator to choose technologies (in this case fibre or FWA). Although the Commission's model accounts for differences in regions (urban and rural) and soil types to calculate the costs of civil engineering assets (including ducts and trenches), there is no analysis of the HEO's technology choice based on regions, terrain and customer density. The Commission assumes that the HEO will provide fibre to all customers within a certain distance from the exchange without considering the cost implications of doing so. In other words, the Commission assumes that an HEO's decision for deploying fibre or FWA will be same for a fixed distance in a busy urban area (such as Auckland) and a remote rural area (such as Tapawera). This is a totally unrealistic and inefficient assumption for an HEO. We have already proposed a reasonable and cost effective approach of modelling FWA in Chorus' Zones 3 and 4 (the rural zones) unlikely to be unbundled.

Our FWA model is not only workable but aligns with TSLRIC standard modelling practice by considering costs for the most efficient least cost modern replacement technology in different geotypes in New Zealand. We recommend that the Commission should use our FWA model as it:

- accounts for complex terrain and propagation factors while providing an efficient solution for a HEO
- can easily be adopted by TERA – we have already suggested a feasible approach to apply our model results to rural areas
- is based on a reasonable assumption that no further unbundling is expected during the modelling period.

2.5 Recommendations

We recommend that the Commission modifies its approach of implementing FWA. An efficient outcome cannot be achieved by capping the number of premises based on distance from the exchange/cabinet as this approach over-estimates the costs and under-utilises the FWA base station sites. The 40 833 premises currently covered in the model is significantly lower than the 250 000 planned RBI premises and does not reflect an efficient deployment.

The Commission should review its capacity and coverage implementation which restricts FWA analysis to ESA boundaries – FWA sites should not be planned to cover selective premises in a particular ESA. The Commission's model should also account for the greater coverage achieved by LTE in 700MHz (compared to 900MHz) as it is using Vodafone's RBI sites which were planned for 900MHz.

In addition the Commission should not overlook the importance and use of microwave backhaul in rural areas by assuming all FWA sites have fibre backhaul. The Commission's assumption should be based on realistic scenarios which consider capacity, reliability and costs. As microwave has sufficient capacity to meet rural demands, Vodafone's current rural network uses microwave backhaul. In addition Vodafone's sites (planned as part of the digital dividend agreement) will also use microwave backhaul as it is significantly more cost-effective than that of fibre. In fact, it is due to government funding that many RBI sites are being upgraded to fibre backhaul but, without any subsidy allowance, this will not apply for the HEO being modelled by the Commission. As such to assume that the HEO would deploy only fibre backhaul is unrealistic and will deliver an inefficient result. We recommend that the Commission assumes the least cost backhaul option for each site as that would reflect an efficient deployment.

We believe that the Commission should apply our FWA modelling approach which is based on actual terrain and propagation conditions in New Zealand. Our model calculates results for sample areas in four different geotypes that can be applied to other areas, without the need for detailed modelling of the whole country. We believe that an efficient HEO will deploy FWA in areas where it is feasible and economical – namely areas of Zones 3 and 4 which are not unbundled – rather than restricting FWA to certain premises and underutilising FWA resources.

Finally, should the Commission decide to retain its proposed approach, some calculations and results of the model are unclear or flawed. These include:

- the calculation of cost per Mbit/s for FWA
- the discrepancies between model documentation and implementation
- the method for allocating premises to fibre and FWA
- the approach for calculating UCLL cost in rural areas.

3 TSO boundary issues

3.1 Inclusion of infrastructure serving TSO customers

The Commission notes that the model has been amended to ensure that the cost of infrastructure serving TSO customers has not been omitted if the infrastructure itself is outside the TSO areas.[42]

As is stated in TERA's documentation – which describes the implemented changes in the model – an alternative approach for TSO modelling was undertaken consisting of:[43]

in TSO areas, the network is dimensioned for the whole country

in non-TSO areas, the network is dimensioned solely for TSO areas

The new approach has been implemented by modifying queries related to distribution and feeder inputs in the Access model[44] but no details were provided about the changes made, or which network components were dimensioned in non-TSO areas.

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42 *Ibid*, paragraph 1604.

43 TERA Consultants (2015),), *TSLRIC price review determination for the UCLL and UBA – Implemented modelling changes*, June 2015, page 11.

44 Refers to the Access Network Cost Modelling – Draft version – June 2015 (CI-ComCom – Access Network – v8.0.accdb).

Further information provided in the model documentation indicates that outside the TSO area the network is only dimensioned for the demand located in the rear area[45] of the section (Exhibit 3.1):[46]

> As non-TSO area benefit from subsidies for network deployment, network modelling follows two distinct approaches in the TSO and outside the TSO in respect of the TSO areas:
>
> > Inside the TSO area, the network is dimensioned according to the national demand, in particular according to all lines in the rear area, including those outside the TSO;
> >
> > Outside the TSO area, the network is dimensioned according to the TSO demand, i.e. for the TSO lines in rear area.

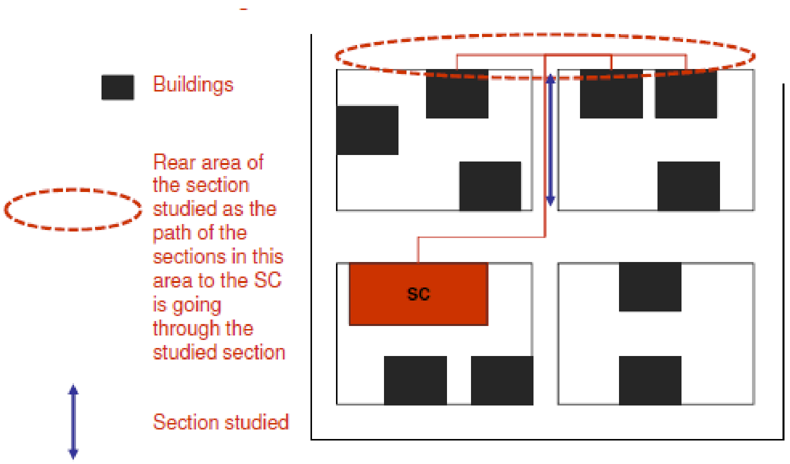

Exhibit 3.1:
Rear area [Source: TERA]

In the particular case of the dimensioning of the FWA network, it is stated that outside the TSO areas only core assets are included:[47]

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45 TERA defines the rear area of a section to be the set of sections for which the links to the street cabinet go through the section. See TERA Consultants (2015), *TSLRIC price review determination for the UCLL and UBA – model documentation*, June 2015, section 8.3, page 146.

46 TERA Consultants (2015), *TSLRIC price review determination for the UCLL and UBA – model specification*, June 2015, section 3.7, page 42.

FWA assets have been removed when sections are outside TSO areas (output multiplied by "AccountTSO") Hence, only Core DSLAM, Core Exchange and Core EAS assets are taken into account in non-TSO areas.

Further information provided by TERA as part of its answers to model queries[48] illustrates the TSO boundary implementation (Exhibit 3.2). The example given by TERA shows that outside the TSO areas the network is rolled out only for those sections which connect TSO premises, and premises outside the TSO areas are excluded. However, as is shown in Section 3.2 the model results are not consistent with the described approach.

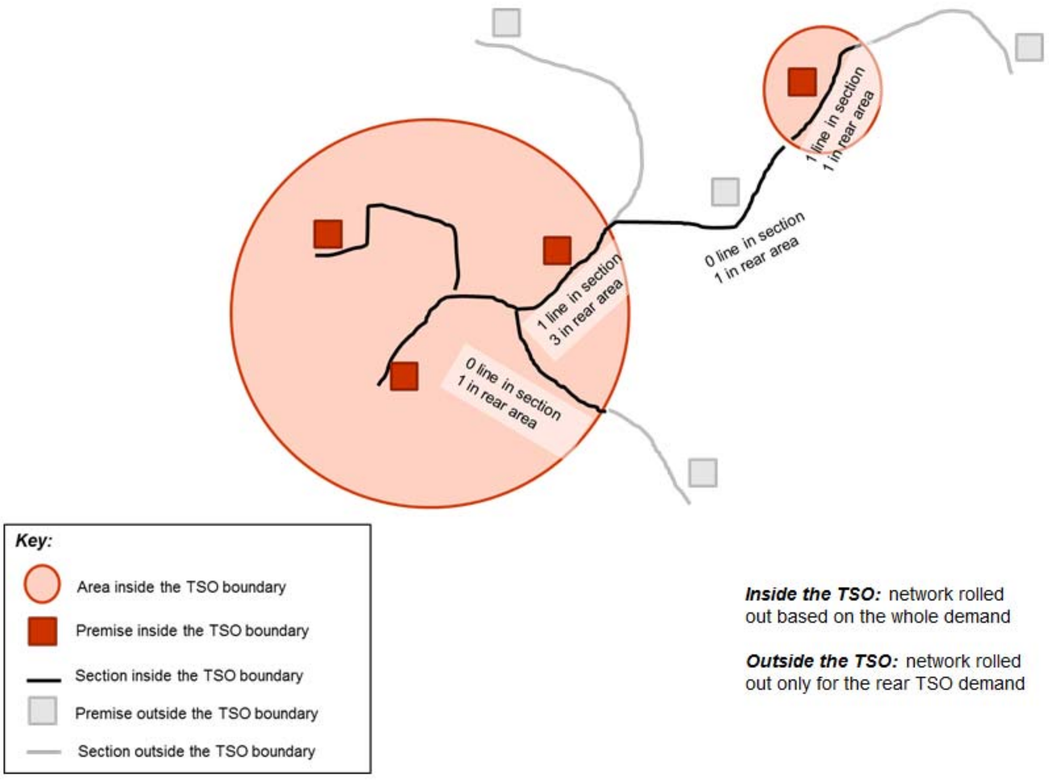


Exhibit 3.2: *TSO boundary implementation [Source: Commerce Commission]*

47 TERA Consultants (2015), *TSLRIC price review determination for the UCLL and UBA – Implemented modelling changes*, June 2015, page 9.

48 Commerce Commission (2015), *FPP further draft model questions – 4 August 2015*

3.2 Inclusion of FWA served premises outside the TSO-derived boundary

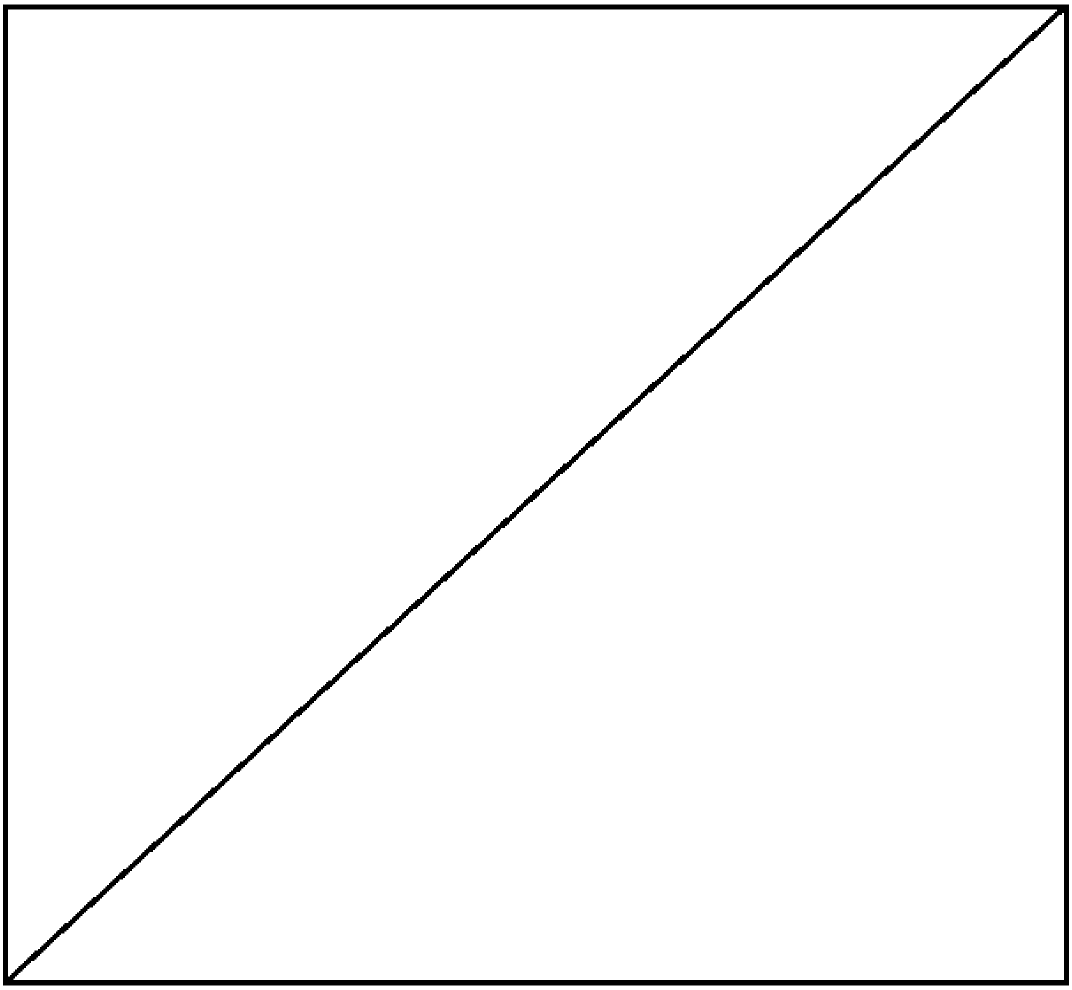
In the Commission's earlier version of the model we demonstrated that a considerable number of FWA-served buildings were actually outside the boundaries of the TSO areas. Using a Geographic Information System (GIS) analysis, we found that the revised version of the model still does not address this issue: of the **[ ]CNZRI** buildings which are served by FWA, **[ ]CNZRI** are outside the TSO boundaries – representing **[%]CNZRI** of all buildings served by FWA. Exhibit 3.3 and Exhibit 3.4 illustrate two examples of the distribution of FWA-served buildings in relation to the TSO areas.

[

CNZRI]

Exhibit 3.3: *FWA served buildings – Otonga, North Island [Source: Network Strategies]*

[



CNZRI]

Exhibit 3.4: *FWA served buildings – Te Kopuru, North Island [Source: Network Strategies]*

As in the earlier version of the model, the existence of FWA-served buildings outside the TSO areas is the result of TERA's classification into TSO and non TSO premises using a section level approach. As illustrated in Exhibit 3.5 sections which extend both within and outside the TSO areas are assumed to be within the TSO area, as are the buildings / dwellings assigned to that section.

[

CNZRI]

Exhibit 3.5:
FWA served buildings – Te Kopuru, North Island [Source: Network Strategies]

Despite the changes introduced in the model's approach, the methodology used in the model to select the buildings / dwellings included within the TSO-derived boundary still delivers results which are inconsistent with both TERA's and the Commission's stated approach:

premises outside the TSO areas are not covered by FWA, as the fibre deployment for such premises should be subsidized.[49]

FWA assets have been removed when sections are outside TSO areas[50]

---

49 TERA Consultants (2015), *TSLRIC price review determination for the UCLL and UBA - Model Specification,*, June 2015, section 3.12.2.1.

We agree that end-users outside the TSO area should not have been served by FWA.[51]

3.3 Conclusions

Our GIS analysis has identified problems that have yet to be rectified in the modelling. Of particular concern is the considerable number of FWA-served buildings that are actually outside the boundaries of the TSO areas. As this was also a problem in the first draft determination, we strongly recommend that the Commission undertakes model sanity checking using GIS analysis.

50 TERA Consultants (2015), *TSLRIC price review determination for the UCLL and UBA – Implemented modelling changes*, June 2015, page 9.

51 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, page 208.

4 Demand

Demand is a key input for determining unit costs for the UCLL and UBA services and as such it is important that the demand forecasts represent a realistic outcome for the New Zealand market. In this section we discuss whether vacant lots would offset multiple connections at single address points (Section 4.1) and new factors that are likely to have a significant impact upon the demand for fixed lines over the next five years (Section 4.2).

4.1 Commission's revised approach

In setting the HEO's demand and network footprint, the Commission now proposes to include HFC demand on the basis that there should be no distinction between Chorus and non-Chorus networks. The Commission notes that although this approach yields higher demand than Chorus' existing network demand, its objective is:

> … to model appropriate scale for the provision of the UCLL service that (in conjunction with the network footprint) results in an average unit cost that meets our TSLRIC objectives and Section 18 purpose.[52]

The Commission puts new emphasis on the importance of establishing 'an appropriate scale' for the provision of the UCLL service[53]. To this end the Commission seeks views on whether its CoreLogic dataset should be further refined to identify instances of vacant lots

52 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 962.

53 *Ibid*, paragraph 952.

and multiple connections at a single address point. However its own view appears to be that these instances are likely to offset each other.

We recognise the difficulty of obtaining information on both vacant lots and multiple connections at address points, however we believe that it is likely that multiple connections at single address points will greatly outnumber vacant lots.

Data from the 2013 census[54] suggests that 17% of occupied dwellings are characterised as “two or more flats/units/townhouses/apartments/houses joined together”. In the Auckland region, there were just under 110 000 such dwellings, equivalent to 23% of total occupied dwellings – it could be assumed that these are likely to have more than one dwelling per address point. As at July 2012, the Auckland region had 11 675 vacant residential sections, and the Ministry of Business, Innovation and Employment estimated that greenfield land ready for subdivision had a capacity of around 14 500 dwellings[55] – representing only a slight offset to the number of multiple dwellings.

Nationwide, excluding Auckland, 157 000 or 14% of occupied dwellings are classed as two or more flats/units/townhouses/apartments/houses joined together.

This information suggests that the view that vacant lots will offset multiple connections at single address points should be discounted – multiple connections are likely to exceed vacant lots.

4.2 Demand growth

The Commission finds that insufficient evidence has been provided to support fixed line growth over the next five years and as such has retained its assumption of zero demand growth. The Commission essentially restates its original assumptions and claims that historical evidence does not support an increase in demand. Our own view is that current

54 Statistics New Zealand *NZ.Stat*, data extracted 5 August 2015.

55 Ministry of Business, Innovation and Employment (2013), *Housing affordability: residential land available in Auckland*, 28 February 2013.

trends indicate that there is a strong risk that the Commission will underestimate demand by a significant margin. Given that regulated prices are to be set for five years this underestimate will have serious ramifications for access seekers.

It is an undisputed fact that fixed lines have been relatively constant in New Zealand for a number of years, however with fixed broadband connections being three-quarters of all fixed lines it is clear that a key purpose for a fixed line is to deliver a broadband service (Exhibit 4.1).

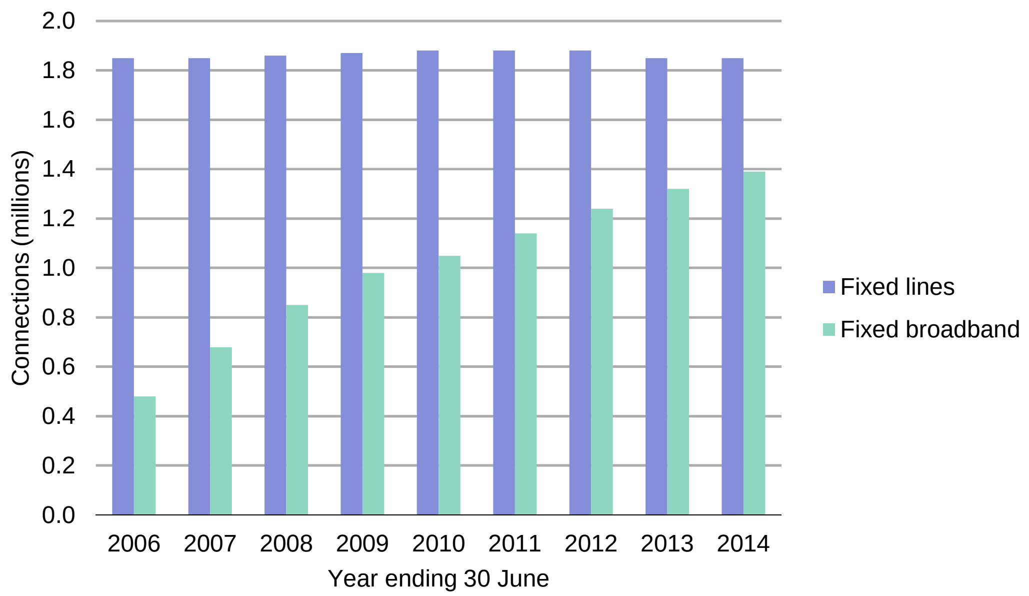


Exhibit 4.1: *Demand for fixed lines and fixed broadband connections, 2006 to 2014 [Source: Commerce Commission]*

The Commerce Commission is assuming that there is no demand growth or migration of hypothetical efficient operator connections.[56] It considers that:

56 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 337.

> …historic fixed line and population growth trends viewed alongside the other data provided by Network Strategies, do not provide sufficient evidence to support modelling a level of demand above what is proposed in this further draft.
>
> New Zealand's population growth is undoubtedly positive, however, this trend has not translated into household fixed line growth on the copper network. It is not clear to us why this trend persists, but it is equally unclear from the data presented to us to date that this trend is likely to break during the regulatory period. Accordingly, we do not support translating population growth into additional modelled UCLL demand.[57]

We believe that the market for fixed lines may be approaching a "tipping point" – a threshold which signifies a dramatic change in demand in response to a confluence of external factors. Such a point occurred with mobile data services, when the combination of devices (smartphones and tablets), sufficient bandwidth and desirable applications, all at affordable prices, generated an explosive growth in mobile broadband after many years of relatively modest take-up and usage.

So what are the potential disruptive factors that may cause such a break in historical trends for fixed lines?

- cloud services
- streaming content
- Internet of Things.

Cloud services

Cloud computing is creating a revolution in information technology. Cloud-enabled services and applications are facilitating greater mobility and flexibility of solutions, and bring the resultant productivity improvements within reach of businesses of all sizes, large or small.

57 *Ibid*, paragraphs 982-983.

Core requirements for effective remote working, whether that be working from home or working away from the normal office location, are the use of cloud services and Internet connectivity.

In mid 2014 the Government of the United Kingdom introduced legislation that enabled all employees with more than 26 weeks service to request flexible working hours or work from home. This legislation is expected to increase the number of home-based workers in the UK (those who spent at least half of their worktime at home), which comprised 13.9% of the workforce in the first quarter of 2014 (prior to the introduction of the legislation).[58]

A 2012 survey by Statistics New Zealand found that one-third of employed New Zealanders undertook some work at home during the previous four weeks, with just 6% working more than 40 hours at home during that period.

Encouraging economic growth is a key aim for the Ministry of Business, Innovation and Employment and clearly there are opportunities for New Zealand businesses to improve productivity through flexible working practices. Compared to the UK, home-based working is still in its infancy, however if such productivity initiatives are to succeed, cloud computing and sufficient bandwidth will be essential.

Streaming content

Another potential gamechanger for fixed line services is the availability of streaming content via services such as Netflix, Lightbox, Neon and Quickflix.

These services can be accessed by a wide range of devices, including smartphones, tablets, computers and smart TVs. The paid services are priced significantly below Sky TV, and there are also free options from TVNZ and TV3.

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58 Office for National Statistics (2014), *Characteristics of Home Workers, 2014*, 4 June 2014.

Since the local launch of Netflix in March 2015, traffic has increased dramatically. After just two months, Netflix accounted for 15-20% of CallPlus' daily traffic[59]. In the United States, Netflix comprises over one-third (36.5%) of downstream peak-time traffic on fixed broadband[60].

These types of services have the potential to cause a shift in the preferred mode of content delivery: from dedicated broadcast spectrum, satellite or cable to streaming over the Internet. This could then translate into an upturn in fixed broadband services, given the more generous data caps in relation to mobile broadband plans.

It is still very early days for streaming services, and firm evidence of any sustained effect on the fixed line market is yet to come. By the time such evidence is available, final prices UCLL and UBA prices will have been set, based on a demand profile that is far from forward-looking.

Internet of Things

Smart devices, smart homes and smart cites are all predicated on the Internet of Things (IoT) – enabling objects, animals and people with Internet connectivity. While many applications such as wearables and smart cars require mobility, this is not necessary for devices in the home, such as security monitors, smart meters, climate control systems or the large format smart televisions. Even mobile-only households will be reconsidering a fixed line service, to ensure continued connectivity while the home is unoccupied and the personal mobile devices are elsewhere.

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59 NBR (2015), *Netflix benchmarks NZ ISPs – and ISPs weigh in on whether they have installed Netflix servers*, 12 May 2015. Available at http://www.nbr.co.nz/caching-in.

60 Sandvine (2015), *Global Internet Phenomena Latin America & North America*, May 2015.

4.3 Summary

We acknowledge that the prediction of tipping points is notoriously difficult and the effect of factors such as cloud computing, streaming content and IoT is uncertain, however given the very long regulatory period, there is a significant risk for the Commission that the prices will be based on a level of demand that bears no relationship to actual market demand. Unit costs will be over-stated, and consumers will be locked into high prices with the resultant loss in welfare.

While all regulators face this situation, the potential for error is reduced where the regulatory timeframe is only one or two years in duration. Unfortunately the Commission is faced with a five-year timeframe at a point in time where demand drivers for the fixed line market are undergoing significant changes.

We recommend that the Commission considers options for reducing the risk of an outcome that would be detrimental to New Zealand consumers. One option could be to adjust the forecasts to allow for growth. Another option would be to review the assumptions during the regulatory period.

We also suggest that the Commission seeks to identify instances of multiple connections and vacant lots.

5 Aerial infrastructure

The Commission has proposed a significant amendment to its approach for modelling aerial infrastructure, replacing its previous 'joint build' scenario with a build and lease scenario: [61]

> Accordingly, we have amended our cost allocation to reflect that the hypothetical efficient operator is building a network that replaces Chorus' copper network only. In areas where the hypothetical efficient operator deploys its network aerially, the hypothetical efficient operator would erect telecommunication poles on the "minor" side of the road for lead-in cables (replacing Chorus' poles) and lease pole space from the EDB [Electricity Distribution Business] on the "major" side of the road to deploy its distribution cables.

In this Section we have reviewed the new assumptions applied by the Commission (Section 5.1) and summarised our recommendations (Section 5.2).

5.1 Assumptions

The main assumptions for aerial deployment used in the Commission's revised model are summarised below:

- The HEO will be able to deploy aerial network where there is existing EDB aerial infrastructure, with a downward adjustment to account for infrastructure that cannot be

61 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1159.

utilised. This results in an aerial infrastructure share of 45% for lead-in cables and 47% for distribution cables.[62]

- The HEO will obtain consent for aerial deployment as no additional aerial network will be built, resulting in minimal visual change.[63] In addition it is assumed that the HEO will pay a one-off allowance for costs related to the consenting and planning[64].

- The HEO will not be involved in a "joint build" scenario with the EDBs and will be building a network that replaces Chorus' copper network.[65] Consequently the HEO will deploy poles on the "minor" side of the road for lead-in cables and lease pole space on the "major" side of the road to deploy distribution cables. Hence the HEO will:
  - own the poles on the "minor" side and have a sharing agreement with the EDBs for lead-in cables
  - pay an annual rental cost of $25 per pole for the use of EDBs' electricity poles for deployment of distribution cables
  - incur the cost of replacing electricity poles which are currently incapable of carrying the HEO's distribution cables (assumed to be 10% of EDB poles).

We support the use of EDB data for estimating the percentage of aerial infrastructure – lead-in and distribution cables – in the HEO's network. As previously submitted[66] we believe it would be unreasonable to use Chorus' UFB aerial deployment as this is limited to urban areas. The EDB data is nationwide and thus accounts for geographical variations. In addition, using EDB data for both lead-in cables and distribution cables provides consistency in the Commission's approach.

62 *Ibid*, pages 208, 211-212.

63 *Ibid*, paragraph 1142.

64 *Ibid*, paragraph 1161.

65 *Ibid*, pages 214-215.

66 Network Strategies (2015), *Commerce Commission Draft Determination for UCLL and UBA*, 20 February 2015, Report Number 34019, section 5.1.

However there are several discrepancies in the Commission's values between the July revised draft determination and the December draft determination. Firstly the percentage of aerial lead-ins, based on EDB data, is incorrect in the revised draft determination. Our analysis suggests that there is a calculation error in average number of overhead customers served by Aurora Energy[67]. This has resulted in a reduction of the final average percentage of overhead customers from 49.5% (December draft determination[68]) to 47% (July revised draft determination[69]).

Secondly the EDBs' percentage of distribution cables is assumed lower in this determination without any explanation. In the previous determination the Commission stated 'EDB information disclosure shows that 51% of EDBs [*sic*] low voltage (less than 400V) networks are deployed using aerial infrastructure'.[70] In our submission we stated that we 'agree with this logic of the Commission and have successfully replicated this result for the percentage of low voltage EDB aerial networks'.[71] However the Commission's revised draft determination[72] has a lower estimate:

> We have considered modelling aerially in areas where there is existing EDB aerial infrastructure. We have estimated this area to be approximately 49% of the UCLL network footprint based on data we have sourced from electricity distribution business (EDB) information disclosure.

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67 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, Table 10, page 213.

68 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop services*, 2 December 2014, Table 8, page 137.

69 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, Table 10, page 213.

70 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop services*, 2 December 2014, paragraph 611.

71 Network Strategies (2015), *Commerce Commission Draft Determination for UCLL and UBA*, 20 February 2015, Report Number 34019, section 5.1.

72 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1134.

It is not clear how the information disclosures have been used to estimate 49% as the calculations from the information disclosures suggest that 51% of EDBs' low voltage networks use aerial infrastructure.

In addition the Commission has applied a downward adjustment of 2% to the two values of aerial infrastructure share for lead-in cables and distribution cables. This allows for a proportion of EDB aerial infrastructure that cannot be utilised by the HEO. The Commission has referred to LFC experiences to support its 2% assumption. Our industry experience suggests that this is a reasonable assumption.

With respect to consents, we agree with the Commission that the HEO will be granted consents for aerial deployment as these are for areas with existing EDB aerial infrastructure however we do not support the assumed costs within the model. The Commission has acknowledged that there is 'considerable uncertainty as to what this amount should be' and that 'Network Strategies … noted that while ensuring compliance with consents would have led to additional costs in the past, this situation may no longer apply'.[73] However it is not clear how or if the Commission has taken our comments into consideration.

Although the Commission has asked for submissions on an appropriate amount for the HEO's consenting costs, the Commission's model is currently using Chorus' 'estimated' value for the costs of obtaining consents:[74]

> As we set out above, there is considerable uncertainty as to the amount of consenting costs the hypothetical efficient operator would occur. However, we have included an allowance of [[ ]]**CNZCI** for consenting, based on information provided by Chorus.

We believe that the Commission should adopt a forward-looking approach that reflects the changing requirements for consents and reduced costs. The recent document released by Ministry for the Environment proposes amendments in National Environmental Standards

73 *Ibid*, paragraph 1143.

74 *Ibid*, paragraph 1161.

for Telecommunication Facilities (NESTF) to speed up the availability of the new and better communications technologies:[75]

> It is proposed that the NESTF be extended to include aerial and underground deployment of telecommunications cables deployed within the road reserve (subject to conditions). It is also proposed that this include the lead-in of these cables (ie, the cable that connects the communal distribution cable to private premises).
>
> If this proposal is adopted, then in those districts that currently require resource consent for the aerial or underground deployment of telecommunications cables, network operators would no longer be required to obtain such consent if they met the conditions. In other districts where these activities are already classified as permitted, the activities would be subject to the conditions in the NESTF rather than the conditions in the district plan.

In an accompanying report the Ministry for the Environment outlines the proposed cost benefits of the amendments to NESTF:[76]

> …the telecommunications industry will be able to save costs spent on reviewing district plans and plan changes, applying for resource consents, attending hearings and complying with consent conditions.

Although we understand that the consultation is in process, the proposed amendments outline the preferred approach of the Ministry for the Environment which has been drafted using inputs from industry.

While we agree with the Commission that the HEO would not build a joint network with the EDBs, we do not support the leasing/upgrading assumptions. The Commission has assumed that the HEO will pay an annual rental cost of $25 per pole as the cost of leasing

75 Ministry for the Environment (2015), *Proposed Amendments to the National Environmental Standards for Telecommunication Facilities: Discussion Document*, March 2015, page 6.

76 Ministry for the Environment (2015), *Proposed Amemdments to the National Environmental Standards for Telecommunication Facilities Preliminary evaluation under section 32 of the Resource Management Act 1991*, March 2015, page 31.

pole space for distribution cables and cover the cost of replacing 10% of electricity poles estimated to be incapable of carrying the HEO's distribution cables:[77]

> Chorus provided pole lease costs showing it pays [[ ]]**CNZCI** for distribution and lead-in cables and [[ ]]**CNZCI** for lead-in cables only. Ultrafast Fibre pays [[ ]]**UFFCI** for access for approved telecommunications equipment. Accordingly, we modelled an annual rental cost of $25 per pole for the use of EDB poles for deployment of distribution cables only.
>
> While we do not have information on how much of the existing aerial network would need to be replaced to carry additional overhead cables, Chorus has estimated that between [[ ]]**CNZCI** of poles that Chorus proposes to use for aerial deployment will require replacement. Having considered Chorus' information, in our view the hypothetical efficient operator would also incur the cost of replacing 10% of electricity poles as those poles are not currently capable of carrying distribution cables.

We do not agree with the assumed values for several reasons:

- the Commission has relied mainly on Chorus' data for the assumed values and has not taken information from other LFCs into account
- it is not clear how Chorus obtained these values and whether the ranges include Chorus' agreements with all EDBs or if the data is based on specific areas only
- it is unclear how the Commission has calculated the lease cost of $25 per pole. Using the Chorus data the average for distribution and lead-in cables is [ ]CNZ**CI** and for lead-in cables only is [ ]CNZ**CI**.[78] The difference between these two averages ($22 per pole) should be the lease cost for deployment of distribution cables.

Consequently we recommend that the Commission should take data from all LFCs to obtain more accurate cost assumptions.

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77 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraphs 1160.1.2 and 1160.2.

78 *Ibid*, paragraph 1161.1.2.

5.2 Recommendations

We recommend that the Commission should:

- check the calculations for the percentage of aerial lead-ins based on EDB data, which has dropped from 49.5% (in the previous draft December determination[79]) to 47% (in the revised draft determination[80]) due to an error
- review the value assumed for the percentage of aerial deployment based on EDB data as it has been reduced from 51% (the draft December determination[81]) to 49% (in the revised draft determination[82])
- adopt a forward-looking approach which considers the changing requirements for consents and consequently reduction in costs
- consider data for pole lease costs and upgrades from all LFCs and for all regions to obtain better estimates
- review its calculations for estimating the pole lease costs.

79 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop services*, 2 December 2014, Table 8, page 137.

80 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, Table 10, page 213.

81 Commerce Commission (2014), *Draft pricing review determination for Chorus' unbundled copper local loop services*, 2 December 2014, paragraph 611.

82 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1134.

6 Price trends

The Commission has obtained advice from NZIER on price trends for use in the UCLL and UBA pricing process[83]. NZIER recommends a number of changes from the price trends implemented by TERA in its earlier draft model, which are due mainly to different methodologies being applied:

- trenching: increased from 3.0% to 3.3%
- copper: increased from 4.56% to 5%
- fabricated steel: increased from 1.43% to 2.9%
- aluminium: increased from 0.09% to 2.9%
- CPI: decreased from 2.18% to 2%
- labour cost index (LCI): decreased from 2.58% to 2.0%
- fibre optic cable: decreased from +4.19% to -1.3%.

The net effect of these changes is uncertain – some costs will have increased, while others would decrease.

We have reviewed:

- NZIER's methodology (Section 6.1)
- NZIER's recommendation for the Consumer Price Index (Section 6.2)
- the use of the heavy construction index for trenching with no efficiency adjustments to reflect construction techniques and technologies used by the telecommunications sector (Section 6.3)

83 NZIER (2015), *Price Trends for UCLL and UBA final pricing principle*, May 2015.

- the price trend for fibre optic cable, noting that other regulators (Denmark, Norway and Sweden) use a more steeply declining price trend (Section 6.4)
- implementation of NZIER's recommended price trends within the TERA model (Section 6.5).

6.1 Methodology

In its report[84], NZIER uses four approaches for determining price trends, namely:

- qualitative judgement based on policy targets
- trends modelled using benchmark prices
- arithmetic averages of annual average percentage growth rates
- deterministic trends calculated using simple linear regression of the price series on time.

The selection of the approach is based on NZIER's judgement of the most appropriate method, with the aim of minimising error and reducing statistical bias.

In our discussions below regarding specific price trends, we examine in more detail the approach used for that data, however it should be noted that NZIER uses a different approach for calculating growth rates to that used by TERA.

We have previously discussed[85] TERA's use of compound average growth rates (CAGRs) for estimating price trends – this relies on only two data points, even if more datapoints are available. This can increase variability and error within the resultant trends.

NZIER recommends the use of average annual growth rates, calculated as the percentage change between the average of last four quarters and the average of the four quarters preceding that. We agree with NZIER that this approach will be less affected by volatility

84 *Ibid*, section 2.3.

85 Network Strategies (2015), *Review of issues from UCLL and UBA submissions*, 20 March 2015, section 4.1.

than annual growth rates – in essence the effects due to seasonal factors and series volatility have been smoothed out, with the result being closer to the underlying data trend.

The advantage of this approach is that it is relatively simple to implement, without the need for complex econometric models which require extensive historical data but still could be poor predictors of forward-looking prices. NZIER's approach is also superior to the CAGRs used by TERA.

6.2 Consumer price index

NZIER's recommendation for CPI is to use the midpoint of the Reserve Bank of New Zealand's (RBNZ's) inflation target (1-3%). NZIER notes that the current Policy Target Agreement between the Minister of Finance and the Reserve Bank has a focus of keeping future inflation near the 2% midpoint[86]. NZIER also notes that prior to this agreement, and indeed for much of the preceding decade:

> …the Governor of the RBNZ was tasked with keeping inflation within the target band of 1% to 3% "on average over the medium term". There was no particular emphasis on the mid-point of the band and, perhaps as a consequence, the CPI grew by an average of 2.4% p.a. [87]

We had previously noted that historically CPI has been higher than the midpoint of the RBNZ's target range[88], nonetheless we recommended that inflation be set to 2% as this is more consistent with recent data. Given that the RBNZ is tasked with keeping inflation close to 2%, NZIER's recommendation is reasonable.

86 Reserve Bank of New Zealand (2012), *Policy Targets Agreement*, 20 September 2012.

87 NZIER (2015), *Price Trends for UCLL and UBA final pricing principle*, May 2015, footnote 7.

88 Network Strategies (2015), *Review of issues from UCLL and UBA submissions*, 20 March 2015, section 4.2.

6.3 Trenching price trend

NZIER bases its recommendation for the trenching price trend on the Statistics New Zealand Producers Price Index (PPI) for outputs of the heavy and civil engineering construction sector.

NZIER states that this series is preferable to the capital goods price indices used by Beca[89] as the latter exclude operational and labour costs, which we agree should be taken into consideration when determining a suitable price trend for trenching costs. The PPI includes all costs of production except taxes and subsidies.

Nonetheless the PPI is still an imperfect proxy. The heavy and civil engineering construction sector includes infrastructure projects other than telecommunications, including roads, dams, tunnels and electricity networks.[90] Clearly output for the sector comprises more than just trenching.

NZIER's recommendation for a trenching price trend is based on:

> …estimated (econometric) long run relationships between annual average growth in the Producers Price Index for outputs of the Heavy and Engineering Civil Construction sector and two predictive series:
>
> - general inflation in operating costs captured in the Producers Price Index for inputs purchased by all sectors
> - labour costs captured by the Labour Cost Index for the construction sector.[91]

However, such a long term trend will take little account of recent technological developments in the telecommunications sector which seek to reduce construction costs. Such developments include hydrotrenching and microtrenching. In a 2008 analysis we

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89 Beca (2014), *FPP Corridor Cost Analysis of Trenching and Ducting Rates in NZ*, 25 November 2014.

90 Ministry of Business, Innovation and Employment (2013), *New Zealand Sectors Report 2013: Construction*, November 2013.

91 NZIER (2015), *Price Trends for UCLL and UBA final pricing principle*, May 2015, section 3.6.2.

found that while microtrenching can reduce costs significantly, it is not a ubiquitous solution for New Zealand conditions.[92] Nonetheless this suggests that a long-term price trend estimated for the heavy and civil engineering sector is likely to over-state the trend for trenching costs.

6.4 Fibre optic cable price trend

NZIER uses the US Producers Price Index (PPI) for fibre optic cable, with historical data going back to 2003. Although earlier data is available, NZIER notes that the dot-com bubble from the 1990s to the early 2000s "reflected unsustainable trends" which would not continue in the future. We agree that data over this period should be omitted.

NZIER acknowledges the price index data from the Japanese Electric Wire and Cable Makers Association, however it prefers to use data from a reputable central government statistical agency, such as the US Bureau of Labor Statistics (which issues the US PPI data). It also notes that the Japanese series has historical data only back to 2009 which is "of limited value for understanding trends".

Even so NZIER claims that the US data is for too short a time "to provide a good sense of the long term dynamics" and thus recommends a simple average annual growth rate for the long term trend rather than deriving a trend via modelling.

Using NZIER's approach for calculating average annual growth rates for the US PPI series for fibre optic cable, we obtain a slightly different result for the given period 2006 to 2014: -1.4% instead of NZIER's estimate of -1.3%[93]. Our calculations give the same result as NZIER's estimate for the period 1991 to 2014.

92 Network Strategies (2008), *Micro-trenching: can it cut the cost of fibre to the home?*, December 2008. Available at http://www.strategies.nzl.com/wpapers/2008019.htm.

93 This is based on the US Bureau of Labor Statistics PPI series WPU10260333, for the period December 1988 to December 2014 (and includes no preliminary data).

We do not understand why NZIER claims that data from 2003 was used, yet its recommended value was based on the period 2006 to 2014. No reason was given for omitting the data from 2003 to 2005. If the period 2003 to 2014 is used, we estimate the average annual growth rate to be -3.0%.

Furthermore in NZIER's comparison of growth rates for European and US industry price indices, most of the average annual growth rates were for the period 2003 to 2014, not 2006 to 2014. In this comparison, the German and US BLS Commodity results should be ignored, as they are for longer periods – 1996 to 2014 and 1988 to 2014 respectively – and thus are not compatible with the other selected estimates.

We recommend that the price trend for fibre optic cable should be -3.0%, based on US data for the period 2003 to 2014.

6.5 Implementation of price trends

In the revised draft determination, the Commission summarises the updated price trends, as advised by NZIER, however we note that not all of these have been used by TERA in its modelling (Exhibit 6.1). In particular, we note that the NZIER price trends for building, copper and fibre were not used by TERA.

Network element	*Price trend in model*	*Source*	*NZIER series*	*NZIER estimate*
Copper cables	2.61%	TERA estimate	Copper	+5.0%
Fibre cables	-0.30%	TERA estimate	Fibre	-1.3%
Ducts	3.30%	BECA/NZIER		
Trenches	3.30%	BECA/NZIER		
Building/Land	2.00%	"Default decision"	Building	+1.9%

Exhibit 6.1: *Price trends in revised TSLRIC model, compared with NZIER estimates [Source: TERA, Commerce Commission]*

No explanation has been provided by TERA as to why it chose to deviate from the Commission's decisions regarding price trends. In the case of building, NZIER clearly states that the price trend for buildings should be below CPI[94].We believe that the net effect of replacing TERA's assumptions with the Commission's recommendations will be to reduce prices for fibre/FWA, however the situation is less certain with the copper model, as although building and fibre costs will decrease, copper prices will increase.

94 NZIER (2015), *Price Trends for UCLL and UBA final pricing principle*, May 2015, section 3.4.2.

7 Capital contributions

The Commission notes that it is free to exercise its own discretion in the treatment of capital contributions. It appears to have implemented the principle that allowances will be made for capital contributions only where there is a demonstrable impact – manifested in 'identifiable assets' – on the TSLRIC cost of the network, and therefore the final price. In this section we consider the Commission's reasoning in respect to third party contributions (Section 7.1) and UFB and RBI subsidies (Section 7.2).

7.1 Third party contributions

The main focus of the Commission's investigation of capital contributions is whether there have been or are instances of relevant third party or end-user contributions to Chorus. The Commission assumes that these contributions would also be available to the HEO. The Commission believes its position is consistent with the 'general intention' in the Act that Chorus should not over recover its costs[95].

We agree with the Commission's position and that the model should ensure no double counting for the purposes of cost recovery. Effectively if there is evidence that Chorus has already received contributions for the provision of the regulated service then there is no case that these costs need to be recovered and the access seeker should not compensate Chorus a second time.

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95 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraphs 1619 and 1621.

7.2 UFB and RBI funding

Clearly in making real world end-user contributions available to the HEO the Commission is seeking to ensure that the model is consistent with real world practice. However, this does not extend to UFB funding which it considers irrelevant to the 'network we are modelling'.

> In this regard, for the purposes of determining all types of contributions that could impact the cost for the hypothetical efficient operator, we have considered the impact of UFB and TSO funding on our model. However, to our knowledge the UFB network has not benefited the network we are modelling. Therefore, based on our position that we are only going to deduct capital contributions to the extent that they influence the TSLRIC cost of the network, we do not consider UFB funding relevant, as Spark and Vodafone submitted we should.[96]

This statement appears to be the extent of the Commission's consideration of all previous submissions relating to the implications of UFB subsidies for the HEO's fibre network deployment.

The Commission is correct in stating that subsidies obtained by Chorus for the UFB network have not **directly** reduced the actual cost of supply of UCLL services.

However this misses the point of our previous discussions of the relevance of UFB subsidies to this proceeding[97]. The Commission is tasked with estimating the long-run costs of a hypothetical efficient operator deploying a modern replacement network today. Different technologies should be considered as possible MEAs, provided that they represent an efficient means of delivering the service to be costed at a similar level of quality. In this respect the Commission states:

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96 *Ibid*, paragraph 1625.

97 Network Strategies (2015), *Commerce Commission Draft Determination for UCLL and UBA, A review of key issues*, 20 February 2015. See Section 3.

> Where the capability of Chorus's copper access network means that end-users can receive voice-only or low-speed data services, we consider that a replacement network that provides unbundleable, point-to-point service provides significantly more capability than required, and that this would not be an appropriate MEA. Accordingly, the unbundleability and point-to-point features of the MEA network are not required throughout the whole network and we have considered alternative technologies, such as FWA, for lines that we identify as low capability lines.[98]

This implies that the Commission now believes that a fibre service is not the appropriate MEA where it delivers significantly more capability than the copper service is providing in the real world.

Our key point is that there is no economic case for unbundling in very rural and remote areas of New Zealand. In an empirical analysis we used GIS mapping to review the co-ordinates of both existing and planned unbundled exchanges, and found none in Zone 4 areas, one in Zone 3b and a small number in Zone 3a. It is notable that we also found in such areas many examples of end-users being served by FWA technology. We conclude that there is no commercial market for unbundling in these areas, and the most efficient forward-looking means of providing a broadband access service in such areas is via FWA technology.

In deciding on the appropriate criteria for the use of FWA in its model the Commission should rely on TSLRIC principles which require the use of the most cost-effective forward-looking technology available to provide a replacement service. In other words it should 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. This is consistent with the HEO construct and with likely future technology deployment. In contrast, an assumption of future fibre deployment in these areas is completely unrealistic, unless subsidies are assumed. The veracity of this statement is illustrated by the need for Government intervention in order to achieve fibre deployment to 80% of the New Zealand population.

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98 Commerce Commission (2015),), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 1016.

As we have previously noted, it is evident that in the absence of RBI subsidies Chorus itself would not have extended broadband services in rural areas. This RBI-funded network extension encompassed 72 000 rural lines as at the end of the 2014 financial year:

> 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.[99]

In constraining the use of FWA in the model with the rule that it is to apply only to 'low capacity lines' the modelled price will be inefficiently high. As TERA has identified:

> In New Zealand, most remote areas are an order of magnitude higher than median costs, then [*sic*] drive average costs upwards. Hence, average costs in New Zealand is [*sic*] around the 80th percentile.[100]

This is hardly surprising when 19% of all lines in New Zealand are in Zone 4 which Chorus describes as a 'large and geographically challenging area' with 'very small towns, low density areas and remote locations e.g. Chatham Islands and Great Barrier Island'[101].

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

100 TERA Consultant (2015), *International comparison of TSLRIC UCLL and UBA costs and prices*, June 2015. See Appendix 5 and Figure 11.

101 Chorus (2014), *Chorus Institutional Investor Briefing*, 7 October 2014.

The Commission has assumed FWA is the appropriate MEA in its model for only 2% of lines.

TERA's highly skewed cost distribution is symptomatic of the fact that the FPP price does not reflect forward-looking efficient costs and therefore is inconsistent with the purpose of TSLRIC. This lack of compliance with TSLRIC principles will lead to an outcome that does not promote competition for the long-term benefit of end-users.

From our own assessment a rational (profit-maximiser / cost-minimiser) HEO would commercially deploy fibre to approximately 65% of the population[102]. If the Commission believes that fibre technology should be modelled beyond this point then it should consider providing an allowance in the model for subsidies for network extension beyond commercially viable areas (based on UFB / RBI subsidies in the real world).

The Commission could also consider introducing a performance adjustment for the superior capabilities of the replacement network. Strictly speaking, to be true to TSLRIC principles, an adjustment is required for this, regardless of the extent to which fibre is deployed in the model[103].

7.3 Conclusions

Where the actual cost of supply of UCLL services has been directly reduced by payments or contributions from third parties or end-users then there is no case for recovery of these amounts from access seekers. Accordingly we agree with the Commission that the model must remove any such financial considerations.

While we agree with the Commission that UFB subsidies have not been paid to Chorus to support its regulated services, these subsidies are nevertheless relevant to the Commission's task of estimating the TSLRIC cost of a modern replacement network since

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102 Network Strategies (2015), *Commerce Commission Draft Determination for UCLL and UBA, A review of key issues*, 20 February 2015. See Section 3.3.

103 Network Strategies (2013), *Review of the Telecommunications Act 2001, Key issues*, 13 September 2013. See Section 3.2.

the MEA is fibre / FWA. The fact that the subsidies are required to encourage commercial fibre deployment beyond more densely populated areas proves that the HEO would seek more cost-effective technological alternatives to serve the more sparsely populated locations. The Commission should thus replace its current approach to technology selection with proper economic calculations to establish the most cost-effective technology by area. We recommend the use of the geotype approach, as reflected in our FWA model, rather than an ESA by ESA analysis.

Finally, the Commission should be careful to ensure that the model's results have not been indirectly affected by real world subsidies without any compensating allowance. For example, as discussed in Section 2 the Commission's assumption regarding the number of low capacity lines is substantially lower than estimates published prior to the RBI programme. Obviously it would be inconsistent for the Commission to include lines upgraded via an RBI subsidy in its count of full-speed lines, without allowing for the subsidy in the model.

8 Cost of capital

In its further draft decision on the weighted average cost of capital[104] (WACC) the Commission has estimated a mid-point post-tax WACC of 6.03%. This represents a reduction from the estimate in the December 2014 draft which was 6.47%. Key changes in parameters are:

- a reduction in the risk-free rate – from 4.19% to 3.26%
- an increase in interest rate swap costs – from 0.04% to 0.08%
- a decrease in the debt premium – from 1.85% to 1.75%
- an increase in the asset beta – from 0.40 to 0.45
- a decrease in notional leverage – from 43% to 37%.

As the risk-free rate and debt premium will be assessed as close as possible to the date of the final determination, clearly the final WACC is unlikely to remain at 6.03%. In this section we review the Commission's other updated parameters.

We also note that TERA's model requires the WACC to be input in two separate places. The most recent version of the model updated only one instance of the WACC with the revised value. We also observed that reducing the uncorrected version of the WACC to the revised value actually increased the unit cost for distribution poles.

104 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015.

8.1 Asset beta

The Commission has increased its estimate of the asset beta from its December estimate of 0.40 to 0.45, using as a basis Oxera's refined comparator sample. The Commission states that it has used the observed asset beta for Chorus as a cross-check on its beta estimate:

> We acknowledge that the Chorus estimate may be the closest comparator to the hypothetical efficient operator that we are modelling. However, we agree with submissions that a comparator sample is needed to minimise the risks of estimation error associated with basing the asset beta on a single firm. Accordingly, we have not based our asset beta estimate for UCLL and UBA on the observed asset beta for Chorus. We have however used this estimate as a cross-check on our estimate of beta[105].

Oxera has updated its earlier analysis[106], including a change to the sample (the omission of Portugal Telecom) and the use of more recent data (up to 16 March 2015). Oxera notes that the outcome has been a 'marginal increase in comparator betas'[107] and 'increased breadth of the Chorus beta range', as well as a 'decline in the average Chorus beta value based on daily and adjusted weekly asset beta values'[108]. Oxera concludes that as recent data reflects greater uncertainty there should be a marginal increase in the upper bound of its earlier recommended asset beta range. As such Oxera recommends a range of 0.30 to 0.50.

We agree that, in the light of the recent volatility of Portugal Telecom's financial data driven by company restructuring, it is prudent to assume that an estimate of its beta would not reliably reflect underlying business risk. As such it has rightly been excluded from the comparator sample. However it appears that Oxera has only excluded data points for Portugal Telecom from the results for 2015. For consistency of the sample we recommend that Portugal Telecom data points be excluded from all of the analysis for preceding time-periods.

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105 *Ibid*, paragraph 156.

106 Oxera (2015), *Second review of submissions on the WACC for UCLL / UBA*, 15 May 2015.

107 *Ibid*, page 19.

108 *Ibid*, pages 18 to 19.

The Commission states that in estimating the asset beta it has 'used data from a combination of the two most recent five-year periods'[109]. The Commission compares Oxera's updated average asset betas for the five years to 2015 with the five years to 2009 (in Table 3) and decides that it must attach some weight to the earlier time-period owing to 'significant differences'.

> There remain quite significant differences between the estimates for the five years to 2009 and the five years to 2015 (and the five years to 2014 reported in our previous draft decision). In particular, estimates drawn from the five years to 2015 are consistently lower than those in the preceding five-year 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.
>
> Instead, we have also placed weight on estimates from the period to 2009 (in addition to those for the period to 2015). Doing so, we determined an asset beta of 0.45. This falls near the mid-point of the estimates reported in Table 3.[110]

However, given that Oxera has used 2015 data, the relevant comparison for the immediately adjacent time period now becomes the five years to 2010, rather than the five years to 2009 which the Commission considered in its December 2014 draft determination. Thus the Commission's Table 3 should be amended as follows:

	Five years to 2010	*Five years to 2015*
Mean using monthly data	0.43	0.41
Mean using weekly data	0.43	0.39

***Exhibit 8.1**:* *Summary of average asset beta estimates from Oxera's refined comparator sample [Source: Commerce Commission, Network Strategies]*

109 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015, paragraph 163.1.

110 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015, paragraphs 179 to 180.

The Commission's states that its approach is to assume an estimate 'near the mid-point of the estimates reported in Table 3'. With the corrected data that estimate would be 0.41 which is lower than the Commission's estimate of 0.45.

Furthermore we note that the updated data for the adjacent time-period does not exhibit the significant differences that the Commission observed in its earlier comparisons (in which the mean based on monthly data for the five years to 2009 was 0.50). As such we recommend that the Commission reconsiders placing any weight on estimates from the earlier time-period. In this case the mid-point estimate of the more recent data would be 0.40.

In any event Network Strategies continues to believe that, given the dynamic nature of the telecommunications industry, the most recent time-period is more relevant as an indicator of the risks facing the business which we would expect to affect the asset beta of an operator[111].

The Commission claims support for its beta estimate in that the average of five year monthly rolling asset beta estimates for the last ten years is 0.45[112]. By using a rolling average of the last ten years the Commission is considering data from 2002 to 2015, since the 2006 estimate is the average of the five years to 2006. This is problematic for a number of reasons:

- it is inconsistent with the Commission's stated principle that 'greater weight should be placed on more recent asset beta estimates' and its rejection of CEG's claims that a longer time period should be used. The Commission clearly states that it has 'continued to focus on asset betas for the most recent 10 years when estimating the asset beta for UCLL and UBA'[113].

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111 Network Strategies (2015), *Review of issues from UCLL and UBA submissions*, 20 March 2015. See Section 3.1.

112 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015, paragraph 181.

113 *Ibid*, paragraph 171.

- the earlier time-periods have far fewer datapoints than the last ten years, which as we have previously discussed[114] introduces a large standard error and distortions due to influential datapoints
- the Commission is implicitly assuming that a long term trend exists in the data, and is giving equal weight to data points from over ten years ago with data points from more recent years. It is difficult to reconcile the evolving and dynamic characteristics of the industry with the notion that an underlying asset beta exists in perpetuity.

We conclude that the value of including the earlier data is highly questionable. In particular, given that the time-period represents a different environment to now and the smaller sample size it is doubtful that its inclusion will improve the accuracy of a forward looking estimate. Thus, if the Commission wishes to make use of rolling averages then it should consider only those years which reflect data from the last ten years. This means that the Commission should consider rolling averages from 2010 to 2015 since these encompass data from the years 2006 to 2015. The average of five year rolling asset beta estimates for 2010 to 2015 is 0.39.

As a general rule we believe that the Commission should refer to the median asset beta estimates rather than the mean. As we have previously noted[115], 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. 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. With the omission of Portugal Telecom, the sample has become smaller than previously and as such this issue becomes even more important.

The Commission gives four other reasons to support its estimate of 0.45:

Proximity to daily data and shorter	The Commission notes that 0.45 is close to Oxera's estimates using daily data for the periods ending in 2009 and 2015. As discussed

114 Network Strategies (2014), Expert reports on WACC for UCLL and UBA FPP, 21 July 2014, section 3.3.

115 Network Strategies (2015), *Commerce Commission Draft Determination for UCLL and UBA, A review of key issues*, February 2015. See Section 7.1.

sampling periods

above the relevant comparison should now be between the period ending in 2010. The daily five year asset beta for the five year period to 2010 is 0.42 and for the five year period to 2015 is 0.38. The Commission also notes that its estimate is close to estimates of beta from two year sampling periods. For the daily two year asset betas for the five year period to 2010 the beta is 0.36 and for the five year period to 2015 it is 0.44. Thus the range of the relevant daily estimates is 0.36 to 0.44. This would tend to support an estimate of 0.40 rather than 0.45.

Within Chorus range

The Commission states that 0.45 is within the range of asset beta estimates observed for Chorus by Oxera. This range extended from 0.30 (two year daily estimate) to 0.49 (two year weekly estimate). Oxera also made an adjustment for volatility leading to an estimate of 0.37. An estimate of 0.40 would appear to be more consistent than 0.45 with the adjusted Oxera estimate, and also represents the mid-point of the range based on two year daily and weekly estimates.

Comparison with electricity and gas

The Commission believes it is appropriate for the asset beta to be higher than the asset beta used for electricity lines in the IMs (0.34) since there is ‘greater risk from other services and technologies’. It also notes that gas pipeline companies face competition from electricity lines and so the UCLL / UBA asset beta should be similar to the IM asset beta for gas companies (0.44). One could equally hypothesise that the level of risk to the UCLL / UBA provider would be between that of an electricity lines supplier and a gas pipeline supplier on the grounds that the risk exposure of the gas pipeline supplier is likely to be greater than the UCLL / UBA provider.

Comparison with regulatory precedent

Since a forward-looking estimate is required we agree with both the Commission and Oxera that it would make most sense to attach a higher weighting to data from more recent years. Our application of the Commission’s methodology yielded estimates of 0.41 (based on the corrected Table 3) and 0.39 (based on rolling averages that reflect the last ten years only). Following an application of the Commission's further sanity checks we conclude that, on balance, there is more evidence to support the Commission's original asset beta estimate of 0.40 than its revised estimate of 0.45.

8.2 Leverage

The Commission has changed its methodology in estimating leverage from the December draft determination. The December estimate was 43% and was based on the average five-year leverage for the refined comparator sample in 2014. The updated leverage estimate is 37% which is based on the average of five-year rolling averages over the period 2006 to 2015 for the refined comparator sample. The Commission explains this as follows:

> We believe that it is important for us to treat leverage consistently with asset beta because we are using the same refined comparator sample. As we have considered rolling averages for asset beta over a 10 year period from 2006-2015, we have now used the same period for leverage.[116]

While in general we support consistency of approach, it is unclear as to why the Commission believes it has adopted a consistent approach in this particular instance. As noted previously the Commission states only that it has 'considered rolling averages over the last 10 years, as additional evidence'[117] and the average of five year monthly rolling asset beta estimates for the last ten years 'supports our updated [beta] estimate'. If in fact the asset beta has been estimated primarily on the basis of this metric then the Commission should clearly state this and the reasons for its decision. As it stands the Commission appears to have used Table 3 as the primary basis for its asset beta estimation. If it adopted a similar approach for estimating leverage then the result would have been 38.5% (the average of five-year leverage for the five years to 2010 and the five years to 2015 for the

116 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015, paragraph 202.

117 *Ibid*, paragraph 163.2.

refined comparator sample). Furthermore, if rolling averages are used for the period 2010 to 2015 (as we recommend to reflect only the last ten years of data) then the result would be 40%, which was the Commission's leverage estimate for the December draft determination.

8.3 Interest rate swap contracts

The Commission has doubled its December draft estimate for swap costs, from four basis points to eight basis points. While the Commission accepted Network Strategies' earlier submission that the number of swaps required will depend on the nature of hedging, it notes that:

> We understand that it is more common for New Zealand firms to issue fixed rate debt than floating rate debt, and therefore, two swaps will generally be required to switch interest rate exposure … [118]

In other words the Commission is assuming that as a general rule firms will need to swap from fixed to floating and then from floating to fixed, thus incurring two swap costs.

The Commission provides no evidence as to the proportions of fixed to floating debt in New Zealand. However, PwC recently released a treasury management survey which contains useful indicative information[119]. The survey includes firms' debt profiles by fixed and floating rate exposure sector in 2014/15. The results indicate a higher proportion of fixed interest rate exposures for New Zealand firms with 57% of interest rates fixed compared to 43% floating. However the results have also been broken down by industry sector. For the energy and utilities sector fixed interest rate exposure only marginally exceeds floating rate exposure[120]. Given this evidence we recommend that the Commission

118 *Ibid*, paragraph 130.

119 PwC (2015), *New Zealand treasury management survey*, March 2015.

120 *Ibid*, page 78.

assumes that in only 50% of instances would two swaps be required, and adjusts its swap cost estimate accordingly.

8.4 Debt premium

In its estimation of the debt premium the Commission has identified Wellington International Airport Limited's (WIAL's) bond that matures in May 2021 as its primary reference point, on the grounds that it has a BBB+ credit rating, a remaining term to maturity of 6.1 years and is not majority owned by the Crown or a local authority. The Commission's target credit rating is BBB+ and bond term is seven years. The WIAL bond was estimated to have a debt premium of 1.65% as at 1 April 2015. In deriving its 1.75% debt premium estimate, the Commission has added 10 basis points to allow for the impact of an additional 0.9 years in the term to maturity.

The Commission then checked its estimate for consistency against New Zealand bonds with credit ratings other than BBB+ that are not majority owned by the Crown or a local authority. The only one of these bonds with the target seven year term was a Spark bond with an estimated debt premium of 1.41%. However as the credit rating is A- an adjustment is necessary since this is higher than the target BBB+. So what adjustment would be appropriate? It is reasonable to assume that an adjusted debt premium may be above the Commission's floor value of 1.65%, although the extent to which it would exceed the floor value is difficult to assess.

We note that the Commission has given less weight to bonds that do not meet its ownership criteria and has also now considered bonds that it previously regarded as anomalous. Two of these bonds (Genesis Energy and Mighty River Power) have seven year terms and a BBB+ credit rating. However it is difficult to determine a reasonable reference point from these bonds, given that the associated debt premiums differ considerably: 1.66 for Genesis Energy and 1.80 for Mighty River Power.

Thus on balance we conclude that the Commission's estimate of 1.75% appears reasonable, noting the lack of bonds that precisely meet its target criteria.

8.5 Summary

We recommend that the Commission:

- accurately implements its stated methodology for estimating the asset beta
- re-estimates notional leverage to ensure consistency with its approach for estimating the asset beta
- adjusts its interest rate swap estimate to reflect evidence that in only 50% of instances would two swaps be required in the New Zealand telecommunications sector.

9 Uplift

The Commission has determined that an uplift to WACC is unjustified following consideration of a new report by Oxera[121], as well as CEG's adaption of the Dobbs model and other quantitative models.

> … we consider that these models ultimately support the conclusion that the link between a WACC uplift for UCLL/UBA and incentives to invest in innovative new telecommunications services is too uncertain to justify an uplift (compared to the increased cost to consumers, which is relatively certain).[122]

Network Strategies has consistently found no evidence that would support an uplift to WACC or a mid-point TSLRIC estimate in these price review proceedings. In this Section we consider whether any new evidence has been presented that would persuade us otherwise.

9.1 The Commission's analytical framework for uplift

In its revised draft determination the Commission has implemented a number of our recommendations regarding its model for a TSLRIC uplift, including:

- reducing the discount rate from 10%

121 Oxera (2015), *Is a WACC uplift appropriate for UCLL and UBA?*, June 2015.

122 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015, paragraph 225.

- introducing the potential for UFB uptake to be lower than 100% of households within coverage areas (although the Commission's base case still appears to be 100%)
- use of Statistics New Zealand population projections for deriving demand projections
- correction of the calculation of the impact of a UCLL uplift to use annual average connections rather than year-end connections.

While these changes have addressed some of the shortcomings we identified in the Commission's model[123], it remains clear that the model still does not demonstrate that welfare would be increased if uplifts are applied. The estimated welfare loss due to the increase in copper prices is likely to far outweigh any welfare gain from faster fibre migration or the development of new services.

9.2 Dobbs model

The Commission has provided Professor Ian Dobbs' response to CEG's proposed uplift model[124] (which is based on an earlier model by Dobbs) and submissions on the CEG report.

In general Professor Dobbs has agreed with key criticisms previously identified in Network Strategies' review of the CEG report[125]. In particular Professor Dobbs notes:

- the zero cross-elasticity assumption in his model which is inappropriate for CEG's application of the model
- the weighting attached by CEG to profit in the welfare function
- the high levels of new investment assumed by CEG
- incorrect truncation values.

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123 Network Strategies (2015), *Analytical frameworks for an uplift to the TSLRIC price and WACC*, 11 May 2015.

124 Dobbs (2015), *Welfare effects of UCLL and UBA uplift, comments on the application of the Dobbs 2011 model*, 29 May 2015.

125 Network Strategies (2015), *Examining welfare effects of UCLL and UBA uplift: A review of the CEG submission dated March 2015*, 11 May 2015.

Professor Dobbs does state that he cannot comment on some of our detailed arguments concerning the telecoms market in New Zealand as he lacks knowledge in this area. As such, for example, he is unsure as to the appropriate assumption for new investment, although he stresses the importance of identifying a realistic level given the sensitivity of the results to this assumption. He notes that CEG's assumed 75% 'seems a fairly high figure'[126].

Nevertheless Professor Dobbs' overall conclusion is that 'the predicted uplift within the model is likely to be significantly less than in the scenarios considered by CEG'[127]. This is consistent with our own analysis of the CEG model in which we demonstrated that CEG's results are particularly sensitive to key assumptions that are either inappropriate or incorrect in the context of UCLL / UBA services in New Zealand[128]. Thus we have not changed our earlier conclusion that the Commission should disregard CEG's implementation of the Dobbs model.

9.3 Oxera model

Oxera has examined whether an uplift to the WACC might deliver end-user benefits that would exceed the direct costs of the uplift. Its analysis is based on the framework previously developed to assist with the Commission's decision on WACC for the regulation of pricing for electricity and gas pipelines, under Part 4 of the Commerce Act.

The Oxera analysis relies on an assumption that a WACC uplift for UCLL and UBA services will have an impact on the timing of major innovations in telecoms. Oxera makes no attempt to demonstrate any causal impact and in fact admits that other factors are likely to affect the pace and scale of new investment. Nevertheless Oxera suggests that a WACC uplift, operating as a 'signalling mechanism' may have an indirect effect.

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126 Dobbs (2015), *Welfare effects of UCLL and UBA uplift, comments on the application of the Dobbs 2011 model*, 29 May 2015, paragraph 44.

127 *Ibid*, paragraph 8.

128 Network Strategies (2015), *Examining welfare effects of UCLL and UBA uplift: A review of the CEG submission dated March 2015*, 11 May 2015. See section 2.

> We note that a WACC uplift on its own is unlikely to affect whether a given innovation is commercialised in New Zealand, and hence change the frequency of the cycle. However a regulatory regime that promotes innovation (through a WACC uplift) could accelerate the process of innovation, such that a new technology will be introduced in New Zealand earlier than it otherwise might have been.[129]

Oxera hypothesises that the major consumer benefits will accrue from disruptive innovation rather than innovations that are simply incremental to existing technologies. Thus the Oxera analysis seeks to quantify the impact of disruptive innovation occurring earlier than otherwise. The key steps in the analysis are:

- estimate the frequency of innovation for disruptive technologies
- assess the benefits of innovation in telecommunications using estimates from the literature
- estimate the acceleration effect of a WACC uplift
- calculate the net present value (NPV) of early technology introduction benefits due to the acceleration effect.

Oxera considers the frequency of disruptive technologies over the last 40 years, focussing on commercialisation dates of 'innovation events within four functions (transmission, switching, mobile and wireless / broadcast) that could be relevant to the context of UBA and UCLL services'[130]. On the basis of its estimated average across the functions (22 years) Oxera assumes a 20 year time-period for disruptive innovation.

Although Oxera does not define disruptive technologies, examples include DSL, PON, GSM and WiFi. We assume that by the term disruptive Oxera means a new technology that renders any predecessor obsolete, and involves substantial new investment. However for a WACC uplift on UCLL and UBA services to have any relevance to a firm's investment strategy and business plan, the disruptive technology would need to deliver a regulated service or at least a service that is highly likely to be regulated in the future, such as monopoly access infrastructure. This implies that Oxera should consider only those

129 Oxera (2015), *Is a WACC uplift appropriate for UCLL and UBA?*, June 2015. Section 4.1.

130 *Ibid*, Section 4.3.1.

potential disruptive technologies that deliver such services. Arguably fibre is the most recent relevant disruptive technology, and large scale commercial investment in this commenced in New Zealand in 2011. So if we let history be our guide, as Oxera suggests with its 20 year time-period between disruptive innovations, then the Commission is being asked to consider, via a WACC uplift, trading off the certain direct costs to the consumer of an uplift against the uncertain benefits that may arise after another two decades.

Furthermore, if a disruptive technology emerges in the short to medium term that reduces costs for access services currently regulated using the TSLRIC standard then it would be in the financial interests of the regulated access provider to adopt it as early as possible within the regulatory period. Given that the proposed regulatory period for UCLL and UBA services is relatively long (five years), the prospective new technology could reduce costs below the efficient price estimated in 2015 by the Commission, which would increase margins for the access provider. The resultant cost savings would not be passed on to the access seeker or the end-user, unless the access provider chose to offer services below the regulated price.

To calculate the benefits of innovation Oxera uses consumer surplus estimates from a literature review of studies on the impact of broadband:

> Broadband is likely to be one of the innovations in telecoms that has been truly transformational for society overall and has created large consumer benefits. Any estimates of the benefits of innovation based on broadband may therefore overstate the benefits that might arise from other innovations in the future. At the same time, we consider that, given that many of the developments in telecoms technology may have similar kinds of benefits to high-speed broadband (e.g. the development of 3G technology), the estimates found in the literature are not completely unrepresentative of the benefits of disruptive innovation in general and are relevant to the WACC uplift context.[131]

Oxera selects two studies on which to base its consumer surplus estimates – the Alcatel-Lucent 2011 study[132] on the impact of UFB and RBI in New Zealand, and a 2003 Criterion

131 *Ibid*, section 4.4.

132 Alcatel-Lucent (2011), *Building the benefits of broadband: How New Zealand can increase the social & economic impacts of high-speed broadband*, 2011.

Economics study of estimated consumer surplus at near ubiquitous levels of broadband penetration (with DSL and cable modem technologies) in the United States[133]. For the latter study we are unable to exactly reproduce Oxera's consumer surplus estimate of NZD352 per person per year. Oxera states that Criterion Economics' result (based on an assumed log-linear demand curve and USD120 'choke price') is in total USD32 billion to USD71 billion which is 'equivalent to around USD1000 per head of the entire US population in 2003 prices'[134]. However the total consumer surplus was calculated by Criterion Economics using household data which would imply an estimated consumer surplus of USD225 to USD502 per household.

The Alcatel-Lucent report is based on an aggregation of potential savings over 20 years for end-users due to efficiency gains in four industry sectors through the availability of higher speed broadband. Oxera simply divides the total result by years and population to derive an annual consumer surplus estimate of NZD366 per person.

Although these two reports provide interesting insights into the potential impact of broadband adoption (Criterion Economics) and high-speed broadband business applications (Alcatel-Lucent) it is highly questionable whether together they deliver a reliable estimate for the consumer benefits of disruptive innovation. The Criterion Economics report is a dated theoretical study and as such we would not recommend that its results be considered in the Oxera analysis. The Alcatel-Lucent report is arguably more relevant as it seeks to measure the economic impact of a step change in broadband speed in New Zealand. However reliance on one study for an estimate of a key assumption in the Oxera analysis is obviously problematical.

Oxera's estimate of the potential acceleration effect of a WACC uplift (new technology becomes available in New Zealand two years earlier than otherwise) is highly speculative and potentially irrelevant as it is based on analysis of the launch dates of ADSL2+ technology of a small sample of operators in 14 countries. It would have been preferable

133 Criterion Economics (2003), *The effects of ubiquitous broadband adoption on investment, jobs and the US economy*, September 2003.

134 Oxera (2015), *Is a WACC uplift appropriate for UCLL and UBA?*, June 2015. Annex A3.

for Oxera to attempt to establish the average time lag (if any) between commercial launches of disruptive technologies in New Zealand operators compared to the leaders.

In summary the key assumptions on which Oxera bases its NPV estimates of early technology introduction benefits, at best, have a large associated margin of error. However the fundamental issues with the analysis lie in:

- the absence of evidence of a causal relationship between a WACC uplift and the acceleration of investment in disruptive technologies
- a failure to demonstrate that New Zealand service providers are technology laggards
- the lack of clarity concerning the next disruptive technology that will have services subject to regulation and is likely to offer benefits on a similar scale as the introduction of high-speed broadband.

Consequently we agree with Oxera's conclusion that 'the evidence is not strong', and as such 'does not contradict the continued use of a midpoint WACC for UCLL/UBA'[135].

9.4 Conclusions

The Commission notes that:

> In practice, we are not convinced, in the quantitative models provided, that the differences between the total welfare and consumer welfare estimates were due to factors other than a transfer of wealth from consumers to producers[136].

We agree with the Commission. The inclusion of a WACC uplift for the estimation of UCLL and UBA prices will inevitably result in direct costs to the end-user while the models that have been examined do not provide reliable evidence of any long-term benefits

135 *Ibid*, section 6.

136 Commerce Commission (2015), *Cost of capital for the UCLL and UBA pricing reviews, further draft decision*, 2 July 2015, paragraph 241.

of a sufficient scale to outweigh these direct costs. We recommend that the Commission does not apply an uplift to the WACC or to a mid-point TSLRIC estimate.

10 Benchmarking

The Commission has responded to concerns that its estimated price is inconsistent with international benchmarks, although noting that while benchmarking was used for the IPP process, it is not directly applicable to the current price review. Nevertheless the Commission asked its consultant TERA to undertake a benchmark analysis of TSLRIC-based UCLL and UBA prices in four European countries – Denmark, France, Ireland and Sweden[137]. This analysis purports to demonstrate that costs in New Zealand are relatively high, which then justifies a high UCLL price.

In our view benchmarking is useful as a cross-check of cost model results. If there is a significant differential between a benchmark price and a cost modelled price then it should be possible to identify key underlying factors that would explain this. We note that the Commission remarks that:

> Our experience with international benchmarking dates back to our first determination of the UCLL service in 2007. At that time we used a variety of benchmarks, including Europe, but also those of US State Regulators. The exclusion of the US State benchmarks largely skews the results of this benchmarking downwards.[138]

In our view this statement is misleading. US State data was excluded from the Commission's benchmark sample in 2012 as it no longer represented efficient forward-

137 TERA Consultants (2014), *International comparison of TSLRIC UCLL and UBA costs and prices*, June 2015.

138 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 13.

looking costs. As such it had no legitimate place in the benchmarking sample. As acknowledged by the Commission:

> The Commission's view remains that US states do not comply with the forward-looking cost-based requirement, because UNE-L prices fail to meet the "forward-looking LRIC" and "updated and recent" requirements of the benchmarking criteria[139].

In this Section we review TERA's choice of benchmark jurisdictions (Section 10.1), the benchmark methodology (Section 10.2) and adjustments (Section 10.3), and its cost comparisons (Section 10.4).

10.1 Benchmark jurisdictions

TERA selected four countries for its benchmark sample: Denmark, France, Ireland and Sweden. The reasons for selecting this sample appear to be:

- sufficient publicly available information for 'an in-depth comparison of UCLL and UBA prices'[140]
- use of the TSLRIC modelling approach
- with a similar level of development to New Zealand these countries 'therefore should experience in theory similar *[sic]* level of labour costs'[141]
- a low level of population density, comparable to New Zealand with the exception of Denmark.

In fact, New Zealand has a lower GDP per capita than all the sample countries and is 18% below the sample average (Exhibit 10.1)[142]. Contrary to TERA's claim, this suggests that labour costs should be lower in New Zealand than the sample countries.

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139 Commerce Commission (2012), *Final determination on the benchmarking review for the unbundled copper local loop service*, 3 December 2012, paragraph 107.

140 TERA Consultants (2014), *International comparison of TSLRIC UCLL and UBA costs and prices*, June 2015, section 0.2.

141 *Ibid*. section 0.2.

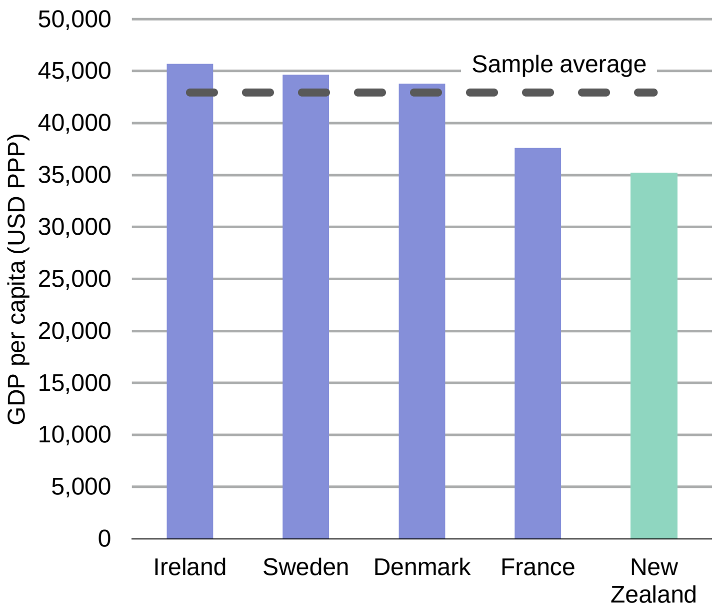

Exhibit 10.1:

GDP per capita 2013 for selected countries [Source: World Bank]

As a general rule, in order to ensure comparability, data used for benchmark purposes should be from a consistent point in time. TERA references documentation with dates ranging from 2005 to 2014 as follows:

- Denmark: 2015
- France: April 2005
- Ireland: 9 February 2010
- Sweden: 26 November 2009.

We note that TERA yet again refers to an outdated 2009 version of the Swedish fixed model, despite a more recent version being publicly available on the Swedish language part of the regulator's website.

We do not believe that France and Ireland can reasonably be included in this benchmark sample. The French data is far too old to be relevant. The Irish data is also outdated, and

142 Subsequent to TERA's report, the World Bank has released updated data on GDP per capita on 28 July 2015. We have used the revised data, which has slight differences from that reported by TERA. Unfortunately 2014 data for New Zealand was unavailable.

with no publicly available model TERA has been compelled to make a number of assumptions and inferences as it seeks to 'transform the Irish UCLL price into a *pro forma* price'[143]. In our view this approach (further discussed in Section 10.3) is unsatisfactory and Ireland should have been rejected on TERA's first criterion – lack of sufficient publicly available data.

We note that TERA did not consider publicly available LRIC models from other countries – such as the Netherlands, Norway and Spain – and no explanation was provided as to why these were excluded. Clearly population density was not a key criterion otherwise Denmark would have been rejected.

10.2 TERA's methodology

Modern Equivalent Asset

In an attempt to ensure comparability across its benchmark jurisdictions TERA has used copper as the MEA. This means that the Commission's preferred MEA – fibre plus FWA – has not been used in the benchmark analysis, apparently to facilitate detailed comparisons with the copper-based models of France, Denmark and Sweden. TERA claims that the last publicly available model for Sweden was published in 2009 and uses mainly copper technology. However, this is not true as a much more recent version (version 10.1, released in December 2013, which was used to set the currently used prices) is available on the regulator's website, and this version uses fibre as the MEA. Given the problems with the French and Irish models, we recommend that only the Danish and Swedish models be considered in the benchmark analysis. Furthermore, given the much closer match in population density between New Zealand and Sweden, compared to New Zealand and Denmark[144], arguably the most relevant benchmark comparison would be between the New Zealand and Swedish models. Consequently TERA should consider the most recent fibre versions of these models.

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143 *Ibid*, section 1.1.2.

144 *Ibid*, Figure 3.

Currency conversion

TERA's approach to converting currencies to New Zealand dollars is inappropriate for benchmarking the UCLL service. It first converts the Danish and Swedish currencies into Euros using current market exchange rates, and then it converts all of the benchmark currencies from Euros into New Zealand dollars, using a single current market exchange rate.

Current market exchange rates are not a measure of relative prices and therefore are unsuitable as a means of adjusting for different currencies. The main problem with market exchange rates is that they are subject to volatile capital movements that have little relationship to relative prices or relative rates of inflation. To convert to a common currency unit Purchasing Power Parity (PPP) exchange rates should be applied. These represent the ratio of the costs of a basket of goods in two countries each calculated in their own currency units. As such the use of PPP rates converts national currencies to a common currency unit, and simultaneously adjusts for average cost differences between countries.

For the more relevant comparators – Denmark and Sweden – the use of 2014 PPP exchange rates[145] leads to lower current UCLL prices and estimated national average UCLL costs than market exchange rates (Exhibit 10.2).

	Price per line per month					
	Current UCLL price (LCU)	*Current UCLL price (NZD)*	*Current UCLL price (NZP - PPP)*	*National average cost of UCLL (LCU)*	*National average cost of UCLL (NZD)*	*National average cost of UCLL (NZD - PPP)*
New Zealand	26.31	26.31	26.31	38.13	38.13	38.13
Ireland	10.87	17.93	18.98	[27 – 31]	[44 – 51]	[47 – 54]
Denmark	57.65	12.75	11.16	57.65	12.75	11.16
Sweden	90.01	16.09	14.77	96.55	17.26	15.85
France	9.05	14.93	16.03	14.44	23.82	25.58

Exhibit 10.2: *TERA benchmarking sample prices – different currency conversion approaches [Source: TERA, Network Strategies]*

145 World Bank World Development Indicators database, accessed 27 July 2015.

10.3 TERA's adjustments

In only one of the countries considered (Denmark) did TERA use the original unadjusted UCLL price. TERA applied various adjustments to the other three countries, including:

- "updating" the prices to 2015, as the set prices applied to an earlier time period
- in the case of France and Ireland, the UCLL prices do not correspond to a national average cost, with the price being determined for a subset of lines
- extending the scope of costs and lines for New Zealand, and using the costs for a copper network rather than the fibre/FWA network.

So are TERA's adjustments fit for purpose?

France

The French data presented by TERA is drawn from a 2002 model, as this was the last time that UCLL prices were assessed on a TSLRIC basis in France. To convert the 2002 results into 2015 datapoints TERA has applied a tilted annuity formula with price trends 'published by ARCEP in 2005'[146]. This is equivalent to assuming a regulatory period of 13 years. The resultant estimates could not possibly reflect the forward-looking costs of providing UCLL services in 2015, given the substantial changes in technology that have occurred since the early 2000s. Thus the French information should not be considered as relevant benchmark data.

Ireland

To transform the Irish UCLL price to a 'pro forma' UCLL price, the following adjustments were made:

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146 *TERA Consultants (2014), International comparison of TSLRIC UCLL and UBA costs and prices, June 2015,* section 1.1.1.

- include the cost of repairing faults (since alternative operators must pay separately for this cost)
- remove the cost for the ETP (External Termination Point) as this is excluded in all other countries
- include all lines, as the Irish regulator ComReg calculated the cost of UCLL only for lines that are likely to be unbundled and only for lines that are no more than 5km from the exchange, which corresponds to 62% of lines
- update to 2015 prices.

TERA states that the relevant starting point is EUR12.41, to which EUR0.96 (fault rental) must be added and EUR1.00 (ETP) must be subtracted. This yields EUR12.37 which must be adjusted to derive a national cost. As the Irish cost model is not publicly available TERA inferred a national cost for Ireland assuming a similar distribution to that in Denmark and New Zealand. TERA claims that the resultant Irish national cost estimate is between NZD44 and NZD50.

However, TERA has erred in its calculations. TERA states that its estimate is based on the average cost for 'the first 62% of lines' for New Zealand and Denmark:

> - Using the New Zealand cost distribution, the average cost for the first 62% lines would be equal to 50% of the national average cost
>
> - Using the Ireland [*sic*] cost distribution, the average cost for the first 62% lines would be equal to 50% of the national average cost[147]

We assume that in the second bullet point TERA was actually referring to Denmark, not Ireland. If we consider TERA's Figure 11 (cost distribution from cheapest to most expensive exchanges) it is clear that the average national cost in Denmark – denoted by the red dotted line – is **lower** than the 62% point. Therefore TERA's statement cannot be correct.

147 *Ibid*, Appendix 5.

In the case of the New Zealand cost distribution the national average cost is at the 80% point, hence it could be true that at the 62% point the average cost equals 50% of national average cost.

Even if the calculation error is addressed, TERA provides no reasons to support its assumption that Irish costs would be 'distributed similarly to Denmark and/or New Zealand'[148]. As such TERA's conclusion in respect of the comparative costs of Irish UCLL – 'it appears that UCLL costs are significantly higher than in France, Sweden and Denmark but not Ireland'[149] – is unsupportable. TERA reaches this conclusion only because of its unjustified assumptions regarding the cost distribution in Ireland. We conclude that the Irish benchmark presented by TERA is both incorrect and irrelevant.

TERA has also presented a comparison of network costs in Dublin and Auckland[150]. This comparison suffers from a lack of accurate and recent data to such an extent that no conclusions can be drawn as to why urban UCLL costs in New Zealand appear to be relatively high. In particular TERA has either no information or has made assumptions about:

- the number of active lines in Dublin
- the cost per line in Dublin
- the network length per line in Dublin.

In addition we note that TERA based its comparison of urban population density on data from 2006 in the case of Auckland and an unspecified point in time for Dublin.

148 *Ibid*, section 1.1.2.

149 *Ibid*, section 2.5.

150 *Ibid*, section 3.

Sweden

As we have already noted the current UCLL price in Sweden is based on a FTTH / FWA MEA, whereas the 2009 TSLRIC model used in TERA's benchmarking analysis is mainly copper. TERA states that the only adjustment it made to the 2009 model was that 'annual costs have been forecasted from 2010 to 2015 using asset price [*sic*] specific to Sweden'[151]. While no further details are provided on this adjustment, the UCLL price in the most recent Swedish model is SEK95.67 per month, which is very close to the national average cost of UCLL used by TERA (SEK96.55), based on its update of the 2009 model results to 2015 prices.

10.4 Comparison of UCLL and UBA prices

TERA provides a breakdown of the monthly unit costs of UCLL (in Figure 2) which illustrates that the costs for underground structure and for overheads are considerably greater in New Zealand than other benchmark countries. TERA also estimates underground infrastructure unit costs per metre (in Figure 7). The New Zealand cost is approximately $85 per metre, compared to just over $50 per metre for Sweden and under $35 per metre for Denmark.

Technology choices

TERA's explanation for differences in infrastructure costs lie in the technology:

> In Sweden and Denmark, low costs stem from the technology used (miniducts and direct burying in Sweden, direct burying in Denmark, i.e. no ducts).[152]

In the Swedish model, almost half the trenches use ploughed cable (Exhibit 10.3).

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151 *Ibid*, section 1.2.

152 *Ibid*, section 2.4.

	%
Duct	27.6%
Ploughed cable	49.7%
Aerial	22.7%
Total	100.0%

Exhibit 10.3: *Trench allocation, 2009 Swedish model [Source: PTS]*

The lower capital costs of direct burying are offset to some degree by higher operating costs (due to the greater costs of fault repair). TERA found that opex in Sweden was higher than in New Zealand, however this was not the case for Denmark. Nonetheless, where appropriate, operators will deploy direct buried cables if there is a financial advantage in doing so.

While we have not been able to confirm the extent of direct burying in the New Zealand model, it is clear that ducting is extensively used. Many cost models include explicit assumptions for the share of ducted and direct buried cable, however this is not the case for TERA's model. TERA's statement implies that the modelled HEO employs less direct burying than in the Danish and Swedish models. We can therefore only conclude that the model does not reflect the costs of an efficient operator.

So what is the situation in real-life New Zealand? Chorus has around 130 000km of distribution cable nationwide, and this is typically direct buried (namely underground cables placed directly into the ground without ducts), with 9000km of feeder cable, typically in ducts.[153]

Population distribution

TERA states that a better comparator of population distribution than population density is the length of roads/streets per active line, and that Sweden has a "lower" road network than New Zealand. It should be noted that road length is still only an imperfect proxy for line

153 Telecom Wholesale (2007), *Telecom Wholesale customer briefing*, 22 November 2007. Available at http://www.spark.co.nz/binarys/telecom_cabinetisation_briefing_22_nov_2007.pdf.

density, and, being a national metric, does not convey the regional variation that may be present – in particular the extent of low density areas that may have a disproportionate effect on costs.

There is a note in the Swedish LRIC model stating that according to state authorities there is around 400 000km of road and that this is consistent with the model. With just over 4.5 million active lines in the model, this translates to 0.09km of road per active line. The New Zealand Transport Authority notes there is 11 000km of state highways and 83 000km of local roads.[154] Our own analysis of the New Zealand geospatial data suggests that the total length of sections[155] is 133 550km, which results in 0.07km of road per active line. This metric therefore suggests that the average population dispersion of the two countries is similar.

Network length

TERA also finds that network length per active line is higher in New Zealand than in Denmark and Sweden (Figure 5), which would tend to increase costs. TERA notes that this could be the result of less concentrated population and buildings in New Zealand.

In fact this claim regarding network length per active line needs to be treated with caution, due to the differing methodologies used by the models. The New Zealand model includes network length calculated from geographic information for all ESAs. In contrast, the Swedish model is based upon detailed modelling for a sample of 25 zones which is then extrapolated across the 7860 zones of the whole country.[156] Hence the network length for the Swedish model is an estimate based on the characteristics of those 25 zones, and is calibrated to ensure the sum of the estimated trench lengths across all zones is equivalent to the total trench lengths nationwide.

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154 New Zealand Transport Authority (2015), *State highway frequently asked questions*, see https://www.nzta.govt.nz/roads-and-rail/research-and-data/state-highway-frequently-asked-questions/.

155 A section is the road portion located between two consecutive intersections.

156 Swedish Post and Telecom Authority (2009), *Hybrid model documentation v7.1*, 26 November 2009.

In a previous benchmarking analysis as part of the UCLL IPP, the Commission determined the average loop length in New Zealand:

> Data supplied by Chorus shows that the average copper loop length has decreased from 2,066 metres in 2008 to 1,470 metres in 2012, a reduction of approximately 29%.[157]

That same analysis stated that the average loop length in Sweden was 1700 metres[158] – 15.6% higher than the average New Zealand loop. The average French loop was even longer – around 2100 metres. This would suggest that loop costs in New Zealand should be lower than in both Sweden and France and that there is a clear disconnect between the modelled network lengths and previously reported data.

Common costs

TERA found that common costs allocated to UCLL for New Zealand were significantly higher than in the three sample countries. According to TERA, the aggregate of common costs and operating costs is the appropriate comparator due to differences in cost categorisation. This is pure conjecture – TERA provides no evidence to support its claim, and indeed TERA's explanations regarding the causes for differences in operating costs in the sample focuses solely on factors which are unrelated to common costs.

Common costs in the sample countries are relatively comparable, so essentially TERA is claiming that New Zealand differs from the sample countries in that:

- some operating costs are classified as common costs
- Chorus has lower economies of scope.

157 Commerce Commission (2012), *Revised draft determination on the benchmarking review for the unbundled copper local loop service*, 4 May 2012, paragraph 213.

158 *Ibid*, Table 7 and Figure 3. Data was obtained from a 2011 benchmarking survery distributed by the Commerce Commission to various regulatory authorities. The survey included regulators in France and Sweden. No responses were reported for Denmark or Ireland.

Denmark has a comparable population to that of New Zealand, yet has several alternative infrastructure providers serving the market, not all of which are integrated operators. It does not seem credible that Chorus would have a lower economy of scope or scale than an operator in Denmark.

WACC

We investigated the impact of using Commission’s WACC in cost models of Denmark[159] and Sweden[160]. The current WACC values used in the two models is lower than Commission’s value and hence the use of Commission’s WACC increases the cost significantly (Exhibit 10.4).

For the Danish model the change in WACC from 5.34% (original pre-tax value) to 8.38% (Commission’s pre-tax value) increased the local loop unit cost per month by 36%. The raw copper 2 wire cost per month increased by 7% as the WACC was increased by 0.88 percentage points in the Swedish model.

Country	*Model WACC*	*Model cost per month (LCU)*	*Commission’s WACC*	*New cost per month (LCU)*
Denmark	5.34%	57.70	8.38%	78.24
Sweden	7.50%	95.58	8.38%	102.07

Exhibit 10.4: *Impact on model results due to Commission’s WACC [Source: Network Strategies]*

159 Danish Business Authority (2014), *Fixed LRAIC-Access Cost Model - v4.07*. Available at https://erhvervsstyrelsen.dk/revision-af-lraic-modellen-i-2012-2014.

160 Swedish Post and Telecom Authority (2013), *Hybrid model documentation v10.1*, 16 December 2013. Avaialble at www.pts.se/sv/Bransch/Telefoni/Konkurrensreglering-SMP/SMP---Prisreglering/Kalkylarbete-fasta-natet/Gallande-prisreglering/.

10.5 Conclusions

TERA's benchmarking study has serious methodological problems which cast doubt on its conclusions. There is little if any value to be obtained by its comparison with France – as the data is outdated – or Ireland – due to the large number of unsubstantiated adjustments made by TERA to the data. Sweden is the most relevant comparator for New Zealand, with Denmark also providing some insight.

One of the key factors resulting in the differing outcomes is the higher WACC used for New Zealand, however this is not sufficient to explain all the variation. Careful examination of the models suggests that in Denmark and Sweden the modelled operator is using more economically efficient techniques, such as direct burying of cables. We can only conclude that the New Zealand modelled operator is not making efficient deployment decisions.

Furthermore, common costs are relatively high in New Zealand, with little evidence to support this outcome.

We therefore conclude that TERA's benchmarking analysis is not able to justify the relatively high costs produced by the model, in relation to those of Sweden and Denmark.

The Commission has claimed that other regulators' price determinations do not provide any evidence that the FPP model is producing unreasonable cost estimates. We are puzzled by this claim. TERA's benchmarking analysis is demonstrably deficient – a fact that the Commission appears to recognise[161] – yet regardless the Commission makes its conclusion based on this obviously flawed research. We and our colleagues at WIK have identified numerous instances where TERA's HEO is opting for inefficient choices – in comparison with international practices – which suggests that in the Commission's view a New Zealand operator must be excused from employing efficient methods (even if such methods are used by Chorus), with no explanation of why this may be justified.

161 See for example paragraph 1830, Commerce Commission (2015), Further draft pricing review determination for Chorus' unbundled copper local loop services, 2 July 2015.

11 Backdating

In a majority decision, the Commission's draft decision is to commence the regulatory period after publication of the final determination. The Commission considers that section 18 is central to the decision to backdate and as such has reviewed evidence as to whether backdating is 'demonstrably efficient' and will 'demonstrably promote competition in a way that is likely to directly benefit end-users'[162].

Commissioners Gale and Welson find that backdating would not promote competition for the long-term benefits of end-users, and may even have a detrimental impact. However Commissioner Duignan finds that backdating with a lump sum settlement would best promote the section 18 purpose.

The key economic points that persuaded Commissioners Gale and Welson to reject backdating include:

- it is futile to attempt to resolve past distortions in relation to investment and consumption caused by incorrect wholesale prices as this will simply introduce a different distortion
- backdating is unlikely to have any material impact on future investment
- there is no evidence that Chorus will not be able to cover actual costs in the absence of backdating
- in practice it may not be reasonable to expect RSPs to anticipate the FPP price.

162 Commerce Commission (2015), *Further draft pricing review determination for Chorus' unbundled copper local loop services*, 2 July 2015, paragraph 854.

On the other hand, Commissioner Duignan favours backdating as in his view it gives effect to an earlier application of and responses to the most efficient price. Reassuring infrastructure investors and regulatory consistency are key considerations for Commission Duignan, and as such he supports a consistent policy of backdating. He is in favour of implementing backdating via lump sum payments, suggesting that the 'financial strength' of RSPs 'will limit the impact of exposure to future lump sum backdating on their ability and incentives to finance investment'[163].

11.1 Is backdating demonstrably efficient?

While a forward-looking cost estimate should promote efficient forward-looking decisions, clearly it is not possible to influence decisions retrospectively, nor is it reasonable to expect that a TSLRIC price estimated today would be the same as the price estimated in an earlier time-period. The implicit assumption of backdating an FPP price is that today's estimated TSLRIC price is in some sense superior to the IPP price. However, today's FPP estimate would be no more than a proxy for the earlier period's true TSLRIC price, and therefore no more accurate than the IPP price. For example, had a TSLRIC cost model been developed at the time of the IPP determination then it is entirely feasible that different modelling assumptions and inputs may have been selected as appropriate for forward-looking estimates at that time.

One might conjecture that today's FPP estimate may still be more accurate for a previous time-period than the IPP, and therefore, assuming that RSPs successfully anticipated retrospective wholesale pricing, a backdated FPP would encourage efficient adjustments to retail prices earlier than the date of the FPP. Even if this is the case then the implication is that RSPs would need to anticipate FPP prices, either through their own cost modelling or through strong signals from the regulator.

In our experience access seekers are at a considerable disadvantage in regulatory access cost modelling exercises due to information asymmetries while the access provider obviously has the benefit of access to its own network and cost data. In fact it is far more

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163 *Ibid*, paragraph 902.

straightforward for access seekers to forecast access prices using benchmarking with publicly available data than to foretell the outcome of a scorched node fixed network model. Thus the IPP price represents the best available information for RSPs to use in their pricing and business planning until updated definitive information becomes available. As such we agree with DotEcon's reflection that '… the view that better decisions would be made on the basis of expected FPP prices being backdated than on the basis of IPP appears to be inconsistent with the rationale for having an IPP phase in the first place'[164].

It is conceivable that the threat of backdating may be efficiency-enhancing in circumstances where interested parties would otherwise deliberately procrastinate or delay price setting processes in order to benefit from interim inefficient prices. However there is no evidence that any gaming of the system has occurred in the current proceeding, which has been managed throughout by the Commission. The timeline and all milestones have been set by the Commission.

11.2 Would backdating promote competition to benefit end-users?

The theoretical basis for the use of TSLRIC for pricing access to monopoly assets is that it will deliver efficient prices that will incentivise investment and innovation while ensuring that end-users obtain benefits from any efficiency gains over time. In short, a TSLRIC price should promote competition for the long-term benefit of end-users. So does backdating the UCLL / UBA FPP price promote competition to the benefit of end-users to a greater extent than otherwise?

Given that the legislation specifies a forward-looking costing standard as the FPP and in the absence on any formal backdating regime, it would be reasonable for market players and investors to assume that there will be no backdating. As DotEcon illustrates[165], it is only the **expectation** of backdating that could potentially influence firms' decision-making and even then a number of important conditions must hold to achieve demonstrable efficiency gains or pro-competitive effects. There is no general backdating regime that

164 DotEcon (2015), *Backdating of FPP prices in New Zealand*, August 2015. See section 4.

165 *Ibid*, Section 2.1.

applies to the UCLL / UBA price review and, as noted in the revised draft determination, this is a discretionary matter that will not bind future Commissioners. As such any decision to introduce backdating made in this proceeding cannot be regarded as providing certainty that the same will happen again in future.

An environment in which there is considerable uncertainty as to whether there will be backdating and the extent (time-period and the quantum) of any backdating, would likely affect RSPs' investment plans while Chorus' investment plans would remain largely unaffected. As we have described previously[166] Chorus' future copper investment is limited by its contractual obligations, while its fibre investment is already committed. On the other hand, typically RSPs in a competitive market have a much shorter investment time-horizon as they seek differentiating solutions to improve or maintain market share.

In its analysis of the likely economic impact of backdating the Commission distinguishes between two different implementation options: lump sum payment and claw back through increasing monthly prices of UCLL and UBA services. If backdating was implemented, whether it be via a lump sum or claw-back, any payment by RSPs would be recovered from an increase in retail charges for copper-based services.

If claw-back is implemented, the most likely outcome would be to increase the retail price by the claw-back amount, with 100% pass-through. If a lump sum payment is introduced, an RSP would then estimate the increase in the retail price using a similar financial model as in the Commission's claw-back modelling approach for an assumed recovery period and number of active lines affected.

What will be the effect of increasing the retail price for copper broadband? In fact, the outcome will be comparable to that identified in the Commission's exploration of an uplift in TSLRIC prices. The impact of an increased retail price will be:

- a very large loss in consumer welfare, unlikely to be offset by a gain in welfare due to potential faster fibre migration
- consumers will seek other alternatives, including mobile, fibre and cable

166 Network Strategies (2015), *Examining welfare effects of UCLL and UBA uplift*, May 2015. See Section 2.1.

- a reduction in the active copper lines used for recovery of the backdated amount
- as the number of active copper lines decreases, the RSP will seek to recover an increasing amount from its remaining copper customers, and thus retail prices would continue to increase.

11.3 Conclusions

We conclude that backdating will not deliver any benefit to end-users. They will face higher retail prices, which in our earlier investigation of TSLRIC uplift we have already seen will result in a very large loss in consumer welfare.

We find that backdating is unlikely to have any material impact on future investment by Chorus, although obviously it will benefit financially from the implied wealth transfer, should the final FPP price exceed the IPP price. In contrast, from our analysis it appears certain that such a wealth transfer will impose a considerable unanticipated financial burden on RSPs, and that it will have an impact on RSP investment.

12 Conclusions and recommendations

In our review of the Commission's December draft determination we identified a number of key assumptions and modelling choices that together indicated that the Commission's TSLRIC estimate was likely to approach an upper bound rather than a mid-point estimate of the true TSLRIC cost[167]. Major issues included the uneconomic extent of the fibre footprint in the model, the limiting of the FWA footprint to RBI areas and the Commission's approach to modelling FWA which reflected inefficient deployment of the technology. In the revised draft determination the Commission seeks to address the issues we identified relating to FWA with a completely new approach. Unfortunately the new approach continues to overestimate costs and thus fails to achieve an efficient outcome. As such the TSLRIC estimate is likely to be beyond an upper bound.

There is no demonstrable evidence that an uplift (either implicit or explicit) to a mid-point estimate is required in order to better promote competition for the long-term benefit of end-users. As such we recommend that the Commission implements changes to its FWA methodology, as well as to other key assumptions, in order to ensure that the TSLRIC result truly reflects a mid-point estimate.

Use FWA as the MEA where costs are high and unbundling is unlikely

The Commission states in the revised draft determination that FWA should be used for lines where costs are particularly high and unbundling is unlikely. This is consistent with our own analysis and recommendation: namely, that the Commission should consider FWA for users in Zones 3 and 4 areas where there is no current

167 Network Strategies (2015), *Commerce Commission Draft Determination for UCLL and UBA, A review of key issues*, 20 February 2015. See Section 10.

unbundling and future unbundling is unlikely. However the Commission has not implemented this, preferring instead a new copper performance-based criterion to define circumstances in which FWA is to be implemented in the model.

Use geotype approach for FWA modelling

The Commission should apply Network Strategies' FWA modelling approach which is based on actual terrain and propagation conditions in New Zealand. Our model calculates results for sample areas in four different geotypes that can be applied to other areas.

Correct errors if the Commission's current approach to FWA is to be retained

Although we do not recommend it, should the Commission retain its proposed FWA modelling approach, there are a number of errors that should be corrected:

- amend capacity and coverage implementation which restricts FWA analysis to ESA boundaries
- allow for the greater coverage achieved by LTE in 700MHz
- replace inappropriate fibre backhaul assumption
- sanity check the estimated number of low capacity lines with actual (pre-RBI) data
- resolve errors revealed by our GIS analysis
- remove inconsistencies between model and model documentation.

Allow for multiple connections

Our analysis indicates that vacant lots will not offset multiple connections at single address points – in fact, multiple connections are likely to exceed vacant lots.

Include impact of population growth or availability of fibre services over regulatory period

In response to the Commission's criticism that we did not provide sufficient evidence regarding the inappropriate constant demand assumption, we have identified that there is a strong risk of the Commission under-estimating future demand which will be stimulated by the potential disruptive influences of cloud computing, content streaming services and the Internet of Things.

Rectify TSO boundary issues

We have demonstrated using GIS that a considerable number of FWA-served buildings are actually outside the boundaries of the TSO areas. This was also a problem in the first draft determination, but it has yet to be rectified.

Review and correct aerial assumptions

We have identified errors in aerial assumptions as well as inconsistencies with a forward-looking approach. Accordingly the Commission should:

- correct the error in the percentage of aerial lead-ins
- correct the value assumed for the percentage of aerial deployment
- adopt a forward-looking approach which considers the changing requirements for consents and consequently reduction in costs
- consider data for pole lease costs and upgrades from all LFCs and for all regions to obtain better estimates
- review calculations for estimating pole lease costs.

Adopt a consistent approach to allowances for the impact of subsidies

The Commission should be careful to ensure that the model's results have not been indirectly affected by real world subsidies without any compensating allowance. For example, it would be inconsistent for the Commission to include lines upgraded via an RBI subsidy in its count of full-speed lines, without allowing for the subsidy in the model.

Adjust WACC parameters

Following an examination of the Commission's updated WACC calculations we note that accuracy could be improved by:

- correctly implementing the stated methodology for estimating the asset beta
- re-estimating notional leverage to ensure consistency with the stated approach for estimating the asset beta
- adjusting interest rate swap estimate to reflect evidence that in only 50% of instances would two swaps be required in the New Zealand telecommunications sector.

Modify price trends	Although in the revised draft determination the Commission summarises updated price trends, as advised by NZIER, TERA has not applied all of the revisions in its modelling. In addition, NZIER's recommendations for the price trends of fibre optic cable and trenching should be reduced.

With respect to backdating, our analysis could not find any demonstrable evidence that this would deliver any benefit to end-users, nor would it have any material impact on future investment by Chorus. However, should the final FPP price exceed the IPP price, the implied wealth transfer is likely to impose a considerable unanticipated financial burden on RSPs, and potentially have an impact on both RSP prices and investment to the detriment of consumer welfare.

As regards the international benchmarking that has been presented to address the disparity between estimated UCLL costs in New Zealand and estimated costs in European jurisdictions, our review has identified serious problems with TERA's benchmarking methodology which casts doubt on its conclusions. However TERA's demonstration that for remote areas of New Zealand modelled costs are 'an order of magnitude higher than median costs'[168] is evidence of the importance of ensuring that these locations are modelled appropriately using the most cost-efficient modern replacement technology. As yet the Commission has not achieved this, and consequently the TSLRIC estimate in the revised draft determination exceeds that of an upper bound.

168 TERA Consultants (2014), *International comparison of TSLRIC UCLL and UBA costs and prices*, June 2015. Appendix 5.