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Report for Chorus

UCLL and UBA FPP draft determination cross-submission – PUBLIC

22 September 2015

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Contents

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1 Introduction

On 3 July 2015, the Commerce Commission published the second draft determination for its final pricing principles (FPP) for the unbundled bitstream access (UBA) service and the unbundled copper local loop (UCLL) service.[1]

Analysys Mason has been commissioned by Chorus to review and comment on the draft model and documentation underlying this draft determination. This report provides a summary of our response to key issues raised by other parties on the determination and is set out as follows:

- Section 1.1 summarises the documents that we have reviewed as part of our investigations
- Section 2 covers more general points
- Section 3 addresses points on the access network model and the build parameters
- Section 4 covers UBA issues
- Section 5 is related to opex and non-network costs
- Section 6 covers FWA
- Section 7 covers non-recurring charges (NRC).

Data that is confidential (i.e. can only be read by those who have signed the confidentiality undertakings) has been redacted from the public version and is indicated by the scissor symbol '✂'. The nature of the confidential information is indicated by the source abbreviation and CI or RI status, e.g. **[CNZCI: ✂✂]**.

The authors of this report have read the Code of Conduct for expert witnesses and have complied with its requirements when completing this report.

1.1 Reference documents

Figure 1.1 below summarises the list of the documents that we will refer to in this report. All of these documents are available on the Commerce Commission's website. We provide a short name for each document, which we will use to refer to it throughout the report for simplicity. Where we need to refer to an earlier version of a report, such as those issued in December 2014, we will prefix their name with "December 2014".

Figure 1.1: Documents referred to in this report [Source: Analysys Mason, 2015]

Title	Short name	URL
Report for Chorus: UCLL and UBA FPP draft determination submission – PUBLIC[2]	Analysys Mason submission February 2015	http://www.comcom.govt.nz/dmsdocument/12915

1 http://www.comcom.govt.nz/regulated-industries/telecommunications/regulated-services/standard-terms-determinations/unbundled-copper-local-loop-and-unbundled-bitstream-access-services-final-pricing-principle/

Title	Short name	URL
Chorus submission on draft determinations for UBA and UCLL services 20 February 2015	Chorus Submission February 2015	http://www.comcom.govt.nz/dmsdocument/12915
Report for Chorus: UCLL and UBA FPP draft determination cross-submission – PUBLIC[3]	Analysys Mason cross-submission March 2015	http://www.comcom.govt.nz/dmsdocument/13122
Chorus cross submission on draft determinations for UBA and UCLL services 20 March 2015	Chorus Cross-submission March 2015	http://www.comcom.govt.nz/dmsdocument/13122
Model Specification (public version)	Model specification	https://login.filecloud.co.nz/shares/folder/32248963d1ab3a/?folder_id=61
Model Reference Paper (public version)	Reference paper	As above
Model Documentation (public version)	Model documentation	As above
Implemented modelling changes (public version)	TERA model changes document	As above
Analysis of industry comments following draft determination	TERA review of submissions	As above
Draft FPP briefing presentation	Commission briefing	http://www.comcom.govt.nz/dmsdocument/13397
Draft pricing review determination for Chorus' unbundled copper local loop service	UCLL draft determination	http://www.comcom.govt.nz/dmsdocument/13373
Draft pricing review determination for Chorus' unbundled bitsream access service	UBA draft determination	http://www.comcom.govt.nz/dmsdocument/13392
Beca FPP Corridor Cost Analysis Response to Submissions	BECA review of submissions	http://www.comcom.govt.nz/dmsdocument/13375
Beca FPP Corridor Cost Analysis, report 3	Beca report 3	http://www.comcom.govt.nz/dmsdocument/13394

Figure 1.2 below summarises the list of modelling-related materials referred to in this report. We provided a short name for each of the Excel files as well, which we will use to refer to these files as well. We will be referring to the Excel files with the short names provided in the list below. Analysys Mason also has access to the confidential versions of these Excel files, but we refer to the public versions unless we state otherwise.

2 Document named "Analysys Mason submission on behalf of Chorus for UBA and UCLL services draft determinations 20 February 2015" Ref: 2002396-81

3 Document named "Analysys Mason on behalf of Chorus on draft determinations for UBA and UCLL services 20 March 2015" Ref: 2002396-123

Figure 1.2: List of modelling materials referred to in this report [Source: Analysys Mason, 2015]

Title	Short name	URL
PUBLIC-ComCom - Access network - v8.0.accdb	(Public) Access database	https://login.filecloud.co.nz/shares/folder/32248963d1ab3a/?folder_id=56
PUBLIC-ComCom - Access network cost model - v8.0.xlsb	(Public) Access model	As above
PUBLIC-ComCom - Inputs for trenches - v8.0.xlsx	(Public) Trench inputs file	As above
PUBLIC_Commission - UBA model v8.0.xlsb	(Public) UBA model	As above
PUBLIC-ComCom-Price trends v8.0.xlsx	(Public) Price trends calculation	As above
Public_TSO_Cluster_Polygons.zip	(Public) TSO polygons	https://login.filecloud.co.nz/shares/folder/32248963d1ab3a/
CI_ComCom-Inputs v8.0	Confidential inputs file	–
CI-ComCom-OPEX model v8.0.xlsm	(Confidential) opex model	–
CI_ComCom - UBA model v8.0	Confidential UBA Model	–
CI_ComCom-UBA Inputs v8.0	Confidential UBA Model Inputs	–
CI_ComCom - UBA model v5.1	Confidential UBA Model December 2014	–
CI_ComCom-UBA Inputs v1.0	Confidential UBA Model Inputs December 2014	–
Beca-report-FPP-corridor-cost-analysis-of-trenching-and-ducting-rates-in-NZ-28-May-2015.XLSX	(Public) Beca trench cost analysis	http://www.comcom.govt.nz/dmsdocument/13372

All of the Excel files referred to in this report are used in the calculation of the costs of UBA and UCLL services.

Figure 1.3 lists the stakeholder submissions from August 2015 to which we refer to throughout this report. Where we refer to earlier submissions, such as those issued in February 2015 (respectively March 2015), we will suffix their name with "(February 2015)" (respectively "(March 2015)").

Figure 1.3: Stakeholder submissions referred to in this report [Source: Analysys Mason, 2015]

Title	Short name	URL
Analysys Mason on behalf of Chorus on further draft determination for UBA and UCLL services – 11 August 2015	Analysys Mason	http://www.comcom.govt.nz/dmsdocument/13542
Submission on the Commerce Commission's Further Draft Pricing Review determinations for UBA and UCLL services	Callplus	http://www.comcom.govt.nz/dmsdocument/13551
Chorus submission on further draft determination for UBA and UCLL services – 13 August 2015	Chorus	http://www.comcom.govt.nz/dmsdocument/13544
Downer New Zealand submission on further draft determination for UBA and UCLL services	Downer	http://www.comcom.govt.nz/d

Title	Short name	URL
– 12 August 2015		msdocument/13550
Network Strategies submission on behalf of Spark and Vodafone on further draft determination for UBA and UCLL services – 13 August 2015	Network Strategies	http://www.comcom.govt.nz/dmsdocument/13553
Spark submission on further draft determination for UBA and UCLL services – 13 August 2015	Spark	http://www.comcom.govt.nz/dmsdocument/13545
Trustpower submission on further draft determination for UBA and UCLL services – 13 August 2015	Trustpower	http://www.comcom.govt.nz/dmsdocument/13567
Vodafone NZ submission on further draft determination for UBA and UCLL services – 13 August 2015	Vodafone NZ	http://www.comcom.govt.nz/dmsdocument/13543
Wigley and Company submission on further draft determination for UBA and UCLL services – 13 August 2015	Wigley main submission	http://www.comcom.govt.nz/dmsdocument/13557
WIK submission on behalf of Spark and Vodafone on further draft determination for UBA and UCLL services – 12 August 2015	WIK	http://www.comcom.govt.nz/dmsdocument/13554

2 General

2.1 Overview of TSLRIC principles

The Commission's approach includes the replacement costs of all the assets required to provide the total service over the long run, depreciates these over the economic lifetime, and includes a reasonable allocation of common costs. This is a conventional TSLRIC approach.

The Commission's approach is to model the entire access network as the modelled increment and to allocate certain elements of the costs to non-UCLL services. Whilst there are several ways in which the cost allocation can be achieved, this is a conventional approach.

A scorched node approach is used, retaining existing points of interconnection (specifically MDF sites, cabinets (where implied by the architecture), and FDS locations). This is a conventional approach, although in some models cabinet locations are not retained.

The Commission assumes a demand level for calculating unit costs, which includes the existing Chorus demand as well as the active demand served by non-Chorus LFC and HFC networks (and, we argue, inappropriately so). To set the active demand at that level is not the conventional approach to TSLRIC price modelling. The conventional assumption is that the modelled operator replaces the current operator and serves its current demand (rather than, as the Commission assumes, the entire market).

2.1.1 Replacement cost is the relevant cost standard

Wigley ((submission of further draft determination) at 10.7) favour and Spark paragraph 39b appear to support the use of historic cost measures (as opposed to "current cost" or "replacement cost" measures).

As we have previously submitted on several occasions, historic cost measures are not relevant in TSLRIC.[4]

2.1.2 Short run suggestions

In paragraph 56 of their submissions Spark say:

> we cannot interpret "long-run" to mean the economic concept of "the length of time in which all factors of production are variable" – we have to give it a more contextual meaning

[4] For example, see http://www.comcom.govt.nz/dmsdocument/11493, Section 1.1

We disagree. "The length of time in which all factors of production are variable" is exactly the interpretation required and is the one conventionally used by regulators in LRIC costing.

Spark (paragraph 51) specifically want to exclude the costs of "sunk and reusable assets" from consideration. This is not a long run approach because in a long run approach there is no such thing as a sunk asset.

In addition, Spark's arguing that specific assets will not be replaced appears to be based on the migration to UFB that is currently under way in much of New Zealand. This is not the case, because even in areas where Chorus is providing UFB it still has obligations to provide UCLL and TSO, and is therefore obliged to replace assets when needed.

Indeed if the occurrence of such a migration were to allow all assets considered "sunk" to be instantly devalued, then there would be strong negative incentives for investment in infrastructure regulated using forward-looking TSLRIC. This is explicitly not just a fixed networks point as similar arguments could be made in relation to the provision of, for example, MTAS on 2G base stations.

2.1.3 The nature of the incremental costs

In paragraph 57 of their submissions Spark say:

> 57. Indeed, the surrounding words of the TSLRIC definition suggest that the "long-run" must relate to
>
> a. Forward looking incremental costs - costs that will not be incurred in the future must not be considered (as these costs will not be forward-looking); and
>
> b. The requirement that costs that are actually variable (sic) in the present must not be considered (as these costs will not be directly attributable to, or reasonably identifiable as incremental to, the service, taking into account the service provider's provision of other telecommunications services).

In relation to 57a, we agree that forward looking costs are costs that occur in the future. If Spark mean to imply that the HEO benefits from "sunk" assets that will not incur future costs including replacement costs then we do not agree (see above).

For the purpose of responding, we assume Spark means "fixed" rather than "variable" in 57b, as (as written) it is contradictory. However, we note that even if so modified, 57b is incorrect in fundamental ways:

- It is not whether costs are fixed or variable in the present but whether they are common or incremental in the long run that is important.
- An allocation of common costs must be included given the applicable definition of TSLRIC

- The common costs are likely to be viewed as fixed costs in the present. The conclusion of 57b is therefore incorrect.

2.1.4 Scorched node

WIK at paragraph 176 claims retaining MDF locations and cabinet locations is not an orthodox or traditional approach

> 176 "This means that from a conceptual point of view the Commission did not apply the orthodox or traditional TSLRIC approach,"

On the contrary, retaining the MDF locations and in some cases the cabinet locations is the conventional ("scorched node") approach.

2.2 Internal consistency / balance of assumptions

We have identified instances where the stakeholders submissions are favouring assumptions that are not fully internally consistent.

We summarise a few examples that arise in this cross-submission below.

Figure 2.1: Examples of where balanced assumptions are important [Source: Analysys Mason, 2015]

Assumption in the model	Analysys Mason comment	How consistent is the July 2015 model
The cheapest trenching method is always used in the trench inputs file for a given soil type	Using the cheapest trenching method is not consistent with a high level of underground route sharing, such as the levels quoted by WIK (most cheap trenching methods do not allow realistic trench sharing (e.g. chain digging and directional drilling).	Any sharing should be restricted to being part of those routes where open trenching is assumed. The conservative level of 5% trench sharing currently assumed is consistent in this context. See Section 3.8
Trench sharing is assumed to lead to a 50% cost reduction	WIK supports 50%, but the Beca model can be used directly to demonstrate a lower percentage cost reduction.	Not consistent See Section 3.8
No spare capacity is assumed in the cabling in the modelled fibre network	The additional demand from granny flats and home offices raised by Network Strategies cannot be necessarily served by the modelled network. Also, if the Commission were to assume any increase in customers using the access network (such as suggested by Section F.3 of the Vodafone submission), or to allow for any relocation of customers (giving a constant total demand but with local fluctuations), then spare	Not consistent See Section 2.3

Assumption in the model	Analysys Mason comment	How consistent is the July 2015 model
	capacity must be introduced into the dimensioning of the network	
Modelling of FWA spectrum cost	Assumed to be a fraction of the full spectrum fee, a position supported by Vodafone's submission, even though the FWA-served road sections are currently scattered nationwide	Not consistent See Section 6.7

We strongly recommend that the Commission ensure internally consistent assumptions are made.

2.3 Demand

Passing (and provisioning enough capacity for) all potential demand locations is a reasonable assumption consistent with other similar models

In paragraph 119 of their report, Spark say:

> We note the Commission's advice from its consultants that the difference between the number of address points used for the network footprint and the modelled demand is within a broad envelope consistent with real world expectations. We note that this advice reflects TERA's opinion based on their experience. As WIK point out in paragraph 330 [sic, should be 354] of their report, their experience is such that they are not able to confirm TERA's opinion that TSLRIC modelling in other jurisdictions usually assumes a modelled demand which may be up to 10%-20% below the modelled footprint demand.

This issue is discussed by TERA in Section 4.1.1 of the model specification. We note that we can provide several examples of models of access networks developed where not only every address point is passed, but also where actual modelled demand is in the region of 80–90% of footprint demand. These are summarised in Figure 2.2 below.

Figure 2.2: Consideration of the footprint modelled in other countries [Source: Analysys Mason, 2015]

Model	Footprint assumed	Active demand / passed demand
Denmark	All premises are passed[5]	80%[6] as of 2014
Belgium	All households are passed by the copper network[7]	83% as of 2010[7]

[5] See https://erhvervsstyrelsen.dk/sites/default/files/media/endelig-modeldokumentation.pdf, page 16

[6] See https://erhvervsstyrelsen.dk/sites/default/files/media/offentlige_modeller_0.zip, cells '[2012-55-DB-DBA-Fixed LRAIC-Access Cost Model - v4.07 DBA - Public.xlsb]Parameters'!I137:I139

Model	Footprint assumed	Active demand / passed demand
(draft model)		
Luxembourg	All customer premises are passed[8]	Not available
US	Network is sized to serve all potential customers[9]	90% as of 2012[9]
Norway	All buildings requiring connectivity (i.e. a residence or business site, but not a holiday home, barn, garage, etc.) are passed[10]	77% as of 2011[11]
Australia	All building locations from the G–NAF database are passed, after poorly geocoded data and duplicates have been removed	91%[12] as of 2007

Therefore we believe that the Commission's current approach is justifiable and consistent with approaches undertaken in models with similar building-level calculations elsewhere.

We stated in Section 3.6 of our August 2015 submission that including HFC demand was not consistent with modelling practice elsewhere. This was because in those countries where HFC demand is included (Denmark and Norway), but in both cases the fixed incumbent owns the relevant HFC network; this is not the case in New Zealand.

If HFC demand was to be excluded from the Commission's model, then modelled demand would still be more than 88% of network footprint demand, which is well within the range of overseas models shown above.

The total level of demand modelled will never be achieved

Vodafone's statement (section F3.2) notes that

> By ignoring expected demographic changes, the Commission's constant demand assumption implies that all growth in telephony connections will be mobile-only, or fixed connections on networks other than the HEO's.

We agree. There are and will be fixed connections on networks other than the HEO. The HEO cannot instantly obtain the current demand of all of Chorus, HFC and the non-Chorus LFCs; nor can it prevent customers using those networks in the future. As a result, the HEO cannot achieve

7 See http://www.bipt.be/en/operators/telecommunication/Markets/price-and-cost-monitoring/ngn-nga-cost-model/access-network-module, checked using Assets!BE124/Assets!BE123 and Assets!BE735/Assets!BE123

8 See http://www.ilr.public.lu/communications_electroniques/encadrement_tarifaire/modele_couts_fixe/2_ILR_ModelMethodology_20140410.pdf See section 4.1.1, pages 18 and 20

9 See https://transition.fcc.gov/wcb/tapd/universal_service/caf/CAF2-Part1.pdf, slide 32

10 See http://www.nkom.no/marked/markedsregulering-smp/kostnadsmodeller/lric-fastnett-aksess/_attachment/1805?_download=true&_ts=139100f7b30, Section 5.2.2

11 See http://www.nkom.no/marked/markedsregulering-smp/kostnadsmodeller/lric-fastnett-aksess/_attachment/3963?_download=true&_ts=13a885c7d51. Total passed lines is SUM(A2NwDsScen!H12:W13). Total active lines is SUM(B3ServiceDemand!BP9:BP38).

12 See http://www.accc.gov.au/system/files/Model%20documentation.pdf, page A-12

the demand levels modelled either on day 0 or subsequently. This means that the Commissions approach does not provide expected NPV neutrality.

Network Strategies arguments in favour of growing demand for fixed lines

In relation to the Network Strategies evidence cited by Vodafone, we agree that cloud computing is becoming more widely used, that Internet Of Things use of connected devices is growing, and that the popularity of streaming video services (and therefore the average throughput needed by end users) is increasing greatly. These three trends are however hardly compelling evidence that total demand for fixed lines will increase, as all these effects exist today.

Streaming video will cause increased bandwidth demand per line. If Network Strategies believe that fixed connections will grow because mobile will be less and less able to meet future demand for higher throughput and that therefore existing mobile-only households will migrate to fixed connections, then the same arguments mean FWA is equally unsuitable as an MEA technology. See for example Analysys Mason Paper in support of UCLL cross-submissions 26 February 2014, Section 1.5.

2.4 Comparator models

In Section R2.1 of their submission, Vodafone state that:

> TERA's selection of comparators is not appropriate. TERA includes regulatory modelling information from Denmark (2015), France (2005), Ireland (2010) and Sweden (2009) in its benchmarking exercise. We note TERA has not made use of the more recent Swedish model that is publically available. Further, the French data is too old to be comparable, and we understand TERA has not had access to the Irish model and so has made assumptions on the relevant data.

We note that:

- The more recent version of the Swedish model calculates costs for a fibre access network rather than the copper network that is the basis for TERA's benchmark, so is therefore not appropriate in this case
- We believe that TERA are familiar with both the French and Irish models and therefore are in a position to make appropriate adjusting assumptions.

2.5 Use of the Swedish model

In Section 9.2 of the WIK submission, WIK describe how they have used the model to derive an "adjusted Swedish benchmark" of NZD23.09 per month (adjusted for differences with New Zealand) which is to be compared with the value of NZD38.13 per month derived by TERA in Table 5 of their report "International comparison of TSLRIC UCLL and UBA costs and prices".

WIK's approach is flawed. In paragraph 416 they state that, when using the Swedish model, that "*The total network capex sum up to a total of 40.5 billion SEK for wholesale products including UCLL lines. This sum has been derived from six asset cost classes, where expensed equipment and installation costs (OPEX) have been removed*." We believe that it includes equipment capex, installation capex and scrap value, but only for assets marked "A" ('annualised').

Their approach is an error, as this excludes the capital expenditure for lead-in trench and cable assets. The NZD38.13 per month derived by TERA clearly includes lead-ins, as stated in Section 1.2 of TERA's aforementioned report.[13]

In order to be comparable, these excluded assets must be included, which increases the total network capex to SEK68.4 billion, rather than SEK40.5 billion.

If these assets are included this leads to a like-for-like final adjusted Swedish benchmark of almost NZD35 per month, rather than the NZD23 per month calculated by WIK.

Figure 2.3: Comparison of WIK's calculation [Source: Analysys Mason, 2015]

Parameter	WIK results table	Swedish model (excluding lead in trench and cable assets)	Swedish model (including lead in trench and cable assets)
Network capex (SEK)	40,500,000,000	40,500,000,000	68,400,000,000
SEK to NZD		5.59	5.59
Network capex (NZD)		7,239,978,332	12,227,518,960
Proportion of network capex allocated to UCLL		62%	62%
UCLL capex (NZD)	4,500,000,000	4,500,000,000	7,581,061,755
Active UCLL lines	2,900,000	2,900,000	2,900,000
UCLL capex per line (NZD)	1,551	1,552	2,614
2009 to 2015 adjustment	1.14	1.14	1.14
UCLL capex per line in 2015 (NZD)	1,774	1,775	2,991
Multiplicative factor to account for higher cost in NZ	1.81	1.81	1.81
Investment per line after adjustment for higher cost (NZD)	3,211	3,214	5,414
Depreciation factor after adjusting for different weights for asset types	6.16%	6.16%	6.16%
Annualised capex	193.12	197.96	333.50
Monthly capex	16.09	16.50	27.79
Opex, common and other costs according to Swedish benchmark (estimate, obtained from	7.00	7.00	7.00

[13] They state "Same scope of costs (from exchanges to premises, excluding external termination point, but including final drop);"

Parameter	WIK results table	Swedish model (excluding lead in trench and cable assets)	Swedish model (including lead in trench and cable assets)
the TERA study)			
Final adjusted Swedish benchmark	**23.09**	**23.50**	**34.79**

As an additional note, we would emphasise that the Swedish model does not use extensive geo-analysis like other models (in particular, it does no building-level analysis), so it would not be appropriate to place too much emphasis on it when compared to models with superior geo-analysis.

It would also be appropriate to note here that on page 103 of their submission that Network Strategies state:

> "As we have already noted the current UCLL price in Sweden is based on a FTTH / FWA MEA."

In fact the current UCLL price in Sweden is based on *the FTTH component from a modelled* FTTH / FWA MEA. Unlike the Commission's model, the costs of FWA are recovered by a separate voice wireless access service.

2.6 Aggregation approach

We note the comments of WIK regarding the aggregation approach at their submission paragraph 384.

We repeat our comment from section 2.11 of our March 2015 cross-submission: the aggregation approach does not affect the price of UCLL which is set by the total cost of the FTTH network and total demand.

We note that by observation, the negative unit cost of SLU occurs in areas where the TSO constraint has removed a very large fraction of lines and where there are a significant fraction of active cabinets. We have plotted out the network built by the model in a number of these areas to understand what is occurring. In summary, if the TSO constraint eliminates all lines on a cabinet, then the fibre network never even goes to that village, whereas the SLUBH network does (and this SLUBH modelling is correct as UBA uses those cabinets and needs a network to carry the UBA traffic). The combination of these effects means that the FTTH total network annualised cost is low (even including the full distribution network, as there are very few lines served because the TSO constraint has removed a very large fraction of the lines) and the SLUBH total network annualised cost can be higher (because it visits all the active cabinets). And hence the Commission's aggregation approach leads to this negative result for SLU in those areas.

The result is a therefore a consequence of the Commission's approach to TSO and to aggregation. If the Commission wants to avoid this effect to the maximum extent possible (without changing the principles it has laid out allowing it to set a single UBA price) then the best approach would be to improve its modelling of which buildings are in the TSO, a matter on which Chorus has already submitted (see paragraph 390 of the Chorus February 2015 submission).

The TSO polygons are in some cases defined in ways which combine poorly with the road section approach taken by TERA. For example, the TSO polygons for AHP include thin slivers, one of which is illustrated below. As a result of this long thin shape, very few of the road sections (in this case, none) overlap the polygon for 50% of their length and they are therefore not designated as being within the TSO. In the case illustrated, the intention of the polygon was to capture the fact that there were buildings served in this village in 2001; but (in combination with the road section approach) this has been lost. While the total number of buildings omitted within polygons ("unders") and included outside polygons ("overs") roughly cancel out using the TERA approach, (which means that Network Strategies concerns in relation to FWA are not well founded, see Section 6.3), the implications for the wireline network design can be material if entire branches of the network are omitted as a result.

One option that retained the Commission's TSO polygons would be to modify the approach to include any building that was within the TSO polygon (the model can already deal with buildings individually: see the way in which post-2001 buildings are excluded). Another would be to use the 2001 building data provided by Chorus in its previous submissions.

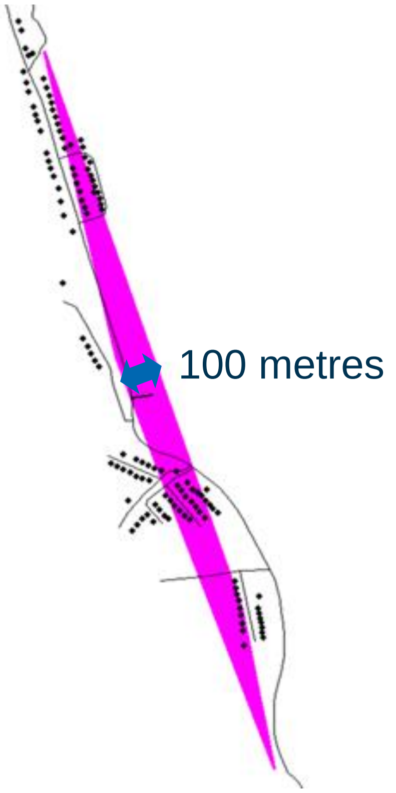

Figure 2.4: Illustration of a single AHP TSO polygon [Source: Analysys Mason, 2015]

3 Access network model and build parameters

3.1 Minimising trench

In paragraph 296 of their submission, WIK state that:

> A shortest trench automatically includes shorter cables also and allows to aggregate the cables to a higher degree.

This is incorrect. Forcing routes to use as little trench as possible can lead to much longer cable lengths, as the cable must reuse as much existing trench as it can on its path back to the parent node. We have described this in our own access modelling work in other countries in the past[14].

3.2 Reticulating subdivisions

The model excludes lead-ins for buildings tagged as post-2001 infill.

There are two issues with this

- The data sets used to determine whether buildings are indeed post-2001 infill have not been provided
- The description of how this is implemented in the model is inaccurate, being based on a criterion applied at the section level[15] where based on our investigation it appears that in fact the buildings are treated individually[16].

WIK are incorrect to say in paragraph 262 of their submission that the Commission should have excluded costs for reticulating subdivisions from the UCLL cost base, because the Commission has excluded these costs by excluding all post-2001 in-fill (and therefore all subdivisions reticulated after 2001).

3.3 Treatment of lead-in assets

The Commission's approach is omitting the costs of on-premise duct and in-berm trench and duct ("laterals"). It is also excluding the costs of ETP which are assumed to be covered in NRC.

[14] See http://www.accc.gov.au/system/files/Model%20documentation.pdf, Section 5.2.2

[15] On p38 of the model specification, TERA state that "Where this ratio [of in-fill building to total buildings on a road segment] was over 75% it was deemed that the entire road segment is in-fill."

[16] For example, the query "SELECT NB DISTR DWELLINGS PER SECTION - TSO - pre 2001".

3.4 We believe that any potential impact of re-use is over-estimated

We have attempted to quantify the potential impact of duct re-use in the TERA model.

Given the architecture that the Commission is modelling, duct reuse would only be an option if there were an empty duct available in the right location, accessible, and in suitable condition. In addition, the reused ducts would have a lower lifetime than new ducts.

The file cited by the Commission (Response to Commerce Commission s98 request Q2.2.xlsx) estimates the proportion of Chorus network routes that have at least one empty duct for each ESA.

By taking the Chorus route metres by ESA from S98 response Q 6.14.1.c, we have estimated reusable metres separately for each ESA and then compared these values on an ESA-to-ESA basis to the route metres in each ESA for the modelled fibre network (i.e. only those road sections used to serve TSO demand, also excluding demand designated as in-fill and as served by FWA). If we make the most aggressive assumptions on the reuse of these routes with spare ducts, then we estimate that at most 19% of the modelled routes (i.e. approximately 7 500km) could be reused[17]. In reality, we expect that the proportion will be far lower, not least since almost 50% of the modelled route network is assumed to be aerial, compared to circa 5% of Chorus' actual routes[18]). Therefore, we would expect that less than 10% of the modelled routes lie along Chorus routes with spare duct available.

We do not accept that book value measures should be used in relation to these assets; we have argued in previous submissions for economic measures of depreciation – but we illustrate the case below using a book value based approach. For the purposes of an indicative calculation, we will also assume that the Chorus copper network has grown uniformly over time (i.e. 2% of route metres have been deployed in each of the last 50 years). Assuming a long-term nominal cost trend of +2.5% (similar to the trends used for ducts/manholes in the July 2015 version of the Commission's model), then it can be demonstrated that the average lifetime remaining of such 50 year lifetime assets is 25 years and the average remaining HCA NBV is 60% of the GBV.

Assuming that 19% of modelled routes are reused with a residual life of 25 years with a value at 60% of their replacement cost leads to a blended average lifetime of 45.25 years and a blended average cost reduction of 7.6% for ducts/manholes/trenches.

Re-running the model under these adjusted unit capex/lifetime assumptions leads to a 0.9% reduction in the UCLL (about NZD0.23), which is far smaller than that posited by the Commission in their further draft determination and in our view an upper bound (i.e. a more reasonable implementation would lead to an even smaller reduction in cost).

Therefore, re-use is not as large an effect as posited by the Commission.

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17 This assumption would be that if an ESA has *x* metres of routes with reusable routes and *y* metres of modelled route metres, then the number of route metres reused is the minimum of *x* and *y*.

18 A public figure of circa 5% is given in Implemented modelling changes (public version), Section 3 (page 16 of 21)

3.5 Treatment of lead-ins over 100 metres

Paragraph 264 of the WIK submission states "the UCLL cost calculation of the Commission has included the cost of lead-ins above 100 m". This is not quite right. The 100m threshold is relevant for on-premise lead-ins. No underground trench vertical lead-in cost is included in the outputs of the Access Database, regardless of whether "ActivateLeadInThreshold" is 0 or 1. However, we agree that the parameter "LeadinThreshold" (set to be 100 metres) is not even used in the July 2015 version of the model.

We note that the road trench is still being allocated between lead-in and distribution based on the surface area of the cables present. Since underground lead-in cables from the CCT/FAT run along the road trench, they are still allocated some cost in this way even when the vertical component of the lead-in has been removed, and this is entirely proper. This is illustrated below in Figure 3.1: the trench highlighted by the green arrow is shared between the lead-in and the distribution networks.

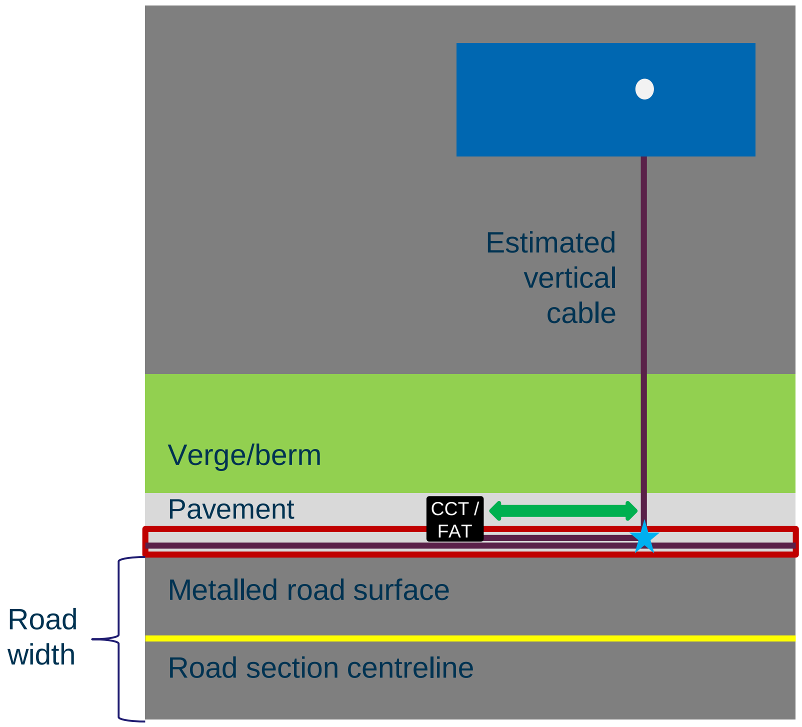

Figure 3.1: Illustration of calculation of lead-in trench [Source: Analysys Mason, 2015]

When "ActivateLeadInThreshold" = 0, as is the case in the July 2015 model, these allocations of lead-in trench are calculated without further adjustment.[19] When "ActivateLeadInThreshold" = 1, the lead-in trench lengths are multiplied by the value IncurredLeadinUrban/IncurredLeadinRural, which reduce the trench lengths (effectively removing some of the road trench entirely from the cost model). This approach is incorrect, since the road trench is required for the distribution network regardless of whether the lead-in is deployed or not (and the 100m cutoff relates to on-

[19] See the VBA subroutines GetTrenchLengthMajor_LeadIn_CuKey, GetTrenchLengthMajor_LeadIn_FbKey, GetTrenchLengthMinor_LeadIn_CuKey and GetTrenchLengthMinor_LeadIn_FbKey in the Access database.

premise trench, not horizontal) and therefore should be incurred regardless of the length of the vertical lead-in.

3.6 Lead-in uplift

Paragraph 283 of the WIK submission states

> "TERA describes, that they consider non-linear paths because of obstacles from the distribution trench to the building by an additional mark-up (parameter "SubOptimalPath") of 5%. This is not justified from our point of view since the rectangular path assumption for the lead-in already considers the worst case, so the longest path a lead-in could take at all."

This is incorrect. As can be seen in Figure 3.1 above, the lead-in is deployed under the extremely tight, global constraint of co-using the road trench as much as possible, so that the incremental lead-in trench is the shortest path from the building location to the road trench (to the point shown by the blue star in the figure above). The incremental trench deployed for the lead-in is therefore the *minimum* amount possible (before the mark-up).

By restricting the model to such a tight constraint, it is essential that the model should reflect the fact that there will be many occasions when deviation from a straight-line path is required due to obstacles both within the property boundary and on the verge/berm. We observe again that two models developed in Denmark included a mark-up accounting for exactly this effect:

- In our own modelling for the Danish regulator DBA in 2011, we concluded "Analysis of TDC geodata on their trench network indicates that the actual final drop length deployed between the BO [outline of the building] and the PB [property boundary] is approximately 15% longer than that assuming straight lines."[20] This analysis was founded on real-world networks and is exactly the same kind of modelling approach as being undertaken by the Commission.
- In more recent modelling by the DBA, this uplift has been increased, where they stated "there can [be] many obstacles that make it difficult to use a straight line from final drop point to the building. In order to take this into account, DBA will extend the length of this trench by 20%."[21]

We do not know how the 20% uplift was derived, but the 15% uplift was derived by analysis of real-world data. We believe an uplift of 15% is still more reasonable than 5% and recommend the mark-up is increased further, rather than decreased as WIK indicate.

We also must be clear that the uplift still applies even if the errors in the vertical length data are corrected for rights-of-way, as described in Section 2.3 of our August 2015 submission, since there

[20] http://danishbusinessauthority.dk/file/233746/lraic-model_dokumentation_14042011_pdf.pdf, page B–17

[21] https://erhvervsstyrelsen.dk/sites/default/files/media/horingsnotat_0.pdf, Page 54

will still exist obstacles (including other buildings) that will require these point-to-point links to be deflected.

3.7 Accuracy/relevance of address points

In paragraphs 955–956 of the further draft determination, the Commission states:

> Deriving the hypothetical efficient operator's network footprint from the Corelogic database has necessarily shifted our modelling approach from connecting buildings to connecting address points. The implication of this is that there are likely to be some address points that relate to vacant lots, reserves, and buildings not connected to Chorus' (or any other fixed) network.
>
> Some of these address points may never require a telecommunications service within the regulatory period. Balancing this, however, are single dwelling buildings with multiple connections, such as granny flats and home offices, which have been included in our model as a single address point. We consider the existence of these lines has an off-setting effect on the inclusion of address points without a current building or connection to a fixed network.

In response to this, Network Strategies assert in Section 4.1 of their report that:

> Data from the 2013 census 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 – representing only a slight offset to the number of multiple dwellings. 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.

We believe that this affects two issues: the dimensioning of lead-ins and the dimensioning of access network capacity. We consider both in turn below.

Dimensioning of lead-ins

The July 2015 model deploys one 2-pair lead-in per building, <u>per address point in that building</u>. This is of course provided that the building is within the TSO area, is not post-2001 in-fill and is not served by FWA. Therefore, apartments within a multi-dwelling building (for example), which each have their own address point, will have their own lead-in deployed. We assume that if an address has a second line (such a home office) or even a second dwelling requiring a second line (e.g. an annex), then the second pair in the lead-in deployed would be assumed to be used. Therefore, we do not believe that too many lead-ins are being deployed under these assumptions.

With regard to the vacant lots, we do not believe the issue is as large as Network Strategies describe. As set out in Section 3.2.2 of the model specification, only addresses flagged as "Yes (Developed)" are included: aliases and unused addresses are excluded. Therefore, some of the dwellings referred to by Network Strategies as "vacant residential sections" or "land ready for subdivision" will have been excluded from the model in the geographic data pre-processing. The datapoints quoted above from the Network Strategies report should therefore be treated with scepticism.

Dimensioning of access network capacity

A more significant issue is that, if Network Strategies are correct and there a significant number of address points representing multiple active lines (e.g. annexes and home offices) than although these lines could be argued as being deployed at the lead-in level, the remaining levels of the network are being underdimensioned (i.e. network cabling and CCTs/FATs). Therefore, the costs of the UCLL service are being underestimated.

We would suggest that a nonzero utilisation factor is assumed in the access network modelling to account for the required spare capacity, by dimensioning additional network cabling and CCT/FAT/Cabinet/MDF/ODF capacity. For example, the copper distribution demand mark-up of 11% (CuSparePairsDistribution, equivalent to an utilisation factor of 90%) could also be applied to the dimensioning of:

- CCTs, MDFs and all copper cabling (not just distribution) in the copper network
- FATs, ODFs and all fibre cabling in the fibre network.

3.8 Underground infrastructure sharing

In paragraphs 284–286 of the WIK submission, they assert that the

"We reported that the relevant range of trenching cost reductions due to external sharing is between 5% and 30% of trenching cost."

Chorus has questioned this point in some depth, in paragraphs 128–145 of their March 2015 cross-submission. In particular, they have observed that WIK does not give any evidence justifying this range. We note that this lack of evidence remains the case in WIK's August 2015 submission.

We have undertaken analysis of the level of underground sharing achievable in the context of not only actual operators in other countries, but also in the context of the Commission's modelling of New Zealand trench networks. These considerations are more relevant than benchmarks of models in other countries.

We observe that the implication of WIK's range of 5–30% cost reduction is related to the reduction in trench costs arising from co-ordinated digging and the proportion of routes where digging is co-ordinated.

We consider these two factors in turn below. This is a prime example of where respondents have asserted a change to the model without considering internal consistency with other inputs in the model. We discussed this issue of internal consistency further in Section 2.2.

Reduction in costs arising from co-ordinated digging

WIK state in paragraph 286 of their submission that: "The model implements a sharing cost benefit of 50% of trenching cost which is an appropriate conservative assumption." We disagree that this assumption is conservative.

We note that the Beca file can be used to inform a reasonable cost reduction assumption in this context. For example, if we take the May 2015 Beca file and remove duct material costs, then it can derive more precise sharing percentages.

Illustrative examples are shown below in Figure 3.2, in the conservative case where no minimum separation of cables/ducts for the two parties is required. We assume that all cost elements that can be shared with another party are shared 50:50, on the basis that if the HEO requires *n* ducts to be deployed then the other party also requires *n* ducts to be deployed. These calculations account for the duct-related labour costs *not* being shareable (i.e. each party has to pay for the installation costs of their own ducts).

Figure 3.2: Illustration of cost reduction percentages for different trenching methods, assuming no separation required [Source: Analysys Mason, 2015]

Trench method	Ducts required by HEO	Soil type	Cost of trench/duct install to HEO (NZD/m)		Cost saving	Additional assumptions
			Unshared	Shared		
Open trenching	110mm x 1	2	34.24	24.66	28% reduction	No additional separation
Open trenching	110mm × 2	Urban	102.06	81.16	34% reduction	300mm separation, implying 0.74m wide trench (0.22+0.3+0.22)
Directional drilling	50mm × 2	Urban	63.82	51.57	40% reduction	1 drill hole containing all ducts
Directional drilling	110mm × 2	Urban	92.24	98.70	28% reduction	1 drill hole containing all ducts

As can be seen above, the percentage reductions are in the range of 30–40%, compared to the 50% reduction in the July 2015 model.

However, we note that some shared deployments require a minimum separation of cables/ducts between parties, as indicated in Figure 3.5 above. This requirement decreases the level of cost reduction, since the shared trench must be larger than the unshared trench. These cases (with additional separation assumptions) are shown below in Figure 3.3. We have added the case of chain digging to this table only, since we find that additional separation is essential in this case (since the ducts are as wide as the trench, meaning that with a single trench, future access to the bottom ducts would be very difficult).

Figure 3.3: Illustration of cost reduction percentages for different trenching methods, assuming additional separation required [Source: Analysys Mason, 2015]

Trench method	Ducts required by HEO	Soil type	Cost of trench/duct install to HEO (NZD/m)		Cost saving	Additional assumptions
			Unshared	Shared		
Open trenching	110mm × 1	2	34.24	26.82	22% reduction	300mm separation, implying 0.52m wide trench (0.11+0.3+0.11)
Open trenching	110mm × 2	Urban	102.06	81.16	20% reduction	300mm separation, implying 0.74m wide trench (0.22+0.3+0.22)
Directional drilling	50mm × 2	Urban	63.82	51.57	19% reduction	2 drill holes each containing 2 ducts
Directional drilling	110mm × 2	Urban	92.24	98.70	7% increase	2 drill holes each containing 2 ducts
Chain digging	110mm x 1	2	29.01	26.35	9% reduction	2 trenches

We would highlight that, according to the second-to-last example, that the cost to the HEO of co-ordinated directional drilling with another party can be *more expensive* than using directional drilling as a standalone deployment. As can be seen above from both tables, whether minimum separation is required or not, the cost reduction is less than the 50% assumption used in the July 2015 model.

Proportion of routes where digging is co-ordinated

We note again that local New Zealand data is to be preferred to benchmarks.

We have identified several relevant data points in other countries: we summarise these in Figure 3.4 below.

Figure 3.4: Summary of trench sharing statements [Source: Analysys Mason, 2015]

Country	Source	Statement
Sweden	Stokab v7.95 model response[22]	Shared trenches have typically accounted for between **3% and 6% of their investments**
Sweden	TeliaSonera v8.06 model response[23]	A realistic level of **trench length shared with utilities** would be **12%**
Denmark	TDC LRIC model response[24]	Less than **1% of annual trench costs** are paid to TDC from third-parties in trench sharing agreements, although third-parties do also pay contractors directly
UK	Thames Water presentation[25]	**Less than 5% of its trenches** are currently shared

We have also identified a number of sources that discuss the challenges associated with trench sharing. In particular, as part of a series of official reports on potential legislation, the Swedish Government produced a paper on the evolution of broadband strategy in Sweden in 2014.[26] This report considered in detail the potential to share physical infrastructure, including sharing digging costs between infrastructure operators. Figure 3.5 summarises the complexities with trench sharing that can limit the extent of sharing currently seen in practice.

Figure 3.5: Complexities of trench sharing [Source: Analysys Mason, 2015]

Source	Complexities
Swedish Government official reports, UK Power Networks[27]	There may be a number of differing (and possibly conflicting) space requirements
Swedish Government official report, ACCC[28]	A consistent and reasonably extensive common route is required for sharing to be worthwhile
UK Power Networks, UK Transport Committee[29], Ofwat[30], ACCC	Long term planning is required for trench sharing. Telecoms operators generally build based on short-term demand, whereas utility companies have much longer planning timeframes
Swedish Government official report	Fair and reasonable mechanisms for splitting both costs and

22 See http://www.pts.se/upload/Remisser/2010/10-420-stokab-yttrande-slutlig-bu-modell-v7-95-ver1.pdf, Page 6

23 See http://www.pts.se/upload/Remisser/2011/Telefoni/10-420-ts-kommenatarer.pdf, Page 14

24 See https://erhvervsstyrelsen.dk/sites/default/files/media/endelig-horingsnotat.pdf, Page 44

25 See http://committees.westminster.gov.uk/Data/Environment%20Policy%20&%20Scrutiny%20Committee/20131105/Agenda/item%207%20-%20Appendix%204%20Thames%20Water%20submission.pdf, Page 32

26 See http://www.regeringen.se/contentassets/04549cddabe64f459f41da97221aa82d/bredband-for-sverige-in-i-framtiden-sou-201421, Section 6

27 See https://www.ukpowernetworks.co.uk/internet/en/have-your-say/documents/Streetworks_Presentation_23Apr2013.pdf, slide 21

28 See http://www.accc.gov.au/system/files/SSD2_26%20Telstras%20Response%20to%20ACCC%20Discussion%20Paper%2012%20August%202008%20Public.pdf, Page 22

29 See http://www.london.gov.uk/moderngov/Data/Transport%20Committee/20080117/Minutes/Transcript%20PDF.pdf, Page 24

30 See http://www.ofwat.gov.uk/consumerissues/selflay/pap_con_compnewwatmainv3.pdf?download=Download, Page 14

Source	Complexities
	responsibilities must first be agreed upon
Swedish Government official report, TeliaSonera[31]	In practice, alignment between networks is often low. For example, much of the electricity grid travels straight across rural land, away from settlements
Swedish Government official report	Established infrastructure (e.g. water, district heating) presents a limited opportunity for trench sharing due to the limited build of new networks
Telenor[32]	Copper cable can interfere with other infrastructure e.g. power lines
UK Power Networks	Legal issues can arise over ownership. For example, in the UK a single registered company must legally own the final reinstatement for the duration of its life
Danish cable owner forum[33], ACCC	There can be safety issues, particularly when sharing trenches with either gas lines or sewer infrastructure
Report by Analysys Mason for Ofcom	Existing duct infrastructure may not be useable due to collapsed sections or obstructions from existing contents[34]
Utah Public Service Commission[35], ACCC, TDC	It can be more expensive to share with electricity infrastructure than build standalone, if electricity cables legally require a minimum separation with other infrastructure, since wider/deeper trenches are needed

On this basis, it is clear that there are many complexities with underground infrastructure sharing which limit real-world opportunities. The current assumed value of 5% lies within the range of real-world trench sharing values identified in Figure 3.4 above, so we believe that the levels assumed in the model are currently reasonable.

We would also observe that the trenching methods that drive the final unit costs of trenching in the model largely use trench methods that cannot feasibly be shared in a co-ordinated deployment with another company such as a utility. In particular, in the v8.0 trench inputs file, only soil types 3 and 4 are assumed to use open trenching under the current approach of "cheapest method is used everywhere". The methods assumed in other soil types are not conducive to route sharing where separation is required (we understand separation is required between copper and electricity cables, or between telecoms cables and gas pipes). For example:

- Mole ploughing cannot guarantee any minimum separation needed
- Chain digging and rock sawing both require narrow routes to be dug and would require two trenches to be dug alongside each other for sharing anyway, since
  - — a horizontal separation would be impossible in a narrow trench

31 See https://www.pts.se/upload/Remisser/2010/10-420-samrad-BU-TS-2.PDF, Page 1

32 See http://www.pts.se/upload/Remisser/2010/10-420-samrad-BU-Telenor.pdf, Page 2

33 See http://dansk-ledningsejerforum.dk/Files/Filer/H%C3%B8ringssvar/Talepapir%20-%20DLF.PDF, Page 2

34 See http://stakeholders.ofcom.org.uk/binaries/consultations/wla/annexes/duct_pole.pdf, e.g.

35 See http://www.psc.utah.gov/utilities/telecom/03docs/03240302/Direct%20Testimony%20of%20Chad%20Duval%209-5-03.doc, Page 18

  - a vertical separation would require deeper digging and would also obstruct future access to the duct/pipe laid at the bottom
- Directional drilling would require two drill holes to provide separation.

As shown in Figure 3.2 above, using the Beca file the cost reduction for chain digging and directional drilling could be very small or even negative. We believe the same would be true for rock sawing. We consider mole ploughing to not be viable for deploying ducts for two companies at the same time. This only leaves open trenching to be a viable trench sharing method.

However, an analysis of the table PROCESS SECTION MODELLING indicates that only 13% of copper network trench (and 11% of fibre network trench) lie on road sections that are soil type 3 or 4 and therefore assume open trenching. The Commission must be balanced in its input assumptions in this case. Specifically, assuming 30% of underground routes are shared (as suggested by WIK) would be totally inconsistent with only 11–13% of routes using a trench method suitable for sharing. The 5% value currently assumed is consistent.

3.9 Proportion of access network costs allocated to leased lines

In paragraph P1.3 Vodafone claim that:

> "The model does not properly take account of leased lines, which in an efficient fibre network, should be expected to share and absorb costs in both in the access and core network. WIK observe that TERA rely on a cost-saving value from models conducted in other jurisdictions, but this information is not available to the FPP parties to interrogate.

The implication being made is that the choice of 5% for the 'Percentage of costs allocated to leased lines'[36] is too low and should be raised.

In actual fact, far from being low, this value is high compared to international comparators as demonstrated in the table below which summarises the proportion of costs allocated to leased line services in other jurisdictions.

Figure 3.6: International precedent for leased line share of costs [Source: Analysys Mason based on published regulatory models, 2015]

Country	Description of allocation of cost to leased lines
Denmark[37]	Access model calculates costs for individual lines rather than by service. 1.3% of access lines are classified as leased lines
Belgium[38] (draft model)	Access model calculates costs for individual lines rather than by service. 0.9% of access lines are classified as leased lines

36 See TERA's UCLL model; 'Parameters' sheet; row 11

37 See '2012-55-DB-DBA-Fixed LRAIC-Access Cost Model - v4.07 DBA - Public.xlsb'; 'Parameters' I106 and I129 and at http://erhvervsstyrelsen.dk/gaeldende-prisafgoerelse-for-2015

Country	Description of allocation of cost to leased lines
Norway[39]	Access model calculates costs for individual lines rather than by service. Up to 2.1% of the modelled lines are leased lines
Australia[40]	1.5% of access network costs allocated to 'Other services' which include transmission and leased line services

3.10 Unit costs of assets

3.10.1 Mole plough trenching

WIK state in paragraph 346 that:

> BECA forgot to delete the $10 material costs per duct in the case of mole ploughing. Extra installation costs have not been considered due to the nature of this methodology to install duct and cable in one step.

We observe that the November 2014 Beca Excel file only assumes mole ploughing of unducted cable, whereas the May 2015 Beca Excel file clearly assumes mole ploughing of ducted cable (it includes costs of ducts and duct jointing). We support the inclusion of ducts in the mole ploughing method. However, we also acknowledge that WIK are correct i.e. the duct *material* costs should indeed have been removed from the Beca file before pasting the output table into the trench inputs file (by setting 'Buildups 50dia'!W18:W33 and 'Buildups 100dia'!W18:W33 to zero). This is to prevent double-counting of the duct material costs, which are captured by the separate duct assets in the model.

However, the resulting rate of mole ploughing costs per metre of NZD9.40 is far lower than the cost experienced by Chorus of NZD **[CNZCI:** ✂✂] per metre (excluding duct material costs). We recommend that the value cell 'Buildups 50dia'!M19 is increased so that the total cost per metre in 'Buildups 50dia'!AC18:AC21 (assuming duct material costs have been excluded) correspond to to this datapoint.

However, we would also make the important observation that on page 5 of their report, Beca state:

- 'Standard' ploughs can be used on ducted cable with a diameter up to 63mm
- 'Vibratory' ploughs can be used with wider ducts (up to 125mm).

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38 See 'Modules 20+21+22+23 - Service costing.xlsm'; 'LRAIC+', rows 484-526 at http://bipt.be/en/operators/telecommunication/Markets/price-and-cost-monitoring/ngn-nga-cost-model/service-costing

39 See http://www.nkom.no/marked/markedsregulering-smp/kostnadsmodeller/lric-fastnett-aksess/_attachment/3963?_download=true&_ts=13a885c7d51, derived by SUM(B3ServiceDemand!BQ16:BQ17)/SUM(B3ServiceDemand!BQ9:BQ38)

40 See 'Cost Allocation.xls'; 'OutTtl' sheet at https://www.accc.gov.au/regulated-infrastructure/communications/fixed-line-services/fixed-line-wholesale-services-pricing-review-2009-2010/consultant-report

Currently, the cost of the plough is covered by cells 'Buildups 50dia'!M23:M24 and 'Buildups 100dia'!M23:M24, with the assumed costs being the same for the 50mm duct case and the 100/110mm duct case. We believe that the costs for the latter case should be increased to reflect the higher costs of the more capable vibratory plough (a standard plough would be unable to do the work).

3.10.2 Ducts

In paragraph 341, WIK state "BECA still includes duct installation costs in the New Zealand trenching costs." This is correct. Beca model both material and installation cost in their public file. However, TERA have then removed duct material costs from the Beca file before importing it to the trench inputs file for the Access model. We note that this has not been done perfectly in the July 2015 model. As WIK state in paragraph 346, the material cost was not correctly excluded from the mole ploughing calculations.

We understand that the material costs of 50mm/110mm duct, as used in the Access model, are sourced from the Beca trench inputs file (NZD12 per metre for 50mm duct and NZD15 per metre for 110mm duct).

We must again emphasise that the value quoted from the Denmark model for paragraphs 345/346 are anonymised values (marked as such by being highlighted in blue in the published Danish model) and therefore should not be used as benchmarks.[41]

In paragraph 341 of their submission, WIK state that "The switch which determines the ducting installation cost is set to "FALSE", that means that zero installation costs are included in the ducts, what can be proved by setting this value to "TRUE".[42]. The model contains an error: the IF() statement in the switches will always be FALSE, due to incorrect use of quotation marks. It is nonetheless correct that duct installation costs are not included in the costs attributed to the duct assets in the Access model and therefore installation costs are always excluded anyway.

We also note that these cells in the confidential input file are looking at installation cost data from an earlier version of the BECA trench inputs file i.e. it is currently out of date.

3.10.3 Subducts

In paragraph 268b of their submission, WIK assert that BECA's trenching costs include the cost of subduct installation. We disagree. An examination of the way in which costs are built up by BECA in their Beca trench cost analysis file shows that ducts are explicitly considered but there is no mention of subduct (they only refer to 50mm/100mm/110mm ducts in their calculations and descriptions). Neither does BECA mention subducts in their statement that:

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[41] For the published model, see https://erhvervsstyrelsen.dk/sites/default/files/media/offentlige_modeller_0.zip

[42] This switch is located in CI-ComCom - Inputs - v8.0.xlsx, Sheet '4. Costs', cell I5, using the named range *DuctLabour*

> "All rates are the national average and allow for excavation, duct install, backfill, surface reinstatement, consenting and traffic management"[43]

Subducts are not mentioned because subducts are not included, as the calculations show. We do not agree that this is an inaccuracy or omission in the description by BECA.

3.10.4 Cabling

In paragraph 273, WIK claim that fibre cable installation costs are too high based on benchmarks. We say direct evidence of New Zealand costs should be preferred to benchmarks from other countries. Nevertheless, for the specific cases of the underground fibre cabling assets, as a cross-check we have benchmarked the unit capex values assumed in a range of other cost models using publically available information. This benchmark is assumed to be for both material and installation costs of these assets, as the Commission is attempting to capture in its own work.

We have compared the benchmarked values to the values in the public TERA model below, but we note our conclusions still apply if we use the values from the confidential model. We also include the values assumed in the Chorus models. This is an update of the benchmark provided to the Commission in our March 2015 cross-submission. Figure 3.7 summarises our benchmark of the unit capex for underground fibre cabling assets up to 312 fibres, converted into 2014 NZD. As can be seen, the values assumed by the Commission are now in the range of the benchmark values for all cable sizes. In particular, whilst being higher than Sweden (as noted by WIK), they are lower than those in Spain. We note (as in previous submissions) that unit costs from the public Danish model are marked as anonymised values and therefore cannot be used as a viable benchmark.

Figure 3.7: Benchmark of unit capex for underground fibre cabling [Source: Analysys Mason, 2015]

[CNZCI: ✂ ✂]

In paragraph 274, WIK also claim that cable installation costs should vary by size, as in the Swedish model. We would note that if cable diameter drove variation in cable installation costs to any significant degree then, in reality Service Companies would have reflected this in their contract and pricing structures. The cost of installation assumed by the TERA model reflects actual pricing structures in New Zealand.

3.10.5 Joints

In paragraphs 255, 256 and 331 of their submission, WIK state that design costs should not be added to the cost of joints and poles because this would be double counted with expenditure on network design in the Opex model. This is incorrect as these are capitalised design costs which are not captured in the opex categories of Chorus' accounts.

[43] In the (Confidential) Trench inputs file, Sheet 'Trenching inputs (w ducting)' and "Trenching inputs (w ducting)", cell B80.

In paragraph 333 of their submission WIK also speculate that the costs for joints used may include the cost of manholes resulting in double counting. The costs Chorus provided in their response to Q6.14.1.F (vi) of the Commissions S98 request exclude manholes that they might be located in. The cost of manholes is shown separately in the response to Q6.14.1.I (ii-iv).

3.10.6 CCTs and FATs

In paragraph 266 of their submission WIK argue that digging costs are double counted for CCT and FAT since the installation cost includes pit digging. This is incorrect. There is no double counting since TERA have removed digging costs from the costs of underground CCT and FAT in their confidential input costs file.

For underground CCT's TERA uses data from (**[CI:✂✂]** for the labour rate and material data from (**[CI: ✂✂]**.

Where a FAT is installed underground[44] TERA have made an estimate of average digging costs and excluded this amount.

WIK also make a comment in paragraph 266 of their submission on overhead costs in relation to CCT and FAT. This is discussed below in Section 3.10.8.

3.10.7 Cabinets

In paragraph 241 of their submission, WIK assert:

> The dramatic increase of price for DSLAM rack cabinets by more than 600% is not comprehensible… Moreover, asset plus installation costs for power and cooling services at DSLAM cabinet sites were already considered in the TERA 2014 model and cannot be considered twice.

The increase in these unit costs can be easily understood by examining the confidential UBA input file. The changes represent the correction of errors and a change to the way in which the incremental costs of UBA are handled within the TERA model. In particular, the increase is unrelated to any inclusion of power and cooling services.

Figure 3.8 below summarises the reasons for the differences in unit cost between the two published versions of TERA's model.

Figure 3.8: Comparison of cabinet unit costs in December 2014 and July 2015 models [Source: TERA, 2014/2015]

[CI: ✂

44 For example see the N2.3 Air blown FAT (underground), see confidential inputs file, cells 'Unit costs calculation'!F804:M804

Asset Name	NZD Unit cost (including installation)		Change	Reason for difference
	Dec 2014	July 2015		

✂]

Most changes are explained by the correction of these unit costs to include the **[CI:** ✂✂] mark-up representing both Service Company overheads and Chorus project management costs. We note that the implementation is still not completely correct:

- The mark-up is only applied to installation costs in the July 2015 version of the model whereas the mark-up should in fact be applied to both the material and installation components;[45]
- TERA have forgotten to apply any mark-ups to the 'Rack Exchange' asset's unit cost which is why the unit cost is unchanged in Figure 3.8 above;[45] and
- TERA have also made a mistake in applying the aforementioned mark-up to subrack assets. The installation cost is calculated to be **[CI:** ✂✂] but this value is from a formula that only applies the markup to one of the constituent items of the cost (**[CI:** ✂✂]). The cost should be **[CI:** ✂✂] which can be corrected by replacing the formula in the confidential UBA inputs file, cell 'Q 6.17.12 (d) Install Costs'!I27 with "=(D27+D26+D29+D30+D31)*I5".

The unit cost of the Rack Cabinet asset has been increased due to aforementioned addition of a markup and also more significantly the addition of **[CI:** ✂✂] per unit representing the difference in cost between an active cabinet housing and a passive cabinet housing[46]. This is correct since the UCLL service requires passive cabinets and this incremental upgrade is required in order to make these cabinets suitable to host active equipment for the UBA service. We also note that benchmarks with other countries should carry less weight compared to New Zealand-specific data, since ambient conditions are very different to those in Europe. For example, cabinet housings in New Zealand must be capable of protecting equipment from higher levels of solar gain, humidity and average temperature than those found in many European countries.

We agree with the allocation of the incremental costs of the active cabinet to UBA, which is a similar approach to the one Analysys Mason also took in its modelling for Chorus, which was submitted to the Commission in December 2014.

The reduction in the SubRack Exchange asset cost is due to the removal of double counted installation costs in the confidential UBA inputs file (cell 'Equipment per year'!AB56).

The fact that a unit cost has increased by a large percentage is not in itself a reason for a change being unjustified. As shown above, all of the changes are fully justifiable and, indeed, some

[45] See the UBA inputs workbook, sheet 'Q 6.17.12 (d) Install Costs', cells I24:I28

[46] This calculation can be seen on the 'Other Inputs' worksheet of the confidential UBA Inputs workbook.

justified cost elements are still not accounted for and should be included in the final version of the model.

3.10.8 Treatment of overheads

We agree with TERA's approach to including Chorus project management and service company overhead fees into the capital unit costs of assets where appropriate.

WIK argue that the changes TERA made to reflect this should be reversed because these costs are 'intransparent and dubious.'[47] In addition, they assert that overhead payments made to service companies in respect of asset deployments are double-counting with opex. We do not agree. Chorus clearly explained the purpose of these payments in previous submissions.[48]

- **Chorus project management** reflects the Chorus internal costs related to managing the project and *are capitalised*. They should therefore be included in asset unit costs.
- **Service Company overheads** amortise service companies internal overheads across the variable 'coded rates'. Chorus and its service companies could equally have agreed a pricing structure that included the overhead costs. However, this pricing structure makes the magnitude of the overhead costs incurred by the service companies more transparent.

In paragraph 266, WIK state:

> "It is not appropriate to mark-up material costs with service company overheads. This seems to be double counting of costs. According to our understanding service companies provide the installation of CCT/FAT as a service to Chorus. These costs are capitalised as installation cost. They cannot be added once more as service company overheads."

We disagree as outlined above.

3.10.9 Discounts for trenching costs

In paragraphs 188–192, Spark assert that the Commission should assume a discount on trenching costs for the HEO given the scale of the network rollout.

We agree with the position asserted by both Downer (paragraph 11) and Beca (in Beca report 3 (Section 10.3) that a further discount for assuming large-scale digging projects would be incorrect.

Where Spark say in paragraph 192 that "the Commission has already been presented with evidence by BECA that up to 20% would represent a reasonable level for such a large scale discount in the New Zealand setting", we observe that:

---

47 WIK submission, paragraph 236

48 For example, in its March cross-submission, paragraphs 202-205

- This was the opinion of one directional drilling contractor[49]
- Beca emphasise this discount was not factored into their pricing in their 2014 report
- In Section 4.5 of the BECA review of submissions, they put that anecdote into proper context.

We would finally note, that given the large proportion of aerial assumed in each ESA, as well the routes removed due to other assumptions relating to TSO/in-fill/FWA, the digging projects in the model would be much smaller.

We would finally observe note that, should the Commission seek evidence for the trenching costs of large-scale deployments, then the cost data underlying our analysis for the hybrid cost models developed for Chorus (see Annex A of our March 2015 submission) is such evidence. It considers the cost of 2.7 million metres of trench. This is equivalent to about **[CNZCI:** ✂✂] of the routes in the modelled network, when compared to 40 million metres in the fibre network and 50 million metres in the copper network (as taken from the July 2015 Commission model).

[49] See November 2014 Beca report, page 11

4 UBA model

4.1 MEA

We support the Commission's choice of MEA for the additional costs of UBA (i.e. DSL based on copper).

We think that the relativity requirement is indeed related to the consideration of the economics of RSPs using UCLL; for this to have meaning, UBA has to be based on DSL.

4.2 Retaining existing node locations

For the same reasons as given in previous submissions[50] we support the retention for the MDF and FDS locations.

[50] See section 2.4.1 of our March 2015 submission

5 Opex and non-network costs

5.1 5% annual opex efficiency improvement

WIK agrees with the use of the LCI but argues that efficiency/productivity improvements should be taken into account. WIK argues for efficiency/productivity improvements no lower than 5% based on the practice of Ofcom.

WIK's assertion that 5% improvement is the minimum is not supported by Denmark using 2%.

Many models use 0% real price trends for opex so WIK's opinion that 5% efficiency/productivity improvements should be used is aggressive. A 0% real price trend is the case for the models built for the regulators in Norway[51], Netherlands[52], Mexico[53] and Portugal[54].

Similarly, the Swedish model has a 0% efficiency adjustment factor[55].

5.2 Opex efficiencies of FTTH[56]

In paragraph 251 WIK state:

> We want to bring to the attention of the Commission most recent data provided by Verizon which have been ignored by TERA.**123** According to Verizon fibre is overall 60% cheaper than copper.

The number is from a conference presentation at Genband Perspectives 15 which is not itself published, although there is a video online; in the press summaries of that presentation we have not found such a statement, but Verizon does state that maintenance costs are reduced by 40% to 60%. Whilst this particular presentation may not have been cited by TERA, the 40-60% figure is (perhaps coincidentally) the same as that previously taken into account by TERA as one of a number of data sources (sourced to NTT/Verizon, via an AGCOM presentation in footnote 25 of the November 2014 TERA model documentation).

51 v1.7 Access model available at http://eng.nkom.no/market/market-regulation-smp/cost-model/lric-for-fixed-access-networks

52 Model last updated in 2013, available at the following link: https://www.acm.nl/nl/publicaties/publicatie/11321/Ontwerpbesluit-marktanalyse-vaste-en-mobiele-gespreksafgifte-2013-2015/

53 Model available here: http://www.cft.gob.mx:8080/portal/industria-2/unidad-de-prospectiva-y-regulacion/modelo-de-costos-utilizado-por-el-pleno-de-la-comision-federal-de-telecomunicaciones-para-determinar-las-tarifas-de-interconexion-en-redes-fijas-para-2012/

54 Available from http://www.anacom.pt/render.jsp?contentId=1278256

55 See http://www.pts.se/sv/Bransch/Telefoni/Konkurrensreglering-SMP/SMP---Prisreglering/Kalkylarbete-fasta-natet/Gallande-prisreglering/, v10.1 model, Consolidation module, cell I_FA_Costs!R4

56 Spark submission, paragraph 301 - WIK submission, paragraph 251

We note that quoted savings on real estate are irrelevant as the TERA model is bottom up in this regard and that savings on power are not relevant to UCLL.

We would also note that other cost models do not assume such large opex efficiencies for fibre. For example, the cost model used in Denmark calculates the costs for copper and fibre access networks. The reduction in opex per line from copper to fibre networks is between 13% and 25%, as illustrated below in Figure 5.1.[57]

Technology	Opex per line (DKK)	Percentage reduction compared to copper
Copper	105.87	0.0%
FTTH PTP	92.04	13.1%
FTTH PON	79.09	25.3%

Figure 5.1: Opex line for different access technologies from the model in Denmark [Source: Analysys Mason, 2015]

57 See https://erhvervsstyrelsen.dk/sites/default/files/media/offentlige_modeller_0.zip, 2012-55-DB-DBA-Fixed LRAIC-Access Cost Model - v4.07 DBA - Public.xlsb, using cells Dashboard!G23:G24

6 FWA

6.1 Overall approach of the Commission

We do not repeat here our previous submissions regarding how to improve the Commission's FWA modelling and the need to take into account the full costs including the additional costs of sites for which FWA installations will fail (e.g. due to obstructions such as shelter belts).

6.1.1 Selection of lines to serve with FWA

We do not agree that FWA meets either the full or the core functionality of UCLL, both of which require inter alia unbundleability at layer 1. There are a very few locations where layer 1 is not available: lines such as those served by country sets or CMAR for which there is no DSL and no layer 1 UCLFS service is possible. These lines use other technologies and could justifiably be excluded from both the modelled UCLL cost base and the demand.

The Commission (UCLL 1132) does value unbundling, but does not insist on it:

> Our view remains that we value unbundling, so we disagree with the view that the choice of FWA should be made purely on cost.

The Commission's approach restricts the use of FWA to long lines that are only capable of voice and low speed DSL. In essence, we understand this to be (implicitly) a position that defines the required core functionality based on the functionality that is accessible to existing end-customers (and their wholesale suppliers including Chorus and the RSPs).

As the Commission puts it in the same section:

> Our view is that FWA should be used for lines where costs are particularly high and unbundling is unlikely – our judgement is that, on balance, the number of customers fed by RBI felt about right.

There is a certain logic to this, because it means that the modelled network would as a minimum meet the needs of existing customers.

6.2 Network Strategies model assumes only 250kbit/s

Spark argues at paragraph 161 that

> The Commission's choice not to implement FWA as an alternative to the FTTH MEA in those geographic locations where it is clearly the most efficient forward looking technology choice creates a pricing construct for UCLL and UBA which provides incentives for RSPs and end users to avoid using the Chorus network.

However, Spark has not provided any evidence that FWA is the most efficient (cheapest) forward looking technology in those locations.

Even if the Commission were to move away from the logic described above that restricts the use of FWA to long lines that are only capable of voice and low speed DSL, to serve the UBA lines it would have to provide a per-user throughput of a minimum of 1.9Mbit/s.[58] By contrast, the Network Strategies modelling being relied on by Spark and Vodafone assumes only 250kbit/s throughput per user to be provided.

We have previously submitted on the much higher unit costs (a multiplier of 4.8; i.e. a 380% unit cost increase) that we believe would occur if the Network Strategies approach were to be modified with a throughput per user increased to 1.5Mbit/s (a six times higher throughput). The increase in unit costs of FWA would be even higher if we assume a 1.9Mbit/s per end user throughput as suggested by the Commission, with an increase in the unit costs of a factor of 6.1 (under the same set of assumptions as we previously used, other than the throughput increase).

TERA has already noted that the actual Vodafone FWA offers have low usage caps[59], and this is why – providing more capacity has significant costs.

This significant increase means that rather than being cheaper, FWA would in our view be considerably more expensive than the wireline solutions modelled by the Commission even in high cost areas of Zones 3 and 4. The comparison of Network Strategies[60] was based on looking at the average cost of wireline and FWA in rural areas. However, if the average cost of FWA is over six times higher than the Network Strategies estimate, then their conclusions are reversed: the average unit cost using FWA will be significantly higher than the average unit cost using wireline technologies.

6.3 Lines served by FWA outside the TSO boundary

In Section 3.2 of their submission, Network Strategies say that as a result of treating the network in whole road sections, some buildings outside the TSO area will be served (with FWA or not).

[58] See paragraph 1123 of the revised draft determination for UCLL.

[59] "FWA service is at similar levels to VDSL but provides a much lower data allowance." "TERA Modern Equivalent Assets and relevant scenarios" July 2014, p34

[60] Modelling Fixed Wireless Access UCLL and UBA Final Pricing Principle PUBLIC Network Strategies Report Number 34020. 23 February 2015

> 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.

What they do not point out is that as a result of this approach treating entire road sections as either included or excluded, there are also buildings inside the TSO area that are not served (i.e. there are some “unders” as well as some “overs”). We expect that these effects roughly cancel each other. Given this, and given that the FWA costs are being incurred on a building-by-building basis, we do not believe that this effect results in a bias to the calculated unit cost.

We note in section 2.6 that improvements to the TSO modelling may be more important in relation to wireline modelling.

6.4 FWA not being limited to ESA boundaries

In Section D.5 of their submission, Vodafone say:

> The Commission’s model neglects to account for simple physics: a radio signal is not limited by map boundaries. Instead, an FWA site will provide coverage across ESA boundaries. The Commission’s method of considering sites in each ESA separately will substantially over-engineer the network resulting in substantially higher deployment and operating costs.

The Commission’s approach does not “consider sites in each ESA separately”. They simply allocate a certain amount of site cost to each line considered to be served by FWA, and sum this up on an ESA basis based on the number of such lines in each ESA in order to present the data in that way – for example, see the Access Excel model (CI-ComCom Access network cost model – v8.0) cells “Export to the core model”:L3657:L4376, where the number of FWA sites for each ESA can be seen to be an unrounded decimal.

6.5 Microwave radio backhaul

Vodafone raise the potential to use microwave point to point links in section D.6, e.g:

> Microwave radio must be considered as an option for modelling FWA backhaul for the HEO. Microwave backhaul can demonstrably provide sufficient capacity for rural demand and is significantly more cost efficient than fibre backhaul.

We agree that mobile operators do currently use microwave point to point links as an option and that such links could have sufficient capacity for rural base stations.

However, noting that Vodafone currently use microwave point to point links is not directly relevant to the Commission’s task, because the modelled HEO is also providing UCLL. Using microwave point to point links in addition to digging trenches and erecting poles to build such a network is likely to be inefficient. Doing this will increase total costs, unless the incremental trench and cable needed to serve the FWA site is more costly in NPV terms than the incremental radio equipment needed to serve that site. Put another way, if FWA backhaul were to be provided by other means, then costs currently allocated to FWA backhaul within the model would be allocated to UCLL, increasing the unit cost of UCLL.

Mobile operators who also own highly capillary fixed access networks are more likely to make substantial use of those fixed access networks and less use of microwave links. For example, past data from AGCOM[61] in Italy shows that the mobile arm of Telecom Italia (who own a highly capillary fixed access network) uses a much larger fraction of fixed wireline backhaul links than the competing Italian mobile operators.

6.6 The calculation of road sections served by FWA isolates over 20000 TSO lines

Section 2.3.2 of the Network Strategies submission states that "It can be seen that some fibre-served buildings are in the midst of FWA-served buildings." We agree that this issue is present and highlighted it in our August 2015 submission. Moreover, road sections served with FWA will not be able to carry distribution cables serving other road segments (as there will be no trench/duct or poles). Using FWA may therefore cut off other end users relying on those road segments.

We have analysed the table SOURCE_DETAILED_MDF_BUILD_PATHS in the Access database. For each road section in New Zealand, this table lists the path of road sections used to route back to the exchange locations in the fibre network. We have cross-referenced the road sections calculated to be served by FWA and then identified any paths containing non-FWA-served road sections that are assumed to pass through FWA-served road sections (such road sections have the same value ID_PATH_MDF_BUILDING but a higher SECTION_NUMBER).

We have identified that 23,065 non-FWA-served unique road sections (out of 286,022 road sections in total) are assumed to pass through FWA-served road sections in the fibre model. These sections serve 45,303 addresses in total (more than 2% of all addresses). Approximately half of these are in TSO sections. The designed cabling network in the model is therefore infeasible for these premises.

An example is shown below for ID_PATH_MDF_BUILDING = 15 in the AWU ESA, which contains eighteen road sections. As can be seen below by the red links (assumed to be served by fibre), the most remote road sections from the MDF location is assumed to be served by fibre, with intermediate road sections to the MDF alternating between fibre-served and FWA-served.

[61] See data summarised by the European Commission on p4 of: https://circabc.europa.eu/sd/a/04e452cd-95bc-48bc-9e7f-848267320d33/IT-2009-0999

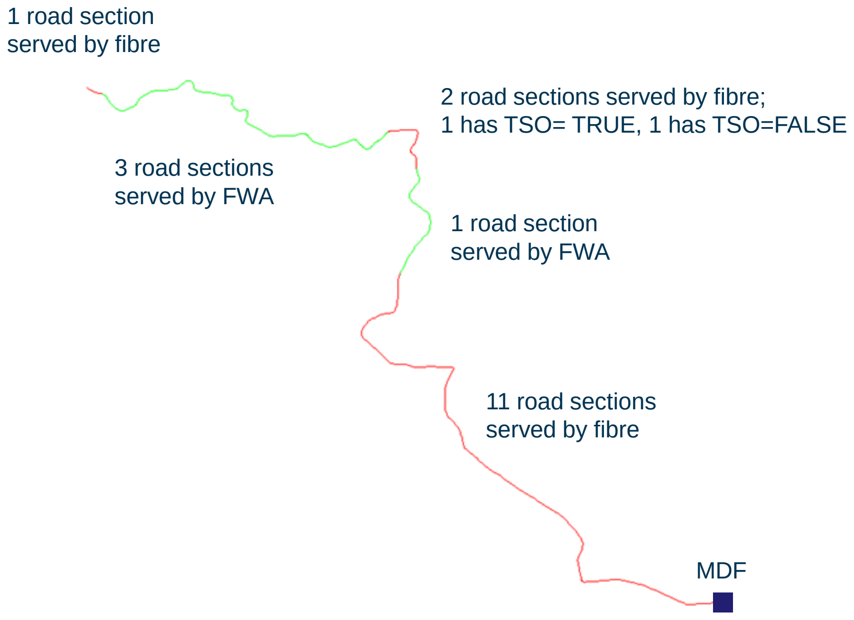

Figure 6.1: Illustration of MDF–building path 15 in the AWU ESA [Source: Analysys Mason, 2015]

6.7 Cost of spectrum

Vodafone D7.2 says

> "The Commission has previously assumed that a FWA would face equivalent spectrum charges as paid by nationwide mobile operators at competitive spectrum auctions. We agree with the Commission's downwards revision the spectrum fee relevant for the operation of FWA in rural areas. The Commission's approach entirely sets aside the approach of an MEA selecting the most appropriate cost effective technologies to serve its customers".

This implies that a lower opportunity cost for the spectrum would be appropriate if the FWA system is only used in rural areas. We have already submitted on this point: in the latest Commission model FWA is not being used exclusively in rural areas and therefore the opportunity cost should be the full value recently paid for similar spectrum at auction (i.e. national costs).

The scaling is therefore irrational. Since the modelled FWA users use up all of the spectrum, they should face the full costs of this use.

7 Non-recurring costs

7.1 Key comments from other stakeholders

7.1.1 Use of outsourcing

Spark says (and a similar point is submitted by Vodafone[62])

> 340. While one may assume that – overall -Chorus' agreements with its service companies represent a competitive package for the totality of services to be provided, that only holds for the package in its entirety. It does not tell us, or the Commission, anything about:
>
> a. The specific transaction charges included in it (it is highly likely that these agreements will incorporate cross-subsidies between different codes or transactions types, and it is equally likely that it will be the regulated NRCs cross-subsidising the commercial or Chorus-internalised ones); and
>
> b. Whether the overall volume or value of transactional charges covered by those agreements is efficient. For so long as Chorus is able to recover all of its transactional costs, and to recover network management and capacity costs, through NRCs, it will continue to do so, even if that is (a) inefficient; and (b) a double-recovery of those costs in so far as they are already recovered through the UCLL and UBA recurring charges.

We agree with Spark that overall the service company packages should be assumed to be competitive. However, we do not agree with the rest.

Part a. claims that it is likely that there is cross-subsidy between regulated NRCs and other codes and transaction types. We consider this further below in section 7.1.6. Any such incentives would be lessened by

- the overlap of codes between internal and regulated charges (to the extent that this occurs)
- careful procurement by Chorus can minimise the ability of the Service Companies to cross-subsidise profitably (e.g. demand uncertainty or weighting uncertainty in procurement assessment exercises will lead to competitive prices on each menu item).

Part b. The argument fails because Chorus is not able to recover all its transactional costs through NRCs due to the existence of Chorus internal charges (as noted in 340a). However, we do agree that volume related effects cannot be treated through the NRC prices (similar to the mix issue in Section 7.1.5 below).

62 Vodafone submission, paragraphs xix R8

7.1.2 Global cost minimisation incentives

There are trade-offs between NRC costs and Chorus processes and systems costs. To reduce NRC costs, Chorus and the Service Companies would need more sophisticated IT systems and/or more spares etc. The modelling from the Commission must be consistent to ensure that the efficiency level attained is achievable rather than theoretical. In other words, the modelled operator can't have simultaneously the lowest IT cost, the lowest cost of spares and the lowest NRC costs. Chorus's actual costs are by definition consistent and reflect the balance between NRCs and its other systems. If the Commission wants to reduce the NRC costs in its model, it needs to either increase IT costs or cost of spares to a level that allows the actual task duration to be reduced.

Spark recognise this and argue in 371c that to efficiently manage the cabinet/exchange and end customer visit elements, it would be optimal to set the cabinet/exchange connection charge NRC to the remote value and to add additional spares (that would by implication increase the level of the recurring charge). They imply the correct approach would be to minimise the total cost (over time).

> Set the UBA cabinet/exchange connection charge (UBA 1.1 cabinet/exchange) equal to the charge for remote connection. While some connection activity is likely necessary, this approach best allocates costs to where they are best managed, i.e. Chorus can optimise between DSLAM port capacity and the costs of an exchange port change; and

This is an interesting suggestion, but an impractical one:

- Firstly, to take this approach would require Chorus (or in this case TERA in modelling the HEO's optimal behaviour) to be able to specify the much higher level of spares required at the DSLAM and the cost of these would need to be recovered as part of the Commission's FPP price. As it is, no such spares are included in the Commission's model.
- Secondly, to take this approach would not minimise total cost because the efficient number of cabinet or exchange visits may not be zero - e.g. there may be an irreducible minimum number of cabinet visits even if the network was pre-built with DSL on every line and disconnected customers ports were not reused. Under Spark's suggestion, this cost would not be recoverable (unless it were rolled into either the recurring charge (which would have distributional effects) or the new (single) NRC).

On a similar point, WIK paragraph 129 is wrong for the same reason as the UBA model has insufficient spares (as previously acknowledged by WIK) and the FTTH model has none.

7.1.3 Wigley suggests that POA does not give sufficient incentive for cost-based pricing[63]

Wigley suggests that the current POA structure for some NRCs should be changed "with some form of clear metric which is directly cost-based, or enables a cost-based price to be fixed quickly (eg by expert determination)". We do not see how such a standardised process can be achieved in practice given the variability in the NRCs subject to POA.

We also do not agree that the current process does not give sufficient incentives for cost based pricing. A competitive process for the POA element with multiple service companies bidding ensures competition as both parties want to win that incremental market (even if they already sell other services to Chorus). Chorus has no incentives to increase the POA prices either as connecting the customer provides a recurring revenue to help it cover its high fixed costs.

7.1.4 CallPlus says there have been no efficiency gains on NRCs[64] and that Chorus has no incentives to reduce pass through copper costs

CallPlus claims that there have been no efficiency gains on NRCs for copper connections and that Chorus has no incentives to reduce pass through copper costs.

We do not agree as Chorus's move to an outsourced model (with competitive procurement from service companies) represents an efficiency gain that benefits RSPs. In addition Chorus has no incentives to make connections more costly as its interest is to have lines in service to be able to receive monthly revenues; and for some Service Company activities it does also use those products with no pass-through.

7.1.5 CallPlus, Spark and Vodafone claim that a study of real-world visits to UBA DSLAMs demonstrates the inefficiency of Chorus' systems and processes[65]

CallPlus, Spark and Vodafone worked together to identify cases where a truck roll was made for lines that had been in use recently (and could in their own view therefore be expected to be intact).

Firstly, as noted by CallPlus in its own submission[66], the possible issue identified by the study is with the mix of NRCs invoiced to customer rather than the cost of the transaction itself. The conclusion that this possible issue requires the cost of the transaction to be reduced is therefore illogical.

Secondly, the argument relies on a key assumption i.e. that a line in use recently should be considered as intact. In fact, the modelled network is likely to present similar issues (but is argued by the parties to be efficient):

63 Wigley submission, paragraph 19.1

64 CallPlus submission, paragraphs 12-13

65 CallPlus submission, paragraphs 6, 7, 23-32 - Spark submission, paragraphs 23-24, 363-367

66 CallPlus submission, paragraph 7

- The FTTH design the Commission is modelling also has no spare cable (other than arising from cable modularity) and no spare duct. Rearrangements will be extremely frequent in this design in the future (e.g. when additional premises are built, especially as in-fill or ROW)

- The design the Commission is modelling also has no spare DSL ports (other than arising from card modularity). There is no option to leave each port permanently connected as there are fewer DSL ports than lines. Rearrangements are therefore essential.

7.1.6 Spark argues that the field services agreements with service companies lead to cross-subsidisation between services[67]

Spark assumes that the field services agreements with service companies lead to cross-subsidisation between services. The example given for that is the decrease in the costs of fibre related activities and the increase in the costs of copper related activities.

This argument is not robust for the following reasons:

- The price structure of service companies is transparent with a breakdown by travel, task duration, material which makes it difficult to cross-subsidise.
- The service company overhead is recovered as an equi-proportional mark-up rather than allocated to some services rather than others.

A similar point is submitted by Vodafone and fails for the same reasons.

> xix R8. Do not accept the direct cost of Service Companies as given. Check the appropriateness of the cost allocation within the multi-product relationship between Chorus and the service companies. Recognise the incentive for Chorus to distort these allocations at the expense of transaction charges

The implied conclusion from Spark and Vodafone, that installation activities subsidise maintenance activities, is therefore not established.

7.1.7 WIK, Spark and Vodafone criticise the inclusion of administrative task times[68]

In paragraph 94 of their submission, WIK state that:

67 Spark submission, paragraph 21

68 WIK submission, paragraphs 94 - Vodafone submission, paragraphs xix - Spark submission, paragraph 345

> Some countries have provided both technician and administrative task times for a given activity. For these dual-activity data points, TERA includes both roles in the time total. However, TERA already applied (1) a (significant) service company overhead cost on direct cost, and (2) another Chorus overhead cost component, both of which should already include administrative task times. We conclude that TERA should not have included administrative time in the benchmark countries comparators.

We fundamentally disagree as administration tasks are not overhead. Administration tasks are non-technician tasks that are directly incremental to the NRC services while overheads are better considered as indirect or common costs. This is why administration tasks are modelled in a bottom-up way while overhead are recovered with a mark-up. To consider particular examples:

- In Belgium, the NRCs are calculated using separate task duration and hourly rates for technicians and administrative staff and then include two overhead mark-ups, one for IT costs and one for business overhead.[69]

- In Denmark, the administrative task times for services are labelled as "Processing of order"[70]. These are the times for activities directly attributable to the service, rather than any other overhead administrative time e.g. from the HR department or senior management. Such overhead contributions are captured separately in the Danish model via the mark-up for LRAIC-regulated services for non-network costs.

- In the case of Spain, we believe the tasks containing the word "gestión" i.e. management are still the directly attributable time of managing the order, rather than any overhead staff time. Spain includes a separate common cost mark-up[71].

- Romania does a similar treatment, covering directly attributable time for the wholesale and technical departments, with a mark-up for overheads[72].

- Italy also specifies times for "direct activities"[73].

Therefore, these directly attributable administrative time durations should be retained in all the benchmarks, with the mark-ups used to capture costs of overhead staff.

69 « DECISION DU CONSEIL DE l'IBPT DU 4 SEPTEMBRE 2007 CONCERNANT "ONE TIME FEES" POUR BRUO & BROBA », VERSION PUBLIQUE

70 See https://erhvervsstyrelsen.dk/sites/default/files/media/offentlige_modeller_0.zip, [2012-55-DB-DBA-Fixed LRAIC-Core Cost Model - v7.2 - Public.xlsb, cells 'Colo and other services'!J8l and 'Non network mark-up'!O111/P111.

71 See http://ftp.cmt.es/201305_Modelo_costes_altas_servicios_acceso_al_bucle.zip

72 http://www.ancom.org.ro/uploads/forms_files/129937748_optimized_hybrid_model_for_public_consultation.xls

73 See http://www.agcom.it/documents/10179/538423/Delibera+14-00-CIR/f8e6fd91-390e-4b9d-97ef-1f71ee185b88?version=1.0, page 8

7.1.8 WIK, Spark and Vodafone criticise the inclusion and level of the Service Companies overhead mark-ups[74]

In paragraphs 88 and 149 of their submission, WIK criticise the lack of benchmarking of the Service Companies overhead mark-ups CI: [✂✂].

In paragraph 97 of their submission, Spark state that:

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a. There is very little transparency of how Chorus' service company mark-ups have been applied and why. It appears that in multiple places they are applied in a way that results in double recovery (for example mark-ups applied to already capitalised installation or material charges); and

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A similar point is submitted by Vodafone[75]

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b. xix R9. Revise Service Companies' overhead mark-up because it is generally too high and leads in some cases to a double-recovery of costs. Correct Chorus' overheads for efficiency and automation savings.

As recognized in paragraph 340 of Spark's submission, overall the Service Companies packages should be assumed to be competitive. The level of Service Companies overhead is a reflection of the outcome of the competitive procurement process. We agree with TERA (section 1.3 of the NRC methodology document) when they acknowledge that there is simply a presentational difference in the way service companies have structured their contracts with different entities.

7.1.9 WIK, Spark and Vodafone say there is a risk of double recovery between recurring and non-recurring charges[76]

In paragraph 302 of their submission, Spark state that:

WIK's also highlights the potential double recovery of costs through opex allocations and non-recurring charges, and notes there is no evidence that the Commission or TERA has performed a rigorous analysis of this potential (paragraph 332 in the WIK report).

A similar point is submitted by Vodafone[77]

74 WIK submission, paragraphs 88 - Spark submission, paragraphs 97

75 Vodafone submission, paragraphs xix R8

76 WIK submission, paragraphs 88 - Spark submission, paragraphs 97

77 Vodafone submission, paragraphs xix R8

> xix R9. Revise Service Companies' overhead mark-up because it is generally too high and leads in some cases to a double-recovery of costs. Correct Chorus' overheads for efficiency and automation savings.

No evidence is offered of double recovery. In fact non-recurring cost items can be clearly identified in the accounts.

7.1.10 WIK, Spark and Vodafone recommend more detailed benchmarking[78]

In paragraphs 83-87 of their submission, WIK argues that the Commission should have adjusted not only the time budgeted to complete a task but also the other components ("Labor rates", "Service Company supplied materials", "Transport Costs", "Design, Records and Supervision Costs", "Vehicle and Equipment Costs", and "Civil Subcontractor and Traffic Management Costs) and argues than less than 50% has been checked for efficiency.

In their recommendation, WIK seem to assume that all cost components are potentially comparable to those in European countries and ignores the fact that for instance transport costs are dependent on geography, traffic management costs on local regulations, etc.

As we proposed in our submissions ("6.1 TERA overall approach") we explained that a proper benchmark would not only consider the quantitative cost components but also the differences in processes and the reasons why the cost inputs may be different before applying efficiency improvements to the cost components.

In their submission, WIK indicate

> 90. TERA has selected 7 countries for its international benchmark. The main criterion to select countries for the benchmark has been that information on transaction service completion time has been available. Whilst this is a relevant comparability criterion it should not have been the only one. Comparability of service provision, degree of process-automation, use of IT systems, labour productivity and the NRA's regulatory approach should have been additional criteria relevant to the efficiency adjustment.

We agree with that assessment to the extent that comparing Chorus NRC data to randomly selected European countries is not robust. However we believe that benchmarking other cost components (as suggested by WIK) could make things even worse if the countries used in the benchmark were still different in terms of geo-demographics, network architecture, technology, degree of process automation, etc.

78 WIK submission, paragraphs 83-87, Spark submission, paragraphs 341-348 – Vodafone submission, paragraphs xiii

7.1.11 WIK, Spark and Vodafone criticise the international benchmarking done by TERA[79]

Spark supports WIK's arguments criticising the international benchmarking done by TERA (and similar points are submitted by Vodafone[80])

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345. The international benchmarking used by the Commission:

a. Uses information that is out of date, some being over 10 years old;

b. Includes countries that do not have comparable labour productivity or labour costs to New Zealand. These countries (Spain, Romania and possible Country A) should be removed from the benchmark;

c. Includes transport times for some countries in benchmarked rates, but not others. We can conclusively surmise that this results in an upward-bias in the benchmark, yet no adjustment is provided for this effect; and

d. Incorrectly includes administrative costs, resulting in a double-recovery of those costs (which are already covered by the service company and Chorus mark-ups allowed by TERA and the Commission).

Regarding part 345.a., we agree with TERA that that using old data points is not necessarily incorrect in so far as processes are well established and mature for copper connections.

Part 345.b. is actually an argument that international benchmarking is not a good methodology as all countries can be shown to be different from New Zealand on some metric or another. In addition we have indicated in the submission that the value used by TERA i.e. the lowest total process duration always comes from one of two countries (CI: [✂✂] or Country A). If Country A was removed as suggested by WIK, then the entire benchmark would be reduced to using the data from one country (CI: [✂✂]). We note WIK's comment about single country benchmarks. Finally the judgement of which countries have labour productivity and labour costs similar to those in New Zealand is subjective. WIK simply asserts that Spain, Romania and potentially Country A are not sufficiently similar.

Part 345.c. is correct in the sense that the inclusion of transport time in the data from some countries could theoretically lead to a more conservative value. However this is negated by the Commission's decision to select the lowest total process duration in the benchmarked countries. Our suggestion in the submissions (namely using median values after excluding from the sample countries where the travel time is included) would address WIK's concerns on the risk of upward-bias due to transport times.

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79 Spark submission, paragraph 345, 347, 348 - Vodafone submission, paragraphs xix R2, R3, R4

80 Vodafone submission, paragraphs xix R2, R3

Part 345.d. is incorrect and addressed in Section 7.1.7.

7.1.12 WIK, Spark and Vodafone criticise the national benchmarking done by TERA[81]

Spark supports WIK's arguments criticising the national benchmarking done by TERA (and similar points are submitted by Vodafone[82])

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347. The application of the Commission's national benchmark is perhaps even more concerning:

a. The national benchmark (which refers to a fibre network operator) fails the comparability criteria, comparing fibre transactions with copper ones; and

b. It has been applied asymmetrically. Of the six service codes considered, the adjusted costs (after the international benchmarking) were:

i. Lower than the national benchmark in two cases. In these cases, the Commission adjusted the costs upwards – effectively assuming the LFC costs are a cost floor in New Zealand;

ii. Closely comparable with the national benchmark in two cases. In these cases the Commission did not adjust the costs; and

iii. Above the national benchmark in two cases. In these cases the Commission did not adjust the costs.

348. Despite evidence of lower costs being available to Chorus in New Zealand the Commission chose to apply "efficiency adjusted" costs that are above those rates. It is difficult to reconcile this approach with an efficiency focus or the Act, or avoid the conclusion that the international benchmark was flawed in some respect for those two cases (perhaps for the reasons laid out by WIK and summarised above).

Part 347.a. is factual but not very useful as there are no copper operators in New Zealand apart from Chorus so it is unclear what alternative is being proposed. More widely, it is inconsistent of WIK to argue against using fibre benchmarks[83] for NRC, saying they fail comparability criteria because they compare fibre transactions to copper ones, when they also ask the Commission to choose a fibre MEA for UBA. The deficiency of setting prices based on the wrong technology is the same in each case.

Part 347.b we do not agree with the conclusions drawn. If WIK and Spark consider that the modelled operator is inefficient when its efficiency adjusted costs are higher than the LFC, then

81 Spark submission, paragraph 345, 347, 348 - Vodafone submission, paragraphs xix R2, R3, R4

82 Vodafone submission, paragraphs xix R4

83 We note that there may be other reasons to treat the LFC benchmarks with caution, such as those noted in Chorus' revised draft determination submission paragraph 376.

that means that either the LFC is inefficient when its costs are higher than the efficiency adjusted costs of the modelled operator or that the efficiency adjustments have been too large.

7.1.13 Additional efficiency gains over time

In paragraphs 160-162 of their submission, WIK argues for the inclusion of additional efficiency gains over time.

A blanket 5% year-on-year efficiency adjustment as proposed by WIK (paragraphs 91 and 162) is not supported by regulatory practice in the EU as WIK suggest. We have only seen productivity factors included in the calculation of NRCs in a small number of cases. Secondly, a common feature of approaches to setting NRCs we have seen internationally is that all make use of data submitted by operators.

- The Danish regulator's latest model includes an annual productivity gain of 2% (i.e. equivalent to -2% price trend before inflation)[84]. However, this is not justified by any evidence - it is simply stated that this value is taken from previous modelling work.[85] The model has been updated annually since 2003 and the same efficiency factor applies to all opex, not simply NRC related opex. Without understanding the way in which the efficiency factor is determined, Danish precedent cannot be relied upon as useful evidence of the appropriate level of productivity gain in New Zealand.

- WIK[86] are correct in identifying that Ofcom apply an efficiency forecast when calculating price controls for Wholesale Broadband Access service charges for the 2014 price control. This is set at a level of 5%.[87] However, it is clear from the context that it is not appropriate to compare this to the New Zealand case:
  - — The 5% efficiency gain is a glide path approach and hence a composite of efficiency gains made by BT's performance getting closer to that of the HEO and of annual gains that the HEO could make.[88] ComCom already take account of the first step in reducing labour time based on the benchmarked values.
  - — The value of 5% was selected by Ofcom after consideration of various actual data, largely specific to BT. This included historical trends in BT data, BT planning documents and public statements, analyst reports and some external benchmarks (such as other UK operators)[89]

84 https://erhvervsstyrelsen.dk/revision-af-lraic-modellen-i-2012-2014 '2012-55-DB-DBA-Fixed LRAIC-Access Cost Model - v4.07 DBA - Public.xlsb'; 'Parameters';Cell I46

85 https://erhvervsstyrelsen.dk/sites/default/files/media/endelig-modeldokumentation.pdf; p100

86 paragraphs 54-60 of WIK's October submission on NRC

87 http://stakeholders.ofcom.org.uk/binaries/consultations/review-wba-markets/statement/WBA-draft-statement.pdf ; page 254

88 http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/annexes/annexes.pdf, paragraph A7.4

89 http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/annexes/annexes.pdf; Annex 7

- In the case study of Spain presented in WIK's October submission on transaction charges (paragraphs 44 – 48) there is no mention of any efficiency adjustment applied to transaction charges. Inspection of the model and documentation itself confirms this. The CMT based their model on actual data from operators.
- "For regulating transaction charges BNetzA, the German regulator, starts with the cost data provided by Deutsche Telekom." (paragraph 50 of WIK's October submission) which is also what the Commission is proposing to do. These costs are adjusted where BNetzA and its expert advisors are able to find evidence of actual inefficiency rather than applying a blanket efficiency factor. No evidence has been offered here.
- In Belgium, the NRCs do not include any productivity gains over time but increase over time due to the increase in labour costs.[90]

The reason why WIK has reached the conclusion they have is the very narrow scope of the benchmark included in Table 3-9 of their submission. This is shown by the fact that the EU average value shows price trends much lower (in absolute value) than the individual countries.

In addition to the review above, we would note that Chorus' situation is different from typical EU incumbent operators where NRCs work is still carried out in-house. Regular procurement exercises with service companies ensure that Chorus and their RSP clients benefit from efficient field services costs and efficiency gains over time. Any efficiency adjustment over time set by the Commission should be informed by the price reduction obtained by Chorus over the last procurement exercises and include the effects of labour unit cost increases.

7.1.14 WIK, Spark and Vodafone claim there are methodological problems relating to the mapping of services codes to NRC services[91]

In paragraphs 130-140 of their submission, WIK argues that there are issues in the mapping from service codes to NRCs.

The first issue claimed by WIK is the mapping of several NRCs to the same service code and the inclusion of activities which are not related to the mapped NRC core services. While we agree that a more accurate mapping between service codes and NRCs would help improve the cost causation of the NRCs, it is not uniformly bad; indeed including similar non-chargeable activities and pass-through activities in the same codes would provide some protection against the alleged incentives for cross-subsidy.

The second issue identified is the inclusion of activities which WIK argue are not related to the mapped NRC core services. For example:

[90] « DECISION DU CONSEIL DE l'IBPT DU 4 SEPTEMBRE 2007 CONCERNANT "ONE TIME FEES" POUR BRUO & BROBA », VERSION PUBLIQUE

[91] WIK submission, paragraphs 108-114 - Spark submission, paragraph 349.b. – Vodafone submission, paragraph xix R7

a) CI: [✂✂]
b) CI: [✂✂]

In relation to the "install ETP" aspect, the ETP has explicitly not been included in the assets costed as part of the recurring charge, and therefore has to be covered by the installation NRC.

7.1.15 WIK's comparison of LLU connection costs in the EU is not useful

In paragraph 96 WIK claims that the "…the UCLL connection charges are…significantly higher than the EU average of €37."

Yet, in paragraph 92 with reference to the benchmarking of labour time WIK state: "we would not regard it as appropriate to include countries like Spain or Romania into the benchmark." If it is inappropriate to compare the labour time component between Spain, Romania and New Zealand on the basis of differing labour/IT capital cost ratios then a comparison with the EU average (which includes Spain, Romania and countries of many different characteristics) is clearly inappropriate as well.

We also note that the EU average of EUR37 is a simple average that does not take account of distribution between different types of connections, purchasing power parity, labour costs or any other significant variable and makes any comparison not very useful. More than anything the data used by WIK shows extreme variations between the different EU countries from EUR6 to EUR113.

We note that in WIK's comparison of proposed NRC charges against those levied in Germany (paragraphs 99 and 100, Table 3-5) the only charge that differed significantly was the one involving a visit to the subscriber premises. WIK claim that this is explained by double counting of activities which affect this type of task. We would argue that the difference is more likely due to country-specific factors such as travel time, as the geography of New Zealand is quite different to that of Germany. This is in line with our continued stance that country specific factors cannot be benchmarked and the view that TERA, rightly, takes (page 13 of methodology document).

7.2 Reliance on models from other countries

A key issue with the type of international benchmarking done to date by the Commission is that they rely on models built by other regulators. This means that any issue with the modelling done in those other countries or any assumption not applicable to New Zealand would have an impact on the results of the Commission's model. It would therefore be better for the Commission to start from actual data points rather than from the modelling output produced by other regulators.

7.3 Recommended changes if current approach is maintained

Annex B describes a list of recommended changes to TERA's model if the current approach based on international and national benchmarking is maintained.

Annex A Other issues raised in submissions

Figure A.1: Responses to other comments by other stakeholders [Source: Analysys Mason, 2015]

Respondent (section/paragraph)	Overview of comment	Analysys Mason comment
Vodafone (F.3)	Demand should increase over the modelling period	The modelled fibre access network currently has no spare capacity assumed for future growth. Any increase in demand must also come with assumptions of spare capacity
WIK (277)	WIK questions why did the new horizontal lengths increase from 45 to 50 thousand kilometres	This was to correct in the values of horizontal length used in the access Database, which Analysys Mason demonstrated to be flawed in their February 2015 submission
WIK 163	WIK point out that service companies may gain economies in use of travel to customer sites relating to other products and services.	If these efficiencies can be gained then the Sercos have good incentives to reflect the expected level in their competitive bids. This illustrates the benefit of using outsourcing to service companies.
WIK 199	In relation to the definition of MDF areas WIK think that the model takes a straight line approach to allocating road segments to street cabinets and MDF (in case of fibre) instead of the concatenated road length or road distance,	We believe that WIK have misunderstood and that road distance is in fact being used, although the TERA text could usefully be made clearer on this point.
WIK 200	Weights in relation to private roads	We believe that the weights are not used to generate unit costs; they are only used to bias the route finding away from private roads where this is possible. We believe that the approach is appropriate.
Commission (1646 of the UCLL decision)	The Commission includes text justifying the use of PMT() as an implementation of the annuity calculation, answering a previous submission of ours.	We apologise for the confusion which arises from our use of the term “argument” in a technical sense. We were trying to point out that the Excel function PMT() must be passed several parameters (also known as the “arguments”) of which three are compulsory and two are optional. Our point is no longer relevant as we can see the model implementation.

Annex B Recommended changes if benchmarking approach to NRCs is maintained

Figure B.1: Recommended changes if benchmarking approach to NRCs is maintained [Source: Analysys Mason, 2015]

Reccomendation	References
If TERA is seeking to benchmark task time only then it should only use time benchmarks which exclude travel time. Therefore benchmarks from the following countries should be ignored: • Romania • Confidential/Country A • UK • France	Analysys Mason August submission p27
Use median of benchmarks rather than minimum and use NZ time where this is the lower than the median. There needs to be a balance between the cost of NRC and the investment in the network. For example, if network investment is low (as per TERA's modelling) then NRCs will either be more expensive or more frequent	Analysys Mason August submission p28
Retain time required for ETP related tasks in NRC (or include cost of ETP in the recurring charge calculation) as the ETP is required in order to provide a service	
NRCs should capture Labour Cost Index adjustments over time	Analysys Mason August submission p28
Overhead mark-up should be increased so that the full absolute amount of fixed overhead is recovered	Analysys Mason August submission p28
The absolute value of Chorus overhead in the NRC model should be correctly and accurately referenced.	
Use NZ Service Company values for No Fault found (299)	Analysys Mason August submission p29 (6.7.1)
Values for 'Abortive end user site visit / Cancellation charge post truck roll' should be updated to include the cost of the truck roll itself. NZ Service company values are best suited for this.	Analysys Mason August submission (6.7.2)