# TSLRIC price review determination for the Unbundled Copper Local Loop and Unbundled Bitstream Access services

## *Analysis of the industry comments following the December 2014 draft determinations*

**Commerce Commission**

Ref: 2014-20-DB-ML-ComCom

**Public Version**

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S.A.S. au capital de 200 000 €
RCS Paris B 394 948 731

June 2015

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# 0 Context

Following the publication of the Commerce Commission December 2014 draft determinations on TSLRIC models and prices, the industry has submitted its views on the material that was published. This document aims at summarising the different comments that have been raised and provides TERA's response where relevant.

The following reports have not been reviewed because they do not raise any comment on the cost modelling work conducted by TERA Consultants:

- CEG "WACC parameters in the UCLL and UBA draft decision" February 2015.
- Rural Women New Zealand "Submission on draft pricing review determinations and emerging views on backdating" 12 February 2015.
- Wigley and Company "Submission on draft pricing review determination for UBA and UCLL services" 20 February 2015.
- Snap "Submission on the Commerce Commission's Draft Determinations for UBA and UCLL services" 20 February 2015.
- Simon Green "Submission on regulated pricing of monthly copper access fees" 2 December 2014.
- Aurecon "Review of FPP Corridor Cost Analysis" CONFIDENTIAL, 10 February 2015.
- CallPlus "Submission on the Commerce Commission's Draft determinations for UBA and UCLL services" CONFIDENTIAL, 20 February 2015.
- Wigley and Company "Submission on backdating in relation to draft UCLL and UBA pricing review determinations" 20 February 2015.

# 1 Analysys Mason

## 1.1 Report

This section aims at addressing the comments detailed in Analysys Mason "Report for Chorus - UCLL and UBA FPP draft determination submission" CONFIDENTIAL, 20 February 2015.

## 1.2 Analysis of the comments regarding CAPEX

| Industry comment | TERA's views |
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| 2.3 Modelling of road width and lead-ins | Regarding the width of streets, following Analysys Mason's comment further analysis has been conducted and the outcomes of these analyses are:<br>- The vertical part of the lead in has been in fact overestimated by half the width of the road. The model has been updated accordingly.<br>- It may be the case that for some lead-ins, a single trench can be used to connect different buildings (e.g. imagine two buildings next to each other) and therefore sharing may need to be taken into account for lead in trenches. The model has been updated accordingly.<br>Regarding the length of lead-in, a 5% mark-up has been applied onto the lead-in cables and trenches in order to reflect non-linear paths from the distribution trench to the building. Mark-up has been aligned to the situation in Denmark. |
| 2.4 The horizontal lengths appear often to be measured to the wrong end of the road segment | The comment is correct and the model has been updated accordingly |
| 2.5 Mapping of buildings to road segments is not accurate | This point has been assessed and no change is needed. |
| 2.6 Number of CCTs | The number of distribution points is not underestimated and the capacity is not wrongly implemented. |

<table>
<tr><th>Industry comment</th><th>TERA's views</th></tr>
<tr><td></td><td>As specified in model documentation (section 4.3.4.3), the dimensioning of distribution points is driven by their capacity and by a maximum dwelling-DP distance.<br><br>The capacity is set to 8 buildings per distribution point (see Access model, tables "SOURCE_PARAMETERS_COPPER", entries CuMaxUGRuralLeadInBuildings and CuMaxUGUrbanLeadInBuildings and "SOURCE_PARAMETERS_FIBRE", entries FbMaxUGRuralLeadInBuildings and FbMaxUGUrbanLeadInBuildings)<br><br>For the overhead network, the capacity criteria is split between minor and major sides of the section, in order to avoid unbalanced distribution points:<br><br>▪ the number of buildings distributed by a DP must not be greater than 8;<br>▪ the number of buildings on each side of the section must not be greater than 4 (see Access model, tables "SOURCE_PARAMETERS_COPPER", entries CuMaxOHRuralLeadInBuildingsMajor, CuMaxOHRuralLeadInBuildingsMinor, CuMaxOHUrbanLeadInBuildingsMajor and CuMaxOHUrbanLeadInBuildingsMinor and "SOURCE_PARAMETERS_FIBRE", entries FbMaxOHRuralLeadInBuildingsMajor, FbMaxOHRuralLeadInBuildingsMinor, FbMaxOHUrbanLeadInBuildingsMajor and FbMaxOHUrbanLeadInBuildingsMinor)<br><br>As a consequence, the dimensioning of distribution points is slightly less efficient in the overhead network as the capacity is constrained by two criteria instead of one.<br><br>The average number of dwellings per distribution point in the draft model is around 5.5 for fibre, i.e. below the capacity (max 8 per DP).<br><br># of dwellings/DP Copper Fibre<br>OH 4.78 5.06<br>UG 5.52 5.92<br><br>In comparison, the average number of dwellings per DP in Chorus model is [ ].</td></tr>
<tr><td>2.7 Number of poles along the road segment</td><td>The comment raised by AM is reasonable and the model has been updated accordingly.</td></tr>
</table>

| Industry comment | TERA's views |
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| 2.8 Deployment of poles | The comment raised regarding poles needed on both side of the road is reasonable as the road clearance would not be respected otherwise. The height of poles should also be increased. The model has been updated for the two issues (height of poles and poles on the minor side of the section). |
| 2.9 There is no spare deployed in copper feeder cable or in fibre distribution | According to our benchmark, spare is not always needed. Especially because:<br>- The network is dimensioned based on the number of addresses<br>- The size of cables is generally greater than the demand (because for example, a 50 pair cable will be deployed if there is a need for 42 customers). |
| 2.12 The model deploys very large fibre cables aerially | Chorus did not provide the list of aerial cables. The largest fibre cable that we have seen elsewhere is 216 fibres for aerial deployment. The model includes 2 types of cables that are bigger. There are no clear reasons why these cables should not be used for aerial deployment. |
| 2.14 The modelled architecture does not ensure that critical infrastructure is well protected | The design rules provided by Analysys Mason as part of their submission were not provided during the data collection phase. However these rules have been analysed and TERA considers they are relevant.<br>With such a design rule, a more expensive trench should be used for the parts of the network where there are more than 5,000 fibres.<br>The trenches unit costs have been updated to take into account reinforcement costs for such trenches, and the model have been updated accordingly. |
| 3.1 Copper and fibre cabling | In the draft model, we have used the data provided by Chorus during the data collection phase.<br>Regarding copper and fibre cabling costs:<br>• First, Chorus did not provide "overheads", "handling fees", 'hauling fees" or any mark-ups. In Analysys Mason comments, there is no figure for such costs.<br>• Secondly, Chorus did not provide any installation cost although it was requested in the data request. Analysys Mason describes a file with the installation cost of copper cable but this file has not been sent to TERA. Thirdly, the unit cost suggested by Analysys Mason to replace the unit costs of the 2 fibre and the 4 fibre cables is a composite cable made of 2 fibres and 4 pairs. This unit cost can |

| Industry comment | TERA's views |
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| | therefore not be used.<br>As a consequence of those data discrepancies, TERA has updated cable unit costs according to those used in the model developed by Analysys Mason, assuming those unit costs are inclusive of all costs related to cabling. |
| 3.3 Trenching | For most of the comments, TERA does not have any opinion.<br>Analysys Mason states that the calculation that uses road section lengths to blend the trenching costs contain proportionately too much non-urban length leading to too low a blended cost.<br>If the non-TSO areas are excluded, the unit cost of trenches should indeed be computed over the TSO areas only. If the model uses a share of aerial deployment defined at the national level, then it is not possible to assess a different share for urban areas and rural areas for computing the blend. If the share of aerial deployment were to be defined at the MDF level, then the blend should be updated. The model has therefore been updated accordingly.<br>Analysys Mason states that row 64 of the Soil-specific trenching cost needs to be corrected.<br>There is indeed a discrepancy between the model documentation and the trenching unit cost file. The model documentation has been updated accordingly. |
| 3.4 Other costs | Joints: design has indeed been excluded from the unit cost as the scope to include was very unclear. However, if these costs are not recovered elsewhere, it seems reasonable to update the unit costs. After having checked that these costs were not already recovered by indirect CAPEX, the model has been updated accordingly..<br>Street cabinets: Chorus did not originally provide any unit cost for cabinet. Analysys Mason provided values in its response to the consultation and therefore the model has been updated accordingly.<br><br>CCT and FAT: Chorus has indeed provided unit costs for these assets. The model has been updated accordingly (source: 20140821_Confidential_B3_C_Q 3.7 Fibre and copper cabinet nodes and cable terminals.pdf)<br>Street cabinets: For the same reasons as for joints, design costs were excluded. It seems reasonable to include them. The model has been updated accordingly. |

| Industry comment | TERA's views |
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| 4.1 The indirect capital costs of installing active equipment need to be included | The unit costs of the SHDSL cards used in the UBA model did not include the installation costs described by Analysys Mason. The model has therefore been updated accordingly, using data provided by Chorus. |
| 4.2 Including traffic throughput | Traffic increase over the price control period has been taken into account and assets are dimensioned on this basis. |
| 4.4 Calculation of SFPs | TERA agrees that the model should indeed include one SFP for each DSLAM sub-rack. The model has been updated accordingly. |
| 6.1 The 250 kbps throughput assumed is insufficient for 2019 | The model has been updated to include allowance for future growth and growing traffic.. |
| 6.2 Many of the modelled premises will in fact not be servable | In the hard lockdown model, FWA coverage is based on distance to active nodes (active cabinets or MDF).<br>FWA costs are modelled separately using Vodafone's RBI sites.<br>It is assumed that the modelling based on Vodafone's RBI sites provides a good estimate of costs per Mbps for the FWA network, relevant to the actual coverage modelled. |
| 6.3 Not all relevant cost components have been included in the FWA modelling | The customer equipment, similarly to the ETP, are out of the scope. This is why they are excluded.<br>The unit cost of the FWA sites includes the cost of all passive and the active equipment. |
| 6.5 FWA opex is undocumented and too low | It is based on the data provided by Vodafone. This is why it is not disclosed. These opex includes proactive and reactive maintenance. The cost is based on a supplier agreement per base station. This value has then been multiplied by the number of FWA sites. |
| 6.6 FWA backhaul assets are deployed even in the FTTN/copper model | The model includes some FWA assets as the FWA sites exist even if they are not used. These links should be part of the fibre leased lines that has not been provided by Chorus. |

## 1.3 Analysis of the comments regarding OPEX

| Industry comment | TERA's views |
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| Application of LFI adjustment to too many opex cost categories (§5.1) | • TERA believes it is indeed reasonable not to apply efficiency adjustment to "Alcatel Lucent maintenance" as this corresponds to network operations centre costs and not to access network faults. |

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| | • TERA believes it is indeed reasonable not to apply efficiency adjustment to "Engineering services" as this corresponds to power equipment support costs and not to access network faults.<br><br>The model has been updated accordingly. |
| An increased proportion of aerial access network will lead to higher opex (§5.2) | Based on the ARMIS analysis (US report), Analysys Mason explains that aerial OPEX are more than 50% higher than underground ones. Even if the ARMIS study is relatively old, TERA agrees that higher % of aerial can in theory lead to higher opex (LFI tends to be higher).<br><br>When setting the target LFI, the following formula is used: Target LFI NZ = Target LFI Ireland x real LFI NZ / real LFI Ireland.<br><br>This does not account for overhead % difference between the real network and the modelled network (Real network: circa 5% of aerial - Modelled network: 47% of aerial).<br><br>TERA has observed elsewhere (source of data confidential) that Aerial LFI = Underground LFI + 4.0%. A 4.0% x (47% - 5%) adjustment has then be added to current target LFI to account for increased use of aerial deployments as compared to real network. This would move target LFI from 9.9% to 11.6% (real network LFI=15.8%).<br><br>However, new figures have been published showing that Eircom is struggling to meet the target LFI (12.8%) due to a force majeure event (massive storms) for its real network that we have used in the modelling. Its LFI is 16.4%[1] for now. This new input has also been taken into account (on top of the aerial deployment assessment) this leads to a 9.4% target LFI for New Zealand. |
| Fibre technology adjustment - Size of adjustment (§5.3.1) | Analysys Mason considers that the 50% discount on copper Opex in order to derive fibre is excessive and provides a number of studies to support this statement.<br><br>Not all studies provided by respondents appear reasonable (e.g. Portugal Telecom example only provides data on the number of technical calls and says nothing on the |

[1] http://www.comreg.ie/_fileupload/publications/ComReg14128.pdf

| | |
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| | corresponding costs).<br><br>It seems reasonable to use the median of the studies proposed by the different respondents, that is to say 40%:<br><br>o AGCOM (provided by TERA) – 50%<br>o FTTH Council (provided by Analysis Mason) – 20%<br>o Plum (provided by Analysis Mason) – 40% (median figure)<br>o Ovum (provided by Analysis Mason) – 50%<br>o Australian NBN (provided by WIK) – 35% |
| Fibre technology adjustment - Size of adjustment (§5.3.2) | Analysys Mason says there is a possible double counting if applying both the LFI efficiency adjustment and the fibre discount as compared to copper. Even if studies used to derive the opex fibre adjustment are not very clear on the scope of costs considered and whether they compare a fibre network with an old copper or a new copper network, Analysys Mason's comment is reasonable. As a consequence, the model has been updated to apply the fibre adjustment factor directly to Chorus OPEX (not after the adjustment for a new copper network). |
| Allocation key used for non-network expenses (§5.4) | • TERA Consultants disagrees with Analysys Mason when they say that allocating non-network expenditures between regulated and non-regulated services based on revenues and then allocating between regulated services with an EPMU approach is inconsistent. It should be noted that for the 1st allocation, revenues is a proxy for the EPMU approach as the EPMU approach cannot be modelled (2nd best approach).<br>• TERA Consultants agrees that non-network costs EPMU allocation should be performed based on both annualised CAPEX and OPEX already allocated (and not only based on OPEX). The model has been updated accordingly. |

# 2 WIK Report

## 2.1 Report

This section aims at addressing the comments detailed in WIK-Consult "Submission in response to the Commerce Commission's Draft pricing review determination for Chorus' unbundled bitstream access and unbundled copper local loop services including the cost model and its reference documents" CONFIDENTIAL, 20 February 2015.

## 2.2 Analysis of the comments regarding CAPEX

| Industry comment | TERA's views |
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| Use of existing ODF locations in the FTTH network and the existing sites of the FWA (§65) | This is consistent with the network optimisation approach selected by the Commission. |
| Bandwidth generates different costs therefore the cost of the different UBA services should be different (§85) | We do not agree given the scope of the UBA service in New Zealand. Speed has very little impact on costs because there are 1Gbps links per DSLAM |
| The cost of UBA varies geographically (§90) | This is correct. However it is not possible to make a different price for each region. (How would we derive the cost of a line going through several MDF areas?) |
| Network optimisation (§§94- 96) | There is no ring in the core network due to the country topology. Instead the network is a tree network. The European standard does not apply to a core network in New Zealand.<br>With respect to Ethernet leased lines we have used the best approach available to us based on the information we have. Ideally, we would implement high speed ethernet leased lines, so we seek submissions on the number of high speed Ethernet leased lines customer per EAS and per speed. |
| The network is under-dimensioned due to the limit at the FDS (140 kbps per customer at peak hour) (§98) | See below (paragraph 270 to 273) |

| Industry comment | TERA's views |
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| 2.4 Network dimensioning | |
| Exchange areas should have been redefined (to follow the approach used for cabinet) (§114) | The comment is relevant and the boundaries of exchanges have been removed and optimised on the basis of Voronoï approach. |
| 7,011/7,111 dwellings served by FWA are outside TSO areas (§125) | According to ComCom decision, FWA coverage is restrained to TSO areas in the hard lockdown model. |
| FWA, MW, Submarine, DWDM, coverage of the exchanges, location of copper cabinets, topology of the core network (§§126-128) | These points are discussed below under "Modelling the core network". |
| The shortest path algorithm should not be used instead the augmented shortest path should be used (minimizing the length and therefore the cost of trenching). (§§130-136) | TERA has tested the impact of the augmented shortest path algorithm and has observed that this would significantly increase the length of copper cables, therefore offsetting the decrease in costs generated by the decrease in the length of trench and poles. Overall costs would increase. TERA believes that the shortest path algorithm remains the most relevant and efficient. |
| Modelling OPEX (§§137-145) | See review of comments related to OPEX (section 2.3). |
| Location of cabinets should be optimized. Boundaries of MDF area should also be optimized (§155) | In the network optimisation approach used by the Commission, modelling is based on actual location of cabinets and actual MDF coverage areas.<br>The model has been however updated with optimized MDF areas (optimization based on the fibre network). |
| MDU should not have a dedicated cable for lead-in (§157) | These points are discussed below as part of the answer to sub-section 5.4.5 of the WIK report "Use of adjacent larger fibre cables appropriate and more efficient". |
| One road crossing for 2 buildings instead of for each building (for the selection between trenching on one side or trenching on two sides) (§158) | If buildings are not next to each other, it is not possible (impact is however negligible) |
| Size of the trench is uniform along the sections/ lead-in share of the trench size is the same on major and minor sides (§159) | The *relative* share of trench allocated (the allocation key) to lead in differs in the major and minor sides, while the *absolute* lead-in share of trench (space occupied by lead in ducts) is assumed the same on the major and minor sides. |

| Industry comment | TERA's views |
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| | This leads to different shares allocated to lead in, as other network levels differ from major to minor side.<br><br>This assumption reflects that the average number of lead-in ducts along the section stems from the number of lines passed per distribution point, not from the total number of lines along the section.<br><br>It is then assumed than there is the same number of lines passed per distribution points on the major side and on the minor side. |
| Similar model deficiencies as for modelling the copper network (§§177-180) | Same as §§155-159 above. |
| FWA sites should be computed. Vodafone sites cannot be used (§189) | WA costs are first modelled according to Vodafone, assuming each cell is at full capacity (22 Mbps), which corresponds to an efficient network costs: a cost per Mbps is then deduced.<br><br>The FWA coverage is modelled separately, based on distance criteria (note that FWA coverage is restrained to TSO areas)<br><br>The actual costs are then inferred from the aforementioned cost per Mbps and the FWA coverage. |
| If LTE is kept, peak throughput should be increased to 35 Mbps (§191) | In the updated model, the peak throughput has been increased from 16.7 Mbps to 22 Mbps. |
| TERA is assuming a standard configuration of three sectors per site Therefore the assumed capacity constraints support to serve 3 x 67 customers per site (§193) | The model connects indeed 67 customers per sector and not per site |
| FWA sites should be shared with mobile operators and thus the cost should be divided by the number of operators (§§199-200) | The comment is relevant and correct and the model has been updated accordingly. |
| Inconsistencies between the fact that the paths have been optimized and the use of the actual DWDM, MW or submarine links (§205) | There is indeed an inconsistency between the fact that the actual DWDM, MW and submarine links have been used and the optimization of these links. It should first be noted that this has almost no impact on the outputs given the very low investment required. The number of submarine links should be computed. The MW links should be |

| Industry comment | TERA's views |
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| | removed. However the DWDM links should be kept as it is quite difficult on a modelling perspective to assess whether such a link would be required or nor. |
| Model does not include traffic and does not achieved the relevant economies of scale as some services have been forgotten (TES, Ethernet leased lines, UFB customers) (§206) | Traffic is not needed and all the services quoted by WIK have been included for computing the relevant economies of scale. The services quoted by WIK do not use the DSLAMs and therefore use different fibres and costs are thus allocated to these services separately. |
| The full core network hierarchy needs to be optimized in order to optimize the trench network dedicated to the core network (§206) | Not consistent with the network optimisation approach used by the Commission and the actual location of the handover points. |
| Location of the FDS should be optimized (§210) | Not consistent with the network optimisation approach used by the Commission and the actual location of the handover points. |
| Data sources not always documented (§§221-223) | This comment has been considered when updating documentation. |
| Benchmark and other sources not revealed (§§224-226) | Benchmarks are based on confidential data and cannot be published. |
| Assets not sufficiently described in the model (§§224-226) | This comment has been considered when updating documentation. |
| Same ducts are used for copper and fibre leading to overestimate the cost of the fibre access network (§229) | Same ducts are used but the number of cables that can be installed changes as it is computed in the model. The size of the sub-duct has been updated to the value recommended by WIK. |
| The different types of manholes should have been modelled. The average unit cost of a manhole should have been computed in the model and not in the input spreadsheet (§230) | The modelling of the different types of manholes does not bring any more accuracy to the model. It is therefore an un-needed complexity. The weight for the average is based on a benchmark. |
| Error of currency change in unit cost calculation in the inputs (§232) | There was indeed one mistake in a formula: the unit cost of the asset named "SubRack Exchange" should decrease by 15%. The model has been updated accordingly. |
| Fibre is the cheapest network only because the SLUBH has been removed (§§233-235) | The cost of the fibre and copper network has to be compared on the same basis, i.e. they should have the same scope. This is why the SLUBH cost is removed from the cost of the fibre network. |

| Industry comment | TERA's views |
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| Cost of handover point should be excluded from the core model (§236) | Cost of handover points is excluded of the model. However handover points are modelled in order to capture the relevant economies of scale. |
| Inconsistencies between the model (§239) | The number of lines used in the Opex model is not the same as in the UBA model. Indeed, the Opex are based on Chorus 2013 accounts. Therefore the number of lines that is taken into account in the Opex model is the number of lines in 2013. The number of lines that is used in the UBA model is the number of lines in 2014 as it is the latest data available.<br><br>Therefore it is not the opex per line that is used when exporting the Opex results to the UBA model but the total Opex. The slight difference identified by WIK is therefore neither a mistake nor an inconsistency. |
| Opex model uses some allocation keys derived from the core model (§240) | This is true. There is no way to avoid this effect. |
| Discrepancy between the Opex and the UBA models regarding the number of lines (§241) | See answer to §239 above. |
| Increase/decrease of FDS capacity increases/decreases UBA cost (§§242-243) | TERA has not been able to carry out the same analysis as WIK as when the capacity of the FDS-7 is set to 14, the price decreases by 0.01%.<br><br>The overall results are consistent:<br><br>• When the capacity is decreased, the price decreases as less FDS-7 are deployed and more FDS-12. This new combination allows to decrease the total investment by 412 kNZD explaining the price decrease;<br>• When the capacity of the FDS-7 is increased, this creates an issue as its capacity becomes above the capacity of the FDS-12. The formula choosing between the FDS-7 and the FDS-12 is not adapted for this case. However, the results show that the total investment decreases by 27 kNZD which explains the price decrease. |
| When changing the unit cost of fibre cables and joints, the copper investment and price changes (§§244-245) | This is due to SLUBH which is made of fibre. |

| Industry comment | TERA's views |
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| OPEX cost calculations bear a high risk of double recovery (§256) | See review of comments related to OPEX (section 2.3). |
| Network OPEX and OPEX for transaction services not always separated (§§257-264) | See review of comments related to OPEX (section 2.3). |
| Most of the time, one sub-rack is sufficient (and therefore one 1 Gbps link) (§267) | Most of the time, solely one rack is indeed needed (in 5,472 cabinets out of 5,496). The recommendation of WIK to include a one sub-rack cabinet seems therefore reasonable. The model has been updated accordingly. It has however no impact on the backhaul as only one cable was used for each cabinet (one fibre for each sub-rack but these fibres are part of the same fibre cable). |
| Size of FDS and racks not appropriately dimensioned (§269) | See answer to §§242-243 above. |
| Wwith traffic increase, the 1 Gbps link may not be sufficient. The model should therefore include traffic forecasts (§270) | The model has been updated to include traffic forecasts. |
| FDS capacity should be dimensioned also based on traffic as there are only 140 kbps per end-customer which is 50% less than what customers experienced today (§271) | The model has been updated according to appendix G of Chorus report. |
| Switches should have a higher port densities and a wider spread of FDS size should be used (§272) | First, WIK does not provide any data. Second, the choice of FDS is quite difficult as it depends on the type of architecture that the operator wants to achieve. As the UBA model contains solely the scope relevant to provide the UBA service, it is difficult to assess precisely the architecture needed. Finally, the price can change from one country to another and no price has been provided by WIK. |
| Backhaul should be allocated based on the traffic even if it is not the real cost driver (§273) | This would be inconsistent with the capacity based allocation approach. |
| For fibre, the 110 mm duct is used for lead-in (§275) | The 50 mm duct is used for the fibre lead-in contrary to what WIK states |
| Several diameters should be used for sub-ducts (§277) | Several diameters of subducts are used in the hard lockdown model: 14 mm and 40 mm (outer diameter). Large subducts are used when cable size excess small subduct capacity (8.5 mm). |

| Industry comment | TERA's views |
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| | As cables smaller than 24 fibres fit in small sub-ducts, small sub-ducts are used in most of the cases.<br>In the UCLL cost model, the aggregated length of sub-duct is taken into account in the inventory. The unit cost used is the weighted average cost of a small and a large subduct. |
| Using a smaller sub-duct than the 32 mm sub-duct would decrease the cost of trenching (§279) | The diameter of the sub-ducts indeed directly impacts the cost of trenching. Choosing more appropriate sub-ducts would thus decrease the cost of trenching. As explained above, this has been achieved by using different types of sub-ducts. |
| One lead-in cable per dwelling not efficient for MDU (§280) | TERA is of the view that having one single cable per MDU which is then split for each premise increases the need for joints/distribution frames and therefore can be very expensive. This has not been modified.. |
| The cables used for the SLUBH should be shared between several DSLAMs when sharing the same path instead of using parallel cables. 12F cable not needed, smaller cables could be used (§283) | This is agreed. The model has been updated accordingly. |
| Same for FWA. It should be merged with SLUBH cables (§284) | This is agreed. The model has been updated accordingly. |
| Backhaul should be underground. When the backhaul is UG, the access network should share the same trench (§285) | This is already the case in the model |
| Fibre cables for core should be merged with core and FWA (§286) | This is agreed. The model has been updated accordingly. However, the core network uses separate cables for resiliency purposes. |
| Larger fibre cables than the 312F cables are available on the market and should be used (§287) | Asset list provided by Chorus has been used. 312F is already a rather big cables not often used elsewhere |
| Due to lower weight, the maximum distance between 2 consecutive poles should be longer for fibre than for copper (§290) | That is in theory right, but we are using poles that are relevant for electricity too (because shared with them) and therefore the constraint is mainly driven by the electricity network. |
| Boundaries of exchanges have not been optimised although not efficient due to the | The comment is relevant and the boundaries of exchanges have been removed and |

| Industry comment | TERA's views |
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| history of the network roll-out (§299) | optimised on the basis of Voronoï approach. |
| For fibre, the number of exchange areas should have been optimized. The location of the FDS should be optimized (§§300-302) | This would be inconsistent with the network optimisation approach used by the Commission. Also, there is no description of how this would be optimised. For example, the locations could be at a very small number of locations but then this would increase the impact of one FDS failure for example. In any case, this would rebalance costs from UCLL to UBA or vice versa with no impact on the sum. |
| The number and location of the SC should be optimized (§303) | This approach would be inconsistent with the network optimisation approach used by the Commission. Also, the criteria to define the relevant location of SC could be very various and would not necessarily be able to reflect New Zealand specificities. |
| The core network hierarchy should have been optimized (§304) | This approach would be inconsistent with the network optimisation approach used by the Commission. Also, the criteria to define the core network hierarchy could be very various and would not necessarily be able to reflect New Zealand specificities. In particular, it is important to note that the structure of Chorus' core network is very different from the one observed in other countries because UBA stops at the first data switch. |
| SLUBH and FWA fibre cables could be deployed OH (core cables should always be UG) (§305) | This is agreed, the model has been updated accordingly. |
| Size of cables for SLUBH, FWA and core should be decreased (§306) | This is agreed, the model has been updated accordingly. |
| The SLUBH and FWA cables should be merged (not installed in parallel) (§307) | This is agreed, the model has been updated accordingly. |
| Parallel core cables should be merged (§308) | No for resiliency purposes, several parallel core cables can be needed. |
| Size of the chambers is not modelled (§§311-317) | Size of the chambers is modelled in the hard lockdown through unit cost determination. The average unit cost of chambers is the weighted average of different sizes of manholes, from pit to large manhole (1200x1200 cm).<br>The following joint capacity is assumed:<br>• Pit: no joint;<br>• 600x600 manhole: one joint; |

| Industry comment | TERA's views |
|---|---|
| | • 600x1200 manhole: two joints;<br>• 1200x1200 manhole: three or more joints.<br>Weights stem from the Access model.<br>The Unit costs model has been updated accordingly. |
| MDU should be accessed by a single cable and not multiple cables (§319) | See previous answer |
| No efficiency consideration conducted for non-network cost (§§320-326) | See section about OPEX (§2.3) |
| Chorus actual submarine links should not be used but optimized (§§320-326) | This would have no impact and WIK does not provide any approach to do so |
| DSLAMs and FDS should include some spare capacity (85%-90% for FDS and 70%-80% for DSLAMs) (§333) | TERA agrees with this comment .The model has been updated accordingly. |
| No spare capacity in feeder segment of the copper network (§334) | See answer to §333 above |
| No spare capacity in fibre access cables (§335) | See answer to §333 above |
| No requirements on network resilience considered for core network (§§336-337) | There is indeed no resilience. This is a specificity of New Zealand and is due to the way Chorus network has been built. European standards do not apply here. |
| Technical computation problems (§338) | These comments do not have any impact on the quality of the results and data flows from one model to another downstream remained unchanged. |
| Assets should be based on the up-to-date assets and based on all operators and not solely on Chorus data (§§340-342) | Mixing the costs of different suppliers is not possible because some suppliers show higher CAPEX but lower OPEX and vice versa. Also, Chorus' data is a relevant source of information since it is the operator in New Zealand with the greatest bargaining power. |
| List prices are not the purchase prices of equipment. Discounts between 20% and 40% are typically applied (§§343-344) | The unit prices provided by Chorus are Chorus unit price Delivered Duty Paid. Discounts are thus already accounted for. |
| Ducts are cheaper in Denmark compared to NZ (§345) | The scope of cost is not the same therefore the comparison made by WIK does not hold. The cost of ducts includes the installation cost in NZ whereas in Denmark it is included in the cost of building the trench. |

| Industry comment | TERA's views |
|---|---|
| Ducts are more expensive than the prices provided by Vodafone. The subducts price should be lower than the linear extrapolation made by TERA (because there is lower quality for sub-ducts compared to ducts) (§346) | The scope of cost is not the same therefore the comparison made by WIK does not hold. |
| Fibre cable surplus is too high compared to benchmark and to the data provided by Vodafone (§§349-350) | The values have been updated in the model based on Vodafone submission. |
| Manholes are too expensive (benchmark with Denmark) (§§357-358) | Manholes are indeed more expensive than in Denmark. The distribution between the different types of manhole has been revised to compute the exact unit cost of manholes relevant to New Zealand (see answer to §§311-317). |
| Sites are too expensive compared to Europe (§§360-363) | This is due to the site costs in New Zealand (anti-seismic sites, mast configurations, etc.). Comparison with Europe does not hold. |
| Several configurations of active assets should be available depending on the traffic (§363) | The generic assets have been selected in order to match the most representative configuration of the country based on the available assets list provided by Chorus. The impact of the traffic on FDS is negligible and its dimensioning is based on the number of ports required. However in order to take into account the DSL traffic growth, some flexibility has been introduced by allowing the DSLAM to host a second backhaul SFP. |
| WIK would like the model to differentiate between ADSL and VDSL cards (§366) | Chorus has stated that ADSL cards were not deployed anymore but only VDSL-compatible cards. In order to validate this statement, the inventory of DSL cards provided by Chorus - which includes DSL cards deployed several years ago - has been analysed. It shows that [ ] of currently installed cards are VDSL cards. Therefore it has been considered that the deployment of a modern network would only use VDSL-compatible cards. |
| The different configurations in the NZ model are more expensive than the same configurations in Europe (§367) | The configurations provided by WIK are indeed cheaper. However, no unit cost has been provided by WIK but total costs only for a given number of customers. Also the source of the data is not clear and it is not clear whether WIK is mixing different suppliers, different countries, etc. |

| Industry comment | TERA's views |
|---|---|
| The number of ports computed for the FDS is wrong (§§370-372) | This is agreed and has been updated according to the engineering rules provided by Chorus in appendix G of their report. |
| The switch that has been selected is overdimensioned (100 Gbps switch when 30 Gbps switches are sufficient) (§373) | The list of assets is based on the list provided by Chorus. This choice has been made to reflect the local context. Also, Chorus is one of the operators in New Zealand with the greatest bargaining power. |
| The sheet "Q6.17.12 (a) – ISAMs" reveals that Chorus delivered more differentiated system configurations than used in the model (§374) | The ISAM configurations that have been kept in the model are a balance between choosing appropriate assets, modelling complexity and impact of the results. There is no need to add a new configuration that will impact the complexity of the modelling and at the same has no impact on the results. To be noted that having very standard configurations allow to increase the bargaining power and therefore decreases the unit cost of the assets and decrease also the operating and the maintenance costs. |
| WIK severely doubts that the computation is adequate (especially the [ ] NZD that is a fixed investment for all exchange) + the regression analysis made in the input files (§§376-378) | Except that WIK states they do not agree with the fixed investment of [ ] NZD per site, no data is provided. |
| The fibre network should be optimized in order to decrease the length of the trench network and not to decrease the length of the fibre cables (§§380-382) | This is agreed. The FWA and SLUBH cables have been further optimized to decrease the length of trench. |
| Inclusion of irrelevant costs (§§383-387) | See analysis of comments related to OPEX (section 2.3) |
| Sharing of cables in feeder and distribution segment not efficient (§391) | See answer to §§380-390 above |
| FWA sites should be shared with mobile operators (§393) | This has been updated in the model since the unit cost provided by Vodafone is for sites designed for sharing. |
| The parameter sets to 2/3 is incorrect as most of the DSLAMs have only 1 sub-rack so only 1 fibre is needed and not 2. Leased lines would also need more fibres (§394) | These parameters have been reviewed to be based on the revenue generated by the considered links. The allocation factor will consider the share of revenue generated by the UBA. |

| Industry comment | TERA's views |
|---|---|
| 395: The value of the macro-parameter for leased lines has not been justified (§395) | Chorus did not provide any data. We therefore had to use data from other access TSLRIC cost models where information is unfortunately confidential. If operators want to provide additional data, they are welcome. |
| The service base allocation leading to allocate 1/3 to UBA of the cost of the link between DSLAM and FDS is wrong (§398) | These parameters have been reviewed to be based on the revenue generated by the considered links. The allocation factor will consider the share of revenue generated by the UBA. |
| WIK recommends allocation 1/3 to UBA and 2/3 to leased lines (§399) | These parameters have been reviewed to be based on the revenue generated by the considered links. The allocation factor will consider the share of revenue generated by the UBA. |
| Overheads are allocated based on OPEX. It should be allocated based on annual cost, i.e. annual CAPEX + OPEX (§402) | See analysis of comments related to OPEX (section 2.3) |
| Non-network costs are too high (cf. mark-up) (§404) | See analysis of comments related to OPEX (section 2.3) |
| Allocation rules for active cabinets not appropriate (§§405-406) | See analysis of comments related to OPEX (section 2.3) |
| Spare is needed in the feeder part of the copper cable but it should be lower than the distribution part (§407) | According to our benchmark, spare is not always needed. Especially because:<br>- The network is dimensioned based on the number of addresses<br>- The size of cables is generally greater than the demand (because for example, a 50 pair cable will be deployed if there is a need for 42 customers). |
| Allocation of IT costs implausible and unsupported (§§408-410) | See analysis of comments related to OPEX (section 2.3) |
| Inappropriate cost allocation (§411) | See analysis of comments related to OPEX (section 2.3) |
| Difference between the number of active lines in the OPEX model and in the UBA model (§§414-418) | This is due to the fact that OPEX data is from 2014 and therefore to calculate a consistent cost per line, number of lines of 2014 must be used while the UBA model is based on latest information |
| The network is dimensioned for 113.5% of the actual demand (§419) | An access network is dimensioned for the whole country to pass all address points in the country and not only for the active customers. |

| Industry comment | TERA's views |
|---|---|
| The number of copper connections used by TERA is lower than the projection provided by Chorus ([ ] vs [ ]) (§421) | [ ] is the total number of copper access lines whereas the [ ] figure includes also fibre connections. |
| The demand should include the leased line demand, the bounded lines and special data access line services (§§422-423) | Leased lines demand is included |
| WIK does not agree with the macro-parameter used to allocate some costs to leased lines (access part), with the 1/3 and 2/3 ratios used to allocate cost to UBA for respectively the link between FDS and DSLAM and the link between DSLAM and cabinet (§§424-431) | See previous answers. |
| The terminating part of international leased lines should be included to capture the relevant economies of scale (§§432-433) | Leased lines data have not been provided by Chorus although it has been requested. But we have assumed 5% of infrastructure cost allocated to leased lines |

## 2.3 Analysis of the comments regarding OPEX

| Industry comment | TERA's views |
|---|---|
| Overall OPEX approach (§137-139):<br>Network modelled is very different from Chorus' real network corresponding to the accounts, mainly concerning the age of the network | This is true and this is why efficiency adjustments are performed. |
| Overall OPEX approach (§137-139):<br>Using a unique source for LFI adjustment is highly questionable | To the best of our knowledge, this is the only available input. WIK proposes no alternative. |
| Chorus accounts are not relevant for FWA (§140) | TERA confirms that FWA OPEX is based on Vodafone inputs. The model documentation has been updated to make it clearer. |
| Chorus accounts are no relevant for fibre + 50% adjustment is highly subjective (§140) | No NZ based fibre OPEX inputs are available. This is why a pragmatic approach has been adopted. |
| Top down approach for OPEX needs to ensure double counting and irrelevant costs are avoided (§141-142) | The Commerce Commission has tried to follow these principles when conducting an analysis of Chorus raw data. There is no "general approach to avoid double counting". |
| Oversea travels should be excluded (§143a) | All Chorus activities take place in New Zealand. Therefore there is no reason to exclude these activities just because these are "oversea travels". |
| Costs of advertising should be excluded as they should be 100% allocated to non-regulated products. (§143b) | This is agreed. Advertising costs have been removed in the model. |
| Modelling choices are not documented enough in the model (§144) | TERA is of the view that the documentation of modelling choices is in line with international best practices |
| Best option to assess OPEX is mark-up on CAPEX (§145):<br>According to WIK, these should be based on international benchmark. | TERA disagrees with this comment since OPEX needs to be representative of the New Zealand context, and of Chorus network architecture choices (for example, Chorus core network is very different from integrated incumbents). Also, using mark-up from other NRA countries does not enable us to know how these mark-ups have been constructed. |
| Overhead on Chorus maintenance contracts not justified (§ | Chorus has selected service companies on the basis of a competitive process. It is noted |

| | |
|---|---|
| 146-147):<br><br>WIK states that service companies' fees include overheads as well as Chorus and that this may imply a double recovery. They state the use of service companies may not be the most efficient option (as compared to Chorus doing the maintenance internally). | that LFCs are doing the same and also make use of service companies. As a consequence, it cannot be said that it is not efficient. This is also a common process for many incumbents. |
| Risk of double recovery with transaction charges (§148) | Maintenance costs are allocated to network elements in "maint alloc" sheet and then allocated to services that make use of these network elements. Costs that are corresponding to non-recurring charges are considered apart (sheet "provisioning allocation" and are not captured in the rental charge calculation. As a consequence, the risk of double recovery is very limited. |
| OPEX cost calculations bear a high risk of double recovery (§256) | WIK provides no example where over recovery happens. Installation costs are treated directly in the capex model. |
| Network OPEX and OPEX for transaction services not always separated (§257-264) | TERA Consultants has tried to isolate non-recurring charges and not to include them in the rental (see for example "provisioning allocation").<br><br>With respect to "IT network expenses", TERA has reviewed IT costs with new information provided by Chorus (provided as part of Chorus UCLL and UBA models) and has updated the model accordingly. |
| No efficiency adjustments performed for non-network or common or overhead costs (§320-322) | TERA has performed an efficiency adjustment based on LFI and has disregarded non-relevant cost categories. At this stage, TERA has not found any evidence of other adjustments being required. This comment is a very general comment and it is not possible to identify any relevant adjustment on this basis. |
| Salesmen costs should be allocated based on the products they are selling (§323) | Corresponding data is not available to conduct such an allocation of costs. |
| IT costs should be allocated to network elements (§323) | TERA disagrees with the comment since there are also non-network IT costs (billing…) so TERA believes that the allocation key that has been used is the most relevant. |
| OPEX Mark-ups should be assessed based on a national benchmark of NZ operators or an international benchmark of cost models (§324) | • If figures from New Zealand operators are used, the same efficiency issues would arise: how can we know that these figures are efficient? Also, they are not necessarily relevant for Chorus network architecture. The current approach is more robust for the New Zealand context. |

| | |
|---|---|
| | • TERA disagrees with the use of international benchmarks in this specific case since OPEX need to be representative of the New Zealand context, and of Chorus network architecture choices (for example, Chorus core network is very different from integrated incumbents). Also, using mark-up from other NRA countries does not enable to know how these mark-ups have been constructed |
| WIK criticises the current level of OPEX (§325-326) | The Issues reported by WIK are now not relevant since EPMU has been applied based on OPEX+CAPEX already allocated. |
| Exclusion of irrelevant cost for non-network cost not transparent (§383) | The level of documentation is in line with international best practices and there is very limited room to enhance it because this depends on details of Chorus costs. |
| Regulatory levies should only be allocated to regulated products. (§383) | It is not clear why non-regulated products would not be allocated a share of regulatory levies (e.g. operators that have no SMP and have no regulated products can face regulatory levies; these would be allocated to non-regulated products). TERA disagrees with WIK comment. |
| Exclusion of non-relevant opex cost non transparent (§384-386) | No examples of errors have been provided by WIK. Capitalized installation costs and provisioning costs are not included in the calculation of recurring charges as these fall out of the scope of the OPEX calculation (provisioning costs are captured in the NRC charges whereas capitalized installations costs are captured within the CAPEX model). |
| Non network cost are allocated on the basis of OPEX and not on total attributable cost (§400-403) | TERA Consultants agrees that non-network costs EPMU allocation should performed based on both annualised CAPEX and OPEX already allocated (and not only based on OPEX). The model has been updated accordingly. |
| Common costs too high(§404) | Comment noted but no proposal is made to amend current calculation. No change made. |
| IT allocation costs (§408-410) | With respect to “IT network expenses”, TERA has reviewed IT costs with new information provided by Chorus (provided as part of Chorus UCLL and UBA models) and has updated the model accordingly. |
| Inappropriate cost allocation (§411) | TERA has reviewed IT costs with new information provided by Chorus (provided as part of Chorus UCLL and UBA models) and has updated the model accordingly. The allocation key “Direct UCLL/UBA” is not used anymore. |

# 3 Chorus Report

## 3.1 Report

This section aims at addressing the comments detailed in Chorus "Submission for Chorus in response to Draft Pricing Review Determinations for Chorus' Unbundled Copper Local Loop and Unbundled Bitstream Access Services and Process and Issues Update Paper for the UCLL and UBA Pricing Review Determinations" CONFIDENTIAL, 20 February 2015.

The comments raised in this report that are already addressed in another report have not been analysed in this section.

## 3.2 Analysis of the comments regarding CAPEX

| Industry comment | TERA's views |
|---|---|
| §93.2 25% spare in the distribution and 30% spare in the feeder for the fibre network | The fibre network does not include any spare capacity in the distribution part whereas the copper network includes 11% spare capacity. This is because the fibre network is already dimensioned for all addresses and because the number of cables is limited which makes that their size is always greater or equal than the demand which means that spare capacity is automatically accounted for. |
| §152 Average pole span is 40m | The maximum distance between two consecutive poles has indeed been set to 65m in urban areas and 100m in rural areas. These rules have been set according to the data provided by Chorus during the data collection phase. The average span between 2 consecutive poles is therefore below these limits. It is reduced by the number of poles required for CCT or FAT. Comparing the average span with the maximum distance between 2 poles is not a relevant comparison. |
| §164.1 The 250 kbps throughput allowance per customer should take into account future growth | The model has been updated to include allowance for future growth and growing traffic. |
| Demand profile | Chorus submission in paragraph 300 is wrong. Chorus states that this is inconsistent with |

| Industry comment | TERA's views |
|---|---|
| | EU but the latest EU recommendation from September 2013 states*: "Active copper lines are decreasing due to customers migrating to cable, fibre and/or mobile networks. Modelling a single efficient NGA network for copper and NGA access products neutralises the inflationary volume effect that arises when modelling a copper network, where fixed network costs are distributed over a decreasing number of active copper lines. It allows for progressively transferring the traffic volume from copper to NGA with deployment of and switching to NGA. Only traffic volume moving to other infrastructures (for example cable, mobile), which are not included in the cost model, will entail a rise in unit costs*." |
| Appendix A | Chorus highlights the fact that the key feature of UCLL versus UBA is the fact that it is unbundable. However:<br>- In many countries, VULA is used as a new access product for NGA network and is at the same level of the investment ladder as LLU. However VULA is not unbundable<br>- One of the differences between UCLL and UBA is that an operator buying UCLL must have a much more capillary infrastructure to connect to MDF instead of FDS. Therefore, it needs to invest more. |
| Appendix D | Service company overheads: The model has been updated to include them as the comment is relevant and service company overheads should be factored in.<br>EPT costs: TERA does not have any opinion on this issue.<br>Traffic management**:** TERA does not have any opinion on this issue.<br>Mana whenua consultation and liaison: TERA does not have any opinion on this issue.<br>Arborists: TERA does not have any opinion on this issue. |
| Appendix F | Already answered in response to AM |
| Appendix G | Most engineering rules provided by Chorus seem reasonable.<br>Traffic growth has been included in the model. The model has been updated so that a second 1Gbps link is installed if needed. |

| Industry comment | TERA's views |
|---|---|
| | The FDS interlinking has also been updated according to the comments made by Chorus especially the interconnection between switches when multiple switches are located in the same exchange. |
| Appendix H | Chorus states in para 668: "it should take into account the higher risks of fibre faced by the HEO as the EC has done" However, the EC requires including an uplift for setting NGA prices not copper prices. Their quote is therefore irrelevant.<br><br>Chorus states some costs have not been taken into account in order to mitigate catastrophic risks such as protection from fire and lightning.<br><br>The model includes the assets provided by Chorus. The unit costs, as most of them are based on the unit costs provided by Chorus, should reflect these protections. To be noted that all sites (exchanges and cabinets) include some security and fire alarm. |

## 3.3 Analysis of the comments regarding OPEX

| Industry comment | TERA's views |
|---|---|
| Use of Chorus operating costs as the starting point<br>(§166-169) | See analysis of AM report (section 1). |
| Optimisation of LFI<br>(§171-175) | See analysis of AM report (section 1). |
| Opex efficiency assessment for fibre<br>(§176-182) | See analysis of AM report (section 1).<br><br>Chorus quotes TERA's 2013 Danish MEA report (efficiency savings for fibre versus copper set between 17 and 33%). This is in fact based on Analysys Mason estimates (author of the 2010 model) |
| Aerial opex adjustment<br>(§183-190) | See analysis of AM report (section 1). |

# 4 Network strategies reports

## 4.1 Report

This section aims at addressing the comments detailed in Network Strategies "Final report for Spark New Zealand and Vodafone New Zealand - Commerce Commission draft determination for UCLL and UBA" CONFIDENTIAL, 20 February 2015, and in Network Strategies "Final report for Spark New Zealand and Vodafone New Zealand - Modelling Fixed Wireless Access" CONFIDENTIAL, 20 February 2015.

## 4.1 Analysis of the comments related to the Draft Determination regarding CAPEX

| Industry comment | TERA's views |
|---|---|
| 2.1 Network footprint | The FWA coverage is restrained to the TSO area. |
| 2.2 Alternative services and demand migration | TERA does not have any opinion on this issue. |
| 2.3 Demand projections | TERA does not have any opinion on this issue.<br>However, it is noted that despite thecomments on the increase of the number of households, the number of fixed active lines (UCLL scope) has remained stable since 2006. Therefore TERA is of the view that it is reasonable to keep a stable demand for UCLL and we believe it is not necessary to include a complex forecast modelling of the demand of each platform (FWA, HFC, UFB, etc.). |
| 3.1 Implicit subsidies in the Commission's model | TERA does not have any opinion on this issue. It is however to be noted that the HEO has 100% demand from year 0 which is not the case for UFB and RBI operators. |
| 4 Trenching and terrain | TERA does not have any opinion on this issue. |
| 5 Aerial deployment | TERA does not have any opinion on this issue. |

| Industry comment | TERA's views |
|---|---|
| 6 Price trends | See review of responses on price trends (see section 4.2) |

## 4.2 Analysis of the comments related to the Draft Determination regarding Price Trends

| Industry comment | TERA's views |
|---|---|
| Benchmark approach (§6.1)<br>Australia | NS proposes to disregard Australia in the benchmark analysis as the model is over 5 years old. As price trends are supposed to be "long term" price trends the fact that the model is old is not necessarily problematic. It should be also noted that it is better not to have only European countries within the benchmark. |
| Benchmark approach (§6.1)<br>Median vs. Average | NS proposes to use median instead of averages in order to reduce the impact of extreme values. However, TERA proposes to keep current approach (average) as there is no clear supporting reasoning to change (also the impact is said by NS to be immaterial). |
| Benchmark approach (§6.1)<br>Split card/rack | NS criticises the Card/Rack split used in the draft model to set price trends for DSLAM and switches and propose to use the split derived from the CAPEX model.<br>While this can add a link between the CORE and the PRICE TRENDS model, increasing the risk of circular references between models, the model has been updated and is using the Card/Rack split taken from the CORE model instead of benchmark values. This has been hardcoded and cannot be updated on an automatic basis in order to avoid circular references. |
| Benchmark approach (§6.1)<br>More recent Swedish model | NS underlines that a more recent version of the Swedish model used in the benchmark is available. This is correct but the price trends values are identical to the ones collected for the draft model. |
| Benchmark approach (§6.1)<br>Swedish inputs for power and air conditioning | NS states latest version of PTS model includes price trends inputs for power and air conditioning that have not been used by the Commerce Commission so far. The model |

| | |
|---|---|
| | has therefore been updated to include Swedish inputs for power and air conditioning. |
| Cost escalation approach (§6.2)<br>Wording | NS criticises the Commerce Commission's wording for the "cost escalation" approach but this has no impact on the model results. |
| Cost escalation approach (§6.2)<br>Error for CPI and GDP indexes | This is correct. September index is used for 2015 instead of December index for CPI and GDP. The model has been updated to remove this issue. |
| Cost escalation approach (§6.2)<br>Error for LCI index | LCI data is incorrectly linked to the raw data. The model has been updated to remove this issue. |
| Cost escalation approach (§6.2)<br>Population and buildings | • NS states forecasts should be used instead of historical data but TERA is of the view that historical data is a very relevant source of information to inform forecasts and to inform long term trends.<br>• Buildings are indeed "double counted" but this issue has no impact as only the % of evolution is used. The model has been updated to remove this issue. |

## 4.3 Analysis of the comments related to FWA

| Industry comment | TERA's views |
|---|---|
| Capacity per sector is too low | Capacity per sector have been increased from 16.7 Mbps to 22 Mbps, which corresponds to 22 1 Mbps data users or 147 150 kbps voice-only users.<br>NS states that 260 customers per base station but do not provide any information about how they have calculated this value.<br>See also TERA's answer to sub-section 4.2.6.1. of the WIK report. |
| 2.2.5 The proxy used by the Commission leads to unrealistic results | The model has been updated to consider a different FWA coverage compared to the draft model. In the updated model FWA coverage is based on distance to active nodes (active cabinet, MDF): all TSO buildings over 5.3 km to active node are covered by FWA.<br>Thus, the proxy referred by Network Strategies is no longer used in the model. |
| MW should be used for the backhaul | The use of fibre links is more future proof than MW links. Furthermore during the site visits |

| Industry comment | TERA's views |
|---|---|
| | organized by Vodafone, Vodafone have explained that they were upgrading the MW links with fibre links. |
| 2.2.7 Inconsistency between demand in Opex model and demand in Cpaex | Demand in the capex model is the demand for UCLL + UFB + HFC<br>The demand in the Opex model is Chorus demand for UCLL as the aim of the model is to derive a cost per line. The accounts are from 2013 so for consistency the number of line in 2013 has been chosen. |
| FWA covers dwellings located outside the TSO areas | In the hard lockdown model, FWA coverage is limited to the TSO area. |
| No evidence that Vodafone's Opex have been used as an input | Vodafone's Opex have been used for the FWA (cell H25 in the spreadsheet "Dashboard" of the UBA model). |
| LTE or LTE-A | The LTE technology has been used as a basis since it is the only one used at the moment. Consistency between the draft determination and the model documentation will be checked for the new consultation |

# 5 Vodafone report

## 5.1 Vodafone report

This section aims at addressing the comments detailed in Vodafone "Submission on process paper and draft pricing review determinations for Chorus' Unbundled Copper Local Loop and Unbundled Bitstream Access Services and comments on Analysys Mason's TSLRIC models" 20 February 2015.

Most of the comments raised in this report are already addressed in either WIK or in Network Strategies reports. This section will thus address solely the new comments.

## 5.2 Analysis of the comments regarding CAPEX

| Industry comment | TERA's views |
|---|---|
| E1.4 (h) FWA sites should not use the specifications of the RBI sites, i.e. FWA sites should cost 30% less than the cost used in the model | The comment raised by Vodafone is reasonable.<br>If the site is shared with several operators, then the site should be dimensioned for sharing, i.e. it should have the RBI specifications. However in this latter case, the cost should be shared between several operators and not allocated 100% to the HEO.<br>The model has been changed accordingly. |
| J Subsidies: the UFB subsidies should be taken into account. | The demand of the HEO has been assumed to be 100% of the demand since year 0 whereas any operator deploying the UFB network will face a take-up. As a consequence, it is not appropriate to say that the UFB subsidy should be included because the HEO is facing a different situation with respect to take-up compared to Chorus and LFC as it will get a faster and better return on investment |

## 5.3 Analysis of the comments regarding OPEX

| Industry comment | TERA's views |
|---|---|
| The commission states that "FWA opex includes spectrum fees and maintenance opex" which is not consistent with "opex model is based on Chorus' 2013/2014 accounts" | Both comments are correct. However, to make it clearer, the documentation has been updated. |
| Price trends (§H) | Vodafone has followed Network strategies views. See analysis of Network Strategy comments (see section 4) |
| Non network costs EPMU should be based on both attributable CAPEX and OPEX (§L1e) | TERA Consultants agree that non-network costs EPMU allocation should performed based on both annualised CAPEX and OPEX already allocated (and not only based on OPEX). This will be changed in the model. |
| Allocation of "DSLAM & Active Equipment" and "Passive equipment" are arbitrary and non-transparent(§L1f) | Vodafone proposes no alternative approach. |
| Allocation rules for IT costs (§L1g) | Same as WIK comment (see section 2) |
| Identifying network OPEX and non-network OPEX (§L2) | Same as WIK comment (see section 2) |
| Discrepancy between UCLL OPEX model and UCLL UBA model (§M1.6b) | We could not identify the issue underlined by Vodafone in the model. |
| Potential circular reference between models (§M1.6c) | The circular reference underlined by Vodafone does not exist |
| Risk of double counting (§M1.9) | Vodafone reports no specific issue |
| Model including irrelevant costs (§M1.10) | Vodafone does not provide any example |
| Data transfer issue between models (§M1.13) | These features of the model do not have any impact on the results |

# 6 Spark report

## 6.1 Spark report

This section aims at addressing the comments detailed in Spark "Submission on UBA and UCLL FPP pricing review determination" CONFIDENTIAL, 20 February 2015.

Most of the comments raised in this report are already addressed in either Chorus or in Network Strategies reports. This section will thus address solely the new comments.

## 6.2 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| 210: The whole market demand should be taken into account (i.e. it should include the HFC demand) | The model now includes the HFC demand. |
| 268.a: Incorrect exchange classifications | This has been checked and there is no issue:<br>- SB and MKJ are indeed exchange locations<br>- There is no MMVG exchange in the model |

# 7 Incite report

## 7.1 Incite report

This section aims at addressing the comments detailed in Incite "FPP RMA Report - Draft Pricing Review Determination for Chorus' Unbundled Copper Local Loop Service" CONFIDENTIAL, 10 February 2015.

## 7.2 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| The aim of the report is to prove that a HNO could not achieve the level of aerial deployment that is used in the model given the number of restrictions faced in real life (and in particular by Chorus). The share of underground deployment should thus be increased. | The rules described by Incite are based on an operator deploying a new network in areas where there are already some infrastructure deployed. This is illustrated by the rolling-out of the UFB network in areas where Chorus copper network already exists.<br>As asset re-use has not being considered in the TSLRIC valuation conducted by the Commerce Commission, these rules are not relevant for the TSLRIC calculation. |
| Incite is making a specific focus on the historical areas (SSMW and SVMW) where specific consent would be needed | The report is not providing any rules, costs or data that could be used in the model. |
| The rule book describes engineering rules that should be followed | The model is consistent with the engineering rules provided in the rule book. |

# 8 CEG reports

## 8.1 CEG report on uplift

This section aims at addressing some of the comments detailed in CEG "Uplift asymmetries in the TSLRIC price" CONFIDENTIAL, February 2015.

## 8.2 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| *"the Commission proposes not to provide compensation for potential regulatory stranding due to regular revaluations of the asset to the assumed changes in the modern equivalent asset;"* | To our knowledge, no regulatory authority provides for such compensation. |
| *"Chorus may be more likely to under-invest if the prices for its copper services are set too low than it is to over-invest if the prices are set too high;"* | This can also provide incentives to further increase efficiency. |
| *"As the Commission has determined the UCLL price based on fibre technology using the MEA approach, which results in lower costs compared to the UCLL price based on the existing Chorus legacy copper infrastructure, it appears that the build or buy decision is skewed towards the buy choice"* | It is important to have in mind that a "build" signal would lead to inefficient duplication of investments which could increase significantly unit costs (because of the decrease in economies of scale) and therefore could increase significantly retail prices without the benefits of competition being able to compensate for this increase. |
| *"We disagree because even if the efficient technology is correctly identified today, the Commission's approach would have prices for the regulated service based on the current efficient technology (i.e., asset price trends for that technology) despite the fact that the efficient technology might be updated before the end of the current asset's life to reflect the cost of the next efficient technology."* | It is to be noted that for UCLL technological progress is very slow. |
| *"We consider that the Commission's reliance on the above statement by Chorus' auditors is not a reasonable basis upon which to support a proposition that Chorus' assets lives already reflect the probability of stranding due to the advent of future technologies. The reasoning underpinning the Commission's use of this statement* | There are multiple cases where NRAs have selected longer asset lives than accounting asset lives (France, Ireland). |

| Industry comment | TERA's views |
|---|---|
| *assumes that the task that accountants set out to achieve in determining asset lives for the purpose of estimating depreciation is the same as the task that the Commission sets out to achieve in estimating TSLRIC for the UCLL and UBA services. We do not consider that this assumption is well-founded. Rather we consider that it is reasonable to expect and believe that the statement of Chorus' auditors is made in the context of the requirements of accounting standards and not with a view about how the Commission would come to model TSLRIC as a tool for estimating forward looking costs"* | |

## 8.3 CEG report on price trends

This section aims at addressing the comments detailed in CEG "Evidence on price trends" CONFIDENTIAL, February 2015.

## 8.4 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| Estimating price trends for a tilted annuity approach to depreciation (§10-11) | • CEG misinterprets the Commission aim "to assess how the cost might change over the regulatory period". The Commission did not mean that it wished to calculate short term price trend. The objective of the Commission is to set long term price trends and price trends have been set with this goal in mind.<br>• TERA agrees with CEG with the fact that price trends should be estimated over the long term but we note that CEG has misinterpreted the Commission's statement |
| Properties of the tilted annuities (§12-19) | This is agreed |
| The price trend must be constant over time (§20-29) | This is agreed |

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| Long terms price trends should be used instead of price trends for the regulatory period (§30-32) | ComCom aims at assessing long term price trends using the longest available data series, as requested by CEG. |
| Use long term forecasts to set long term price trends (§33-36) | Price trends have been reviewed by the Commerce Commission with the assistance of NZIER. |
| Overview of the Commission's approach (§37) | This is agreed |
| Estimating the price trend (§39-43) | The choice between estimating the price trend using a linear regression (based on all years) or calculating a geometric average based on the first and the last point is not relevant anymore. NZIER long term price trends are now used as price trends inputs. |
| Buildings cost driver (§46) | The price trends model wrongly uses the trend in the number of buildings as a proxy for buildings price trends. This has been updated<br><br>Price trends have been reviewed by the Commerce Commission with the assistance of NZIER. |
| Consumer price index (§47-50) | Price trends have been reviewed by the Commerce Commission with the assistance of NZIER. |
| Wages / Labour (§51-54) | • TERA shares CEG's view that LCI data is incorrectly linked to the raw data (to be corrected)<br>• TERA shares CEG's view that a cost index that is specific to technicians and associate professionals would be more relevant (e.g. Statistics New Zealand, LCI: technicians and trades workers).<br><br>These have been updated in the model. |
| Fabricated steel (§55-58) | Price trends have been reviewed by the Commerce Commission with the assistance of NZIER. |
| Copper (§59-62) | Price trends have been reviewed by the Commerce Commission with the assistance of NZIER. |
| Fibre optic cabling (§63-71) | Price trends have been reviewed by the Commerce Commission with the assistance of NZIER. |

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|---|---|
| Price trends estimates for asset and opex categories (§72) | • CEG criticises the split for each asset / Opex category among the different drivers.<br>• CEG proposes no alternative approach / figures<br>• These are based on TERA's expertise from other projects in the absence of NZ based inputs (confidential inputs) |
| International benchmark (§73-74) | TERA shares CEG's view |

# 9 Hausman report

## 9.1 Hausman report

This section aims at addressing the comments detailed in Prof Jerry Hausman "Response to the Commerce Commission's Draft Determination on Uplift".

Here TERA expresses some comments it had when reading this report, even if this is not related to our modelling work. This is not an exhaustive analysis but just a list of some comments.

## 9.2 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| Paragraph 19 – These concerns relating to congestion and quality services are important for UBA and similar services provided at the wholesale level since the wholesale level service will typically be the primary determinant of service quality for final consumers | What causes congestion in fixed network today is not the access part (UCLL) but rather the Internet part. As a consequence, this statement is highly debatable. In particular, it is worth having in mind that in New Zealand the UBA service stops at the fist data switch and therefore the scope of the UBA service is a part of the network where congestion is probably less likely. |
| Footnote 21 – "For example, given the much higher capacity of fiber compared to coax copper, the design of ducts would likely be different" | The design of ducts has no relationship with the fact that fibre has much higher capacity. |
| Paragraph 53 – Vogelsang ignores the fact that removal of TSLRIC regulation led Verizon and AT&T to the replacement of their copper network | It is important to note that the presence of CATV operators in the US is probably much stronger than in Europe and therefore these operators may have reacted more strongly because of CATV operators' strength. |

# 10 Consumer NGO report

## 10.1 Consumer NGO report

This section aims at addressing the comments detailed in InternetNZ, Consumer and TUANZ "Submission on draft UCLL and UBA price review determinations" 20 February 2015.

## 10.2 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| There is an inconsistency on EPMU in TERA documentation | In the hard lockdown model, this inconsistency has been fixed: non-network costs allocation is based on the total attributable costs (annualized capex and opex). |
| Poor TERA documentation | To our knowledge, TERA's level of documentation is greater than what is observed in other countries |
| Lack of audit or validation of data used | TERA has compared inputs provided by Chorus with international benchmark but given the fact that it is important to reflect the specificities of New Zealand (size of the country, wages, etc.), Chorus data cannot be ignored. |

# 11 L1 Capital, IML and Allan Gray report

## 11.1 L1 Capital report

This section aims at addressing the comments detailed in L1 Capital "Submission on draft UCLL and UBA pricing review determinations" 20 February 2015", Investors Mutual "Submission on draft determinations for the UBA and UCLL services" 20 February 2015 and in Allan Gray "Submission to UCLL and UBA FPP draft determination" 16 February 2015 (the last two are much less detailed than the former but uses similar arguments).

## 11.2 Analysis of the comments

| Industry comment | TERA's views |
|---|---|
| L1 shows that OPEX used in the model are much lower than Chorus or Openreach OPEX | L1 compares the OPEX of legacy networks (Chorus and Openreach) with OPEX of a new network. This is not consistent. |
| L1 explains that LFI is not a relevant factor and that adjustment to account for the share of aerial network has been factored | LFI is generally considered as a good proxy and has been considered by ComReg in Ireland and has not been contradicted by Chorus.<br>The different share of aerial versus underground is discussed in the response to Analysys Mason's comment "An increased proportion of aerial access network will lead to higher opex (§5.2)" |
| L1 states that in Denmark only a 17% efficiency adjustment is applied | The decrease in OPEX is driven by the lower level of fault encountered in a fibre network. In Denmark, the level of fault encountered by the incumbent in its copper network is already almost the level of fault that is expected in a fibre network. This is why the adjustment on the level of Opex made in Denmark is much lower than the adjustment recommended in New Zealand. |