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Report for Chorus

Working paper – proposed hybrid approach to modelling the UCLL service

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1 Proposed approach

1.1 Background

This document has been prepared for Chorus.

As a result of requests from industry parties, the Commerce Commission is currently engaged in a process to set the price of UCLL using FPP. At the same time, the Commission is also engaged in a process to set the price of UBA using FPP.

At the moment, one issue which particularly concerns the Commission is the ability to complete this process relatively rapidly.

1.2 Proposed approach

There is an approach which would offer the Commission a relatively rapid process for UCLL, specifically a hybrid approach based on a forward-looking model of TSLRIC based on Chorus' actual asset counts as an equivalent of the forward looking asset count. We call this "hybrid based on actual asset counts". This approach would be practical and could be achieved relatively quickly in our view; it would also be relatively cheap to execute compared to a full bottom up model (one based on running algorithms to deploy hypothetical network in New Zealand).

The proposed approach

- models the forward-looking cost of the local loop network based on an equivalent of today's efficient asset count: the actual UCLL-related asset counts of Chorus
- this data can be obtained from Chorus' own GIS system, which we understand has sufficiently granular data to allow asset counts in different geographical areas to be provided if needed (e.g. areas with competing HFC or competing local fibre company networks which might have different demand levels in the future)
- all other parameters would be forward looking including unit costs, asset economic lifetimes, asset price trends, WACC, etc.
- the model would be assuming the actual technology used by Chorus to supply the UCLL service (copper to the home). We believe copper to the home is an appropriate forward looking technology choice (MEA) for UCLL given the minimum set of services we believe should be delivered by the network.
- The level of future demand over which these costs need to be recovered would be forward-looking (costs need to be recovered over future demand over the asset economic lifetime).
- This approach would in effect use an element-based approach to shared costs.
- The modelled operating costs would automatically be consistent with the deployed technology and deployment style (aerial/buried/ducted)
- The approach does not constrain the choice of forward-looking depreciation schemes (tilted annuity, adjusted tilted annuity, economic depreciation)

1.3 Pros and cons of this approach

1.3.1 Advantages

The chief merits of this approach are that:

- It is demonstrably possible to build and operate a network in New Zealand with these quantities of assets and levels of operating cost. This is not a trivial point as alternative methods will have to provide a great deal of evidence to be able to claim this.

- It is substantially faster to execute (and easier to understand and to check) than the alternative bottom-up techniques. The most complex, difficult, time consuming and contentious parts of a bottom-up cost model are those parts which calculate the required efficient asset counts. The remaining parts move from an asset count to a total capital and operating cost in each year modelled and finally to an annualised service unit cost in a relatively straightforward manner. These parts can be readily achieved in a single Excel workbook which can be re-implemented or audited by a third party.

1.3.2 Disadvantages

The disadvantages of this approach as a solution to the modelling of UCLL TSLRIC are that:

- The approach cannot of itself prove that the asset count chosen is the most cost-efficient level. To do so would require the time-consuming and expensive bottom-up calculation plus a hybrid calibration process to examine the asset counts in great detail. However, we do not believe that Chorus has or had in the past any incentive to incur inefficient costs, with the exception that there will be some copper pairs deployed (to meet past demand levels) that would probably not be deployed today (unless TSO concerns were considered to force Chorus to provide for the possibility of ubiquitous takeup of fixed connectivity) – which means that the cables deployed in the actual network will be slightly too high in their capacity.

  - Some relatively small adjustment to cable capacity could therefore be argued to be justified; we would be happy to discuss with NZCC how this might be achieved while maintaining the operating cost calibration and taking into account the likelihood of future declines in demand for fixed lines.

- The model would be assuming the modelled operator was the current scale of Chorus' copper network. If NZCC were to be interested in the costs of an operator of a markedly lower scale, then the approach is of less relevance.

- The assumed deployment style will be that of Chorus (e.g. aerial/buried/ducted). A modern deployment under modern town planning rules is likely to be more ducted and buried than aerial, which means this method is likely to underestimate the forward-looking costs.

- It might be possible to adjust for a different deployment style, for example by changing some fraction of distribution cable route deployment to be ducted or buried rather than aerial (poled). We would be happy to discuss with the Commission how this might be achieved while maintaining the correct level of operating cost.

1.4 Merits of hybrid models

Uncalibrated bottom-up models suffer from a danger that they may create super-efficient deployments which either meet demand in an unrealistic way[1] or they may not meet real world constraints:

— algorithms not providing enough assets to link the nodes in a practical way (e.g. in practice these routes have to be along streets)
— a few isolated locations may be left unserved
— they may violate network design rules such as maximum distance from cabinet to end user or MDF site to end user,
— they may not meet required standards in relation to, for example, use of aerial deployment (i.e. cable attached to poles rather than buried or ducted cables).

Using real data to provide calibration (ie the use of "hybrid" models) is therefore strongly to be encouraged where this is possible. These calibrations usually involve checks of the asset counts and the unit capital costs of the assets, as well as the total operating costs by various cost categories. A forward-looking bottom-up model based on the current asset count is one way to achieve such a hybrid approach.

Here the proposed approach is therefore cheaper to execute and similar in its result to a full (engineering based) bottom-up calculation of the deployment of a realistic network, using the same technology and network coverage, that has been properly hybrid calibrated.

1.5 Reasons why a local loop bottom-up asset count calculation is time consuming and expensive

The asset count calculation in a local loop cost model is intrinsically time consuming:

- The algorithms are not simple. Estimating the required asset counts requires procedural algorithms (i.e. not just Excel, but branching and looping) which are designed to estimate the asset counts by "building" network to connect a required set of end-points to their serving nodes. These algorithms have embedded within them the engineering rules which describe how to deploy the required architecture (e.g. via distribution points/pillars/cabinets, etc) in such a way as to minimise cost while meeting the requisite geographical constraints (e.g. with trenches dug alongside roads, minimising the crossing of rivers and railways, etc). Some of these constraints may be implemented indirectly (e.g. minimising crossing railways or rivers

[1] Examples of such issues may include insufficient provision for spares, or for flexibility in future demand locations (insufficient over-dimensioning of distribution cables)

may be embedded in the definitions of the areas served by MDFs). The algorithms may in some cases try out multiple different solutions and choose the lowest cost, which is an approach that is intrinsically time consuming.

- The algorithms are demanding as regards their required data inputs. A large quantity of high resolution geo-data is required for the algorithms to work (e.g. house locations accurate to a few metres; road centre lines accurate to a similar level). Obtaining and cleaning the required input data is a task which can be automated to some degree, but requires manual interventions and checks. For example, some data sets contain duplicate data (e.g. roads on top of roads) which needs to be detected and removed; the roads must interconnect for the algorithms to find the short routes; data sets sometimes have low-quality estimated locations for a small percentage of properties (e.g. that may be assumed to be placed in the middle of the postcode); or premises may be in the geodata which are not actually required to be served (such as rural holiday homes - which are not mandatory to serve in some countries). The demand for loops by multi-line business premises may also need to be allowed for / added to the data set. As a result, the generation of the required input data is a time-consuming process.

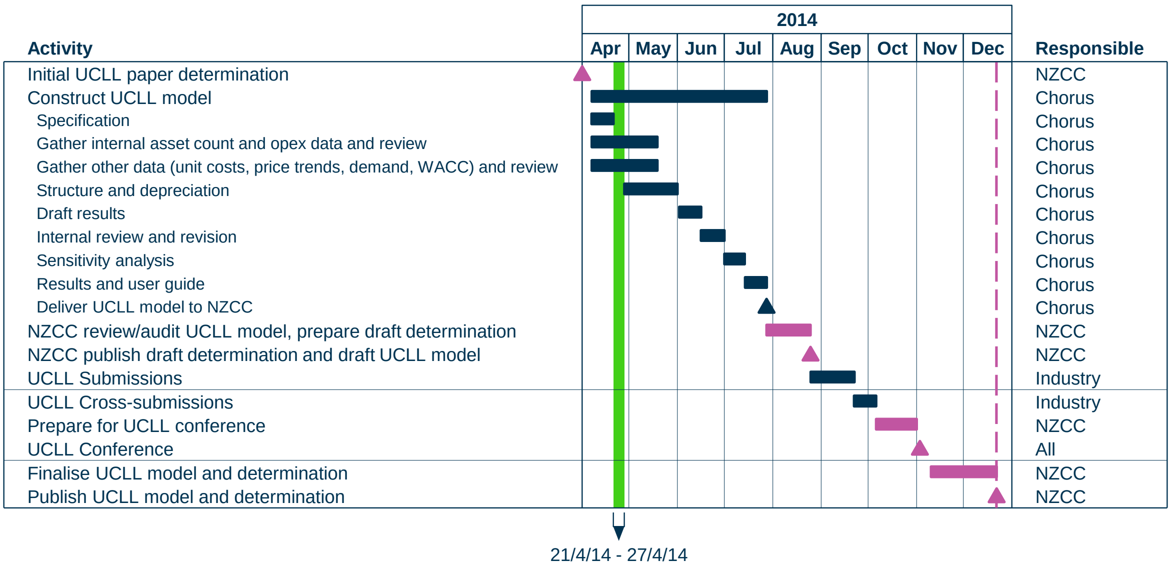
- The algorithms are time consuming to execute. These algorithms are computationally expensive even in the simplified forms that are usually used (e.g. a form of minimum spanning trees, noting that even minimum Steiner trees are not cost minimising for a telecoms network; various kinds of clustering algorithms). Running these models therefore takes a long time. To give an example, re-running the Analysys Mason Australian local loop model from scratch took approximately 3 weeks of computer time for the sample used.

- The algorithms are time consuming to understand. The algorithms are embedded in perhaps several thousand lines of procedural computer code (which might be Visual Basic for Applications (VBA), C, C++ etc). Even with access to that code and documentation, understanding these algorithms and the ways in which their parameters, input data, and the approximations made in them (e.g. minimum spanning tree; approximations to the distance functions used) may deviate from reality in important ways is therefore also time-consuming. To make any changes to the algorithms and re-run them as part of such auditing will also run into the "time consuming to execute" issue.

1.6 Time plan

We believe that our proposed hybrid approach can be relatively rapidly implemented, allowing a full consultation in sufficient time to complete the UCLL process in December 2014.

Figure 1.1: Possible GANTT chart for proposed approach [Source: Analysys Mason, 2014]



This time plan assumes a 1 April start date after a UCLL initial process determination. An earlier start is possible.

Figure 1.2: Time plan [Source: Analysys Mason, 2014]

Task	Start	End
Specification	1/4/14	20/4/14
Gather internal asset count and opex data and review	7/4/14	18/5/14
Gather other data (unit costs, price trends, demand, WACC) and review	7/4/14	18/5/14
Structure and depreciation	28/4/14	31/5/14
Draft results	2/6/14	15/6/14
Internal review and revision	16/6/14	30/6/14
Sensitivity analysis	1/7/14	13/7/14
Results and user guide	14/7/14	27/7/14
Deliver model to Commission	28/7/14	
Commission review audit UCLL model, prepare draft UCLL determination	28/7/14	24/8/14
Publish draft model and draft UCLL determination	25/8/14	
Industry submissions	25/8/14	21/9/14
Cross-submissions	22/9/14	5/10/14
Commission prepare for conference	6/10/14	31/10/14
Conference	3/11/14	
Finalise model and determination	7/11/14	21/12/14
Publish model and determination	22/12/14	

While a consultation on the model specification sometimes happens in other countries, here that specification is rather simple, unless there are to be specific modifications in relation to

- adjusting the asset count and opex for e.g. lower current demand (e.g. reduce level of over-provisioning on the distribution side, reducing the average pair count per cable in distribution cable)
- Adjusting the deployment style (more buried, more ducted) and related asset choices and opex changes

We believe that a short consultation with the Commission on the best approach to adopt with respect to these points could be achieved within the above timetable; a full submissions/cross submissions/conference process would however add substantially to the required time.