COMPETITION ECONOMISTS GROUP

Evidence on price trends

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Executive summary

1. We have been asked by Chorus to review the price trends adopted by the Commission in its Draft Determination, as well as the approach adopted by TERA and Beca in its work on price trends for the Commission.

2. The Commission has adopted a tilted annuity approach to depreciation. The tilted annuity formula requires a price trend that is a constant annual change in the price of an asset in perpetuity. The Commission's approach however seeks to estimate cost changes over just the regulatory period, and not in perpetuity.

3. The Commission's approach will create a regulatory regime that is unlikely to be NPV neutral, as shorter periods of time are more likely to capture temporary fluctuations in price. If the price trend does not reflect a long term trend rate of change, then the tilted annuity will not result in charges that, after discounting to allow for the time value of money, recover the asset's purchase price and financing costs. Using a long term trend rate of change is also expected to avoid windfall gains and losses caused by changing prices for network elements.

4. In our view, the Commission's proposed approach will not estimate price trends in a way that is consistent with the purpose of the tilted annuity formula, i.e. using a long term trend, in two ways:

   - TERA has estimated price trends using a geometric average. Using a geometric average gives weight to only two data points, and may give rise to considerable error in estimating the trend rate of growth. A more appropriate method is to use a trend rate of growth in prices that utilises information over the whole period. This is more likely to simulate the long term trend rate of change; and
   - Neither TERA nor Beca have taken into account all the available pricing information. Although TERA has considered a long history of pricing information, it has not considered any forecasts of future prices. Beca has considered a very short history of prices, only one year. This is highly unlikely to be sufficient to reflect a long-term trend rate of change in prices.

5. Further, we find that TERA and Beca have not consistently used the most suitable source information to develop time series of prices for the different cost drivers and/or asset categories. In several instances, we find that the price trend for an asset category, such as fibre optic cables, is better proxied by an alternative price series.

6. We set out the ways the proposed price trend estimates should be amended. Specifically, we calculate that:

- The price trend for buildings should be increased from 1.90% to 2.49%, in order to be consistent with the long term trend of growth in Statistics New Zealand capital goods price index for non-residential housing.
- The price trend for CPI should be decreased from 2.18% to 2%, in order to be consistent with the Reserve Bank's target average inflation over the medium term.
- The price trend for labour/wages should be decreased from 2.58% to 2.22% to be consistent with the long term trend rate of growth in the Statistics New Zealand labour cost index specific to technicians and associated professionals.
- The price trend for fabricated steel should be increased from 1.43% to 1.76% to be consistent with the long term trend rate of growth in the MEPS Asian steel series.
- The price trend for copper should be decreased from 4.56% to 4.46% to be consistent with the long term trend rate of growth in copper prices based on a combination of LME history, futures and Consensus Economics forecasts.
- The price trend for fibre optic cabling should not be based on a very narrowly defined series when there is significant uncertainty around the products it contains or aims to reflect, as is the case with the insulated cable and wire series relied on by TERA. The Commission should have regard to alternative price trend information for fibre cables, such as that presented in the body of this report, to inform its view on the price trend for fibre cables. This alternative information suggests that a price trend for fibre may lie in the range from -15% to 0%.

7. We also conclude that the price trend for ducting and trenching should be reduced from 3.00% to 1.88% to be consistent with long term growth for CGPI all groups. CGPI all groups is the index with by far the most weight in Chorus' agreements for ducting and trenching price escalation, and also represents a broad category that includes ducting and trenching costs, without any false precision from a narrow definition.

1 Introduction

8. We have been asked by Chorus to review the price trends adopted by the Commission in its Draft Determination, as well as the approach adopted by TERA and Beca in its work on price trends for the Commission.

9. The structure of this report is as follows:

   - **Section 2** sets out the role of price trends in the tilted annuity approach to depreciation. We demonstrate that the tilted annuity formula requires a price trend that is based on a constant annual change in the price of an asset in perpetuity, and that the Commission's proposed approach whereby it has sought to estimate cost changes over the regulatory period will create a regulatory regime that is unlikely to be present value neutral.
   - **Section 3** summarises the Commission's approach to estimating price trends. We also set out our calculations for a refinement of the price trend estimates and why we consider these refinements are sensible to make.

2 Estimating price trends for a tilted annuity approach to depreciation

10. The Commission has proposed to adopt a tilted annuity approach to depreciation. The tilted annuity formula requires a price trend that is based on a constant annual change in the price of an asset in perpetuity. The Commission's proposed approach however seeks to estimate cost changes over just the regulatory period, and not in perpetuity[1]:

> *We are required to form a view on how costs might change over the regulatory period. We do this by forecasting price trends.*

11. The Commission's proposed approach will create a regulatory regime that is unlikely to be NPV neutral, as shorter periods of time are more likely to capture temporary fluctuations in price. If the price trend does not reflect a long term trend rate of change, then the tilted annuity will not result in charges that, after discounting to reflect the time value of money, recover the asset's purchase price and financing costs. Using a long term trend rate of change is also expected to avoid windfall gains and losses caused by changing prices for network elements.

2.1 Properties of the tilted annuity

12. In the Commission's TSLRIC modelling, price trends are used to populate the tilted annuity formula which annualises capital expenditure on an asset. The tilted annuity formula is set out below:

$$TA_t = C\frac{(r-\alpha)(1+\alpha)^{t-1}}{1-\left(\frac{1+\alpha}{1+r}\right)^{T}} \qquad (1)$$

13. In equation (1) above:

- TA_t is the annual capital cost in year t;
- C is the upfront capital cost of the asset;
- r is the cost of capital;
- α is the expected price trend; and
- T is the expected life of the asset.

[1] Commerce Commission (2014) *Draft pricing review determination for Chorus unbundled copper local loop service*, p. 164

14. The tilted annuity formula returns a path of depreciation that:

    - recovers the cost of the asset in present value terms over its expected life;
    - changes in line with expected changes in an assets replacement cost; and
    - predicts a smooth path of revenue over time and therefore avoids price shocks where demand is stable.

15. This is reflected in the Commission's deliberations on the tilted annuity in its Draft Determination for the UCLL. The Commission states:[2]

> *A tilted annuity calculates an annuity charge that changes between years at the same rate as the expected change of the asset value. … As with a standard annuity, the tilted annuity should still result in charges that, after discounting, recover the asset's purchase price and financing costs.*

and:[3]

> *A tilted annuity will result in a relatively constant rate of change in prices in a situation where a stable demand profile is modelled. This is expected to avoid windfall gains and losses being caused by changing network costs.*

16. The tilted annuity formula is unique as a depreciation methodology in that it (in expectation) gives a smooth path of compensation for the cost of an asset over time – including over multiple asset lives, not just within the life of a single asset. This is demonstrated graphically in Figure 1 below, which shows the path of tilted annuity compensation over two lifetimes of a 10 year asset that begins with a replacement cost of $100 that is expected to grow at 4% per year. We assume a cost of capital of 10%. We also assume that the path of compensation is reassessed after 10 years, although the same effect could be demonstrated with any other period of assessment, including over 5 years.

17. Figure 1 shows that under these assumptions, the path of compensation provided by the tilted annuity formula remains smooth over time, including after reassessment of the costs at year 10. By contrast, straight line depreciation does not demonstrate this smoothness.

18. Compared to the tilted annuity straight line depreciation tends to be "front-loaded"; starting higher than the tilted annuity and finishing lower. Since the return on

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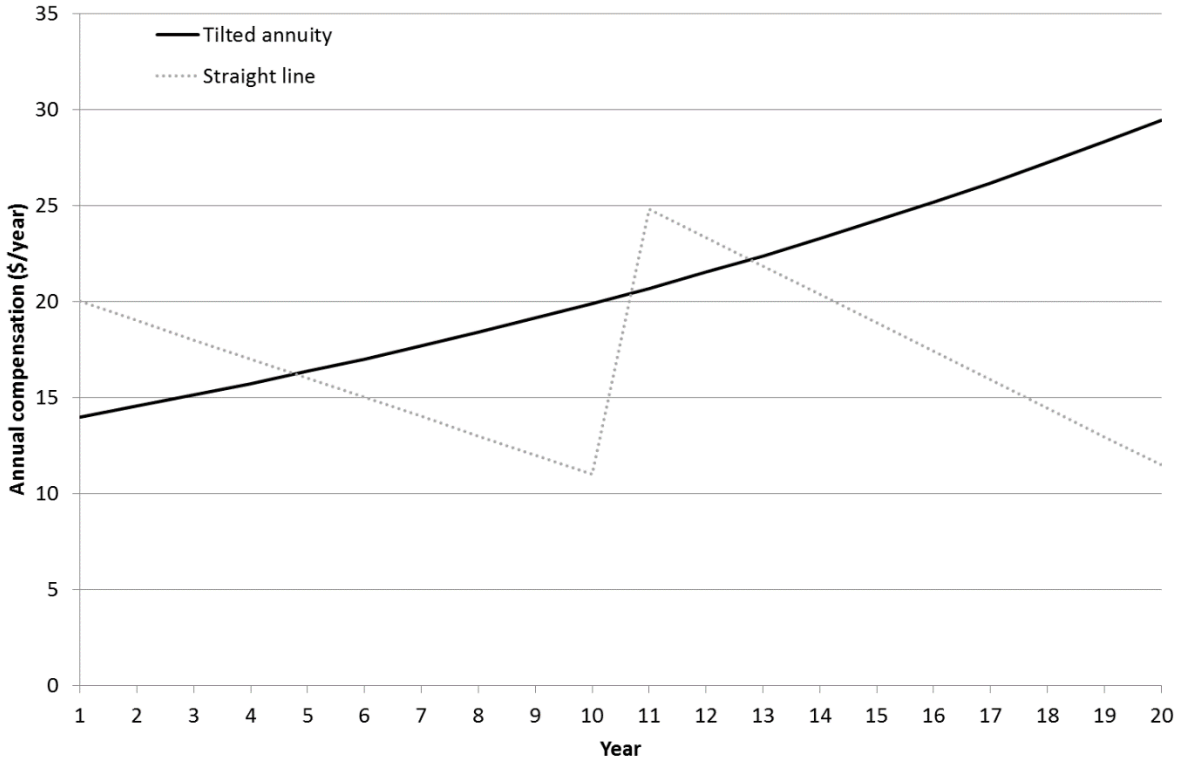
2 Commerce Commission, *Draft pricing review determination for Chorus' unbundled copper local loop service*. 2 December 2014, p. 172

3 Commerce Commission, *Draft pricing review determination for Chorus' unbundled copper local loop service*. 2 December 2014, p. 74

capital component of straight line depreciation is calculated based on the written down value of an asset, this declines over time to be lowest in the final year of an assets life. When the asset is replaced, it results in a sudden upward bump in return on capital. There is also an upward jump in the return of capital since the asset is now assessed at a revalued higher cost.

Figure 1: Smooth tilted annuity compensation



Source: CEG analysis

19. Figure 1 and the explanation above demonstrate the properties noted by us and the Commission. It is important that the estimate of price trends that is used in the tilted annuity formula preserves these attributes. If the method for estimating price trends gives rise to a tilted annuity that did not follow *"expected changes of the asset value"* or give rise to a *"relative constant rate of change in prices"* then this would undermine the purpose for the Commission selecting the tilted annuity as its proxy for economic depreciation.

2.2 The price trend must be constant over time

20. A key assumption that gives rise to the desirable properties of the tilted annuity demonstrated above is that the price trend used in the tilted annuity formula is constant over time.

21. Changing the tilt used in the tilted annuity formula *during the life of the asset* violates the two underlying principles determining the tilted annuity formula. That is, it results in a path of compensation that:

    - is not present value neutral; and
    - does not change in line with replacement costs by containing discontinuities (or 'shocks').

22. One example serves to demonstrate both issues. We assume an asset with a life of 20 years and with an initial replacement cost of $100. The price trend of the asset is expected to be 4% over the first 10 years, and 8% over the subsequent period.

23. The solid line in Figure 2 shows the path of compensation assuming a constant price trend of 4% over time. This serves to demonstrate a baseline level of compensation that is present value neutral (returns the original $100 investment) over the 20 year life of the asset.

24. The dashed line in Figure 2 shows the path of compensation assuming that:

    - revenues for the first 10 years are set on the basis of a tilted annuity using a 4% price trend; and
    - revenues for the subsequent 10 years are set on the basis of a tilted annuity using an 8% price trend, assuming that the expectations of price growth in the first 10 years of 4% were realised.

25. The solid line uses a constant price trend over time – albeit not a price trend that is consistent with the average expected rate of price growth over the life of the asset. Consequently, by construction it returns in present value terms the investment cost of the asset over its life.

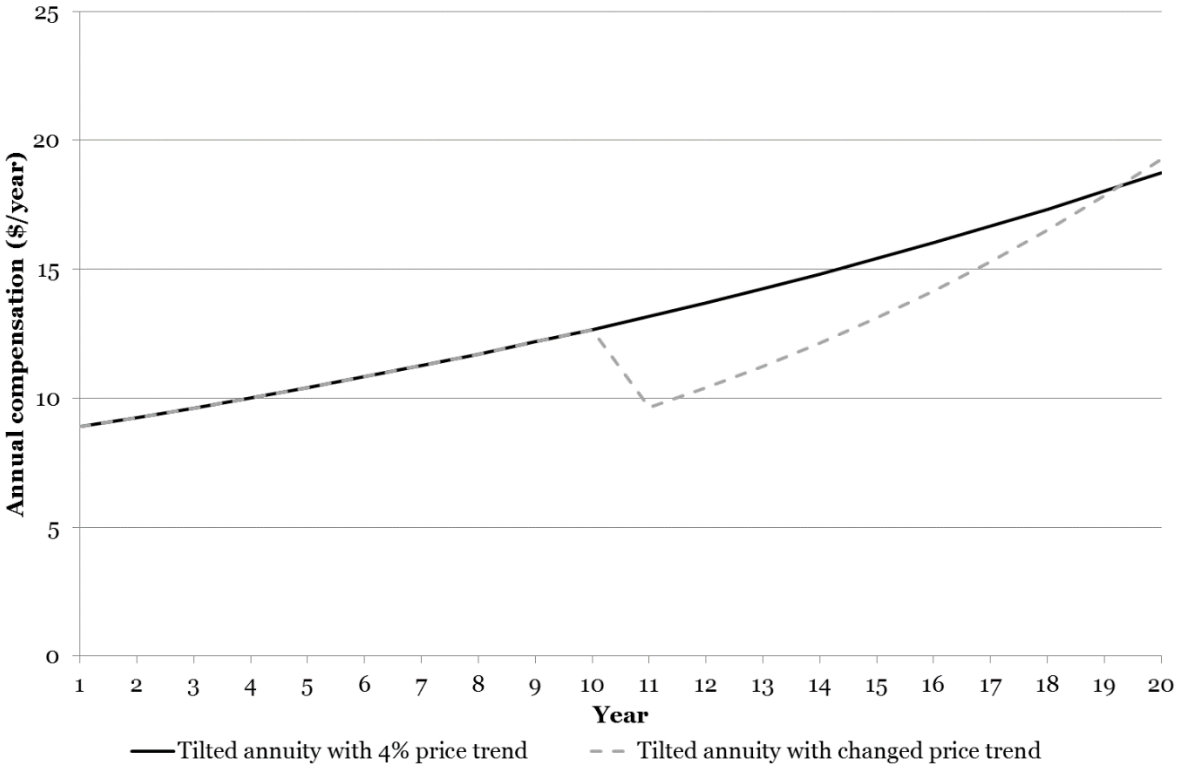
26. However, the dashed line returns less than the initial investment cost of $100 over time. This can be clearly seen in Figure 2 because it lies coincident with or under the present value neutral solid line for almost the entire life of the asset. The present value compensation returned by the dashed line is $94.81 over the life of the asset.[4]

27. In addition to this critical deficiency, the dashed line also exhibits a significant discontinuity at the point at which the price trend is re-estimated as 8%. This is despite the fact that by assumption all expected price trends to that point have been realised. At year 11, rather than increasing by 8% in line with changes in expected costs, the path of compensation drops by almost 24%. This happens because:

[4] Alternative assumptions could also give rise to examples of over-recovery.

- the application of the tilted annuity formula with the revised price trend of 8% after 10 years requires the path of compensation to 'swivel' so that present value neutrality is preserved over the subsequent 20 years; however
- this means that present value neutrality over the initial 20 year period is lost.

Figure 2: Effect of changing price tilts



Source: CEG analysis

28. The problems identified in Figure 2 are material and will occur if the price trend for the tilted annuity is estimated in such a way that it is expected to change over time. While a path of depreciation could be calculated to accommodate expected changes in the price trend, this path could not be generated using the tilted annuity formula – it would be more complex than this.

29. In summary, if the tilted annuity formula is applied where price trends are expected to change over time then it loses the key properties that motivate and justify its use. This must be taken into consideration when estimating price trends to populate the tilted annuity formula.

2.3 Period over which to measure price trends

30. The discussion above establishes that the tilted annuity formula only retains its desirable properties when the price trend is expected to be constant over time. If this assumption is violated then application of the tilted annuity formula will:

    - not provide present value neutral compensation (in expected terms) for costs incurred;
    - result in discontinuities or "shocks" in the path of compensation over time and in doing so will not follow the path of compensation that changes in line with replacement cost.

31. With this understanding, it is clear that estimating price trends that are expected to apply only over the immediate regulatory period would not be appropriate.

32. If, by random chance, these price trends were the same as the expected long term price trends for an asset, then this will not give rise to the issues described above. However, generally we would expect that sampling price trends over a particular period leaves open the prospect that price trends could be different outside that interval.

33. In our view, there are two paths that the Commission could consider taking. It could:

    - estimate price trends over the first regulatory period, but also estimate price trends beyond that and take this information into account in a depreciation framework that is capable of appropriately using this information (i.e. not the tilted annuity formula); or
    - it could use the tilted annuity formula with a price trend that is calculated as the long term trend rate of change of an assets replacement cost.

34. The first methodology is theoretically the more accurate of the two. However, there are two considerations that suggest that it may nonetheless not be preferable to the second:

    - the depreciation approach under the first methodology loses the simplicity of the tilted annuity formula. It may not be workable in the context of a large TSLRIC model; and
    - the information available to forecast price trends over the first regulatory periods and over subsequent regulatory periods is not likely to be very robust.

35. In our view it is likely to be a better and more stable methodology to use a long term forecast of the price trend. This is also consistent with the use of the simpler tilted annuity methodology.

36. In estimating a long term forecast of the price trend, we consider that the Commission should have regard to as long as possible a time series of price data, including both historical observations and forecasts of future values. As discussed above, estimating trends over a shorter period of time may not generate the best estimate of a long term price trend for the purpose of use in the tilted annuity formula because it is likely that these estimates would be expected to change (potentially significantly) over time which gives rise to the issues discussed at section 2.2 above.

3 Price trend estimates for the TSLRIC cost model

3.1 Overview of the Commission's approach

37. The Commission, through its consultants TERA and Beca, has used different approaches to estimating price trends for different asset or opex categories, including:

- Cost escalation: This involves identifying a relevant index or combination of indices that costs are expected to evolve with[5]. TERA uses this approach to estimate price trends for passive equipment, other than ducts and trenches, and labour-related opex. If a suitable index cannot be identified, then CPI (for passive equipment) and LCI (for labour-related opex) are used as a 'default'.
- International benchmarking: This involves calculating average price trends from assumptions in publicly available models (Australia, Denmark, Sweden, France and Norway). This approach is used for active equipment. The Commission considers that using the international benchmark approach is appropriate for assets which are likely to be purchased from worldwide suppliers, such as DSLAMs and switches. The Commission further observes that the information is available and reliable, and that it is a transparent approach.[6]
- Beca estimates: These are estimates for price trends for ducts and trenches in the New Zealand context commissioned from engineering consultancy Beca.
- Stable price trend: The Commission has assumed that the non-labour related opex remains stable, i.e. a price trend of 0%.

3.2 Estimating price trends using cost escalation

38. TERA has relied on a cost escalation approach for all asset / opex categories in the cost model except ducts, trenches and active equipment. This means that they have assumed that the price for different asset or opex categories will evolve in line with the price trends of different cost drivers, or combinations of cost drivers. In the instances where a combination of cost drivers is used, TERA has used its judgement

5 The indices considered by TERA are CPI, LCI, the fabricated steel index, the copper index and the fibre optic cabling index.

6 Commerce Commission, *Draft pricing review determination for Chorus' unbundled copper local loop service*. 2 December 2014, p. 168

to assign different asset or opex categories with cost driver weights. The price trends for each cost driver has been calculated using a geometric average of available historical price information.

3.2.1 Estimating the price trend

39. TERA estimates price trends as a geometric average over a period of time for which historical price information is available. A geometric average is calculated as:

$$\alpha = \left(\frac{P_e}{P_s}\right)^{\frac{1}{e-s}} \quad (2)$$

40. In equation (2) above:

- α is the price trend;
- P_t is the price (or expected price) at time t;
- s is the time at the start of the sampling period; and
- e is the time at the end of the sampling period.

41. The geometric average in essence provides a rate of price growth that, if applied to the price at the start of the sampling period, will estimate the price at the end of the sampling period. This is a useful property. However, we consider that the methodology suffers from the fact that it gives exclusive weight to information derived from only two data points. Where there is variation in price trends the use of the geometric mean may give rise to considerable error in estimating the trend rate of growth.

42. In light of the above, we consider that price trends should be estimated as the **trend rate of growth** of prices. The trend rate of price growth utilises information over the whole time period. That is, an estimate of α that minimises the sum of squared errors of the regression model specified in equation (3) below, where $\alpha = e^{\beta} - 1$:[7]

$$\ln(P_t) = \theta + \beta t + u_t \quad (3)$$

[7] Note that the fitted value of P_t from this equation is: $P_t = Ae^{\beta t}$. Then:

$$\alpha = \frac{P_{t+1}}{P_t} - 1 = \frac{Ae^{\beta(t+1)}}{Ae^{\beta t}} - 1 = e^{\beta} - 1$$

43. We consider that this methodology will produce a better estimate for the trend rate of price growth than using a geometric average. We also note that using a trend rate of growth is consistent with existing precedent used by the Commission in its regulation of energy network businesses. For example, in its recent decision on final default price-quality paths for electricity distribution businesses over 2015-2020, the Commission uses exactly this methodology to estimate the growth trend for network line lengths.

3.2.2 Estimating the price trend for specific cost drivers

44. TERA has estimated price trends for nine different cost drivers, however, it only gives weight to six out of the nine cost drivers to determine price trends for the different asset / opex categories in the TSLRIC model. The six cost drivers are:

- Buildings;
- Consumer Price Index (CPI);
- Wage / Labour (based on a general Labour Cost Index (LCI));
- Fabricated Steel;
- Copper; and
- Fibre Optic Cabling.

45. In this section, we recommend alternatives to TERA's price trend estimates for the six cost drivers which contribute to the price trends in the TSLRIC model given TERA's proposed weightings. We are of the view that our price trend estimates will provide a more accurate forecast of long term trends.

3.2.2.1 Buildings

46. TERA has estimated a CAGR for buildings of 1.90%, however it has done so based on the number of dwellings in New Zealand, as opposed to the price of buildings. In our view, the Commission should use the Statistics New Zealand capital goods price index for non-residential buildings, having regard to a set of data including forecasts from NZIER (up to March 2020).[8]

> CEG estimates a price trend for buildings of **2.33%,** using the trend rate of growth methodology between December 1989 and March 2020.

[8] Statistics New Zealand, Capital goods price index: non-residential buildings, CEPQ.S2GB. Historical data available through InfoShare

3.2.2.2 Consumer Price Index (CPI)

47. TERA has calculated a CAGR for CPI of 2.18% between 1994 and 2014[9]. Whilst we find that 2.2% is a reasonable representation of the average annual percentage growth in CPI in the past, it may or may not be a reasonable estimate of the average annual percentage growth in CPI over both the past and future periods.

48. In our view, the Commission should have regard to a wider period of data, including forecasts of future CPI, consistent with our view set out in section 2.3 above that as long a time series of data as possible should be used to inform stable estimates of price trends. In this regard we also observe that historical data for the CPI does not start in 2004, and in fact begins much earlier.

49. CEG estimates a price trend for the consumer price index of **2.22%** using the trend rate of growth methodology between December 1989 and March 2019.[10] We note that data for CPI exists prior to December 1989. However, we consider that this date provides a useful point at which to start a long run analysis of inflation because:

    - the Reserve Bank Act was passed in December 1989. This created the framework for policy target agreements that have since been used to maintain price stability in New Zealand; and
    - this date is consistent with the period from which other price trends have been estimated in this report – see for example section 3.4.2 below.

50. We note that, since September 2002, the inflation target for the Reserve Bank of New Zealand has been to keep inflation within a range of 1-3% on average over the medium term. This suggests an average inflation target of 2% over the medium term.[11]

> CEG proposes that the Commission use a price trend for CPI of **2.22%,** based on the estimated price trend for the consumer price index using the trend rate of growth methodology between December 1989 and March 2019.

9 We note that there is an error in the Commission's calculation (incorrect reference to December 2014 number, and that when this is corrected for the CARG is marginally higher at 2.21%.

10 Statistics New Zealand, Consumers price index: all groups, CPIQ.SE9A. Historical data available through InfoShare. Forecasts sourced from NZIER.

11 Reserve Bank of New Zealand (2014), *Inflation,* accessed on 30 January 2015, available here: http://www.rbnz.govt.nz/statistics/key_graphs/inflation/

3.2.2.3 Wages/Labour

51. TERA has used a general labour cost index (LCI) to forecast a price trend for labour/wages of 2.58% based on data from 1994 to 2014.[12] This price trend is, first of all, incorrect based on the Commission's own methodology. The labour cost index data in the Commission's spreadsheet only starts in December 1995, meaning that the estimated price trend uses 1995 – 2014 data and not 1994 – 2014 data. Further, and more importantly, the December 2014 value (1,212) is actually the March 2019 value (the result of a spreadsheet reference error). Once these errors are corrected, the 1995 – 2014 CAGR is 2.22%.

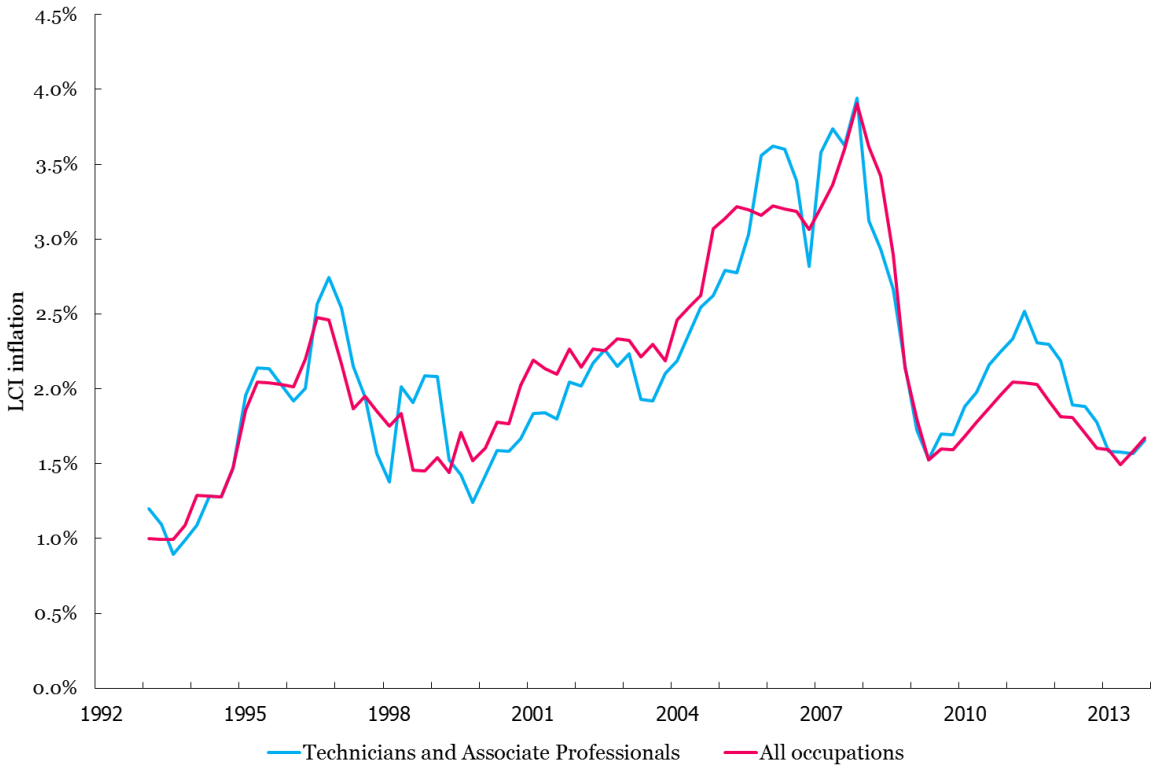
52. In our view, a more appropriate approach would be to use a labour cost index which is specific to technicians and associate professionals, rather than one that is general to all occupations.[13] This index is also very important in escalating the prices that Chorus actually pays network services, as per its field service agreements (or statements of work) with its three main contractors (Transfield, Downer and Visionstream). Prices are indexed forward giving partial weight to changes in the labour cost index which is specific to technicians and associate professionals (to the exclusion of other labour cost indices). This suggests the index is particularly relevant to the type of labour necessary in this context. See Appendix A for more details of the cost escalation specified in Chorus' field service agreements.

53. That said, we note that LCI inflation for technicians and associate professionals and all occupations are closely related, so the impact of changing the labour cost index may not be very large (see Figure 3).

[12] Statistics New Zealand, Labour cost index: All sectors salary and ordinary time wage rates, LCIQ.SG51Z9. Historical data available through InfoShare.

[13] Statistics New Zealand, Labour cost index: technicians and trades workers, LCIQ.SH43c9; and prior to June 2010, Statistics New Zealand, Labour cost index: technicians and associate professionals, LCIQ.SF43C9.

Figure 3: LCI inflation for technicians and associate professionals vs. all occupations



Source: NZIER

54. NZIER does not forecast the labour cost index specific to technicians and associate professionals, and therefore we have relied on a history of this index in combination with a forecast for all occupations.

> CEG estimates a price trend for labour/wages of **2.22%** using the trend rate of growth methodology between December 1992 and March 2019.

3.2.2.4 Fabricated steel

55. TERA has relied on a steel price (converted from US dollars to New Zealand dollars) from NZIER to estimate a price trend of 1.43% from 1995 to 2014. The conversion from US dollars to New Zealand dollars has been done using purchasing power parities, however this is not necessary seeing as steel is an internationally traded commodity. Using market exchange rates is more appropriate.

56. We have developed a steel price history and forecasts based on historical steel prices on a MEPS Asian carbon steel price index.[14] Forecasts are based on Consensus Economics short and long term forecasts of Asian hot rolled coil steel.[15]

57. We use linear interpolation to join these observations and to form a continuous series for steel. We convert this series into New Zealand dollar terms using exchange rates for the New Zealand dollar against the United States sourced:

- in history from the Reserve Bank of New Zealand;[16] and
- in the future using traded forward exchange rates at the end of October as reported by Bloomberg.[17]

58. The resulting continuous series of steel prices in New Zealand dollars from February 1997 to April 2022 is illustrated Figure 4.

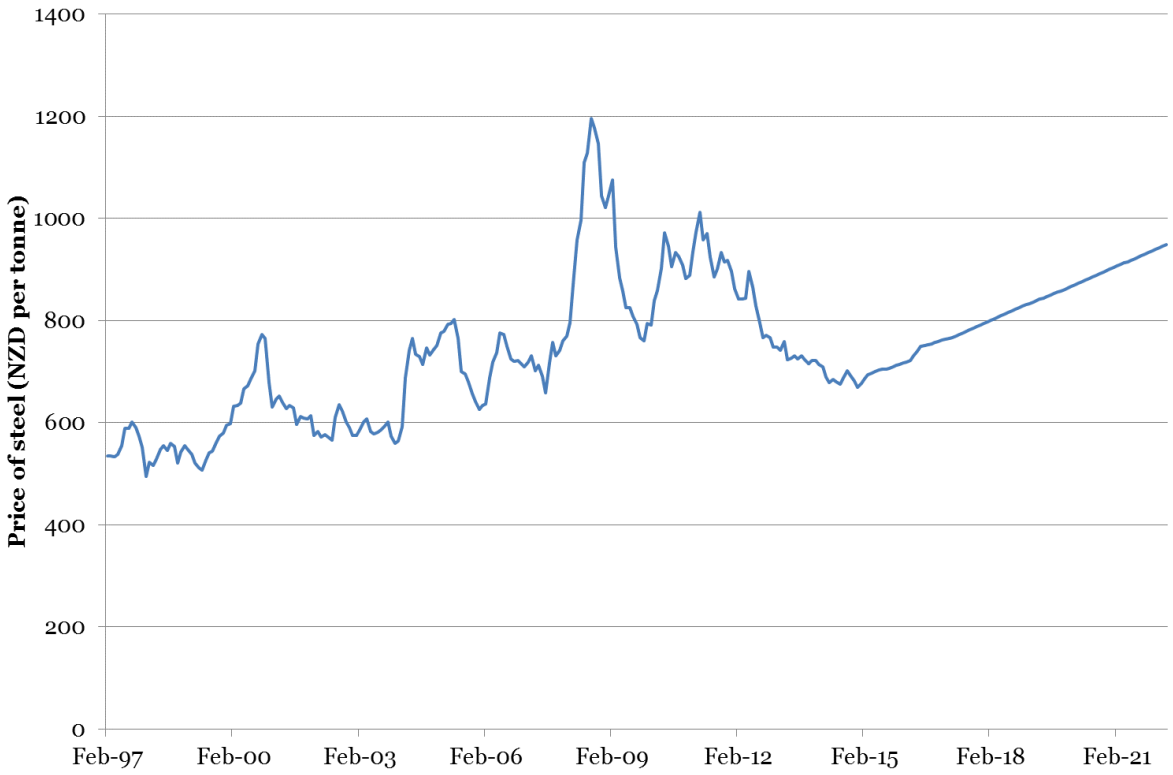
14 Bloomberg series MEPSASPR Index.

15 Consensus Economics, *Energy & Metals Consensus Forecasts*, December 2014

16 Available on the RBNZ's website at: http://www.rbnz.govt.nz/statistics/tables/b1/

17 We use mid-prices on exchange rate forwards, such as NZD5Y CMPT Curncy in relation to 5 year forwards for the NZD-USD cross rate.

Figure 4: Price of steel (NZD per tonne)



Source: Bloomberg, Consensus Economics, Reserve Bank of New Zealand, CEG analysis

CEG estimates a price trend for fabricated steel of **1.76%** using the trend rate of growth methodology between February 1997 and April 2022.

3.2.2.5 Copper

59. TERA has relied on a copper price (converted from US dollars to New Zealand dollars) from NZIER to estimate a price trend of 4.56% from 1995 to 2014. The conversion from US dollars to New Zealand dollars has been done using purchasing power parities, however, in our view this is not necessary seeing as copper is an internationally traded commodity. Using market exchange rates is more appropriate.

60. We have developed a copper price history and forecasts based on:

    - LME monthly historical prices up to and including October 2014;[18]

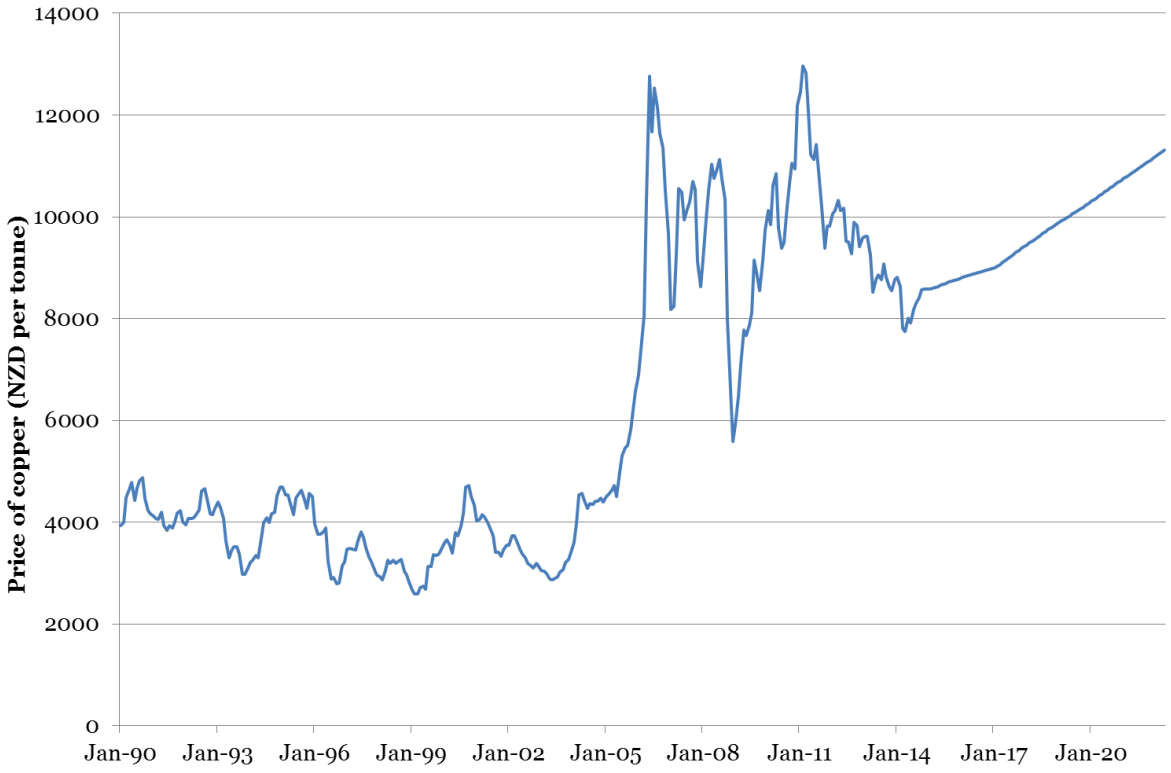
[18] We use Bloomberg series LMCADY Comdty sourced daily and averaged monthly to develop this history.

- LME futures over 3 months, 15 months and 27 months to predict the copper spot prices out to January 2017;[19] and
- a long term forecast sourced from Consensus Economics as an estimate of copper prices at April 2022.[20]

61. We use linear interpolation to join these observations and to form a continuous series of United States dollar prices for copper. We convert this series into New Zealand dollar terms using the same method as described and referenced above for steel.

62. The resulting continuous series of copper prices in New Zealand dollars from January 1990 to April 2022 is illustrated in Figure 5. In our view, the Commission should estimate the price trend for copper based on the long term trend growth rate in this complete series.

Figure 5: Price of copper (NZD per tonne)



Source: Bloomberg, Consensus Economics, Reserve Bank of New Zealand, CEG analysis

[19] Futures prices are sourced using Bloomberg series LMCADS03 Comdty, LMCADS15 Comdty and LMCADS27 Comdty.

[20] Consensus Economics, *Energy & Metals Consensus Forecasts*, December 2014

CEG estimates a price trend for copper of **4.46%** using the trend rate of growth methodology between January 1990 and April 2022.

3.2.2.6 Fibre optic cabling

63. TERA has relied on the Statistics New Zealand capital goods price index for 'insulated wire and cable; optical fibre cables' to estimate a price trend for fibre cables of 4.88% from 1996 to 2013.

64. It is not clear to us that this particular series will give a good estimate of fibre cable prices over this period, or that the prices paid for optical fibre cables is a key driver for this series. Statistics New Zealand reports that the detailed weightings behind this series are confidential, but we understand from conversation with Statistics New Zealand that fibre cables are a small proportion of the index. Further, we understand that it is mainly made up of other types of wires and cables, for example power cables, which are primarily copper.[21] This is supported by the path of this series, shown in Figure 6 below, which suggest elevated levels since 2006 consistent in timing with changes in copper prices from Figure 5 above.

65. Whilst we recognise that information about fibre cable pricing is not very readily available, it is our view that the Commission should not have regard to a series when there is significant uncertainty around the products that it captures or aims to reflect, as is the case with the insulated cable and wire series.

66. We have sourced three alternative series of fibre prices. One of these series represents the price Chorus pays its suppliers for fibre cables. Chorus purchases fibre optic cable on a competitive market, suggesting that the price actually paid by Chorus should reflect a world market price.

67. The second series is derived from total optical fibre value and quantity indices reported on a monthly basis by the Japanese Electric Wire and Cable Makers Association (JCMA)[22], as reported on Bloomberg (CAOTOPTV Index and CAOTOPTQ Index). We calculate a price index from these data as the value index divided by the quantity index.

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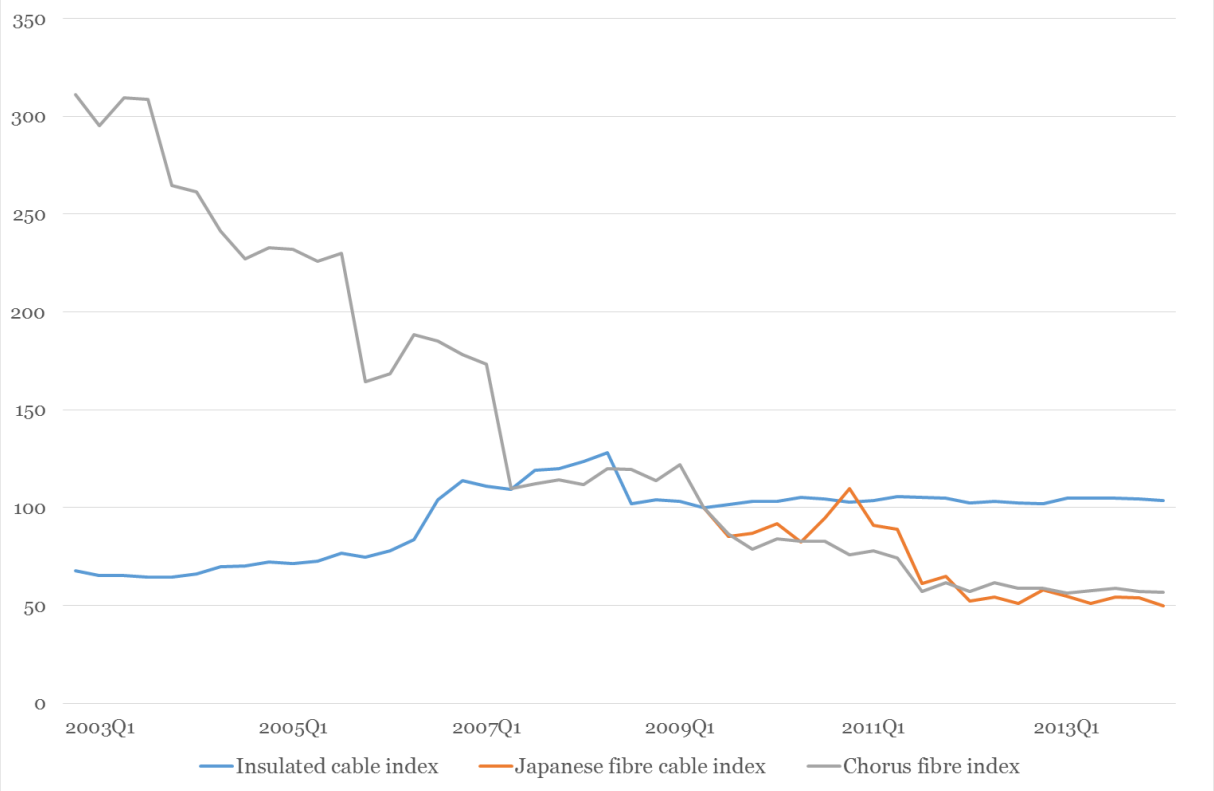
[21] We also note that the identically named series in the UN Statistics Central Product Classification (CPC) version 2 includes a number of sub-categories which are not related to fibre cables: Insulated winding wire, coaxial cable and other coaxial electric conductor, ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships, other electric conductors for a voltage not exceeding 1000 V, other electric conductors, for a voltage exceeding 1000 V and optical fibre cables made up of individually sheathed fibres.

[22] The Japanese Electric Wire and Cable Makers' Association brings together Japan's electric wire and cable manufacturers. JCMA members account for 90% of the Japanese market for electric wire and cable manufacturing in Japan.

68. We compare these two series (in New Zealand dollar terms) with the Statistics New Zealand insulated wire and cable series in Figure 4. It is clear from this figure that the insulated wire and cable index from Statistics New Zealand does not move in line with either the index based on the price actually paid by Chorus, or the index based on the fibre cable prices reported by the JCMA.

69. The price trend of the Chorus fibre index, based on the trend rate of growth methodology between December 2002 and March 2014, is -15.7%. The price trend of the JCMA optical fibre index, based on the trend rate of growth methodology between June 2009 and March 2014, is -15.0%.

Figure 6: Comparison of fibre price sources



Source: Chorus and Bloomberg, CEG analysis

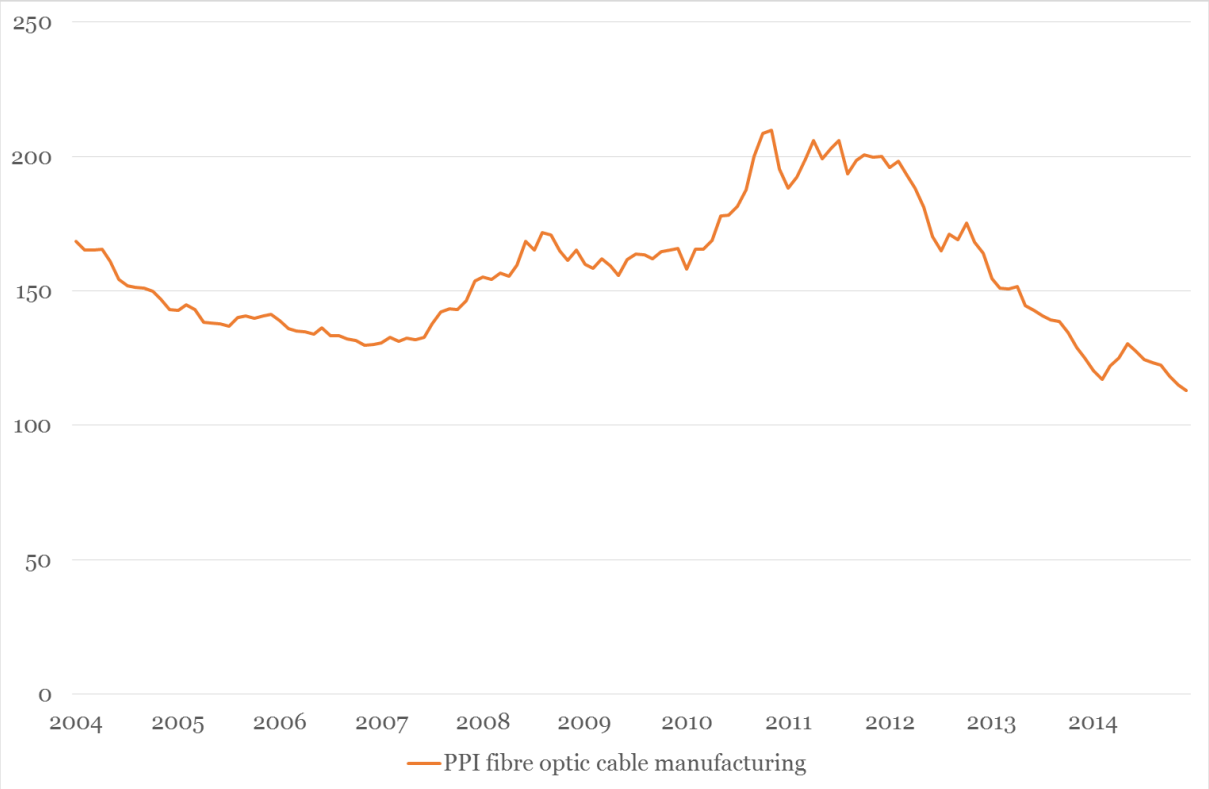
70. The third series of fibre prices is the US Producer Price Index for fibre optic cable manufacturing in the United States. This series is produced by the US Bureau of Labour Statistics, and is available on a monthly basis since January 2004 (see Figure 7). The United States Census Bureau notes that[23]:

[23] United States Census Bureau (2104), North American Industry Classification System, NAICS 335921., accessed on 30 January 2015, available at: http://www.census.gov/cgi-bin/sssd/naics/naicsrch

This U.S. industry [335921 Fibre Optic Cable Manufacturing] comprises establishments primarily engaged in manufacturing insulated fibre-optic cable from purchased fibre-optic strand.

71. The price trend of this series, based on the trend rate of growth methodology between January 2004 and December 2014, is 0.43% in New Zealand dollar terms.

Figure 7: Producer price index for fibre optic cable manufacturing



Source: US Bureau of Labour Statistics, CEG analysis

CEG is of the view that the Commission should not have regard to a series when there is significant uncertainty around the products it captures or aims to reflect, as is the case with the insulated cable and wire series. The Commission should have regard to alternative price trend information for fibre cables, such as that presented in this section. This alternative information suggests that a reasonable price trend for fibre may lie in the range from -15% to 0%.

3.2.3 Price trend estimates for asset and opex categories

72. TERA has split each asset / opex category across cost drivers using its judgement. It has not provided any justifications for these splits. We note that in particular the copper price contribution to the copper cable price trend is very low at 20%, and in

our view the copper cable price should have a larger weighting given that the price trend is intended to reflect the cost of actual copper cables.

3.3 International benchmark

73. The Commission has used the international benchmark approach for five asset categories: FWA base stations – active, DWDM links (active part), DSLAM (card/subrack/rack), power equipment and air-conditioning equipment. It has relied on benchmark information from five countries (Australia, Denmark, Sweden, France and Norway) to calculate an average price trend.

74. Whilst we do not find that benchmarking is a very good method for estimating price trends in general, we do not have an alternative methodology that we consider superior to benchmarking for these particular asset categories. Whilst we have not reviewed TERA's benchmarking exercise in detail, we accept that benchmarking may be the only viable alternative for these asset categories.

3.4 Beca estimates for ducting and trenching

75. TERA's price trend for ducting and trenching comes from Beca's report for the Commerce Commission. Beca estimates price trends for ducting and trenching of 3.0% per year. It states that:[24]

> *We have considered civil and non-residential construction cost escalation for the next 3 years based on Statistics NZ Capital Goods Price Index forecasts. Estimates range from 2.2%, being the average CPGI annual increase to June 2014, up to 3.5% - the average for non-residential buildings. We have based our conclusion on the upward trend in the CGPI generally along with the increase for earthmoving and site works, tempered with the relatively stable prices for electrical works. We therefore forecast the escalation to be at +3.0% per annum.*

76. Beca has not described or justified why it has chosen to rely on certain indices, nor how the different indices contribute towards its final price trend estimate of 3.0%.

77. Further, Beca has not justified its chosen time period. Beca suggests that it has used *"Statistics NZ Capital Goods Price Index forecasts"*, however, Statistics New Zealand does not produce forecasts for the all groups CGPI or for the individual categories of the CGPI. Although it appears that Beca has used data on CGPI growth for the year to June 2014, its report does not provide any rationale for why this would be a reasonable basis for an estimate of the price trend to use in the tilted

[24] Beca, *FPP Corridor Cost Analysis of Trenching and Ducting Rates in NZ – Final Issue Nov14*, 25 November 2014, p. 8

annuity formula. Indeed, it is not clear that Beca has been asked to produce an estimate of a price trend to be used in a tilted annuity formula.

78. In the remainder of this section we consider in more detail the indices and time period that Beca has used to estimate a 3.0% price trend for ducting and trenching.

3.4.1 Choice of indices

79. Beca refers to the following indices in support of its estimate of 3.0% for the price trend for ducting and trenching:

- CGPI all groups (series reference S2GG);
- CGPI non-residential buildings (series reference S2GB);
- CGPI electrical works (series reference S2CC); and
- CGPI earthmoving and site work (series reference S2CD).

80. Beca also includes a table that refers to CGPI civil construction (series reference S2GC), a group that includes electrical works and earthmoving and site work. Beca does not provide any justification for why these particular indices are appropriate, or how each index contributes to its 3% estimate.

81. We consider that some of the indices relied on by Beca are likely to be more appropriate than others as an approximation of the growth in the cost of ducting and trenching.

82. We do not consider that the changes in the price of non-residential buildings (series S2GB) could be expected to be a useful approximation of the growth in the cost of ducting and trenching. This is because the non-residential buildings index includes the following components:[25]

- shops, offices;
- warehouses, factories;
- farm buildings; and
- other non-residential buildings.

83. Generally, we consider it likely that the civil-construction group, which includes transport ways, pipelines, electrical works (series S2CC) and earthmoving and site work (series S2CD), is likely to be a better approximation of the tasks required for trenching and ducting for a telecommunications network than for example non-residential buildings. Beca has relied on two of the sub-series of the civil construction series.

[25] Statistics New Zealand, *Capital goods price index: September 2014 quarter*, Table 3

84. Beca also has regard to the CGPI all groups index. We note that the CGPI all groups index is very important in escalating the prices that Chorus actually pays for trenching and ducting work. In Chorus' field services agreements (or statement of work) with its three main service contractors (Transfield, Downer and Visionstream) prices are indexed forward over time using a formula which gives **[CI:]** weight to changes in CGPI all groups (on average)[26]. The field services agreements are long term contracts that set prices for many of the network services that Chorus requires in its build-out of the UFB. A more detailed discussion of Chorus' field services agreements and the provisions for contract prices to change over time are set out in Appendix A.

85. The heavy weight given to CGPI all groups in Chorus' field services agreements suggests that it may be reasonable to place significant weight upon the expected growth in the CGPI all groups index as an approximation of price trends for trenching and ducting. While this is unlikely to provide a very precise approximation for changes in costs of trenching and ducting, it is likely to capture these activities without any false precisions from a narrow definition. Given this, it is our view that the Commission should rely on the CGPI all groups index to approximate the growth in the cost of ducting and trenching.

3.4.2 Choice of time period

86. As noted above, Beca's estimate of the price trend for ducting and trenching appears to be based solely on CGPI data over the year to June 2014. Although Beca makes reference to a 'forecast', it does not seem to have used an actual forecast to estimate the price trend. Beca's report does not provide any rationale for why data over the year to June 2014 would be a reasonable basis for an estimate of the price trend to use in the tilted annuity formula.

87. We consider that a price trend estimated over a single year of data cannot be a robust estimate of the price trend to apply in a tilted annuity for a TSLRIC exercise. In chapter 2 we explain that to be consistent with the rationale for using the tilted annuity formula, the price trend must be based on a long term average. Estimating the price trend based on a year of recent history is very unlikely to be consistent with a long term average, as a short period of time, such as 12 months, may incorporate temporary fluctuations in price.

88. The particular period chosen by Beca reflects a time during which the New Zealand economy has been growing strongly, and therefore it is likely that the Beca

[26] 23% weight is given to LCI technicians and trade works and 6.5% weight is given to PPI road transport on average.

estimates are high compared to a long term average. In September 2014, Bloomberg observed[27]:

> *New Zealand's economy grew at the fastest pace in 10 years in the second quarter, outperforming most major developed markets as the country prepares to hold an election this weekend.*
>
> *Gross domestic product increased 3.9 percent from a year earlier, the strongest growth since the second quarter of 2004, Statistics New Zealand said in Wellington today. That beat the 3.8 percent median forecast in a Bloomberg News survey of 10 economists. GDP rose 0.7 percent from the first quarter.*

89. HSBC similar noted that the New Zealand economy was booming in the first half of 2014, and that a main driver of this growth construction, including the (temporary) Canterbury re-build after the 2011 earthquake[28]:

> *New Zealand is booming. Its GDP, up 1 per cent in the first quarter of 2014 to give an annual increase of 3.8 per cent, is outperforming almost all other economies in the Organisation for Economic Co-operation and Development. […]*
>
> *Rebuilding the Canterbury region after the 2011 earthquake involves spending around 20 per cent of GDP – a far larger share of the economy than Japan's rebuild after the Fukushima disaster. Indeed, construction has been the main driver of growth this year. […]*
>
> *Not all of the factors driving the economy will permanently lift growth. The Canterbury rebuild is only temporary even if it runs for another year or two.*

90. This corroborates the suggestion that Beca's estimates are likely to be high relative to a long term average. To confirm, we have sourced a long history of the series which Beca relies on. We note that:

- Beca cites recent growth of 2.2% per annum for the all groups CGPI. However, the average compounding rate of growth from December 1989 to September

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27 Bloomberg (2014), *New Zealand Economy Grows Fastest in 10 Years as Election Looms,* accessed on 30 January 2015, Available at: http://www.bloomberg.com/news/articles/2014-09-17/new-zealand-gdp-grows-faster-than-forecast-0-7-in-june-quarter

28 HSBC (2014), *New Zealand's rock-star economy,* accessed on 30 January 2015, available at: http://www.hsbc.com/news-and-insight/2014/new-zealands-rock-star-economy

2014 for this series has been 1.78%. The trend rate of growth over this period has been 1.80%.[29]

- Beca cites recent growth of 3.5% per annum for non-residential buildings. However, the average compounding rate of growth from December 1989 to September 2014 has been 1.89%. The trend rate of growth over this period has been 2.13%.[30]
- Beca also cites earthmoving and site works, and electrical works. These are two categories of civil construction. The civil construction series has grown at an average compounding rate of 2.73% per annum and at a trend of 2.96% per annum between December 1989 and September 2014.[31]

91. Clearly, Beca has selected a period of strong growth compared to the long term average. In our view, the Commission should use as much information as possible, i.e. both the long history and forecasts of the CGPI all groups, to estimate the price trend for ducting and trenching. This will be most likely to accurately reflect a long term trend, as it will serve to smooth temporary fluctuations in the price.

92. In addition to the longer series of historical data that we reference above, we have also sourced forecasts from NZIER for each of the series that Beca relies on. We use these to extend the period of analysis further:

- for all groups CGPI we have sourced quarterly NZIER forecasts to March 2019. The average compounding rate of growth from December 1989 to March 2019 is 1.87%, while the trend rate of growth over the same period is 1.83%;
- for non-residential buildings CGPI we have sourced quarterly NZIER forecasts to March 2020. The average compounding rate of growth from December 1989 to March 2019 is 2.32%, while the trend rate of growth over the same period is 2.33%; and
- for civil construction CGPI we have sourced quarterly NZIER forecasts to March 2010. The average compounding rate of growth from December 1989 to March 2019 is 2.72%, while the trend rate of growth over the same period is 2.99%.

93. None of these estimates supports Beca's price trend for trenching and ducting of 3.0%. As discussed above, we consider that an estimate based upon the CGPI all

[29] Statistics New Zealand, Capital goods price index: all groups, CEPQ.S2GG. Historical data available through InfoShare.

[30] Statistics New Zealand, Capital goods price index: non-residential buildings, CEPQ.S2GB. Historical data available through InfoShare.

[31] Statistics New Zealand, Capital goods price index: civil construction, CEPQ.S2GC. Historical data available through InfoShare.

groups index is reasonable and is supported by its use in Chorus' own field services agreements.

CEG estimates a price trend for ducting and trenching of **1.83%** using the trend rate of growth methodology between December 1989 and March 2019.

3.5 Summary

94. Based on the analysis in this chapter, we conclude that the following changes need to be made to the cost drivers which inform the price trends estimated using the cost escalation approach:

- The price trend for buildings should be increased from 1.90% to 2.49%, in order to be consistent with the long term trend of growth in Statistics New Zealand capital goods price index for non-residential housing.
- The price trend for CPI should be decreased from 2.18% to 2%, in order to be consistent with the Reserve Bank's target average inflation over the medium term.
- The price trend for labour/wages should be decreased from 2.58% to 2.22% to be consistent with the long term trend rate of growth in the Statistics New Zealand labour cost index specific to technicians and associated professionals.
- The price trend for fabricated steel should be increased from 1.43% to 1.76% to be consistent with the long term trend rate of growth in the MEPS Asian steel series.
- The price trend for copper should be decreased from 4.56% to 4.46% to be consistent with the long term trend rate of growth in copper prices based on a combination of LME history, futures and Consensus Economics forecasts.
- The price trend for fibre optic cabling should not be based on a very narrowly defined series when there is significant uncertainty around the products it contains or aims to reflect, as is the case with the insulated cable and wire series relied on by TERA. The Commission should have regard to alternative price trend information for fibre cables, such as that presented in this chapter, to inform its view on the price trend for fibre cables. This alternative information suggests that a reasonable price trend for fibre may lie in the range from -15% to 0%.

95. We also conclude that the price trend for ducting and trenching should be reduced from 3.00% to 1.88% to be consistent with long term growth for CGPI all groups. CGPI all groups is the index with by far the most weight in Chorus' agreements for ducting and trenching price escalation, and also represents a broad category that includes ducting and trenching costs, without any false precision from a narrow definition.

Appendix A Chorus' field services agreements

96. **[CI:]**