ANNEXURE B

1. In this Annexure, Telstra expands on some of the WACC issues raised by the Commission in the Discussion Paper.

How should the WACC parameter point estimate be calculated?

2. In Telstra's view the starting point for a robust calculation of the WACC is to consider each of the normal WACC component parameters in turn and to estimate appropriate point values for each that are consistent with the particular application. These should then be compounded together to estimate the WACC using a set of by now fairly standard and agreed formulas. To our knowledge the Commission agrees that the formulas proposed and used by Telstra are reasonable and no carriers have contested the appropriateness of these formulas.

3. As articulated elsewhere in this submission Telstra considers that use by the Commission of its best point estimate alone is not reasonable given the existence of asymmetric consequences of mis-estimating the WACC. The best point estimate (assumed near the mean of a properly constructed WACC distribution) leaves considerable risk that the significant negative consequences of under-estimating the WACC will emerge. In Telstra's view this is an inappropriate risk for the regulator (on behalf of end-users) to take given the centrality of these assets (and the services they enable) to Australia's standard of living and economic prosperity.

4. The "vanilla" WACC values that Telstra has calculated for each of the years of the term of the Undertaking, and the values assigned to the various component parameters of the WACC are set out in detail in a series of reports prepared by Professor Bowman dated March 2006. Telstra submits that the estimates of the WACC parameters are reasonable for the reasons set out in these reports. The main reasons for the component parameter values and ultimate WACC estimate relied on by Telstra are outlined below. The recommended point estimate for each parameter and the resultant WACC estimates are summarised in the table at the end of this section.

5. Telstra submits that the WACC employed in the PIE II model used to calculate the network costs associated with PSTN OTA and LCS is reasonable for the reasons set out in the report prepared by Professor Bowman and summarised below.

6. The maturity of the riskfree rate was calibrated with the useful lives of the network assets rather than the regulatory period. Given the long useful lives of network assets, a 10-year maturity Government bond was proxied as the riskfree investment. Although this was shorter than the useful lives of network assets, 10-year Government bonds have significant depth of trading and are generally used for long-lived assets. The principle of calibrating the maturity of the riskfree rate with the asset lives has been established by the decision of the Australian Competition Tribunal in the GasNet case.[1]

7. Professor Bowman does not advocate averaging of the riskfree rate but relies on the rate on the day as the best unbiased estimate of the opportunity cost embedded in the network assets also valued on the same day. Telstra has consistently applied WACC estimates quantified effectively at 1 July of each year covered by the relevant undertaking. For years where 1 July had passed (ie for the first year of the undertaking only), the opening bond yield on that day was used, proxied by the closing yield on the previous trading day. However, the years covered by this undertaking (2006-07 and 2007-08) were in the future at the time of estimation (early-November 2005) and so the preferred rates as of 1 July of each relevant year were unobservable. Hence a contemporary bond yield was used (rather than a forecast) as the best unbiased forward indicator of the rate that would pertain on that future date embodying all the relevant information currently available to the market. The rate applied was based on the closing yield on Government 10-year bonds on 31 October 2005 (5.48%). Given recent moves in 10-year bond yields (5.74% at close of trading on 2 June 2006) application of this rate appears significantly downwardly conservative in effect on the WACC estimate.

8. The debt risk premium (DRP) is the margin above the riskfree rate that a particular entity must offer to attract debt funding. The DRP must be set relative to and consistent with the riskfree rate. This requires the DRP to be quantified using a similar approach and as at the same date as the various riskfree rates underpinning the various WACC estimates. The DRP should not be averaged and a contemporary DRP should be used where the beginning of the relevant financial year was into the future.

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[1] Australian Competition Tribunal, Application by GasNet Australia (Operations) Pty. Ltd. ACompT 6

9. The DRP relevant in this context is one that would pertain to a stand-alone provider of PSTN OTA and LCS access services. There is no direct empirical support for this metric. Professor Bowman relies on empirical data on the market-determined Telstra-wide DRP at 10-year maturity as a reliable guide to that relevant for the stand-alone provider of PSTN OTA and LCS access services. Professor Bowman considers that a standalone provider of PSTN OTA and LCS access services would have about the same debt riskiness as the other business activities of Telstra and essentially the same default risk as the whole of Telstra. Given this the DRP for Telstra overall is likely a reliable proxy for that applicable to the standalone provider of PSTN OTA and LCS access services. Professor Bowman applies an observed, market determined DRP at the Telstra level at close of trading on 31 October 2005 of 1.15%. Again this engenders some downward conservatism to the WACC estimate given that more recently the Telstra-wide DRP has approached 1.25%.

10. Professor Bowman advocates the inclusion of a margin in the cost of debt to cover the costs to the entity associated with the issuance of debt rather than the alternative of specific recognition of these costs in the notional cashflows. This is consistent with the recognition by various Australian regulators of debt issuance as a cost requiring recovery and legitimately includable in the WACC. These once-off costs are converted to an annual amount suitable for addition in the cost of debt using the logic of net present value and the coupon yield of the relevant bond as the discount rate.

11. Although the relevant issuance costs are those that would apply to the stand-alone provider of PSTN OTA and LCS access services, there is no empirical information at this level. Again Professor Bowman relies on empirical data at the Telstra-wide level as a reliable guide to the margin for issuance costs applicable to the stand-alone provider of PSTN OTA and LCS access services. He scales back the estimate to be consistent with the likely gearing and asset base employed by the standalone provider of PSTN OTA and LCS access services. The actual quantum adopted (0.2%) was based on a typical public placement of debt and recognition that private placement (ie direct to a particular lender) generally results in higher issuance costs.

12. The market risk premium (MRP) recommended and applied by Professor Bowman was based on a benchmarking approach which specifically recognises that the Australian specific MRP is now established in an international market.[2] The Australian-specific MRP could thus be based on the US MRP plus a margin to reflect net incremental risks associated with investment in the Australian market. This avoided a key problem encountered with many estimates of the Australian MRP based on long-term data on the observed ex post MRP. Older estimates (before the mid-1980's) were in the context of a highly regulated and non-integrated Australian market and thus not representative of the forward-looking ex ante MRP that would pertain today in a globally integrated market environment. Prior to the mid-1980's Australian debt and equity markets were subject to specific controls and interventions with little direct influence from international investors. This tended to reduce the riskiness of investment for domestic investors and hence the required return and achieved ex post MRP's were lower than otherwise.

13. Professor Bowman made specific adjustment to the widely used US MRP estimate (5.5%) to reflect the likely impact of key structural differences between the US and Australian markets. The key structural differences directly adjusted for included taxation (no clear adjustment); market differences including the greater share of resources and small caps listed on the Australian market relative to the US market (addition of between 1.1% and 2.75%): and country risk (no adjustment was made although uplift was most likely relevant). This implied an Australian-specific ex ante MRP of between 6.6% and 8.25% from which Professor Bowman adopts 7.0% as a likely but conservative estimate.

14. The debt beta advocated by Professor Bowman was 0.0 reflecting the low systematic riskiness of debt generally and for either the stand-alone provider of PSTN OTA and LCS access services or Telstra. A zero debt beta is also consistent with the long-held practice of the Commission.

15. Professor Bowman considers that the Telstra-wide target market gearing would be a reliable broad indicator of the likely gearing for the stand-alone provider of PSTN OTA and LCS access services. It is likely that the gearing applicable to the standalone provider of PSTN OTA and LCS access services would be somewhat

[2] See Bowman report, March 2006, section 6.2 for more detail.

higher than that applicable to Telstra overall given the lower systematic riskiness of the PSTN assets and reflecting that the tangible, long-lifed nature of the network assets would provide good security to a debt provider. Professor Bowman recommended that the target market gearing for the standalone provider of PSTN OTA and LCS access services would be [c-i-c]% debt. This view was based partly on specific advice from Telstra that the target market debt ratio was [c-i-c] at the Telstra-wide level and based on calculations estimating actual market gearing as at 30 June 2005.

16. The asset betas estimated relied on empirical data obtained via Bloomberg Financial Services on the equity beta for the 4 Regional Bell Operating Companies ("RBOC's") operative at the time. These were generally considered the closest listed analogues to the stand-alone provider of PSTN OTA and LCS access services. Professor Bowman also considered beta information for five international companies broadly comparable to Telstra. The observed betas were de-levered to remove the impact of differential gearing. It was also recognised that the businesses of the RBOC's and the other international telcos were broader than just that comparable to the standalone provider of PSTN OTA and LCS access services and that would mean a downward adjustment for application in the context of a stand-alone provider of those services. [[c-i-c] Despite the likelihood that betas for telecommunications providers would be rising over time, Professor Bowman recommends the same asset beta for each of the relevant years covered by the undertaking. Reflecting the above, Professor Bowman ultimately recommended an asset beta for the standalone provider of PSTN OTA and LCS access services of 0.7. This was adjusted using the Monkhouse equation to derive an equity beta of 0.873.

17. Under a post-tax "vanilla" WACC approach all tax effects, including the benefit of imputation, are captured in the notional cashflows rather than the WACC. Nevertheless imputation and tax remain relevant in the calculation of the beta. The imputation factor has been particularly difficult to quantify and both Telstra and Professor Bowman have consistently supported the continued use by the Commission of 50%. Professor Bowman considers that the marginal investor valuation of imputation is relevant for application in WACC estimates and that recent evidence is accumulating towards the view that the marginal investor in Telstra is an international investor. As international investors are unable to

realise value from distributed franking credits this would imply an imputation factor valued at zero.

18. Recent empirical analysis[3] suggests that the imputation effect under an average investor approach (ie based on the distribution of shareholders who can and cannot use imputation credits) has fallen from near 50% (based on earlier Officer and Hathaway estimates) to around 35% based on recently updated estimates. As with the previous estimates this updated estimate specifically compounds a factor reflecting access to imputation credits (based on the distribution of imputation credits with dividends) and a redemption factor (based on actual recognition of imputation credits in investor tax assessments). Telstra has historically considered the previous estimate by Officer and Hathaway as providing some empirical support to the 50% estimate used by Telstra and by the Commission. This update however, suggests that a lower rate was now relevant.

19. Nevertheless, given the continuing uncertainty around valuation of this parameter, Professor Bowman considers that the prudent regulatory stance is for the Commission to persist with 50%. Nevertheless, relative to the most likely value of the imputation factor, this introduces an element of downward conservatism to the resultant cost estimates.

20. Both Telstra and Professor Bowman have consistently used the statutory corporate tax rate in WACC quantification as the best estimator of the future tax burden. Accelerated depreciation was discontinued as from September 1999 meaning that costing undertaken on a TSLRIC basis for assets valued at subsequent dates should not countenance accelerated depreciation as it was not available for those assets and not part of the build decision for access seekers. Moreover since the tax rate is only relevant in the equations for de-levering and re-levering betas and because the de-levering of the observed betas is undertaken using statutory tax rates, the re-levering should also use the statutory tax rate. Unless such consistency is applied the beta estimates will be distorted.

21. The statutory corporate tax rate should clearly be used in the gross-up equation designed to estimate the net tax burden as a specific component of the cashflows, since this calculation itself directly accounts for the impact of interest and

[3] Hathaway, Neville *Imputation and Valuation, Tax parameters updates 2005 and a very common error*, October 2005

depreciation on the tax burden. Use of a so-called effective rate in this calculation would double count the deductibility of depreciation.

22. Professor Bowman and Telstra have argued that it is appropriate to recover the costs associated with equity issuance as a margin on the cost of equity. These costs relate to the preparation of financial information and documentation required for an equity issue and for underwriter fees. In its Final Decision on GasNet the Commission decided to include an allowance for equity issuance costs but as a cost cashflow. Telstra is indifferent between recovering these costs as a specific cashflow or as a margin on the WACC, so long as they are recovered. The value for equity issuance recommended by Professor Bowman was based on the Commission estimate in the GasNet context, downward adjusted to reflect the larger scale associated with the stand-alone provider of PSTN OTA and LCS access services and the scale economies associated with these costs. On balance, Professor Bowman recommends that 15 basis points should be added to the CAPM determined cost of equity to reflect equity issuance costs.

23. Further, Professor Bowman outlines his view that there is an asymmetry in the social consequences of mis-estimating the WACC. If the WACC is set too high, there will be a cost imposed on the ultimate consumers, but this is unlikely to have a detectable welfare effect on individual consumers. Such a WACC will provide incentive for long-term and sustainable investment in the relevant infrastructure. Conversely, if the WACC is set even a little too low, serious long-term economic consequences can ensue. Critically, infrastructure providers will not have the necessary incentive to invest, which may even threaten the viability of the provision of services. That asymmetry applies to the provision of PSTN OTA and LCS access services. If the applied WACC should turn out to be set low, it would lead to under investment by Telstra or notionally the standalone provider of PSTN OTA and LCS access services. It will also discourage investment by access seekers, as they will be able to access Telstra's PSTN OTA and LCS access services at an artificially low price thus dis-incenting build even if access seekers were actually more efficient than the standalone provider of PSTN OTA and LCS access services.. If the WACC did turn out to be set too high, there would remain appropriate long-term economic incentives for both Telstra and the access seekers to invest.

24. Professor Bowman recommends that all regulatory WACCs should be determined with reference to the error involved in estimating the parameters (and hence the WACC), and therefore should be set above the best estimates of WACC to reflect the asymmetry of social consequences of errors in setting the WACC. Professor Bowman has provided estimates of the statistically valid one standard deviation ranges for the WACC input parameters. Monte Carlo simulations were then run on these parameter values and ranges. The results reported by Professor Bowman show that Telstra's WACC estimates are supported. Moreover, the plus one standard deviation WACC generated in the Monte Carlo analysis should be used to reduce the risk of under-enumerating the WACC.

ANNEXURE B

Parameter	2006-07	2007-08
Risk-free rate	5.48%	5.48%
Debt risk premium	1.15%	1.15%
Debt Issuance costs	0.20%	0.20%
Cost of debt pre-tax	6.83%	6.83%
Debt beta	0.00	0.00
Asset beta	0.70	0.70
Gearing	[c-i-c]	[c-i-c]
Equity Beta	0.873	0.873
Market Risk Premium	7.0%	7.0%
Equity Issuance costs	0.15%	0.15%
Imputation factor	50%	50%
Corporate tax rate	30%	30%
Cost of equity after tax	11.74%	11.74%
Nominal Post-tax "Vanilla" WACC	10.76%	10.76%
Including 1 standard deviation uplift	14.06%	14.26%

Approximating the WACC distribution

25. The Commission has used a constructed WACC distribution profile to assess the appropriateness of their WACC estimates and those of Telstra. As indicated above Telstra considers that a constructed WACC distribution can also be useful in responding to the issue of asymmetric consequences of mis-estimating the WACC. In both cases a robust distribution of the WACC needs to be constructed. The Commission has sought views on this issue (see question below).

    How should the WACC parameter standard deviation be calculated?

26. As outlined above, Telstra's view is that the Monte Carlo technique would be the most preferred method for understanding the distributional properties of the estimated WACC, including its estimated standard deviation.[4] The Monte Carlo technique specifically allows the construction of the distribution curve for a parameter (the WACC) which is in turn dependent on a range of component parameters all with different statistical distributions and potential for estimation error. This capability makes it a useful tool for analysing the implied statistical properties of dependent variables like the WACC.

27. Like most analysis, the quality of the data and other supporting information going into the Monte Carlo analysis will be important determinants of the usefulness of the outputs (eg the distributional data and the estimated standard deviation).

28. Monte Carlo analysis constructs a distribution curve for the dependent variable (the WACC) by randomly choosing values for each of the WACC component parameters and then compounding these together consistent with the CAPM equations. Monte Carlo analysis can readily sample each component parameter 100,000 times and construct 100,000 WACC estimates. The random sampling for each component parameter is critically dependent on summary information provided about the likely distribution characteristics of each component parameter. The random sampling for each component parameter is then undertaken consistent with that specified distribution type. If the distribution

[4] Telstra also considers that Monte Carlo analysis has dual uses. Firstly to understand the distributional characteristics of the WACC and secondly and more critically, to educate a considered move to adopt a higher than best point estimate WACC in recognition of the asymmetries around the consequences in mis-estimating the WACC.

type for a particular component parameter is normal then the distribution of the 100,000 randomly selected "observations" for that component parameter will also have a normal distribution.

29. If the nominated distribution does not accurately describe the true distribution of the component parameter the sampling will not match the likely reality and this will in turn distort the WACC calculation and thus its statistical distribution. Consequently, it is important that the statistical distribution of each variable is described appropriately.

30. Although the Monte Carlo analysis can maintain the relationships underpinning the high level WACC/CAPM equations it does not capture some of the other dependencies not specifically captured in the equations but nevertheless important in quantifying some of the WACC component parameters. This includes such relationships as those around the debt risk premium and gearing. In essence relationships outside those specified by the CAPM/WACC equations are assumed away and the variables are assumed to be independent of each other.

31. The "fitted" distributions of each of the WACC component parameters should ideally reflect only estimation uncertainty and exclude variations in estimated parameter values dependent on different methodological approaches. For instance, the riskfree rate could arguably be based on 5 or 10 year maturities and the regulator would need to make a decision about the appropriate approach given the context. However, it would not be appropriate to construct a distribution descriptor for the riskfree rate that straddled both the 5 year and 10 year maturities. This would involve an uncertain combination of different values due to different approaches (5 or 10 year maturities) as well as estimation uncertainty around the appropriate value for each maturity. The appropriate approach in a Monte Carlo perspective is for the regulator to identify a preferred maturity and then to identify the distribution characteristics of that maturity only.

32. The following sections discuss the pertinent issues encountered in ascribing likely distribution types to each of the WACC component parameters.

Riskfree rate

33. The identification of the distributional characteristics of the riskfree rate will depend inter alia on whether the WACC estimate is for a past or future time period and on the useful life of the underpinning asset to which the riskfree maturity is aligned. These separate aspects are discussed in turn below.

34. As outlined above Telstra has estimated an updated asset base for each year of the undertaking to which it has applied an estimate of the WACC as at that date. Where the asset valuation date (and consequently the date on which the riskfree rate is based) is in the past, the applicable riskfree rate is readily observable. Consequently there should be no estimation error associated with this quantum. The opportunity cost of the assets employed is determined on the date that the investment is sunk (ie 1 July each year of the undertaking) and is not affected by subsequent volatility in the riskfree rate. Estimation error associated with the fact that the Government bond market is not completely riskfree is typically ignored in WACC quantification and is generally regarded as trivial relative to the vagaries associated with the other WACC parameters. On balance therefore, estimates of the riskfree rate for past dates should be regarded as error free for Monte Carlo purposes. In the current undertaking for PSTN OTA and LCS access services the relevant WACC estimates relate to future dates and so are currently unobservable.

35. In this particular context, where the asset valuation date is into the future Telstra has used a contemporary riskfree rate as the best unbiased market driven forward estimate of the likely rate to apply on the future valuation date. Nevertheless, bond yields are quite volatile and there is undoubtedly estimation error associated with these forward-looking estimates of the riskfree rate. The historical volatility of bond yields can provide some guidance as to the potential for estimation error in these forward-looking estimates of the riskfree rate.

36. In Telstra's view pure methodological issues around the specification of the riskfree rate need to be resolved before attempting to identify distributional characteristics. This is because "combining" two different approaches when attempting to discern distributional characteristics really results in a combination of different variables each with different estimation errors. This makes it difficult to reliably discern a single distributional profile (eg a single standard deviation).

The major methodological issues pertaining to the riskfree rate relate to the maturity of the relevant Government bond and the desirability of averaging.

37. The vexed regulatory question of the appropriate maturity on which to base the riskfree rate is important in considering inputs to the Monte Carlo analysis. In Telstra's view it is not appropriate to include in the Monte Carlo analysis a single distribution descriptor that straddles both a 10-year and a 5-year maturity riskfree yield. This is because the distributional properties associated with 5-year bond yields are different to those of 10-year bonds. Moreover, a significant portion of the volatility if measured on a combined basis is due to approach error rather than estimation error. Approach error is not relevant in a Monte Carlo analysis.

38. Similarly, with the issue of the appropriateness of averaging bond yields over a particular span of trading days to determine a so-called more representative estimate of the riskfree rate. In Telstra's view, there is a decision point for WACC practitioners and the regulator around the appropriate approach which should pre-date consideration of the estimation error relevant for Monte Carlo analysis. The estimation error included in the Monte Carlo analysis should only incorporate pure estimation error and exclude variability due to different approaches. Again the estimation error impounded in an averaged estimate will be different to the error impounded in an estimate on a single day and hence they should not be conflated into a single Monte Carlo analysis.

39. The Monte Carlo analysis should be done on the basis of a particular methodological approach so that the error relevant for the particular parameter relates only to estimation error (on the decided approach). This essentially requires that the regulator decide an approach and undertake the Monte Carlo analysis specifically only capturing distributional properties based on estimation error inherent with that approach. Otherwise, separate Monte Carlo analysis could be undertaken for each methodological approach.[5]

40. The approach used by Professor Bowman is to analyse changes in yields in non-overlapping periods of 8 months and 20 months using monthly close data on bond yields for the last 10 years. The rationale for 8 and 20 months respectively is

[5] Across all the WACC component parameters and reflecting the divergence in views about methodology this could amount to a number of Monte Carlo analyses.

that these relate to the time between the currently observable rates (31 October 2005 when estimates were undertaken) and the dates on which the WACC estimates should ideally be quantified for direct application with asset valuations as at those same dates. The relevant dates for these in the latest PSTN OTA and LCS access services undertaking were 1 July 2006 and 1 July 2007.

41. The average absolute changes in yield calculated by Professor Bowman were 0.68% for 8 months and 1.12 for 20 months. If a shorter time series were used (from July 1997) to exclude higher than current yields in the mid-1990's the average absolute changes in yields are calculated at 0.61 for 8 months and 0.95 for 20 months. On the basis of these empirical results Professor Bowman recommends one standard deviation ranges for the riskfree rate of 0.6% for the 2006-07 WACC estimate and 1.0% for the 2007-08 WACC estimate. If more recent empirical information on the riskfree rate is used in the WACC calculation (and hence closer to the effective dates of July 2006 and July 2007) these estimates of a one standard deviation uplift would need to be modified (downwards). This simply reflects the view that the closer the empirical observation of the riskfree rate to the date on which they are applied (and WACC estimated) the more representative of the appropriate bond yield they become.

Debt risk premium

42. Similar issues to those described above for the riskfree rate emerge in considering the statistical distribution of the debt risk premium (DRP). These include the appropriate maturity and the extent if any of averaging. Telstra's views on these issues in the DRP context are consistent with those in the riskfree rate context. In summary, issues concerning different approaches should not be conflated with issues of estimation error. Only the latter is relevant for the Monte Carlo analysis.

43. The Telstra-wide DRP is determined within financial markets and hence exhibits significant day-to-day volatility. Consequently, it is not sensible to estimate the estimation error based on estimates at different points of time, although the volatility can provide some guidance. The estimation error relevant for the Monte Carlo analysis must be at a particular point of time and consistently calculated with the specification of the riskfree rate including in respect of averaging and maturity of the riskfree investment (to which the DRP is a margin). As indicated above, Professor Bowman has used the Telstra-wide DRP as at 31 October 2005 as

a proxy for the DRP applicable for the standalone provider of PSTN OTA and LCS access services. This includes two sources of uncertainty.

44. Firstly, there is uncertainty around the applicability of the contemporary estimate in the WACC calculations 8 months and 20 months forward. This is similar to the issue discussed above for the riskfree rate and suggests a higher standard deviation when applying the current view as a proxy for the 20 month forward view.

45. The second source of potential estimation error implied for the DRP (that does not apply to the riskfree rate) is the adaptation of the Telstra-wide observed DRP for use in the context of a stand-alone provider of PSTN OTA and LCS access services.[6] The stand-alone access provider business is a sub-component of the entire Telstra business to which the observed Telstra-wide DRP pertains. This adaptation therefore potentially introduces estimation error into the estimate of the DRP applicable to the stand-alone access provider. Estimation error associated with this should be part of the distributional properties imposed on the DRP in the Monte Carlo analysis.

46. Overall, Professor Bowman advocates a one standard deviation range in the estimate of the DRP for the PSTN OTA and LCS access services of approximately 0.15% for both years. This likely introduces an element of downside conservatism to the estimate of the standard deviation for the 20 month forward view. This though is considered immaterial relative to the broader error margin around this estimate.

Market Risk Premium

47. The Market Risk Premium (MRP) is possibly the most challenging component parameter from the perspective of identifying distributional characteristics free from approach variance. Typically estimates of the MRP are based on a number of different approaches and simply using all these approaches to determine a single distribution is not appropriate. A combined approach would conflate effects of different approaches with true estimation error.

[6] This includes the potential to simply use the observed Telstra debt risk premium in the access provider context.

48. There are a number of different aspects to estimating the MRP which relate to approach (rather than pure estimation error). These include:

49. Arithmetic or geometric averaging of historical estimates. This relates to the method of calculating a representative MRP from historical data on the annual year by year ex post MRP. Geometric averaging represents a compounding of the rates to determine a (compound) average whilst arithmetic averaging is just a simple average of the observed MRP's. Even though the underpinning data is the same in both cases the MRP estimate is different and the error surrounding the estimates are therefore both different depending on the approach chosen for averaging.

50. Australian-specific or estimates for overseas countries. In Telstra's view it is not acceptable to include in an analysis attempting to identify the distribution characteristics of the Australian MRP data on overseas MRP's. Unless the overseas estimates have been adjusted to be applicable to the Australian environment, they have no informational content for estimating the Australian MRP or its likely distributional characteristics.

51. Different riskfree maturity underpinning the different estimates of the MRP. Although most estimates of the MRP are typically benchmarked relative to 10 year Government bonds not all estimates are. Consequently it is important to identify the riskfree investment benchmark applied in the studies. Variation in the estimated MRP which are dependent on or due to different maturity riskfree benchmarks is not a legitimate component of the distribution characteristics for use in Monte Carlo analysis.

52. Different time periods covered by the estimates. Estimates that cover different time periods will likely differ from each other and the consequent error relative to the true contemporary ex ante MRP is different as is the distribution of that error. Consequently, care needs to be taken when inferring estimation error from estimates straddling different time periods. As Telstra has argued previously, estimates of the Australian MRP including large periods of time when the Australian market was segmented from global capital markets would not provide meaningful insights into the contemporary ex ante expectation of the MRP now that the Australian market is fully integrated into global capital markets. A

necessary corollary of this is that it does not assist in ascertaining the appropriate distributional characteristics of the current ex ante MRP.

53. Imputation adjusted or not. Estimates of the MRP for years pre-dating the introduction of dividend imputation capture the full return available to the market (capital gain and dividends). Since the introduction of dividend imputation though there has been another component of the market return which is often ignored – the benefit of dividend imputation to equity investors. Unless the historical post-imputation estimates of the MRP have been adjusted they will not capture the effects of imputation and hence will tend towards under-estimating the true ex ante MRP in an imputation inclusive market. Complicating this issue is the moves to limit trading in imputation credits and more recently to allow full usage by all domestic-based equity investors, including in generating tax refunds. Unless these factors are somehow controlled for the estimated distributional characteristics may not match the true characteristics needed for inclusion in a Monte Carlo context.

54. Studies of the ex ante or ex post MRP. Although the MRP for inclusion in the CAPM is clearly expectational, most studies of the MRP use estimates of the achieved ex post MRP and apply that as a guide to the ex ante or forward-looking MRP. There have been a number of attempts to directly estimate the ex ante MRP. Again, including estimates of the MRP on both these bases and inferring distributional characteristics from this pooled data is flawed and provides misleading information for inclusion in a Monte Carlo analysis. Because of the innovative nature of the techniques involved, it is likely that the estimation error in the direct estimates of the ex ante MRP are likely higher than the ex post estimates.

55. All of these factors make it extremely difficult to identify robust distributional characteristics absent the influences of approach variation. One potentially useful approach in this context is provided by the various estimates of Officer reported by the Essential Services Commission[7]. Officer also estimated the historical standard error of each of these reported MRP estimates. Although these estimates of standard error suffer from some of the short-comings discussed above they may provide useful guidance on how to delineate or estimate

[7] See Essential Services Commission, *Review of Gas Access Arrangements, Final Decision*, October 2002, page 324.

distributional characteristics for the MRP. The (simple) average standard error of the Officer estimates is 2.17% compared with a (simple) average MRP estimate of 6.82%. The standard error of historical, ex post estimates of the MRP is likely to underestimate the standard error in the forward-looking, ex ante MRP.

56. This suggests that the standard deviation of the MRP could be around 2.0% to 2.5%, in part depending on the MRP estimate used. Professor Bowman recommends a one standard deviation range of 2.5% in the current PSTN OTA and LCS access services context.

Beta

57. The beta estimates obtainable from the various risk management service providers (eg Bloomberg, the AGSM/CRIF) also come with estimates of the standard error. The associated standard error typically is quite significant relative to the actual beta estimate. Data compiled by the Centre for Research in Finance at the Australian Graduate School of Management shows that the average standard error of the equity beta estimates is 0.92[8].

58. These standard errors only capture estimation error associated with estimating beta for a particular listed company. In determining the appropriate beta for the stand-alone provider of PSTN OTA and LCS access services there are a number of other steps each of which introduces further potential for estimation error of the relevant beta. These other steps include:

59. The selection of listed comparable companies. Often it is difficult to identify listed companies that solely provide the service of the stand-alone access provider. To the extent there is a mis-match some degree of error is introduced;

60. Observed equity betas need to be de-levered to remove the differential impact of gearing and then re-levered commensurate with the targets gearing. This can introduce estimation error around the gearing used in the de-levering;

61. The averaging process may not be robust. Typically de-levered betas are simply averaged rather than perhaps market cap weighted. The choice of weighting may distort the averaging process and thus introduce further error;

[8] See the Australian Graduate School of Management, Centre for Research in Finance, June 2005 Risk Measurement Service.

62. The Blume correction[9] also may introduce some estimation error that is unlikely to cancel out across the sample chosen;

63. Historically determined betas are applied in an ex ante sense. The estimates of beta for an individual company are volatile through time and hence it is not clear that an ex post estimate of beta will be robust ex ante. There is therefore some potential for estimation error based on historical betas applied in a forward-looking sense;

64. Given the starting point standard error in estimating beta for listed companies and the potential for further estimation error when adjusting to betas applicable to the relevant stand-alone access provider, the potential for estimation error is quite significant.

65. Professor Bowman recommends a one standard deviation range of 0.25 as reasonable relative to the asset betas recommended for the standalone provider of PSTN OTA and LCS access services. The effect of this range on the equity beta is applied via the normal re-levering equations applied in the Monte Carlo analysis and essentially implies a one standard deviation range for the relevant equity beta of around 0.3.

Debt Issuance Costs

66. The debt issuance costs that Professor Bowman has recommended have been loosely based on the costs associated with a particular debt-raising by Telstra. This may create potential for estimation error if the particular debt raising was not typical. Further, this Telstra-wide estimate has been proxied as applicable at the stand-alone access provider level. Obviously there is potential for further estimation error in the application of the Telstra-wide estimate to the stand-alone access provider level.

67. The extent of debt issuance costs (expressed as an annualised % of debt) will vary with the size of debt assumed to be raised (reflecting scale economies in some of the related costs) and the life of the assets involved (reflecting the period over which the debt issuance costs can be amortised

[9] The Blume correction starts from the premise that betas have mean reversion towards 1 and hence makes a correction to the observed beta to push the corrected beta closer to 1. The simple formula is adjusted beta = 0.66 * observed beta + 0.33*1.

68. The distributional characteristics of the debt issuance costs are difficult to portray. Given the low values and the fact that debt issuance costs must be positive it is likely that the distribution is positively skewed. Professor Bowman considers that it may be useful to proxy a normal distribution with a standard deviation of 0.15% for application in the PSTN OTA and LCS access services context.

Equity Issuance Costs

69. Consistent with emerging regulatory practice both Telstra and Professor Bowman advocate the inclusion of a margin for equity issuance costs in the estimated cost of equity.[10] The relevant issues are similar to those discussed above in respect of the debt issuance costs. The amortisation of equity issuance costs is best made using a useful life at least as long as the asset life and in some cases a perpetuity assumption may not significantly distort the estimate.

70. The distributional characteristics of the equity issuance costs are difficult to portray. Given the low values and the fact that equity issuance costs must be positive it is likely that the distribution is positively skewed. Despite this it may be useful to proxy a normal distribution with a standard deviation of 0.1%.

Gearing

71. Both Telstra and Professor Bowman have consistently argued that the appropriate gearing structure in the WACC context is the target market gearing. Estimating this at the stand-alone access provider level can be challenging given that no entity actually trades on that basis and it is difficult to locate reasonable "pure plays" around which likely gearing could be benchmarked. There is therefore, the potential for estimation error in determining the gearing used to weight the cost of debt and cost of equity.

72. In theory, the estimation error associated with gearing would not translate into significant error in the estimated WACC, provided the impact of gearing is endogenised in the calculation of the equity beta and ultimately the estimation of WACC. This would require that the CAPM/WACC model employed in the Monte Carlo analysis recognised the impact of debt gearing on the equity beta. If this

[10] See ACCC, "*Final Decision, GasNet Australia Access Arrangements Revisions for the Principal Transmission System*" November 2002, pages 143-151.

were the case, the distributional characteristics of gearing are largely irrelevant as factors affecting the distributional characteristics of the WACC (for which the Monte Carlo analysis is being undertaken).

73. Problems would emerge if the equity beta and gearing are assumed independent (either actively or by default). In this case, sampling of different gearing would flow entirely through to different values of the WACC to a significantly greater extent than CAPM (properly implemented) would suggest. In Telstra's view application of such an under-specified equity beta would significantly distort the estimated distributional characteristics of the WACC estimated by the Monte Carlo analysis and radically reduce the informational content. Recognising the above lack of sensitivity of WACC estimates to gearing Professor Bowman considers it may be preferable to leave gearing as a constant in the Monte Carlo context.

Corporate Tax Rate

74. Although the corporate tax rate is not directly relevant for the post-tax vanilla WACC construct, it is applied in the "gross up" equation. It has not previously been suggested but it appears to Telstra that similar techniques (ie Monte Carlo analysis) could be applied to the parameters in the "gross-up" equation. Arguably the Commission should ensure that it does not under-enumerate the allowed return to access providers including through its approach to converting post-tax returns into pre-tax equivalents.

75. The logic of applying the statutory tax rate in WACC and related contexts is quite strong. In the context of the gross-up equation there are other parameters that specifically capture depreciation effects and so the tax rate relevant in that context is necessarily the statutory corporate tax rate. Even in the broader WACC context in which the Commission has previously applied the effective tax rate there is really little scope for Telstra to advance depreciation and hence the effective corporate tax rate will approximate the statutory rate. This is especially more pertinent in a TSLRIC context in which the assets are constructed and valued today, well after the expiration of accelerated depreciation. Moreover, the de-levering of observed betas typically employs the statutory corporate tax rate effective in the relevant country. For consistency the re-levering equations

should also use the appropriate statutory corporate tax rate applicable in the target country (ie Australia in this context).

76. From a Monte Carlo perspective it is important to note that there is no estimation error applicable to the statutory corporate tax rate. There may well be considerable estimation error in determining the so-called effective rate. The Commission estimate it at 20% although the detail of that estimate has not been exposed to public scrutiny.

77. In Telstra's view though it would not be appropriate to ascertain a single distributional metric from the combined sample of 20% effective rate and 30% statutory rate. The difference between these estimates is not estimation error but due to different approaches. Consistent with the foregoing, approach error is not relevant in a Monte Carlo context.

78. Professor Bowman's view is that the statutory corporate tax rate is applicable and it is normal in WACC calculations to assume that this is stable over the life of the relevant assets. Obviously, there is an element of uncertainty around this assumption but a range is not necessary.

79. A possible alternative approach would be to estimate separate Monte Carlo analyses for the statutory corporate tax rate as above (using a standard deviation of 0) and a undertake a separate set of Monte Carlo calculations using an effective tax rate with some uncertain and difficult to specify distribution of likely estimation error.

Imputation Factor

80. The distributional characteristics of the imputation factor depend in part on whether an average or marginal investor approach is taken to valuing the imputation effect. This is explained below but again, consistent with the views on other parameters, estimation differences caused by different approaches are not normally consistent with the distributional characteristics required for Monte Carlo analysis.

81. The average investor approach to valuing the effect of imputation looks at the distribution of shareholders across those who can and those who cannot fully

utilise dividend imputation credits. The recent analysis by Hathaway11 is an example of the average investor approach. Virtually the only category of shareholder that cannot fully utilise the imputation credits are international (ie non-Australian) shareholders. If the share registry has a higher representation of international shareholders the imputation benefit will be lower. In this average approach therefore the gamma is closely correlated with the extent of foreign representation on the share registry.

82. A more meaningful approach is to base the imputation factor on the marginal investor who effectively determines the share price and thus it is the imputation benefit of the marginal investor that matters. It is most likely that the marginal investor in Telstra (and the stand-alone access provider) would be an international investor. This is likely the case for most major Australian listed companies. On this basis the imputation factor would be zero. It is possible that a major Australian investor (say a large superfund) was the marginal investor for Telstra and/or the standalone access provider. On this basis the imputation factor is 1.0. Under the marginal investor approach the imputation factor can only be 0.0 (international marginal investor) or 1.0 (domestic marginal investor). Hence that distribution is bi-modal with a slight tendency towards 0 given the greater likelihood that the marginal investor is a major international investor.

83. Given the requirement that the distributions relevant for Monte Carlo analysis do not incorporate factors due to divergent approaches, it would appear potentially sensible to run separate Monte Carlo analyses with the distribution of the imputation factor separately based on the marginal investor and average investor approaches.

84. Under the marginal investor approach the value of imputation is either close to zero (marginal investor is international investor unable to utilise imputation credits) or close to 1 (marginal investor is close to 1 (marginal investor is domestic/Australian). This is the approach recommended by Professor Bowman in which the imputation factor is bi-modal, that is equal to 0 or 1 with equal probability.

[11] Hathaway, Neville *Imputation and Valuation Tax parameter updates 2005 and a very common error*, October 2005