Report prepared for the Australian Energy Regulator

Efficient allocation and compensation for inflation risk

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Executive summary

1.   Network Service Providers (NSPs) have raised a number of concerns about how inflation risk is addressed within the current arrangements for regulating NSP revenue.

2.   We take as the starting point for our analysis the national electricity and gas objectives, as these provide the overarching economic objective for the regulation of NSPs. The national electricity and gas objectives provide for the promotion of efficient investment in the long-term interests of consumers. Promoting efficient investment requires that the regulatory regime provide investors with the opportunity to earn a return which covers the opportunity cost of capital. That is, the expected present value of future revenue from an efficient investment should be no less than the expected present value of costs, including a return on capital (NPV=0).

3.   Investors in long-lived assets would expect to maintain the real value of their assets. Ex ante, a service provider would expect to achieve a real return and be compensated for expected inflation. Ex post, the service provider would expect to be compensated for actual inflation so that it achieves the expected real rate of return.

4.   The AER operationalises this expectation by determining an allowed nominal rate of return. The net cash flow (after operating expenditure and tax) allows a real rate of return, estimated by deducting the AER's estimate of inflation from the allowed nominal rate of return. Actual inflation is compensated through a revaluation of the service provider's asset base at the end of the period, and by substituting actual (lagged) inflation for expected inflation in the annual price adjustment process.

5.   The AER model is therefore consistent with the regulatory objective. We have tested this outcome through formal modelling (algebraic equations) and by spreadsheet modelling scenarios over multiple regulatory periods.

6.   There is a relatively small deviation from NPV=0 in the typical application of the AER model. For most NSPs, the revenue in the first year of a regulatory period locks in expected inflation for that year, rather than substituting in actual (lagged) inflation. Therefore, if expected inflation for that year is greater (less) than actual inflation, the NSP receives a higher (lower) return than expected. This effect persists through the regulatory period because each year's revenue is a function of the previous year and so, ultimately, all are a function of the first year.

7.   Although the AER model delivers expected real returns (setting aside the first year variation), two key issues remain:

    • The estimated real allowed rate of return is unlikely to be equal to the underlying real return inherent in the nominal allowed rate of return due to errors in estimating inflation and differences in the estimation periods.

    • Debt is issued in fixed nominal terms. This means that equity holders bear the costs (revenue shortfall) if actual inflation is less than expected (and conversely

receive a benefit where inflation is unexpectedly high as revenue reflects the higher inflation but debt costs do not).

8. Errors in estimating inflation are inevitable as the future is uncertain and the inflation expectation held by investors is not observable. In any regulatory year, the allowed real rate of return may therefore differ from that inherent in the nominal return. The consequences of this divergence largely depend on the size of the forecasting error and whether there is any persistence in the direction of the errors (that is, bias).

9. Systematic forecasting errors across a regulatory period would not be consistent with the regulatory objective, even if it were offset by a later reversal of the error. We consider minimising these errors a forecasting issue, rather than an issue with the model. We are not aware of another model that would avoid the need to estimate inflation, while meeting the regulatory objective of providing NSPs with the opportunity to achieve an expected real return on investment.

10. There is some residual risk to equity holders because service providers typically issue debt in fixed nominal terms. If actual inflation were less than expected, and hence nominal cashflows were lower, returns to equity would be lower than expected because the residual cashflow after meeting debt costs would be less than expected (conversely, if inflation is unexpectedly high, equity holders receive a benefit). This impact on the return on equity is magnified by leverage. For example, with leverage of 60%, a 1% difference between the AER's estimate of expected inflation from the expectation of inflation implicit in the nominal WACC, would mean a 2.5% difference in the nominal return to equity.

11. While the impact on equity holders could increase the likelihood of financial distress (when inflation is lower than expected), we consider it is likely that service providers can bear this risk, or manage it (at a cost) by issuing inflation-indexed debt and choice of leverage. This judgment relies on the AER's inflation estimates being reasonable and unbiased; that is, the estimation errors are relatively small and are not systematic.

12. Provided errors are relatively small and not systematic, we consider that any additional costs associated with inflation risk would likely be factored into the nominal rate of return. This is because the equity beta selected by the AER is at the top end of a range estimated from comparator companies which, at least for nearly a decade, have been subject to the same inflation risk as NSPs.

Introduction

13. The Network Service Providers (NSPs) have raised a number of concerns about how inflation risk is addressed within the current arrangements for regulating NSP revenue. These concerns include whether the revenue and price modelling undertaken by the Australian Energy Regulator (AER) provide for:

    • an efficient level of inflation risk

    • appropriate compensation for this efficient level of inflation risk

    • an efficient allocation of inflation risk between Network Service Providers (NSPs) and end users.

14. In this report, we:

    • draw from the national electricity and gas objectives the overarching economic objectives for addressing inflation risk in regulating NSPs

    • specify a formal model to assess whether the building block model achieves, in concept, the regulatory objectives for inflation risk

    • apply this model to the approach taken by the AER in its Post-Tax Revenue Model (PTRM), Roll Forward Model (RFM), and price control mechanisms

    • re-present scenarios submitted by the NSPs to be consistent with the formal model and assess whether those scenarios identify any divergence between the outcomes of the models and the regulatory objective

    • apply the formal model to the approach taken by the AER in constructing its estimates of allowed returns including assessing embedded expectation and estimates of inflation, fixing debt in nominal terms and annual updates to the cost of debt

    • consider the implications of the various lags of inflation used by the AER in its measure of actual inflation

    • consider whether there is an adjustment to the framework that would remove the discussion about inflation expectations and would achieve an efficient compensation for inflation and risk

    • consider whether the method by which equity beta is estimated may compensate regulated firms for bearing inflation risk.

15. In considering the points outlined above, we review and comment on the inflation-related issues raised by stakeholders in submissions and proposals to the AER.

The regulatory objective

National electricity and gas objectives

16.   The starting point for our analysis is the national electricity and gas objectives, as these provide the overarching economic objective for the regulation of NSPs. These objectives are:

> *to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to— (a) price, quality, safety, reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system[1]*

> *to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas[2]*

17.   It would seem that although there may be debate about how some aspects of these objectives should be interpreted,[3] there is general agreement that these objectives provide for the promotion of efficient investment in the long-term interests of consumers. The Australian Competition Tribunal has summarised the economic foundation of the national electricity objective and the revenue and pricing principles as follows:[4]

> *Consumers will benefit in the long run if resources are used efficiently, i.e. resources are allocated to the delivery of goods and services in accordance with consumer preferences at least cost. As reflected in the revenue and pricing principles, this in turn requires prices to reflect the long run cost of supply and to support efficient investment, providing investors with a return which covers the opportunity cost of capital required to deliver the services.*

The opportunity cost of capital

18.   *Ex ante* a firm must have an expectation that its investment will be profitable, or it will not invest.[5] This means investors expect the present value of future revenue to

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[1]   National Electricity (South Australia) Act 1996, Schedule—National Electricity Law, section 7.

[2]   National Gas (South Australia) Act 2008, Schedule—National Gas Law, section 23.

[3]   We are aware of some contention as to whether these objectives could be read as equating the long-term interests of consumers with efficient investment, operation and use of electricity and gas services, see Federal Court of Australia, *Australian Energy Regulator v Australian Competition Tribunal* (No 2) [2017], paragraph 97.

[4]   Australian Competition Tribunal, *ElectraNet Pty Limited (No 3),* [2008], paragraph 15, cited by the Federal Court of Australia (above) as principles "all parties appear to embrace", paragraph 496.

[5]   See for example Joskow, Paul L., 2005, *Regulation of natural monopolies*, Centre for Energy and Environmental Policy Research 05-008 WP, page 41, 54.

be no less than the present value of costs, where cost includes a reasonable return on the investment (the opportunity cost of capital):[6]

> ***No commercial competitor would come into an industry if they did not expect to be able to recover the decline in the real values of their assets, as well as earn a normal profit (the opportunity cost of capital)****. They would measure their return in investment after recovery of funds sufficient to maintain the real value of the financial capital they had invested.*

19.   If the present value of revenue is equal to the present value of costs, then consumers pay no more than is required to attract the investment needed to efficiently provide the service. Hence, regulation that seeks to set the present value of revenue equal to the present value of costs is in the long-term interests of consumers.

20.   This principle, of setting the present value of revenue equal to the present value of costs, is referred to as the NPV = 0 principle. This principle is particularly important for promoting efficient investment in sectors such as electricity and gas networks where investments tend to have long economic lives and are highly specific (cannot be shifted to alternative uses). A decision to invest in 'specific assets' commits capital to that use for a long period of time – the capital cannot be recovered by selling the asset for an alternative use if returns are not satisfactory. To commit to long-term investments in specific assets, investors must expect to be compensated for inflation over the investment horizon. If investors cannot expect to be compensated for inflation, the investment would not be expected to be profitable *ex ante* and the investment would not occur. Investors in long-life assets have an *ex ante* expectation of real returns.

21.   As specific, long-life, assets are a significant fraction of total costs of NSPs, the long-term credibility of the regulatory rules are important in convincing investors they will be fairly compensated for the efficient costs they incur in the provision of services. Future decisions are influenced by past outcomes. The long-term interest of consumers requires both an *ex ante* expectation of real returns, and that these returns are able to be achieved *ex post*.

22.   It is important to draw a distinction between the allowed regulatory return and the return actually achieved. A number of factors can influence the level of actual returns and regulation does not guarantee a normal return over the lifetime of a regulated supplier's assets. We return to this point below.

23.   The objective, of providing investors with the opportunity to achieve an expected real return, is reflected in the National Electricity Rules (NER), which specifies that the post-tax revenue model must be such that:[7]

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[6]   HM Treasury Advisory Group, *Accounting for Economic Costs and Changing Prices: a report to HM Treasury by Advisory Group*, Vol 1, HMSO, London, 1986, paragraph 19 (emphasis in original) quoted in Commerce Commission New Zealand, 2016, *Input methodologies review draft decisions Topic paper 1: Form of control and RAB indexation for EDBs, GPBs and Transpower*, footnote 96.

[7]   NER, section 6A.5.3 (c)(1),(3). This clause pertains to electricity transmission, but there are equivalent requirements around the use of CPI-X inflation adjustments for both electricity distribution and gas.

the net present value of the expected maximum allowed revenue for the provider for each regulatory year of the regulatory control period is equal to the net present value of the annual building block revenue requirement for the provider for each regulatory year

…

the maximum allowed revenue for the provider for each regulatory year (other than the first regulatory year) is calculated by escalating the maximum allowed revenue for the provider for the previous regulatory year using a CPI - X methodology

24. Hence, allowed revenue should be set *ex ante* to equal expected costs in net present value terms so the service provider could expect to achieve a real return (the opportunity cost of the capital), and to be compensated for expected inflation. As allowed revenue would be adjusted during the regulatory period for actual inflation (using the CPI - X methodology), investors should anticipate that the expected real returns can be achieved *ex post*.

25. In setting the net present value of expected revenue equal to the net present value of expected costs, the AER is required to use a nominal rate of return.[8] Specifying a nominal return is consistent with the fact that prices are nominal and hence allowed revenue must also be expressed in nominal terms.

26. The requirement that the allowed rate of return be specified in nominal terms in the NER/NGR appears to have caused some confusion. Some stakeholders infer that the underlying regulatory objective is therefore that the service provider should achieve a regulated nominal allowed rate of return. For example, Ausgrid in its submission on the AER discussion paper, "Regulatory Treatment of Inflation" (AER inflation discussion paper)[9] refers to:[10]

    the current inconsistency between the PTRM and RFM means that the total nominal return on capital actually received by a distributor can be different to what is determined as efficient by the regulator at the start of each regulatory determination. The degree of difference is determined by how much actual inflation varies from the AER's forecast of inflation at the start of the regulatory period.

27. Similarly, the APA considers the current framework provides "a nominal return on an original cost asset base".[11]

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[8] NER, section 6.5.2(d)(2) This example pertains to electricity distribution but is mirrored by similar requirements in relation to transmission and gas, see for example, NER cl. 6A.6.2(c)–(d) (transmission) and NGR r. 87(3)–(4) (gas).

[9] AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, available at https://www.aer.gov.au/system/files/AER%20inflation%20review%202017%20-%20discussion%20paper%20-%2018%20April%202017.pdf

[10] Ausgrid, 29 June 2017, *Submission letter on the AER regulatory treatment of inflation discussion paper*, page 2.

[11] APA, 29 June 2017, *Regulatory treatment of inflation: APA submission in response to AER consultation*, page 17, section 4.12.

28. Other stakeholders appear to accept that the regulatory framework is designed to achieve real rates of return. The Consumer Challenge Panel (CCP) for example submitted that:[12]

> *The results are consistent with expectations as the PRTM and RFM models are designed to yield prices and revenues that are consistent with the achievement of the real rate of return.*

29. Similarly, the Energy Consumers Australia comment that "*nominal WACC is estimated, but the PTRM provides a return based on a real WACC plus actual inflation.*"[13] In its submission, Jemena Limited underlines the AER's description of the intent of regulatory regime that "*prices faced by consumers and the revenues received by the networks change by actual inflation, but are constant in real terms.*"[14]

30. In the sections that follow, we consider whether the AER's model is specified so that NSPs could have, *ex ante*, an expectation of achieving real returns and that those returns can be achieved *ex post*.

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12   Consumer Challenge Panel PTRM, 29 June 2017, *Response to the AER discussion paper, 'regulatory treatment of inflation*, page 15.

13   Energy Consumers Australia, 3 July 2017, R*egulatory treatment of inflation: Response to the AER discussion paper*, page 6.

14   Jemena Limited, *Submission on AER's discussion paper on regulatory treatment of inflation*, page 8.

The AER building block model

31. Several submitters refer to the lack of a shared understanding of the AER's models. For example Energy Networks Australia acknowledges that: [15]

    the AER public forum highlighted that there were differing understandings between stakeholders on the actual operation and interaction of the treatment of inflation through the RFM and PTRM. There was broad agreement that there needed to be a shared understanding prior to any solutions being implemented.

32. Endeavour Energy echoed the sentiment "that the understanding of the issues do not appear to be commonly held". [16]

33. SA Power Networks, Citipower, Powercor and Australian Gas Networks similarly stated that:[17]

    the complexity of how the treatment of inflation is applied across the regulatory framework was evident at the AER's recent inflation workshop, where there was a lack of understanding and agreement on how the models operate.

34. As a step toward a common understanding, we describe the AER's model below. A more detailed algebraic treatment is provided in Appendix 2 and Appendix 3. Appendix 1 provides a list of symbols used in the equations.

The net present value of the investment is zero

35. The basis of the model is the building block model, where revenue is based on the sum of several cost building blocks. The NER define the building blocks as indexation of the RAB, return on capital, depreciation, estimated cost of corporate income tax, revenue adjustments and forecast opex.[18] In the PTRM handbook (and spreadsheets) depreciation and indexation of the RAB are combined into regulatory depreciation: "*Regulatory depreciation (row 473) is calculated as the nominal straight-line depreciation (row 472), less the inflation adjustment on the opening RAB (row 471).*"[19] This means that the annual change in the nominal value of the RAB is measured by capex less regulatory depreciation.

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[15] Energy Networks Australia, *Response to AER discussion paper*, 29 June 2017, p.2.

[16] Endeavour Energy, *Response to AER discussion paper*, 30 June 2017, p.1.

[17] SA Power Networks, Citipower, Powercor and Australian Gas Networks, *Response to AER discussion paper*, 29 June 2017, p.2.

[18] NER, clause 6.4.3 (distribution) and clause 6A.5.4 (transmission); a similar provision is found in the National Gas Rules Part 9, Division 3, clause 76.

[19] AER, *Electricity distribution network service providers Post-tax revenue model handbook*, 29 January 2015, page 19. The inflation adjustment is specified in the NER 6.4.3(b)(1)((i) and S6.2.3(c)(4) and 6A.5.4(b)(1)(i) and S6A.2.4(c)(4).

36. In the AER's building block model, for any year t in regulatory period j, the annual revenue requirement (ARR) is the sum of the expected nominal return on capital (ENRC), regulatory depreciation (RegD), nominal opex (O), revenue adjustments (RA), and tax payable (Tax). This is shown in equation (1):

$$ARR_t^j = ENRC_t^j + RegD_t^j + O_t^j + RA_t^j + Tax_t^j \qquad (1)$$

37. Regulatory depreciation is defined as depreciation (or the nominal return of capital) (D) less an allowance for inflation (AI), that is:

$$RegD_t^j = D_t^j - AI_t^j$$

and thus:

$$ARR_t^j - O_t^j - RA_t^j - Tax_t^j = ENRC_t^j + D_t^j - AI_t^j$$

38. In the context of discussing the treatment of inflation within the AER's model the aggregation of depreciation and the allowance for inflation as "regulatory depreciation" appears to have caused confusion.

39. Depreciation and the allowance for inflation both act on the value of the asset base – depreciation decreases the value of the asset base and inflation increases the nominal value. Including only a net amount for the adjustment and describing it as *regulatory depreciation* appears to have caused some stakeholders to consider that their ability to recover their capital (that is, depreciation) is impaired. This is not the case.

40. While depreciation is a cost, the allowance provided for inflation is actually a component of revenue. The allowance for inflation recognizes that, as well as income from tariffs, NSPs receive income through the revaluation of their assets. For clarity, we separate depreciation and the allowance for inflation in our description of the model. This approach allows us to represent the allowance for inflation as part of the return on capital, which assists in demonstrating whether the regulatory regime achieves the regulatory objective. This approach of separating depreciation from the allowance for inflation is presentational and the net adjustment adopted within the AER model achieves the same result.

41. The regulatory objective of maintaining real returns means that the present value of revenue must equal the present value of costs; that is, the net present value of the entity is zero. This result is explained below, and Appendix 2 provides a more detailed derivation.

42. The present value of the investment at the opening of year t in regulatory period j, V_{t-1}^j, is the sum of the cash flow for the current year, including capital expenditure, and the residual value of the entity at the end of the year. Using the symbols defined in Appendix 1, for any year t during regulatory period j, the net nominal revenue after tax (NNRT) is equal to the expected real return on capital plus the return of capital, and is given by:

$$NNRT_t^j = A_{t-1}^j (w_t^j - e^j) + D_t^j$$

43. The residual value of the entity at the end of the year is the closing asset value of the asset base plus net capex. Hence the value of the investment is:

$$V_{t-1}^j = \frac{[A_{t-1}^j(w_t^j - e^j) + D_t^j] + [A_{t-1}^j(1 + e^j) - D_t^j + C_t^j]}{1 + w_t^j}$$

44.   Rearranging and simplifying this equation we can see that the present value of the investment is equal to the opening investment in the asset base plus the present value of capex made at the end of the year:

$$V_{t-1}^j = A_{t-1}^j + \frac{C_t^j}{(1 + w_t^j)}$$

45.   Thus, for any year t during regulatory period j, in the AER's building block model the present value of the cash flow for the year and the residual value of the entity at the end of the year (the present value of revenue) equals the initial outlay plus the present value of capex at the end of the year (the present value of costs), that is NPV = 0. It follows that the principle NPV = 0 must also hold for the whole sequence of years to any future date T.

Real returns in the AER's RFM and PTRM models

46.   The application of the RFM and the PTRM achieves the expected result that the net present value of the investment is zero and the NSP maintains the real value of its capital investment. Appendix 3 shows the detailed derivation.

47.   Recall that the net nominal revenue after tax of the NSP in year t of regulatory period j is:

$$NNRT_t^j = A_{t-1}^j(w_t^j - e^j) + D_t^j$$

48.   Net nominal revenue after tax (NNRT) depends only on the opening asset base, the expected real rate of return, and depreciation. It does not depend on the allowed values of opex and the other building block allowances. Having determined NNRT, the annual revenue requirement (ARR) is determined by adding opex and the other building block allowances to NNRT.

49.   In the PTRM, the value of the opening asset base in year t of regulatory period j is the opening value of the asset base for that regulatory period plus real net capex since the start of the period (where net capex is capex less depreciation), both adjusted for the expected inflation for the period. Again, using the symbols defined in Appendix 1, we show in Appendix 3 that:

$$A_t^j = (A_0^j + RNC_1^j + \cdots + RNC_{t-1}^j + RNC_t^j)(1 + e^j)^t$$

50.   The opening value of the asset base in regulatory period 1, A_0^1, is the actual closing value of the asset base at time 0. In the second and subsequent regulatory periods the opening value of the asset base, A_0^j, (j >1), is determined in the RFM by adjusting the opening value of the asset base from the previous period and the real net capex of that period (capex less depreciation) by actual inflation. That is:

$$A_0^j = (A_0^{j-1} + RNC_1^{j-1} + RNC_2^{j-1} + RNC_3^{j-1} + RNC_4^{j-1}$$
$$+RNC_5^{j-1})(1 + a_1^{j-1})(1 + a_2^{j-1})(1 + a_3^{j-1})(1 + a_4^{j-1})(1 + a_5^{j-1})$$

51.   Thus, each regulatory period starts with an asset base that reflects the net capex made in the previous period and the actual inflation experienced during that previous period. That is, the opening asset base for all periods is the then current value of the asset base.

52.   It is shown in Appendix 3 that:

$$NNRT_t^j = [(A_0^j + RNC_1^j + \cdots + RNC_{t-1}^j)(1 + e^j)^{t-1}](w_t^j - e^j) + RD_t^j(1 + e^j)^t \text{ (2)}$$

53.   Equation (2) shows that in any given year t in regulatory period j, the NSP achieves the expected real return on its opening asset base (the term in square brackets), plus expected nominal depreciation. The cashflows in equation (2) occur at the end of the year.

54.   Thus, the PTRM and RFM models produce the normal building block result; that is, the allowed real rate of return on capital for any year t in regulatory period j is $(w_t^j - e^j)$.

Scenarios to demonstrate model outcome

55.   To help develop a shared understanding of the regulatory objective, we use scenarios in this section to demonstrate that the RFM and PTRM achieves the regulatory objective as intended (i.e. *ex ante* and *ex post* real returns). These scenarios were presented by Frontier Economics in their paper for the Energy Networks Association and provided to the AER in the context of the consultation on the amendments to the RFM.[20]

56.   Frontier Economics concludes that its example shows over/under recovery and this was due to a mismatch between the AER's estimate of expected inflation and actual inflation. However, following the approach outlined above, the equations in the Frontier Economics example can be rearranged to show that all the scenarios presented in its example achieve the same real return. As in equation (2), our analysis is based on flows measured at the end of the year.

57.   The RAB in the example is assumed to be $100m, depreciation, opex, capex and tax are all assumed to be zero. The expected nominal rate of return is 6.0%, inflation is forecast to be 2.5% and thus the expected real return is 3.5% (6% - 2.5%).

58.   *Ex ante*, the nominal allowed return is $6 million which comprises:

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[20]   Frontier Economics, 2016, *Comment on the treatment of inflation in the AER's PTRM and the RFM*, section 3.2.1.

(a)   a cash flow of $3.5 million, comprising a return on capital of $6 million less a deduction for expected growth in the value of the assets of $2.5 million.[21]

(b)   plus an expected revaluation of the RAB of $2.5 million.

59.   In the first scenario, given that actual inflation equals expected inflation, the actual nominal return is also 6% (= (6.0 - 2.5 + 2.5)/100) and the actual real return is 3.5%. This scenario shows the unsurprising result that if everything is as anticipated, the *ex post* return is the same as expected *ex ante*.

60.   However, if inflation turns out to be lower than anticipated at 1% (Frontier's scenario 2), the actual nominal return is lower than anticipated, comprising:

(a)   a cash flow of $3.5 million

(b)   plus a revaluation of the RAB of $1 million (being 1% of the total asset value).

61.   The nominal value of the return *ex post* is $4.5 million, or 4.5%, which is lower than the expected return of 6%. However, the real return remains at 3.5% (= 4.5% - 1%). Thus, we do not agree that this result is below the efficient level of returns as the real value of the investor's capital is maintained.

62.   Conversely, if inflation turns out to be higher than anticipated at 4% as in Frontier's scenario 3, the net nominal revenue after tax is:

(a)   a cash flow of $3.5 million

(b)   plus a revaluation of the RAB of $4 million (being 4% of the total asset value).

63.   In this scenario, the actual nominal return is 7.5%, but real returns are again maintained at 3.5% (= 7.5% - 4%).

64.   These results show that the model compensates NSPs for actual inflation, ensuring they achieve the expected return $(w_t^j - e^j)$.

Extending analysis to include opex and tax

65.   Extending the analysis of NNRT to include opex and tax does not change the expected outcome. While NNRT is defined as

$$NNRT_t^j = ARR_t^j - O_t^j - RA_t^j - Tax_t^j$$

66.   Appendix 2 shows that for any year t in regulatory period j:

$$NNRT_t^j = A_{t-1}^j(w_t^j - e^j) + D_t^j$$

67.   Hence NNRT depends only on the opening asset base, the real rate of return and depreciation. It does not depend on the allowed values of opex and the other

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[21]   In the AER's models, this allowance for expected inflation in the asset value is deducted from depreciation in the calculation of regulatory depreciation.

building block allowances. *Ex ante* the entity expects to earn sufficient revenue (ARR) to cover its opex, revenue adjustments, and tax: the NPV=0 principle still holds. The derivation of this result for the ARR is shown in Appendix 4.

68.   We discuss further below a result (the so called 'first year effect') which arises from the method commonly (but not exclusively) used by the AER in translating the ARR into the annual price adjustments. This effect results from the annual price setting process and does not change the conclusion that the ARR formula achieves NPV = 0.

69.   Of course the entity may experience actual opex (and tax) of a different amount than its opex allowance. Expected real, non-equity costs are specific to the firm, and can be affected by the choices of the firm or the regulator. For example, the expected (post tax) return on equity will be greater (less) than the allowed regulatory return on capital if: [22]

(a)   the regulatory allowance for tax is greater (less) than the expected actual cost of tax

(b)   the allowed cost of debt is greater (less) than the actual cost of debt

(c)   regulatory gearing is lower (higher) than actual gearing

(d)   the allowed level of opex is greater (less) than the expected actual opex.

70.   In addition, actual non-equity costs may be different than expected because of differences in factors not related to inflation (for example if actual volumes are different to forecast, or actual real opex is different to forecast).

71.   Our focus is on inflation-related variances, and we consider the impact of inflation on nominal debt costs further below. In the following section, we consider the effects of the inflation adjustments in smoothing the allowed revenue and the annual price adjustment process.

Smoothing and annual adjustment

Smoothing

72.   The annual revenue requirements (ARR) may vary substantially from year to year throughout a regulatory period depending on the value of the building blocks in each year. To mitigate the price shocks that would arise from such variability the ARR series within a regulatory period is smoothed to a series of smoothed maximum allowable revenues (SMAR). The smoothing process is such that the present value of the ARR series is equal to the present value of the SMAR series. The smoothing process thus maintains the NPV = 0 principle.

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[22]   Houston, Greg, Hird, Tom and Nicola Tully, 2001, *International comparison of utilities regulated post tax rates of return in: North America, the UK, and Australia*, NERA.

73. The SMAR series assessed at time 0 in any regulatory period j reflects expected inflation and an X factor ('CPI-X' adjustment). Thus, the SMAR for year t in regulatory period j, assessed at time 0, is given by:

$$SMAR_{t,0}^{j} = SMAR_{t-1,0}^{j}(1 + e^{j})(1 - X_{t,0})$$

where:

$$SMAR_{1,0}^{j} = ARR_{1,0}^{j}$$

74. The X factors are initially set equal across the years of the regulatory period and can be interpreted as the annual change in real smoothed maximum allowable revenue. Derivation of the initial SMAR series is shown in Appendix 5.

Annual price adjustment

75. At time 1 the SMAR for year 1 is typically kept at the value set at time 0, that is:

$$SMAR_{1,1}^{j} = ARR_{1,0}^{j}$$

76. However, the SMAR values for the later years in the regulatory period are adjusted for actual one year lagged inflation (that is, at time 1, for the inflation experienced in year 1) in place of expected inflation. The X factor calculated at time 0 continues to be applied.[23] Similarly for the adjustments made at later times in the period.

First year effect

77. The effect of keeping the first year SMAR at the value set at time 0 is to lock into the outcome for the first year the expected inflation rather than actual inflation. This means that for most NSPs, there is a difference between the expected real revenue and the actual real revenue. If expected inflation for the first year is greater (less) than actual inflation, the NSP receives a higher (lower) return than expected. This effect persists throughout the regulatory period because each year's revenue is a function of the previous year and so ultimately all are a function of the first year.

78. The error in actual tariff revenue in year 1 equates to $[1 - (1 + a_1^{j})/(1 + e^{j})]$ times the allowed revenue for year 1. The error only applies to revenue from tariffs. Through the RFM, revaluation income is not subject to this error, because in each year it is updated using actual inflation.

79. The error can be corrected by adjusting the SMAR for year one by $(1 + a_1^{j})/(1 + e^{j})$.

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[23] For example, for the 2013-18 SA transmission determination, which did not include the debt cost update approach, the required annual revenue adjustment process treats the X factor as fixed: https://www.aer.gov.au/system/files/AER%20-%20transmission%20determination%20for%20ElectraNet%27s%202013-18%20regulatory%20control%20period%20-%2030%20April%202013.pdf, pages 3 – 4.

Smoothing and annual pricing adjustments

80. To illustrate the effects of smoothing, and the annual pricing mechanism, we have extended the simple scenario described by Frontier Economics and discussed above, at paragraphs 55 to 64. The results are shown in the excel spreadsheet, 'smoothing and price adjustment: simplified example". In this simplified example, we assume:

   - expected nominal rate of return (WACC) is 6%

   - expected inflation is 2.5%

   - actual inflation (in all years of the regulatory period) is 1%.

   - opening RAB is $100 million

   - no depreciation.

81. To illustrate the effects of smoothing with a positive X factor, we assume a real annual opex profile which is higher in the initial years and falls away in the latter years, and varies between years.

82. The X value is obtained so that the PV of the smoothed revenues (SMAR) is equal to the PV of the ARR. These amounts are estimated in the PTRM and use expected inflation. From time 1, actual tariff revenue (that is excluding revaluation revenue from the RAB indexation) is set in the annual pricing update replacing expected inflation with actual inflation in the CPI-X formula, with the exception of the first year SMAR which is kept at the value set at time 0.

83. Real returns in each year vary because of the smoothed revenue and varying opex. However, the real internal rate of return (IRR) over the 5-year regulatory period in this scenario is 3.49% as compared with the expected rate of 3.41% $[= (w_t^j - e^j)/(1 + e^j);$[24] the small increase over the expected IRR is because of the 'first year effect' discussed above.

84. We also provide a scenario in which the adjustment to inflation in the CPI-X formula is made in every year by adjusting the first year SMAR by $(1 + 0.01)/(1 + 0.025)$.[25] As a result the real revenue stream (after the annual pricing adjustment) is the same as the real SMAR revenue stream (from the PTRM), and the real PV are equal; that is, this scenario provides the expected IRR of 3.41%.

Annual adjustment with trailing average cost of debt

85. If the entity has opted to update the cost of debt during the regulatory period, the X is adjusted to reflect this. The X factor for year 2 is calculated from resetting the 'PV{ARR} = PV{SMAR}' equation. Similarly for years 3, 4 and 5. The derivation is set out in Appendix 6. With this approach, the revised X for year 2 could incorporate adjustment for the first year effect. Thus, adjusting the X for year 2 could be an

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24 That is, the return at end of period t expressed as at t₋₁.

25 That is, to make the adjustment, the first year SMAR is deflated using expected inflation to obtain a value in prices of year 0 and then inflated by the actual value of inflation in year 1 to obtain the actual revenue for year 1.

alternative to adjusting the first year SMAR in order to correct for the first year effect.

Construction of the estimated real rate of return

AER's estimate of WACC and inflation

86. We have explained that the regulatory objective is established in real terms and shown that the allowed real return for any year t in regulatory period j is the nominal weighted average cost of capital (WACC) for year t, less the AER's estimate of inflation for period j; that is, $(w_t^j - e^j)$.

87. In this section, we discuss the construction of the allowed real rate of return by the AER. The WACC for year t, w_t^j, is the weighted average of the estimated nominal return on equity over a 10-year horizon from year 1 in period j, k^j, and an estimate of the nominal cost of debt. The cost of debt is the 10 year trailing average cost estimated to apply from year 1 of the period. Alternatively, NSPs may elect to update the cost of debt each year as the 10-year trailing average cost of debt over the period $(t - 9, t)$.

88. The AER uses the Sharpe–Lintner form of the capital asset pricing model (CAPM) to estimate a starting point and a range for the expected return on equity, and considers a range of material in arriving at a point estimate for the expected return.[26] The cost of equity is forward looking. It thus reflects estimates of the risk free rate (based on the rate observed shortly before the start of the regulatory period on Commonwealth Government Securities with a 10-year term), the market risk premium, and the equity beta (the measure of the extent to which returns to equity for an NSP vary with the aggregate market). The estimated cost of equity is the return that the AER expects is needed to attract funds to make efficient investments in network assets.

89. The AER introduced the option for NSPs to update annually the 10 year trailing average cost of debt in 2013.[27] Introduction of this option was intended to reduce the risks facing suppliers by more closely matching the method of estimating the regulatory return on debt with debt raising practices. The former method of estimating the cost of debt, an 'on the day approach', gave rise to non-inflation risks that are outside of the scope of this report.

90. The use of a trailing average cost of debt reflects the AER assumption that the benchmark efficient entity issues debt with a 10-year term, and issues 10% of its debt portfolio each year (with a BBB+ rating). The opportunity for NSPs to elect to update this annually is intended to be consistent with this assumption. The NSP can nominate a period between 10 business days and 12 months in length over which

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[26] AER, *Better regulation: Rate of Return Guideline,* December 2013.

[27] AER, *Better Regulation: Explanatory Statement, Rate of return guideline*, December 2013, pages 102-110.

yields for this benchmark debt are averaged. This is intended to allow the NSP to match the cost of debt to their debt practice.[28]

91.　The AER's estimate of inflation for period j, e^j, applies throughout period j and is the geometric average of 10 years of annual inflation forecasts from year 1 in period j.[29]

92.　The method of estimating the nominal WACC and the AER's approach to estimating inflation are out of scope for this report and are taken as given.

Embedded expectations and estimated inflation

93.　As discussed above, the regulatory regime provides for a real return, and this targeted real return is not impacted by any mismatch between the AER's estimate of expected inflation and inflation outturns (except for the first year for most NSPs). However, the targeted real return relies on an estimate of expected inflation embedded in the WACC (and introduced through the methods used to estimate WACC).

94.　Actual expected inflation at any point in time, like the WACC itself, is not observable. If the AER's estimate of expected inflation is in error relative to the (unobservable) actual expectation of inflation, NPV=0 may not hold *ex ante*; the real allowed rate of return may differ from the real rate of return that is implicit in the nominal WACC that NSPs might expect to earn.

95.　The AER acknowledges this possible result in its inflation discussion paper, noting that it is unlikely that its estimate of inflation is equal to the weighted average rate of inflation embedded in the WACC.[30] This result occurs because the return on equity reflects the market expectation of inflation looking forward over 10 years while the return on debt is calculated using a trailing average approach. The inflation implicit in these two measures will therefore relate to different periods, reflecting the different periods over which the returns are earned. The AER's estimate of inflation more closely matches the term of the return on equity, while the inflation embedded in the trailing average cost of debt is the average of the inflation expectations that pertained over the previous 10 years.[31]

96.　In the following sections, we discuss the impact on equity holders if estimated inflation differs from inflation embedded in the WACC. This could arise from forecasting errors or the mismatch in the estimation periods we have described.

28　AER, *Better Regulation: Explanatory Statement, Rate of return guideline*, December 2013, pages 102-110.

29　AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, p. 23 (table 2).

30　AER, *Regulatory treatment of inflation: Discussion paper*, April 2017, pages 40-41.

31　Ibid.

Effect on return to equity magnified by leverage

97.   The effect of any error in the AER's estimate of expected inflation relative to the true estimate of expected inflation that is implicitly embedded in the nominal WACC, can be demonstrated as follows. If the true expectation of inflation for year t in period j is i_t^j, then the expected rate of return is $(w_t^j - e^j) + i_t^j$.

98.   Thus the difference between this implicit nominal rate of return and the rate set by the AER, Δw, is thus:

$$\Delta w = \left(w_t^j - e^j\right) + i_t^j - w_t^j$$

$$= i_t^j - e^j$$

99.   The difference in the return on equity, Δk, is:

$$\Delta k = k^{j\prime} - k^j$$

where:

$$k^{j\prime}(1 - L) - k^j(1 - L) = d^j L - d^j L + i_t^j - e^j$$

therefore:

$$\Delta k = \frac{i_t^j - e^j}{1 - L}$$

100.   Thus, while the impact on WACC is just the difference between the expectation of inflation implicit in the nominal WACC and the AER estimate of expected inflation, the impact on the return on equity is magnified by leverage.

101.   For example, if the AER's estimate of expected inflation is higher (lower) than the expectation of inflation implicit in the nominal WACC by 1%, say, then an NSP's expected WACC would be 1% lower (higher) than the allowed WACC. However, with leverage of 60%, that is $L = 0.6$, the return to equity would be 2.5% lower (higher) than implied by the allowed WACC.

Annual update to the cost of debt

102.   NSPs can elect to update the cost of debt each year during the regulatory period as a trailing moving average over 10 years. For example, in the first year of regulatory period j, the cost of debt is the average of the cost of debt over the 10 years from the second year in regulatory period $(j - 2)$ to the first year in regulatory period j. In the second year of regulatory period j the cost of debt in the second year of regulatory period $(j - 2)$ is dropped from the calculation of the average cost of debt and the cost of debt in the second year of regulatory period j is added to the calculation.

103.   The cost of debt in year t in regulatory period j is thus calculated as:

$$\frac{1}{10} \sum_{v=t-9}^{t} d_v$$

where d_v is the nominal cost of debt for year v in the interval $[t-9, t]$. With this election, WACC varies from year to year even within a regulatory period.

104. The impact on the allowed real return of the election to base the estimate of WACC on a trailing moving average cost of debt can be analysed in terms of (i) contrast with WACC based on the cost of debt for the regulatory period (the cost estimated at the beginning of the period), and (ii) the year on year effect.

105. Paragraph 196, Appendix 7, shows that the expected impact on WACC, Δw, from estimating the cost of debt as a trailing moving average is given by:

$$\Delta w = L[\frac{1}{10} \sum_{v=t-9}^{v=t} (d_v - d^j)]$$

106. If the real cost of debt is assumed to be constant, then the impact on WACC can be stated in terms of a difference in expected inflation rates:

$$\Delta w = L[\frac{1}{10} \sum_{v=t-9}^{v=t} (i_v - i^j)]$$

107. That is, if historical inflation expectations are on average greater (less) than the expectation at the beginning of the period, then the impact is positive (negative) but is reduced by leverage. The expected (allowed) real return will be higher (lower) than the real return implicit in the nominal WACC.

108. Paragraph 199 shows that the impact on the cost of equity, Δk, is given by:

$$\Delta k = \frac{L}{(1-L)} [\frac{1}{10} \sum_{v=t-9}^{v=t} (d_v - d^j)]$$

and with constant real cost of debt:

$$\Delta k = \frac{L}{(1-L)} [\frac{1}{10} \sum_{v=t-9}^{v=t} (i_v - i^j)]$$

109. Thus, as with WACC, if inflation expectations over the 10-year interval are on average greater (less) than the expectation at the beginning of the period, then the impact on returns to equity holders from the mismatch between estimation periods is positive (negative). However, in contrast with WACC, the impact is magnified by leverage.

110. Paragraph 201 shows that in terms of the year on year effect, the expected change in WACC from period t to $t+1$ is given by:

$$\Delta w = \frac{L}{10} (d_{t+1} - d_{t-9})$$

111. If the real cost of debt is assumed to be constant, then the impact on WACC is given by:

$$\Delta w = \frac{L}{10}(i_{t+1} - i_{t-9})$$

112. That is, if the inflation expectation for year $t + 1$ is greater (less) than it was for year $t - 9$ then the impact is positive (negative) but reduced by leverage. The expected (allowed) real return is higher (lower) than the real return implicit in the nominal WACC.

113. Paragraph 203 shows that the impact on the cost of equity, Δk, is given by:

$$\Delta k = \frac{L}{(1-L)}[\frac{1}{10}(d_{t+1} - d_{t-9})]$$

114. If the real cost of debt is assumed to be constant, then the impact on cost of equity is given by:

$$\Delta k = \frac{L}{(1-L)}[\frac{1}{10}(i_{t+1} - i_{t-9})]$$

115. That is, if the inflation expectation for year $t + 1$ is greater (less) than it was for year $t - 9$ then the impact is positive (negative). However, the impact is magnified by leverage. Intuitively, as the inputs to the estimate of the cost of debt for year t are increasingly within period j, the period of the inflation estimate, the impact of the year to year difference on the estimate of the rate of return may decrease.

Debt is fixed in nominal terms *ex ante*

116. NSPs have expressed a range of concerns regarding the treatment of debt costs by the AER. In particular, some NSPs expressed concern that equity investors bear the difference between forecast and actual nominal returns because debt is fixed in nominal terms (*ex ante*).[32]

117. Most submitters who raised this concern considered that it was inefficient for equity investors to bear this risk, or that exposing equity investors to this difference in returns would raise the risk of default. For example, Major Energy Users consider that there should be:[33]

> *a true up each year which eliminates any errors made in forecasts for inflation and labour and material costs. Such a change would remove some of the risks that are faced by networks and so allow a lower return on equity to be paid by consumers.*

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[32] For example, Ausgrid, 29 June 2017, *Submission letter on the AER regulatory treatment of inflation discussion paper*, page 2, and CEG, 14 December 2016, *Final Plan Attachment 9.5: Inflation Compensation – Addendum to September report, report for Australian Gas Networks*, page 13.

[33] Major Energy Users, (undated) *Submission letter on the AER regulatory treatment of inflation discussion paper*, page 2.

The outcome would also ensure that consumers pay no more than the efficient costs for the service.

118.   Spark Infrastructure submitted that:[34]

> *recovering the efficient cost of services is fundamental to effective operation of the regulatory framework. We do not agree with the AER's position that businesses are compensated for inflation because this is only true for costs that rise or fall with inflation. NSPs and investors accept inflation exposure on the return on equity. However where costs do not rise or fall with inflation such as is the case for the efficient cost of debt, the AER's approach provides lower or higher compensation than the determined level of efficient costs.*

119.   The increase in the risk of default arises where actual inflation is lower than forecast, because the nominal WACC is lower than expected, meaning that when the debt cost (which is unchanged) is settled a lower return is available to equity holders than the allowed return to equity. Using an analysis similar to that presented in paragraphs 97 to 101 above,[35] the impact on the return to equity is given by:

$$\frac{a_t^j - e^j}{1 - L}$$

where a_t^j is the actual inflation in year t of period j.

120.   Thus, just as with the impact from a difference in expectations, the impact on the return to equity is magnified by leverage.

Importance of potential errors and alternative approaches

121.   We have seen that the estimated allowed real return to equity holders may differ from the real return implicit in the nominal WACC. In this section we consider submissions made on this point, and the potential effects and alternative approaches.

Significance of any variation between inflation expectations

122.   Some NSPs argue that Australia is in a period of sustained low inflation and therefore the AER's method of estimation of expected inflation as the midpoint of the Reserve Bank of Australia's band set for monetary policy is likely to overestimate the market's inflation expectations as implicit in the nominal WACC. Submitters

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[34]   Spark Infrastructure, 29 June 2017 *Submission letter on the AER regulatory treatment of inflation discussion paper*, page 2.

[35]   The derivation presented for expected inflation was for cost of debt fixed at the beginning of the period. However, the results also hold for use of trailing average cost of debt as the cost is also the same across the comparison made.

point to an apparent mismatch between the AER's estimate of inflation and the inflation expectations as indicated by the bond breakeven rate as evidence.[36]

123.   CEG, acting as expert consultant to the Australian Gas Networks in an earlier regulatory process, conclude that the regulatory model should ensure that the nominal compensation for the cost of debt matches the nominal cost of debt. To illustrate the effect of a regulatory model which yields *ex post* real returns, CEG present an example which assumes an unforeseen halving of prices across the Australian economy (i.e. 50% deflation).[37] As CEG acknowledge, this scenario seems unrealistically extreme. Nonetheless, we agree that some risk of bankruptcy may arise (conversely, where there is unexpectedly high inflation, equity holders will obtain a windfall gain). Consistent overestimation of inflation over a period of time would add to the risk of financial distress. As noted above, our scope is limited to considering inflation effects and we have not assessed all of the effects of moving from the former 'on the day' approach to the trailing average approach to estimating the cost of debt.

124.   SA Power Networks, Citipower, Powercor and Australian Gas Networks in their combined submission agree there is a risk to equity returns but consider that "*the issue is not that inflation risk is likely to have a material effect on the risk of default, but that it can result in departures from the efficient operation of the firm.*"[38]

125.   We have shown in paragraphs 97 to 120 the impact on the return to equity of differences between estimated expected inflation and expected inflation embedded in the nominal WACC and between estimated expected inflation and actual inflation (in the presence of fixed nominal debt costs). Attempting to empirically test the likelihood of the AER's estimate differing from actual inflation expectations or actual inflation is outside the scope of this report. However, the consequences of any variation between the AER estimate of expected inflation and actual inflation expectations or actual inflation will largely depend on the size of the errors and the persistence of any direction of error (or bias).

126.   Provided that any forecasting error is relatively small and the risk of over- or under-estimation of inflation is symmetric (that is, there is no systematic forecasting error) then it is likely that suppliers can bear the risk (because over time the losses to equity holders would be offset by windfall gains). Alternatively, the risk associated with differences between estimated and actual inflation could be managed by issuing inflation-indexed debt, although this brings some cost as noted by Ausgrid in their submission.[39] We consider further below whether the estimate of equity beta might compensate NSPs for AER's estimate of inflation differing from actual inflation expectations.

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36   See for example a suite of reports prepared by CEG for the Australian Gas Networks.

37   CEG, 14 December 2016, *Final Plan Attachment 9.5: Inflation Compensation – Addendum to September report,* report for Australian Gas Networks, paragraphs 35 & 36.

38   SA Power Networks, Citipower, Powercor and Australian Gas Networks, *Response to AER discussion paper*, 29 June 2017, page 2.

39   Ausgrid, 29 June 2017, *Submission letter on the AER regulatory treatment of inflation discussion paper*, page 2.

127.   SA Power Networks, Citipower, Powercor and Australian Gas Networks in their joint submission provide an empirical example that suggests that even where annual inflation is equal to expected annual inflation (not the average), networks are likely to under- or over-recover costs over the regulatory period. They submit that this effect arises as the averaging period for inflation is longer than the regulatory period.[40] Methodologically, it would not seem unreasonable to estimate the real WACC over the same period as the nominal WACC. The period over which WACC is estimated by the AER is outside the scope of this report.

Potential adjustments to the AER approach

128.   APA submit that when the annual update to the cost of debt is made, the inflation forecast should also be updated to the preceding year's inflation.[41] While the discussion above highlights the mismatch between embedded inflation expectations in the cost of debt and the AER estimate of inflation, it is not apparent that the adjustment proposed by APA is an appropriate solution. The previous year's actual inflation would not match the inflation expectations embedded in either the trailing average cost of debt or the estimated return on equity. Like a number of other submitters, APA considers that the framework is intended to deliver a nominal return and its proposed approach would not deliver forecast real returns.

129.   Energy Consumers Australia submit that the AER should consider matching the inflation forecast to the purpose for which it is used; that is, separate forecasts be made for different parts of the model including the trailing average debt cost.[42] This suggestion primarily concerns the method for estimating inflation. The approach could have the potential to reduce the difference between the estimate of inflation and the cost increases incurred by NSPs. The merit of adopting it may depend on the implementation cost relative to the improved accuracy obtained, and would in part depend on the stability of inflation expectations and the method used to estimate these.

130.   Some submitters suggest that the allowed return on debt should be fixed in nominal terms. For example, Spark Infrastructure argues that fixing the allowed return on debt in nominal terms would reflect the efficient costs of NSPs.[43] It considers the framework is intended to provide compensation for efficient costs, and that efficient debt costs are nominal and efficient equity costs are real. Spark Infrastructure proposes an annual adjustment to revenue to compensate for the effect of the difference between expected and actual inflation on debt costs. A similar effect could be achieved, it argues, by rolling forward the debt component of the RAB by forecast inflation and the equity component by actual inflation. This approach would

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40   SA Power Networks, Citipower, Powercor and Australian Gas Networks, *Response to AER discussion paper*, 29 June 2017, page 9.

41   APA, 29 June 2017, *Regulatory treatment of inflation: APA submission in response to AER consultation*, page 10.

42   Energy Consumers Australia, 3 July 2017, R*egulatory treatment of inflation: Response to the AER discussion paper*, page 7.

43   Spark Infrastructure, 29 June 2017 *Submission letter on the AER regulatory treatment of inflation discussion paper*, page 10.

require a change to the regulatory objective, a consideration that is outside the scope of our report.

131. We have considered whether there is an adjustment to the framework that would remove the discussion about inflation expectations and would achieve an efficient compensation for inflation and risk.

132. The approach taken by the AER is to estimate a nominal rate of return and an inflation adjustment that is incorporated into regulatory depreciation. The alternative would be to estimate a real rate of return and nominal depreciation (unindexed RAB). However, we are not aware of a method for estimating a real rate of return that avoids an estimate of future inflation. In other words, we are not aware of a method that avoids a potential difference between an estimate of expected inflation and (the unobservable) actual inflation expectations.

Lag structure

133. The AER uses various lags of inflation in its measure of actual inflation. The AER undertook a Monte Carlo simulation of three different lag structures when it proposed amending the RFM in 2016:[44]

- the unlagged approach for all elements of the RFM (ignoring the 6-month implementation delay)
- the partially lagged approach which uses a one year lag for some elements and unlagged inflation for others
- the all lagged approach which uses a one year lag of inflation for all elements.

134. The Monte Carlo analysis shows that over a 50-year time horizon, with random inflation outcomes in each year, all three approaches had average NPV near zero, but the unlagged approach has the lowest absolute error (average squared NPV). In other words, while there was no evidence of systematic bias in any of the approaches the volatility in the unlagged approach is lowest.

135. Our initial consideration of these results are that they suggest that given a particular benchmark, the long-run average allowance for inflation will be the same which means that over time consumers will pay the same amount regardless of which approach is followed. However, the volatility can be reduced by matching the regulatory allowance for inflation as closely as possible to actual inflation.

136. Consumers and equity holders are on opposite sides of the volatility risk, where there is a mismatch in some cases equity holders receive too high a return and customers pay relatively too much. The reverse also occurs just as frequently in the simulation. The risk to both parties can be reduced by matching the allowance more closely to the cost (i.e. using unlagged inflation).

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44   AER, 2016, *Proposed amendment Electricity distribution network service providers Roll forward model (version 2) - Explanatory statement*, 31 August.

137. The AER notes that there are transition issues that would affect the benefit of moving away from the current lagged approaches. These need to be taken into account to determine whether it is in the long-term interests of consumers to reduce this risk.

Multi-period spreadsheet modelling

Spreadsheet modelling

138.   To provide quantified illustrations of the findings discussed above, we set up scenario modelling of the AER PTRM and RFM models over 10 regulatory periods (50 years), to test the NPV=0 conclusions. A brief overview of this modelling is described below. The test models are available for inspection with this report.

PTRM and RFM

139.   We setup a scenario test bed model to compare the effects of differences between expected inflation and actual inflation in the AER PTRM and RFM framework across 10 regulatory periods or 50 years.

140.   This model has been developed so that it is only necessary to link into one set of the AER models (i.e. the PTRM and RFM). The model then uses a scenario control mechanism so the linked AER models are run multiple times with each run representing a different regulatory period. The inputs and outputs are stored along with the calculation process so the entire 50 year sequence is generated from the two AER models. This structure allows specific changes, or components, of the AER models to be tested readily (the changes only affect one model and not 10).

141.   For test purposes, the models were populated with a single asset, where the opening asset value is $1000 (in real terms) with annual capital investments of $100 (in real terms). For simplicity all operating costs were set to zero. The model was setup to explore two key effects discussed above:

   •   NPV of the expected net revenue and the actual net revenue; that is, the NPV = 0 test

   •   the difference between the expected and actual return on equity; that is, the bankruptcy risk.

142.   All results calculated in the model are derived from key outputs calculated in the RFM and the PTRM, including the annual revenue requirement (ARR), the X-factor, annual opening and closing RAB, and annual equity value.

143.   The NPV =0 test for the 50 year model is based on a calculation for the SMAR where the SMAR for each regulatory period is calculated from a constant X-factor that is generated from the PTRM (i.e. the default case). The model then calculates the SMAR externally from the PTRM such that $SMAR_1 = ARR_1$, $SMAR_2 = SMAR_1*(1-X)*(1+a)$, and so on for each year in the active regulatory period. We have also calculated the PV for the unadjusted ARR from each PTRM run for comparison. (In addition we have tested for NPV = 0 using the same SMAR calculation that is used in the AER long run simulation models, where $SMAR_1 = ARR_1$, $SMAR_2=ARR_2*ActualCPI_2/ForecastCPI_2$, etc).

144.   The bankruptcy test is calculated for the first regulatory period only and is based on the ARR from the PTRM, updated using the annual pricing mechanism, and the asset value from the RFM. There is no benefit from extending the analysis to multiple regulatory periods as the risk is reset in the determination for each regulatory period.

145.   The inflation scenarios used in the model are then used in the AER long-run simulation model plus two others. Further details on the model calculations and the associated results can be found in the model.

NSPs may be compensated for inflation risk

Efficient allocation of risk

146.   The regulatory regime is consistent with the regulatory objective of providing an expected real return (with the exception of the first year effect). However, equity investors typically bear the difference between expected and actual nominal returns because debt costs are typically fixed in nominal terms. A question therefore arises as to whether this risk is efficiently allocated, and whether equity holders are compensated for bearing the risk in the nominal allowed rate of return.

147.   As noted above, we are not aware of a method for estimating a real rate of return that avoids an estimate of future inflation. A change to the regulatory regime to target nominal returns would introduce a risk of variations in real returns, which might undermine confidence to invest in long-lived assets (for the reasons discussed in paragraphs 16 to 10). As a change to the regulatory regime is beyond the scope of this paper, we do not consider the efficiency effects further but evaluate whether NSPs are compensated for the risks to equity holders of variations between expected and nominal returns.

Comparator firms for equity beta and inflation risk

148.   In estimating the allowed return, the AER estimates a cost of equity to reflect the riskiness of the *benchmark efficient entity* relative to the market. If the comparator firms from which the asset beta is calculated are also exposed to a similar form of inflation risk, the equity beta estimate may include the extent to which inflation risk is more or less costly for the benchmark efficient entity relative to the market. The implication would be that equity holders in entities regulated by the AER are compensated for the effects of inflation risk inherent in the method used by the AER.

The AER estimate of equity beta

149.   The AER currently adopts an equity beta value of 0.7 for its benchmark efficient entity. The reasons for adopting this value of equity beta were set out by the AER in its Equity Beta Issues Paper (October 2013),[45] and are revisited as it considers the

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[45]   AER – *Equity beta issues paper* – October 2013.

allowed revenue for the entities it regulates.[46] In summary form, the AER arrived at its estimate through:

- conceptual analysis which indicated that the value for an efficient entity "would be very low" and "less than 1.0"[47]
- empirical estimates of equity beta of comparator firms.

150. Table 1 lists some of the empirical studies reviewed by the AER, the period over which data was analysed in those studies, and the individual firm averages of beta obtained by the authors:

Table 1 Empirical estimates of equity beta

Author	Study	Years of analysis	Equity beta (individual firm averages)
Professor Henry	Henry, Estimating β, April 2009[48]	2002-2008	0.45-0.71
ERA	ERA, Draft decision on proposed revisions to the access arrangement for the Western Power network, March 2012	2002-2011	0.44-0.60
ERA	ERA, Explanatory statement for the draft rate of return guidelines: Meeting the requirements of the National Gas Rules, August 2013[49]	2002-2013	0.49-0.52
SFG	Regression-based estimates of risk parameters for the benchmark firm, June 2013[50]	2002-2013	0.60
Professor Henry	Estimating β: An update (2014)[51]	1992-2013	0.3-0.8

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[46]　See for example: AER – *Draft Decision AusNet Services Gas Access Arrangement 2018 to 2022 – Attachment 3 Rate of Return* – July 2017.

[47]　See page 6 Equity Issues paper.

[48]　https://www.aer.gov.au/system/files/Attachment%20C%20-%20Henry%20-%20Estimating%20beta_0.pdf

[49]　https://www.erawa.com.au/cproot/11952/2/Explanatory%20Statement%20for%20the%20Rate%20of%20Return%20Guidelines.PDF

[50]　https://www.erawa.com.au/cproot/11651/2/Energy%20Networks%20Association%20-%20Draft%20Rate%20of%20Return%20Guidelines%20-%20Report%207%20-%20Beta%20Parameter%20Estimates.pdf

[51]　https://www.aer.gov.au/system/files/Henry%20%E2%80%93%20Estimating%20Beta%20%E2%80%93%20An%20update%20%E2%80%93%20April%202014_2.PDF

151. In arriving at its estimate of equity beta for the benchmark efficient entity, the AER places weight on the empirical estimates prepared by Professor Henry.[52] Professor Henry carried out his initial analysis for the period between January 2002 and September 2009. He updated his paper in 2014, this time covering a longer period of analysis but retaining the same companies used in his initial study. His updated study indicated a range of between 0.3 and 0.8 for the equity beta.

152. The full list of companies in Professor Henry's dataset, including the major assets they held at the time of the analysis, are set out in Table 2:

Table 2 Details of companies used to determine value of equity beta

Company	Industry and where active	Data available
AGL	Gas transmission eastern states	May 1992-October 2006
Alinta	Regulated pipelines in WA and Victoria	October 2000-August 2007
APA	Ownership and interest in gas transmission in all states and territories (except Tasmania)	June 2000-June 2013
DUET	Gas distribution in Victoria and WA, electricity distribution in Victoria	August 2004-June 2013
Envestra	Gas transmission and distribution eastern states	August 1997-June 2013
Gasnet	Ownership and interest in gas transmission in all states and territories (except Tasmania)	December 2001-November 2006
HDUF	Gas transmission in WA and eastern states	December 2004-November 2012
SP Ausnet (now Ausnet)	Victoria electricity transmission, distribution; gas distribution in Victoria	December 2005-June 2013
Spark	Electricity distribution eastern states	March 2007-June 2013

153. As seen in Table 2, not all companies were active over the whole period from which the equity beta for the benchmark efficient entity was derived, with some assets being transferred between different parties.

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[52] AER – *Final decision – review of the weighted average cost of capital (WACC) parameters* – May 2009, table 8.5.

Changes in regulatory jurisdiction

154. There have been significant changes to the jurisdictions of Australian regulators during the period over which the equity betas from the comparator list of companies were calculated. The main changes in jurisdiction include:[53]

- Electricity transmission in the eastern states came under the auspices of the ACCC when the NEM was formed; this role was transferred to the AER in 2005.

- Responsibility for electricity distribution in the eastern states was transferred to the AER in 2008, becoming effective over subsequent years; previously, individual states regulated electricity distribution.

- Regulation of gas transmission and distribution was up to individual states within the Gas Pipelines Access Law and the National Gas Code until 2008 when this function was transferred to the AER under the National Gas Law and Rules.

- The ERA in Western Australia continues to have responsibility for regulated returns of energy utilities (though under updated 2009 National Gas Law and the National Gas Objective).[54]

Inflation risk of comparator companies

155. Comparing the activities and time period over which data is available for the comparator companies, and the changes in regulatory jurisdiction, would suggest that:

- The equity beta data for electricity distribution and transmission companies in the comparator list was obtained over the period in which those companies have been regulated by the ACCC/AER; assuming efficient markets, this data could reasonably be assumed to reflect any inflation risk borne by those entities under the AER approach relative to the market risk.

- Equity beta data for the gas distribution and transmission companies in the comparator list for the period from 2008 should reflect any inflation risk inherent in the AER's approach (as the regulation in the eastern states and western states has over that period been governed by the National Gas Law and National Gas Objective).

156. Hence, the comparator estimates might not fully reflect any inflation risk under the current AER approach, to the extent that the approach to regulating gas transmission and distribution entities prior to 2008 resulted in the firms facing a different inflation risk.

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[53] See ACCC – *State of the Energy Market 2008* – Appendix A Energy Market Reform.

[54] Western Australian Government Gazette 2009, National Gas Access (WA) Act 2009, p. 76.

157.   We have not been able to assess all regulatory decisions in relation to gas transmission and distribution back to 1992 (the start of the analysis period in Professor Henry's 2014 study). However, we note that Professor Henry provided comparator tables for equity beta estimates for the periods 1992 to 2013, 2002 to 2013, and for 2008 to 2013. These tables provide estimates, which Professor Henry found to be broadly consistent (though noting the data limitations for the five year period).[55]

158.   Hence, the estimates of equity beta prepared by Professor Henry appear to be broadly consistent whether taken over an extended period or over just the period in which all of the comparator companies were regulated under the same national electricity and gas objectives and therefore subject to the same inflation risk. The AER adopts an equity beta estimate at the top end of the range estimated by Professor Henry. The implication, therefore, is that subject to the accuracy of the comparator estimates (we have not reviewed the estimates) this equity beta estimate should reflect the inflation risk inherent in the regulatory model applied by the AER.

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[55]   Henry 2014, tables 5, 6, 7, ibid.

Conclusions

159. This report considers concerns raised by Network Service Providers (NSPs) about how inflation risk is addressed within the current arrangements for regulating NSP revenue.

160. We take as the starting point for our analysis the national electricity and gas objectives, and that these objectives provide for the promotion of efficient investment in the long-term interests of consumers. Promoting efficient investment requires the regulatory regime provide investors with the opportunity to earn a return which maintains the real value of their assets (NPV = 0).

161. *Ex ante*, a service provider would expect to achieve a real return and be compensated for expected inflation. *Ex post*, the service provider would expect to be compensated for actual inflation so that it achieves the expected real rate of return.

162. The AER model is consistent with the regulatory objective. We have tested this outcome through formal modelling (algebraic equations) and by spreadsheet modelling scenarios over multiple regulatory periods.

163. There is a relatively small deviation from NPV=0 in the typical application of the AER model. This deviation occurs because, for most NSPs, the revenue in the first year of a regulatory period locks in expected inflation for that year, rather than substituting in actual (lagged) inflation.

164. Although the AER model delivers expected real returns (setting aside the first year variation), two key issues remain:

    • The estimated real allowed rate of return is unlikely to be equal to the underlying real return inherent in the nominal allowed rate of return due to errors in estimating inflation and differences in the estimation periods.

    • Debt is issued in fixed nominal terms. This means that equity holders bear the costs (revenue shortfall) if actual inflation is less than expected (and conversely receive a benefit where inflation is unexpectedly high as revenue reflects the higher inflation but costs do not).

165. While the impact of these effects on equity holders could increase the likelihood of financial distress (when inflation is lower than expected), we consider it is likely that service providers can bear this risk, or manage it (at a cost) by issuing inflation-indexed debt and choice of leverage. This judgment relies on the AER's inflation estimates being reasonable and unbiased; that is, the estimation errors are relatively small and are not systematic.

166. Provided errors are relatively small and not systematic, we consider that any additional costs associated with inflation risk would likely be factored into the nominal rate of return. This is because the equity beta selected by the AER is at the top end of a range estimated from comparator companies which, at least for nearly a decade, have been subject to the same inflation risk as NSPs.

Appendix 1 Symbols used in equations

w_t^j = nominal WACC for year t in regulatory period j with the cost of

debt estimated as a trailing moving average

w^j = nominal WACC for regulatory period j if the cost of debt is estimated

at the beginning of the period

d^j = cost of debt for regulatory period j estimated at the beginning of the period

k^j = nominal cost of equity for regulatory period j

d_v = nominal cost of debt for year v in the interval

$[t - 9, t]$, concluding in regulatory period j

$(1 - L), L$ = proportions of equity and debt in the capital structure

e^j = expected inflation for regulatory period j

i_t^j = market assessmen of inflation for year t in regulatory period j

i^j = market assessmen of inflation for regulatory period j

i_v = market assessment of inflation for year v in the interval

$[t - 9, t]$ concluding in regulatory period j

a_t^j = actual inflation for year t in regulatory period j

A_{t-1}^j = nominal opening RAB for year t in regulatory period j

D_t^j = nominal SL depreciation for year t in regulatory period j

RD_t^j = real SL depreciation for year t in regulatory period j

$taxD_t^j$ = depreciation for tax purposes for year t in regulatory period j

C_t^j = nominal capex for year t in regulatory period j

RC_t^j = real forecast capex for year t in regulatory period j

$NC_t^j = C_t^j - D_t^j$ = nominal net capex for year t in regulatory period j

$RNC_t^j = RC_t^j - RD_t^j$ = real net capex for year t in regulatory period j

RA_t^j = revenue adjustments for year t in regulatory period j

$NNRT_t^j$ = net nominal revenue after tax for year t in regulatory period j

O_t^j = nominal opex for year t in regulatory period j

RO_t^j = real opex for year t in regulatory period j

int_t^j = interest deduction for tax purposes for year t in regulatory period j

$TLCF_t^j$ = tax loss carried forward for application in year t

in regulatory period j

$$t = \frac{\gamma T}{1 - T(1 - \gamma)}$$

γ = value of imputation credits

T = corporate tax rate

$ARR_{t,v}^j$ = annual revenue requirement for year t, assessed at time v,

in regulatory period j

$SMAR_{t,v}^j$ = smoothed ARR for year t, assessed at time v, in regulatory period j after

"$CPI - X$" adjustment

Appendix 2 NPV equals zero

167.   In the AER's building block model, in any year t in regulatory period j, the annual revenue requirement (ARR) is the sum of the expected nominal return on capital (ENRC), regulatory depreciation (RegD), nominal opex (O), revenue adjustments (RA) and a net tax allowance (T). This is shown in equation (1):

$$ARR_t^j = ENRC_t^j + RegD_t^j + O_t^j + RA_t^j + Tax_t^j \qquad (1)$$

168.   Expanding regulatory depreciation into its component parts, equation (1) can be rearranged to show that the AER model achieves the NPV = 0 principle:

$$ARR_t^j - O_t^j - RA_t^j - Tax_t^j = ENRC_t^j + D_t^j - AI_t^j \qquad (2)$$

169.   The left-hand side of this equation is net nominal revenue after tax (NNRT). That is:

$$NNRT_t^j = ARR_t^j - O_t^j - RA_t^j - Tax_t^j$$

170.   It thus follows that NNRT is equal to the right hand side of equation (2), viz, expected nominal return on capital, less the allowance for inflation, plus depreciation (return of capital). That is:

$$NNRT_t^j = ENRC_t^j - AI_t^j + D_t^j$$

171.   But expected real return on capital (ERRC) is equal to expected nominal return on capital less allowance for inflation, that is:

$$ERRC_t^j = ENRC_t^j - AI_t^j$$

and therefore:

$$NNRT_t^j = ERRC_t^j + D_t^j \qquad (3)$$

172.   That is, expected nominal net revenue after tax, is equal to the expected real return on capital plus the return of capital.

173.   The ERRC for any year is the real rate of return on the opening value of the capital base. Thus, using the symbols defined in Appendix 1, for any year t during regulatory period j, equation (3) can be stated as:

$$NNRT_t^j = A_{t-1}^j(w_t^j - e^j) + D_t^j$$

174.   The present value of an NSP's investment at any time t in regulatory period j, V_{t-1}^j, is the sum of the cash flows for the next year and the residual value of the entity at the end of the year. The cash flow for the current year is the NNRT and the residual value is the closing value of the asset base plus net capex. Thus:

$$V_{t-1}^j = \frac{\left[A_{t-1}^j\left(w_t^j - e^j\right) + D_t^j\right] + \left[A_{t-1}^j\left(1 + e^j\right) - D_t^j + C_t^j\right]}{1 + w_t^j} \tag{4}$$

$$= \frac{\left[A_{t-1}^j\left(1 + w_t^j\right) + C_t^j\right]}{\left(1 + w_t^j\right)}$$

$$= A_{t-1}^j + \frac{C_t^j}{\left(1 + w_t^j\right)}$$

175.   The right-hand side of this equation is the opening outlay plus the present value of capex made at the end of the year. Thus, for any year t during regulatory period j, the present value of the cash flow for the year and the residual value is equal to the present value of the outlays, that is, NPV = 0. It follows that NPV = 0 for the sequence of years to any horizon date T.

Appendix 3 PTRM and RFM achieve real return

176. Application of the models requires independent inputs of: the opening RAB, real capex and depreciation amounts for each regulatory period, an estimate of the cost of equity for each period, estimates of the cost of debt starting from 9 years prior to the opening date, leverage, the AER estimates of inflation for each regulatory period, and actual inflation rates starting from the opening date of period 1.

Asset base in the PTRM

177. For regulatory period 1:

$$A_1^1 = A_0^1 + e^1 A_0^1 - D_1^1 + C_1^1 = A_0^1(1 + e^1) + NC_1^1$$

$$= A_0^1(1 + e^1) + RNC_1^1(1 + e^1)$$

$$= (A_0^1 + RNC_1^1)(1 + e^1)$$

$$A_2^1 = A_1^1 + e^1 A_1^1 - D_2^1 + C_2^1 = A_1^1(1 + e^1) + NC_2^1$$

$$= A_1^1(1 + e^1) + RNC_2^1(1 + e^1)^2$$

$$= (A_0^1 + RNC_1^1)(1 + e^1)^2 + RNC_2^1(1 + e^1)^2$$

$$= (A_0^1 + RNC_1^1 + RNC_2^1)(1 + e^1)^2$$

$$A_3^1 = A_2^1(1 + e^1) + NC_3^1$$

$$= (A_0^1 + RNC_1 + RNC_2^1)(1 + e^1)^3 + RNC_3^1(1 + e^1)^3$$

$$= (A_0^1 + RNC_1 + RNC_2^1 + RNC_3^1)(1 + e^1)^3$$

$$A_4^1 = A_3^1(1 + e^1) + NC_4^1$$

$$= (A_0^1 + RNC_1 + RNC_2^1 + RNC_3^1 + RNC_4^1)(1 + e^1)^4$$

$$A_5^1 = A_4^1(1 + e^1) + NC_5^1$$

$$= (A_0^1 + RNC_1 + RNC_2^1 + RNC_3^1 + RNC_4^1 + RNC_5^1)(1 + e^1)^5$$

178. For regulatory period 2:

$$A_1^2 = A_0^2(1 + e^2) + NC_1^2 = (A_0^2 + RNC_1^2)(1 + e^2)$$

$$A_2^2 = A_1^2(1 + e^2) + NC_2^2 = (A_1^2 + RNC_1^2 + RNC_2^2)(1 + e^2)^2$$

and so on to the end of the period:

$$A_5^2 = (A_0^2 + RNC_1^2 + RNC_2^2 + RNC_3^2 + RNC_4^2 + RNC_5^2)(1 + e^2)^5$$

179. Thus for year t in regulatory period j:

$$A_t^j = (A_0^j + RNC_1^j + \cdots + RNC_{t-1}^j + RNC_t^j)(1 + e^j)^t$$

180. The opening asset base for regulatory period 1 is an exogenous input but the opening capital base for all later periods is determined by the RFM.

RFM

181. The opening value of the capital base for the second and subsequent regulatory periods is given by adjusting for actual inflation the opening value of the capital base and net capex of the previous regulatory period:

$$A_0^j = (A_0^{j-1} + RNC_1^{j-1} + RNC_2^{j-1} + RNC_3^{j-1} + RNC_4^{j-1}$$
$$+ RNC_5^{j-1})(1 + a_1^{j-1})(1 + a_2^{j-1})(1 + a_3^{j-1})(1 + a_4^{j-1})(1 + a_5^{j-1})$$

NNRT in the PTRM

182. For regulatory period 1:

$$NNRT_1^1 = A_0^1 w_1^1 - A_0^1 e^1 + D_1^1 = A_0^1(w_1^1 - e^1) + RD_1^1(1 + e^1)$$
$$NNRT_2^1 = A_1^1(w_2^1 - e^1) + D_2^1$$
$$= [(A_0^1 + RNC_1^1)(1 + e^1)](w_2^1 - e^1) + RD_2^1(1 + e^1)^2$$
$$NNRT_3^1 = A_2^1(w_3^1 - e^1) + D_3^1$$
$$= [(A_0^1 + RNC_1^1 + RNC_2^1)(1 + e^1)^2](w_3^1 - e^1) + RD_3^1(1 + e^1)^3$$
$$NNRT_4^1 = A_3^1(w_4^1 - e^1) + D_4^1$$
$$= [(A_0^1 + RNC_1^1 + RNC_2^1 + RNC_3^1)(1 + e^1)^3](w_4^1 - e^1)$$
$$+ RD_4^1(1 + e^1)^4$$
$$NNRT_5^1 = A_4^1(w_5^1 - e^1) + D_5^1$$
$$= [(A_0^1 + RNC_1^1 + RNC_2^1 + RNC_3^1 + RNC_4^1)(1 + e^1)^4](w_5^1 - e^1)$$
$$+ RD_5^1(1 + e^1)^5$$

183. Similarly for later regulatory periods. Thus for year t in regulatory period j:

$$NNRT_t^j = A_t^j(w_t^j - e_1) + D_t^j$$
$$= [(A_0^j + RNC_1^j + \cdots + RNC_{t-1}^j)(1 + e^j)^{t-1}](w_t^j - e^j) + RD_t^j(1 + e^j)^t$$

184. The term in square brackets is the nominal opening capital base for year t in period j and thus the expression for $NNRT_t^j$ is the normal building block model with real

return $(w_t^j - e^j)$ on the nominal opening capital base, plus nominal depreciation for the year.

Appendix 4 Derivation of ARR

185.   Appendix 2 shows that for any year t in regulatory period j:

$$ARR_t^j - O_t^j - RA_t^j - Tax_t^j = NNRT_t^j$$

but tax payable is determined as:

$$Tax_t^j = t(ARR_t^j - O_t^j - RA_t^j - taxD_t^j - int_t^j - TLCF_t^j)$$

therefore:

$$ARR_t^j(1-t) - O_t^j(1-t) - RA_t^j(1-t) + t(taxD_t^j + int_t^j + TLCF_t^j) = NNRT_t^j$$

that is:

$$ARR_t^j = \frac{NNRT_t^j}{(1-t)} + O_t^j + RA_t^j - \frac{t}{(1-t)}(taxD_t^j + int_t^j + TLCF_t^j)$$

but:

$$t = \frac{\gamma T}{1 - T(1-\gamma)}$$

therefore:

$$ARR_t^j = NNRT_t^j \frac{1 - T(1-\gamma)}{(1-T)} + O_t^j + RA_t^j - (taxD_t^j + int_t^j + TLCF_t^j)\frac{\gamma T}{(1-T)}$$

Appendix 5 Initial derivation of SMAR

186. The set of annual revenue requirements, assessed at time 0, in regulatory period j, $\{ARR_{t,0}^j\}$ are converted by the '$CPI - X$' adjustment to a smoothed set, $\{SMAR_{t,0}^j\}$, with, in aggregate, the same present value. That is:

$$PV\{ARR_{1,0}^j, ARR_{2,0}^j, ARR_{3,0}^j, ARR_{4,0}^j, ARR_{5,0}^j\} =$$
$$PV\{SMAR_{1,0}^j, SMAR_{2,0}^j, SMAR_{3,0}^j, SMAR_{4,0}^j, SMAR_{5,0}^j\} \qquad (5)$$

where

$$SMAR_{1,0}^j = ARR_{1,0}^j$$

$$SMAR_{2,0}^j = SMAR_{1,0}^j(1 + e^j)(1 - X_{2,0})$$

$$SMAR_{3,0}^j = SMAR_{2,0}^j(1 + e^j)(1 - X_{3,0}) = SMAR_{1,0}^j(1 + e^j)^2(1 - X_{2,0})^2$$

$$SMAR_{4,0}^j = SMAR_{3,0}^j(1 + e^j)(1 - X_{4,0}) = SMAR_{1,0}^j(1 + e^j)^3(1 - X_{2,0})^3$$

$$SMAR_{5,0}^j = SMAR_{4,0}^j(1 + e^j)(1 - X_{5,0}) = SMAR_{1,0}^j(1 + e^j)^4(1 - X_{2,0})^4$$

187. With use of the trailing average cost of debt, at time 0 in period j, only the WACC for year 1 of the period, w_1^j, is available. The set $\{NNRT_{t,0}^j\}$ is therefore calculated with $w_t^j = w_1^j$ for $t = 1, \ldots, 5$ and from which the corresponding set $\{ARR_{t,0}^j\}$ is calculated, as set out in Appendix 4. Thus equation (5) can be stated in full as:

$$\sum_1^5 \frac{ARR_{t,0}^j}{(1 + w_1^j)^t} = \sum_1^5 \frac{SMAR_{t,0}^j}{(1 + w_1^j)^t}$$

$$= \frac{SMAR_{1,0}^j}{1 + w_1^j}\left\{ 1 + \frac{(1 + e^j)(1 - X_{2,0})}{1 + w_1^j} + \cdots + \left[\frac{(1 + e^j)(1 - X_{2,0})}{1 + w_1^j}\right]^4 \right\}$$

$$= \frac{SMAR_{1,0}^j}{1 + w_1^j} \frac{1 - \left[\frac{(1 + e^j)(1 - X_{2,0})}{1 + w_1^j}\right]^5}{1 - \frac{(1 + e^j)(1 - X_{2,0})}{1 + w_1^j}}$$

$$= SMAR_{1,0}^j \frac{1 - \left[\frac{(1 + e^j)(1 - X_{2,0})}{1 + w_1^j}\right]^5}{(1 + w_1^j) - (1 + e^j)(1 - X_{2,0})}$$

188. This equation can be solved iteratively for $X_{2,0}$ and thus the set $\{SMAR_t^j\}$ for the next 5 years can be determined with application of $SMAR_{1,0}^j = ARR_{1,0}^j$ in year 1.

Appendix 6 Subsequent derivation of SMAR (annual price adjustment)

189. If there is a change in debt costs, or the determination is reopened for cost pass through or contingent projects, then the smoothing process as explained in Appendix 5 is modified.

190. At time 1 in period j, the WACC for year 2 of the period, w_2^j, is available. The set $\{NNRT_{t,1}^j\}$ is therefore calculated with WACC set again at w_1^j for year 1 but w_2^j for years 2 to 5. The actual inflation rate for year 1 is also available at time 1 and is substituted for expected inflation in the SMAR for year 2. Thus, $ARR_{1,0}^j$ remains the same but there will be a new set $\{ARR_{t,1}^j\}$ for years 2 to 5 and the set of forward smoothed annual revenue requirements is given by:

$$SMAR_{2,1}^j = SMAR_{1,0}^j(1 + a_1^j)(1 - X_{2,1})$$

$$SMAR_{3,1}^j = SMAR_{2,1}^j(1 + e^j)(1 - X_{3,0})$$

$$= SMAR_{1,0}^j(1 + a_1^j)(1 + e^j)(1 - X_{2,1})(1 - X_{3,0})$$

$$SMAR_{4,1}^j = SMAR_{3,1}^j(1 + e^j)(1 - X_{4,0})$$

$$= SMAR_{1,0}^j(1 + a_1^j)(1 + e^j)^2(1 - X_{2,1})(1 - X_{3,0})^2$$

$$SMAR_{5,1}^j = SMAR_{4,1}^j(1 + e^j)(1 - X_{5,0})$$

$$= SMAR_{1,0}^j(1 + a_1^j)(1 + e^j)^3(1 - X_{2,1})(1 - X_{3,0})^3$$

and thus equating present values gives:

$$\frac{ARR_{1,0}^j}{1 + w_1^j} + \frac{ARR_{2,1}^j}{(1 + w_1^j)(1 + w_2^j)} + \cdots + \frac{ARR_{5,1}^j}{(1 + w_1^j)(1 + w_2^j)^4}$$

$$= \frac{SMAR_{1,0}^j}{1 + w_1^j} + \frac{SMAR_{1,0}^j(1 + a_1^j)(1 - X_{2,1})}{(1 + w_1^j)(1 + w_2^j)}$$

$$+ \frac{SMAR_{1,0}^j(1 + a_1^j)(1 + e^j)(1 - X_{2,1})(1 - X_{3,0})}{(1 + w_1^j)(1 + w_2^j)^2} + \cdots$$

$$+ \frac{SMAR_{1,0}^j(1 + a_1^j)(1 + e^j)^3(1 - X_{2,1})(1 - X_{3,0})^3}{(1 + w_1^j)(1 + w_2^j)^4}$$

$$= \frac{SMAR_{1,0}^{j}}{1 + w_1^{j}} \left\{ 1 + \frac{(1 + a_1^{j})(1 - X_{2,1})}{1 + w_2^{j}} \right.$$

$$+ \frac{(1 + a_1^{j})(1 + e^{j})(1 - X_{2,1})(1 - X_{3,0})}{(1 + w_2^{j})^2} + \cdots$$

$$\left. + \frac{(1 + a_1^{j})(1 + e^{j})^3(1 - X_{2,1})(1 - X_{3,0})^3}{(1 + w_2^{j})^4} \right\}$$

191.　This equation can be solved for $X_{2,1}$ and thus the set $\{SMAR_{t,1}^{j}\}$ for years 2 to 5 can be determined with application of $SMAR_{2,1}^{j}$ in year 2.

192.　Similarly for years 3, 4 and 5.

193.　The $NPV = 0$ principle is maintained in each year in the estimation of the ARR series (updated for use of the trailing moving average cost of debt in WACC) and the conversion each year to the SMAR series (to reflect experienced inflation) also maintains the $NPV = 0$ principle as the 'CPI – X' adjustment equates aggregate present values.

Appendix 7 Annual update to the cost of debt

194.   NSPs can elect to have the estimate of the cost of debt in the WACC updated annually such that it is based on a trailing moving average cost of debt rather than being fixed at the start of the regulatory period. The impact of this election on nominal WACC and return on equity can be analysed in terms of (i) contrast with WACC based on the cost of debt set at the start of the regulatory period, and (ii) the year on year effect.

195.   Firstly, the contrast with cost of debt for the regulatory period, that is, the cost of debt estimated at the beginning of the regulatory period along with the cost of equity. With nominal WACC based on a trailing average cost of debt an NSP's allowance for debt costs in year t of regulatory period j is given by:

$$(\frac{1}{10} \sum_{v=t-9}^{v=t} d_v) \, L$$

196.   If instead nominal WACC were based on the cost of debt for period j, the allowance for debt costs would be given by:

$$d^j L$$

Thus, Δw the impact on allowed WACC is given by:

$$\Delta w = (\frac{1}{10} \sum_{v=t-9}^{v=t} d_v) L - d^j L$$

$$= L \frac{1}{10} \sum_{v=t-9}^{v=t} (d_v - d^j)$$

197.   If the real cost of debt is assumed to be constant, then the impact on WACC can be stated in terms of difference in inflation rates:

$$\Delta w = L \left[\frac{1}{10} \sum_{v=t-9}^{v=t} (i_v - i^j)\right]$$

198.   That is, if inflation expectations are on average greater (less) than the expectation at the beginning of the period, then the impact is positive (negative) but the impact is reduced by leverage.

199.   The impact on the return on equity for period j, Δk, from WACC set on the basis of the trailing average cost of debt rather than the cost of debt for period j, is:

$$\Delta k = k^{j\prime} - k^j$$

where:

$$k^{j\prime}(1-L) - k^j(1-L) = (\frac{1}{10}\sum_{v=t-9}^{v=t} d_v)L - d^j L$$

therefore:

$$\Delta k = \frac{L}{(1-L)}[\frac{1}{10}\sum_{v=t-9}^{v=t}(d_v - d^j)]$$

and with constant real cost of debt:

$$\Delta k = \frac{L}{(1-L)}[\frac{1}{10}\sum_{v=t-9}^{v=t}(i_v - i^j)]$$

200. Thus, as with WACC, if historical inflation expectations are on average greater (less) than the expectation at the beginning of the period, then the impact is positive (negative). However, the impact is magnified by leverage.

201. Secondly, the year on year effect. An NSP's allowance for debt costs during year t of regulatory period j is given by:

$$\left(\frac{1}{10}\sum_{v=t-9}^{v=t} d_v\right)L$$

and in year $t+1$ during period j:

$$\left(\frac{1}{10}\sum_{v=t-8}^{v=t+1} d_v\right)L$$

Thus, Δw, the change in allowed WACC from period t to $t+1$ is:

$$\Delta w = \left(\frac{1}{10}\sum_{v=t-8}^{v=t+1} d_v\right)L - (\frac{1}{10}\sum_{v=t-9}^{v=t} d_v)L$$

$$= L[\frac{1}{10}(d_{t+1} - d_{t-9})]$$

If the real cost of debt is assumed to be constant, then the impact on WACC is given by:

$$\Delta w = L[\frac{1}{10}(i_{t+1} - i_{t-9})]$$

That is, if the inflation expectation for year $t+1$ is greater (less) than it was for year $t-9$ then the impact is positive (negative) but is reduced by leverage.

202. The impact on the return on equity, $\Delta k,$ is:

$$\Delta k = k^{j\prime} - k^j$$

where:

$$k^{j\prime}(1 - L) - k^j(1 - L) = \left(\frac{1}{10} \sum_{v=t-8}^{v=t+1} d_v\right) L - \left(\frac{1}{10} \sum_{v=t-9}^{v=t} d_v\right) L$$

therefore:

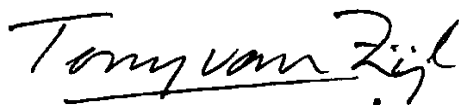$$\Delta k = \frac{L}{(1 - L)} \left[\frac{1}{10}(d_{t+1} - d_{t-9})\right]$$

203.   If the real cost of debt is assumed to be constant, then the impact on equity is given by:

$$\Delta k = \frac{L}{(1 - L)} \left[\frac{1}{10}(i_{t+1} - i_{t-9})\right]$$

204.   That is, if the inflation expectation for year $t + 1$ is greater (less) than it was for year $t - 9$ then the impact is positive (negative) but the impact is magnified by leverage.

Appendix 8 Acknowledgement and declaration

205.   We have read and complied with the "Expert Evidence Practice Notes (GPN-EXPT)" of the Federal Court of Australia, which are attached as annexure Appendix 9. We agree to be bound by the Practice Notes. Our opinions are based wholly or substantially on the specialised knowledge arising from our training, study and experience.

206.   We declare that we have made all the inquiries that we believe are desirable and appropriate (save for any matters identified explicitly in the report) and that no matters of significance that we regard as relevant have, to our knowledge, been withheld.
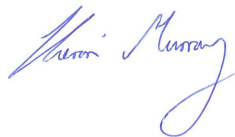

Tony van Zijl

25 September 2017

Vhari McWha

25 September 2017

Kieran Murray

25 September 2017

Appendix 9 Expert evidence practice notes (GPB-EXPT)

General Practice Note

INTRODUCTION

1.1 This practice note, including the *Harmonised Expert Witness Code of Conduct* ("**Code**") (see **Annexure A**) and the *Concurrent Expert Evidence Guidelines* ("**Concurrent Evidence Guidelines**") (see **Annexure B**), applies to any proceeding involving the use of expert evidence and must be read together with:

   (a) the Central Practice Note (CPN-1), which sets out the fundamental principles concerning the National Court Framework ("**NCF**") of the Federal Court and key principles of case management procedure;

   (b) the Federal Court of Australia Act 1976 (Cth) ("**Federal Court Act**");

   (c) the *Evidence Act 1995* (Cth) ("**Evidence Act**")**,** including Part 3.3 of the Evidence Act;

   (d) Part 23 of the *Federal Court Rules 2011* (Cth) ("**Federal Court Rules**")**;** and

   (e) where applicable, the Survey Evidence Practice Note (GPN-SURV).

1.2 This practice note takes effect from the date it is issued and, to the extent practicable, applies to proceedings whether filed before, or after, the date of issuing.

APPROACH TO EXPERT EVIDENCE

1.3 An expert witness may be retained to give opinion evidence in the proceeding, or, in certain circumstances, to express an opinion that may be relied upon in alternative dispute resolution procedures such as mediation or a conference of experts. In some circumstances an expert may be appointed as an independent adviser to the Court.

1.4 The purpose of the use of expert evidence in proceedings, often in relation to complex subject matter, is for the Court to receive the benefit of the objective and impartial assessment of an issue from a witness with specialised knowledge (based on training, study or experience - see generally s 79 of the Evidence Act).

1.5 However, the use or admissibility of expert evidence remains subject to the overriding requirements that:

   (a) to be admissible in a proceeding, any such evidence must be relevant (s 56 of the Evidence Act); and

   (b) even if relevant, any such evidence, may be refused to be admitted by the Court if its probative value is outweighed by other considerations such as the evidence being unfairly prejudicial, misleading or will result in an undue waste

of time
(s 135 of the Evidence Act).

1.6   An expert witness' opinion evidence may have little or no value unless the assumptions adopted by the expert (ie. the facts or grounds relied upon) and his or her reasoning are expressly stated in any written report or oral evidence given.

1.7   The Court will ensure that, in the interests of justice, parties are given a reasonable opportunity to adduce and test relevant expert opinion evidence. However, the Court expects parties and any legal representatives acting on their behalf, when dealing with expert witnesses and expert evidence, to at all times comply with their duties associated with the overarching purpose in the Federal Court Act (see ss 37M and 37N).

INTERACTION WITH EXPERT WITNESSES

1.8   Parties and their legal representatives should never view an expert witness retained (or partly retained) by them as that party's advocate or "hired gun". Equally, they should never attempt to pressure or influence an expert into conforming his or her views with the party's interests.

1.9   A party or legal representative should be cautious not to have inappropriate communications when retaining or instructing an independent expert, or assisting an independent expert in the preparation of his or her evidence. However, it is important to note that there is no principle of law or practice and there is nothing in this practice note that obliges a party to embark on the costly task of engaging a "consulting expert" in order to avoid "contamination" of the expert who will give evidence. Indeed the Court would generally discourage such costly duplication.

1.10   Any witness retained by a party for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based in the specialised knowledge of the witness[56] should, at the earliest opportunity, be provided with:

   (a)   a copy of this practice note, including the Code (see Annexure A); and

   (b)   all relevant information (whether helpful or harmful to that party's case) so as to enable the expert to prepare a report of a truly independent nature.

1.11   Any questions or assumptions provided to an expert should be provided in an unbiased manner and in such a way that the expert is not confined to addressing selective, irrelevant or immaterial issues.

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[56]   Such a witness includes a "Court expert" as defined in r 23.01 of the Federal Court Rules. For the definition of "expert", "expert evidence" and "expert report" see the Dictionary, in Schedule 1 of the Federal Court Rules.

ROLE AND DUTIES OF THE EXPERT WITNESS

1.12   The role of the expert witness is to provide relevant and impartial evidence in his or her area of expertise. An expert should never mislead the Court or become an advocate for the cause of the party that has retained the expert.

1.13   It should be emphasised that there is nothing inherently wrong with experts disagreeing or failing to reach the same conclusion. The Court will, with the assistance of the evidence of the experts, reach its own conclusion.

1.14   However, experts should willingly be prepared to change their opinion or make concessions when it is necessary or appropriate to do so, even if doing so would be contrary to any previously held or expressed view of that expert.

Harmonised Expert Witness Code of Conduct

1.15   Every expert witness giving evidence in this Court must read the *Harmonised Expert Witness Code of Conduct* (attached in Annexure A) and agree to be bound by it.

1.16   The Code is not intended to address all aspects of an expert witness' duties, but is intended to facilitate the admission of opinion evidence, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is expected that compliance with the Code will assist individual expert witnesses to avoid criticism (rightly or wrongly) that they lack objectivity or are partisan.

CONTENTS OF AN EXPERT'S REPORT AND RELATED MATERIAL

1.17   The contents of an expert's report must conform with the requirements set out in the Code (including clauses 3 to 5 of the Code).

1.18   In addition, the contents of such a report must also comply with r 23.13 of the Federal Court Rules. Given that the requirements of that rule significantly overlap with the requirements in the Code, an expert, unless otherwise directed by the Court, will be taken to have complied with the requirements of r 23.13 if that expert has complied with the requirements in the Code and has complied with the additional following requirements. The expert shall:

   (a)   acknowledge in the report that:

   (b)   the expert has read and complied with this practice note and agrees to be bound by it; and

   (c)   the expert's opinions are based wholly or substantially on specialised knowledge arising from the expert's training, study or experience;

   (d)   identify in the report the questions that the expert was asked to address;

   (e)   sign the report and attach or exhibit to it copies of:

   (f)   documents that record any instructions given to the expert; and

   (g)   documents and other materials that the expert has been instructed to consider.

1.19 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the other parties at the same time as the expert's report.

CASE MANAGEMENT CONSIDERATIONS

1.20 Parties intending to rely on expert evidence at trial are expected to consider between them and inform the Court at the earliest opportunity of their views on the following:

(a) whether a party should adduce evidence from more than one expert in any single discipline;

(b) whether a common expert is appropriate for all or any part of the evidence;

(c) the nature and extent of expert reports, including any in reply;

(d) the identity of each expert witness that a party intends to call, their area(s) of expertise and availability during the proposed hearing;

(e) the issues that it is proposed each expert will address;

(f) the arrangements for a conference of experts to prepare a joint-report (see Part 7 of this practice note);

(g) whether the evidence is to be given concurrently and, if so, how (see Part 8 of this practice note); and

(h) whether any of the evidence in chief can be given orally.

1.21 It will often be desirable, before any expert is retained, for the parties to attempt to agree on the question or questions proposed to be the subject of expert evidence as well as the relevant facts and assumptions. The Court may make orders to that effect where it considers it appropriate to do so.

CONFERENCE OF EXPERTS AND JOINT-REPORT

1.22 Parties, their legal representatives and experts should be familiar with aspects of the Code relating to conferences of experts and joint-reports (see clauses 6 and 7 of the Code attached in Annexure A).

1.23 In order to facilitate the proper understanding of issues arising in expert evidence and to manage expert evidence in accordance with the overarching purpose, the Court may require experts who are to give evidence or who have produced reports to meet for the purpose of identifying and addressing the issues not agreed between them with a view to reaching agreement where this is possible ("**conference of experts**"). In an appropriate case, the Court may appoint a registrar of the Court or some other suitably qualified person ("**Conference Facilitator**") to act as a facilitator at the conference of experts.

1.24 It is expected that where expert evidence may be relied on in any proceeding, at the earliest opportunity, parties will discuss and then inform the Court whether a conference of experts and/or a joint-report by the experts may be desirable to assist with or simplify the giving of expert evidence in the proceeding. The parties should

discuss the necessary arrangements for any conference and/or joint-report. The arrangements discussed between the parties should address:

(a) who should prepare any joint-report;

(b) whether a list of issues is needed to assist the experts in the conference and, if so, whether the Court, the parties or the experts should assist in preparing such a list;

(c) the agenda for the conference of experts; and

(d) arrangements for the provision, to the parties and the Court, of any joint-report or any other report as to the outcomes of the conference ("**conference report**").

Conference of Experts

1.25   The purpose of the conference of experts is for the experts to have a comprehensive discussion of issues relating to their field of expertise, with a view to identifying matters and issues in a proceeding about which the experts agree, partly agree or disagree and why. For this reason the conference is attended only by the experts and any Conference Facilitator. Unless the Court orders otherwise, the parties' lawyers will not attend the conference but will be provided with a copy of any conference report.

1.26   The Court may order that a conference of experts occur in a variety of circumstances, depending on the views of the judge and the parties and the needs of the case, including:

(a) while a case is in mediation. When this occurs the Court may also order that the outcome of the conference or any document disclosing or summarising the experts' opinions be confidential to the parties while the mediation is occurring;

(b) before the experts have reached a final opinion on a relevant question or the facts involved in a case. When this occurs the Court may order that the parties exchange draft expert reports and that a conference report be prepared for the use of the experts in finalising their reports;

(c) after the experts' reports have been provided to the Court but before the hearing of the experts' evidence. When this occurs the Court may also order that a conference report be prepared (jointly or otherwise) to ensure the efficient hearing of the experts' evidence.

1.27   Subject to any other order or direction of the Court, the parties and their lawyers must not involve themselves in the conference of experts process. In particular, they must not seek to encourage an expert not to agree with another expert or otherwise seek to influence the outcome of the conference of experts. The experts should raise any queries they may have in relation to the process with the Conference Facilitator (if one has been appointed) or in accordance with a protocol agreed between the lawyers prior to the conference of experts taking place (if no Conference Facilitator has been appointed).

1.28   Any list of issues prepared for the consideration of the experts as part of the conference of experts process should be prepared using non-tendentious language.

1.29 The timing and location of the conference of experts will be decided by the judge or a registrar who will take into account the location and availability of the experts and the Court's case management timetable. The conference may take place at the Court and will usually be conducted in-person. However, if not considered a hindrance to the process, the conference may also be conducted with the assistance of visual or audio technology (such as via the internet, video link and/or by telephone).

1.30 Experts should prepare for a conference of experts by ensuring that they are familiar with all of the material upon which they base their opinions. Where expert reports in draft or final form have been exchanged prior to the conference, experts should attend the conference familiar with the reports of the other experts. Prior to the conference, experts should also consider where they believe the differences of opinion lie between them and what processes and discussions may assist to identify and refine those areas of difference.

Joint-report

1.31 At the conclusion of the conference of experts, unless the Court considers it unnecessary to do so, it is expected that the experts will have narrowed the issues in respect of which they agree, partly agree or disagree in a joint-report. The joint-report should be clear, plain and concise and should summarise the views of the experts on the identified issues, including a succinct explanation for any differences of opinion, and otherwise be structured in the manner requested by the judge or registrar.

1.32 In some cases (and most particularly in some native title cases), depending on the nature, volume and complexity of the expert evidence a judge may direct a registrar to draft part, or all, of a conference report. If so, the registrar will usually provide the draft conference report to the relevant experts and seek their confirmation that the conference report accurately reflects the opinions of the experts expressed at the conference. Once that confirmation has been received the registrar will finalise the conference report and provide it to the intended recipient(s).

CONCURRENT EXPERT EVIDENCE

1.33 The Court may determine that it is appropriate, depending on the nature of the expert evidence and the proceeding generally, for experts to give some or all of their evidence concurrently at the final (or other) hearing.

1.34 Parties should familiarise themselves with the *Concurrent Expert Evidence Guidelines* (attached in Annexure B). The Concurrent Evidence Guidelines are not intended to be exhaustive but indicate the circumstances when the Court might consider it appropriate for concurrent expert evidence to take place, outline how that process may be undertaken, and assist experts to understand in general terms what the Court expects of them.

1.35 If an order is made for concurrent expert evidence to be given at a hearing, any expert to give such evidence should be provided with the Concurrent Evidence Guidelines well in advance of the hearing and should be familiar with those guidelines before giving evidence.

FURTHER PRACTICE INFORMATION AND RESOURCES

1.36 Further information regarding Expert Evidence and Expert Witnesses is available on the Court's website.

1.37 Further information to assist litigants, including a range of helpful guides, is also available on the Court's website. This information may be particularly helpful for litigants who are representing themselves.

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J L B ALLSOP
Chief Justice
25 October 2016

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HARMONISED EXPERT WITNESS CODE OF CONDUCT[57]

APPLICATION OF CODE

1. This Code of Conduct applies to any expert witness engaged or appointed:

    (a) to provide an expert's report for use as evidence in proceedings or proposed proceedings; or

    (b) to give opinion evidence in proceedings or proposed proceedings.

GENERAL DUTIES TO THE COURT

2. An expert witness is not an advocate for a party and has a paramount duty, overriding any duty to the party to the proceedings or other person retaining the expert witness, to assist the Court impartially on matters relevant to the area of expertise of the witness.

CONTENT OF REPORT

3. Every report prepared by an expert witness for use in Court shall clearly state the opinion or opinions of the expert and shall state, specify or provide:

    (a) the name and address of the expert;

    (b) an acknowledgment that the expert has read this code and agrees to be bound by it;

    (c) the qualifications of the expert to prepare the report;

    (d) the assumptions and material facts on which each opinion expressed in the report is based [a letter of instructions may be annexed];

    (e) the reasons for and any literature or other materials utilised in support of such opinion;

    (f) (if applicable) that a particular question, issue or matter falls outside the expert's field of expertise;

    (g) any examinations, tests or other investigations on which the expert has relied, identifying the person who carried them out and that person's qualifications;

    (h) the extent to which any opinion which the expert has expressed involves the acceptance of another person's opinion, the identification of that other person and the opinion expressed by that other person;

    (i) a declaration that the expert has made all the inquiries which the expert believes are desirable and appropriate (save for any matters identified explicitly in the

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report), and that no matters of significance which the expert regards as relevant have, to the knowledge of the expert, been withheld from the Court;

(j)   any qualifications on an opinion expressed in the report without which the report is or may be incomplete or inaccurate;

(k)   whether any opinion expressed in the report is not a concluded opinion because of insufficient research or insufficient data or for any other reason; and

(l)   where the report is lengthy or complex, a brief summary of the report at the beginning of the report.

SUPPLEMENTARY REPORT FOLLOWING CHANGE OF OPINION

4.   Where an expert witness has provided to a party (or that party's legal representative) a report for use in Court, and the expert thereafter changes his or her opinion on a material matter, the expert shall forthwith provide to the party (or that party's legal representative) a supplementary report which shall state, specify or provide the information referred to in paragraphs (a), (d), (e), (g), (h), (i), (j), (k) and (I) of clause 3 of this code and, if applicable, paragraph (f) of that clause.

5.   In any subsequent report (whether prepared in accordance with clause 4 or not) the expert may refer to material contained in the earlier report without repeating it.

DUTY TO COMPLY WITH THE COURT'S DIRECTIONS

6.   If directed to do so by the Court, an expert witness shall:
        (a)   confer with any other expert witness;

        (b)   provide the Court with a joint-report specifying (as the case requires) matters agreed and matters not agreed and the reasons for the experts not agreeing; and

        (c)   abide in a timely way by any direction of the Court.

CONFERENCE OF EXPERTS

7.   Each expert witness shall:
        (a)   exercise his or her independent judgment in relation to every conference in which the expert participates pursuant to a direction of the Court and in relation to each report thereafter provided, and shall not act on any instruction or request to withhold or avoid agreement; and

        (b)   endeavour to reach agreement with the other expert witness (or witnesses) on any issue in dispute between them, or failing agreement, endeavour to identify and clarify the basis of disagreement on the issues which are in dispute.

CONCURRENT EXPERT EVIDENCE GUIDELINES

APPLICATION OF THE COURT'S GUIDELINES

1. The Court's Concurrent Expert Evidence Guidelines ("**Concurrent Evidence Guidelines**") are intended to inform parties, practitioners and experts of the Court's general approach to concurrent expert evidence, the circumstances in which the Court might consider expert witnesses giving evidence concurrently and, if so, the procedures by which their evidence may be taken.

    OBJECTIVES OF CONCURRENT EXPERT EVIDENCE TECHNIQUE

2. The use of concurrent evidence for the giving of expert evidence at hearings as a case management technique[58] will be utilised by the Court in appropriate circumstances (see r 23.15 of the *Federal Court Rules 2011* (Cth)). Not all cases will suit the process. For instance, in some patent cases, where the entire case revolves around conflicts within fields of expertise, concurrent evidence may not assist a judge. However, patent cases should not be excluded from concurrent expert evidence processes.

3. In many cases the use of concurrent expert evidence is a technique that can reduce the partisan or confrontational nature of conventional hearing processes and minimises the risk that experts become "opposing experts" rather than independent experts assisting the Court. It can elicit more precise and accurate expert evidence with greater input and assistance from the experts themselves.

4. When properly and flexibly applied, with efficiency and discipline during the hearing process, the technique may also allow the experts to more effectively focus on the critical points of disagreement between them, identify or resolve those issues more quickly, and narrow the issues in dispute. This can also allow for the key evidence to be given at the same time (rather than being spread across many days of hearing); permit the judge to assess an expert more readily, whilst allowing each party a genuine opportunity to put and test expert evidence. This can reduce the chance of the experts, lawyers and the judge misunderstanding the opinions being expressed by the experts.

5. It is essential that such a process has the full cooperation and support of all of the individuals involved, including the experts and counsel involved in the questioning process. Without that cooperation and support the process may fail in its objectives and even hinder the case management process.

(i)   CASE MANAGEMENT

6. Parties should expect that, the Court will give careful consideration to whether concurrent evidence is appropriate in circumstances where there is more than one expert witness having the same expertise who is to give evidence on the same or

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[58]   Also known as the "hot tub" or as "expert panels".

related topics. Whether experts should give evidence concurrently is a matter for the Court, and will depend on the circumstances of each individual case, including the character of the proceeding, the nature of the expert evidence, and the views of the parties.

7. Although this consideration may take place at any time, including the commencement of the hearing, if not raised earlier, parties should raise the issue of concurrent evidence at the first appropriate case management hearing, and no later than any pre-trial case management hearing, so that orders can be made in advance, if necessary. To that end, prior to the hearing at which expert evidence may be given concurrently, parties and their lawyers should confer and give general consideration as to:

    (a)   the agenda;

    (b)   the order and manner in which questions will be asked; and

    (c)   whether cross-examination will take place within the context of the concurrent evidence or after its conclusion.

8. At the same time, and before any hearing date is fixed, the identity of all experts proposed to be called and their areas of expertise is to be notified to the Court by all parties.

9. The lack of any concurrent evidence orders does not mean that the Court will not consider using concurrent evidence without prior notice to the parties, if appropriate.
CONFERENCE OF EXPERTS & JOINT-REPORT OR LIST OF ISSUES

10. The process of giving concurrent evidence at hearings may be assisted by the preparation of a joint-report or list of issues prepared as part of a conference of experts.

11. Parties should expect that, where concurrent evidence is appropriate, the Court may make orders requiring a conference of experts to take place or for documents such as a joint-report to be prepared to facilitate the concurrent expert evidence process at a hearing (see Part 7 of the Expert Evidence Practice Note).
PROCEDURE AT HEARING

12. Concurrent expert evidence may be taken at any convenient time during the hearing, although it will often occur at the conclusion of both parties' lay evidence.

13. At the hearing itself, the way in which concurrent expert evidence is taken must be applied flexibly and having regard to the characteristics of the case and the nature of the evidence to be given.

14. Without intending to be prescriptive of the procedure, parties should expect that, when evidence is given by experts in concurrent session:

    (a)   the judge will explain to the experts the procedure that will be followed and that the nature of the process may be different to their previous experiences of giving expert evidence;

    (b)   the experts will be grouped and called to give evidence together in their respective fields of expertise;

    (c)   the experts will take the oath or affirmation together, as appropriate;

(d)   the experts will sit together with convenient access to their materials for their ease of reference, either in the witness box or in some other location in the courtroom, including (if necessary) at the bar table;

(e)   each expert may be given the opportunity to provide a summary overview of their current opinions and explain what they consider to be the principal issues of disagreement between the experts, as they see them, in their own words;

(f)   the judge will guide the process by which evidence is given, including, where appropriate:

(g)   using any joint-report or list of issues as a guide for all the experts to be asked questions by the judge and counsel, about each issue on an issue-by-issue basis;

(h)   ensuring that each expert is given an adequate opportunity to deal with each issue and the exposition given by other experts including, where considered appropriate, each expert asking questions of other experts or supplementing the evidence given by other experts;

(i)   inviting legal representatives to identify the topics upon which they will cross-examine;

(j)   ensuring that legal representatives have an adequate opportunity to ask all experts questions about each issue. Legal representatives may also seek responses or contributions from one or more experts in response to the evidence given by a different expert; and

(k)   allowing the experts an opportunity to summarise their views at the end of the process where opinions may have been changed or clarifications are needed.

15.   The fact that the experts may have been provided with a list of issues for consideration does not confine the scope of any cross-examination of any expert. The process of cross-examination remains subject to the overall control of the judge.

16.   The concurrent session should allow for a sensible and orderly series of exchanges between expert and expert, and between expert and lawyer. Where appropriate, the judge may allow for more traditional cross-examination to be pursued by a legal representative on a particular issue exclusively with one expert. Where that occurs, other experts may be asked to comment on the evidence given.

17.   Where any issue involves only one expert, the party wishing to ask questions about that issue should let the judge know in advance so that consideration can be given to whether arrangements should be made for that issue to be dealt with after the completion of the concurrent session. Otherwise, as far as practicable, questions (including in the form of cross-examination) will usually be dealt with in the concurrent session.

18.   Throughout the concurrent evidence process the judge will ensure that the process is fair and effective (for the parties and the experts), balanced (including not permitting one expert to overwhelm or overshadow any other expert), and does not become a protracted or inefficient process.

Appendix 10 Terms of reference

Stage one

Australian
Competition &
Consumer
Commission

EXPERT CONSULTANCY PANEL REQUEST FOR QUOTE (RFQ): EFFICIENT ALLOCATION AND COMPENSATION OF INFLATION RISK

FOR THE PROVISION OF CONSULTANCY SERVICES

Invitation to Quote

The Australian Competition and Consumer Commission (ACCC)/Australian Energy Regulator (AER) are seeking quotations from suitably qualified service providers for the provision of consultancy services.

In submitting a response, potential suppliers are required to comply with all the requirements set out in the Deed of Standing Offer. The services are required in two stages and the deliverable under the first stage is required before 30 June 2017.

Requirements

Recently, the AER's method for estimating expected inflation has been the subject of debate in our regulatory determinations. Further, the AER in December 2016 published an update to its asset base Roll Forward Model (RFM). During that process of updating the RFM, stakeholders requested us to reconsider our method for estimating expected inflation and its implications. Consequently, the AER issued a communications notice of its intention to review the current method of estimating expected inflation.[59] On 18 April 2017, the AER published its Discussion Paper – Regulatory treatment of inflation.[60]

The AER typically applies the Post-Tax Revenue Model (PTRM) and RFM across all its determinations. The use of these models for electricity service providers is mandated by the National Electricity Rules (NER). While the National Gas Rules (NGR) do not mandate the use of these models for gas service providers, these models have often been used in the gas

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[59]   See https://www.aer.gov.au/communication/2017-review-of-expected-inflation

[60]   AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, available at https://www.aer.gov.au/system/files/AER%20inflation%20review%202017%20-%20discussion%20paper%20-%2018%20April%202017.pdf

context as well. Annual pricing mechanisms are also typically applied consistently (at a general level) across all of our determinations—that is, we use a 'CPI minus X' mechanism to adjust revenues or prices from year to year. The widespread use of our PTRM and RFM, and the ubiquitous nature of inflation, necessitates that we conduct an industry-wide review before making changes to these models. The NER also require that we follow certain consultation procedures before amending these models.

The network service providers (NSPs) have raised a number of concerns with the AER's current method for estimating expected inflation. These can be largely divided into two high level aspects. One is whether the current method derives the best estimate of expected inflation. The other is that, irrespective of the method chosen, whether the AER's revenue and price modelling provides an efficient level of inflation risk, appropriate compensation for this efficient level of inflation risk, and efficient allocation of inflation risk between NSPs and end users. This RFQ relates to the latter. Nevertheless, the Consultant is required to engage with the AER's findings/research in relation to the best estimate of expected inflation.[61] Expert advice is sought to assist the project team in understanding the NSP's perspective on perceived (or real) risk of under compensation associated with expected inflation forecasts and how they currently manage such (if any) risks. This advice is largely required during the period between the AER publishing the Discussion paper and the end of the closing date for submissions, which is 29 June 2017.

The Consultant is required to provide its advice in two stages. In the first stage the Consultant is required to provide advice in written form but is not required to produce it as publishable report. In the second stage the Consultant is required to consider any written submissions we receive and provide an updated report. The updated report is to be finalised as a publishable report to the standard of the Federal Court requirements for expert reports.[62] A contract variation will be negotiated with the Consultant for the second stage.

The successful Consultant is expected to have a good understanding of the relevant clauses in the NER (and NEL), and NGR (and NGL), that interact with the expected inflation estimate under the CPI–X incentive regulatory framework. The Consultant is required to provide a written memorandum with all models and workings attached. The Consultant is expected to attend stakeholder engagement meeting(s), when requested by the AER's project team.

In addition to the AER Discussion Paper, the Consultant is also required to consider the following information currently before the AER:

- APA's proposed approach to changing the AER's current method of applying expected inflation in the PTRM under the CPI–X regulatory framework for the Roma to Brisbane Pipeline[63]

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61   See ACCC/AER Working Paper Series, Paper No. 11 "Consideration of best estimates of expected inflation: comparing and ranking approaches", available at https://www.accc.gov.au/system/files/Working%20Paper%20no.%2011%20-%20Best%20estimates%20of%20expected%20inflation%20v2.pdf

62   See http://www.fedcourt.gov.au/law-and-practice/practice-documents/practice-notes/gpn-expt

63   APA, *Roma to Brisbane pipeline, Access arrangement submission, Public*, September 2016, pp. 202–208 (and accompanying PTRM). The submission and PTRM are available at https://www.aer.gov.au/networks-

- APA's proposed approach to changing the AER's current method of applying expected inflation in the RFM and PTRM under the CPI–X regulatory framework for the Victorian Transmission System[64]
- AusNet Services, Multinet Gas and AGN's proposed approaches to changing the AER's current method of applying expected inflation under the CPI–X regulatory framework[65]
- TransGrid, ElectraNet and Murraylink's statements on the estimation of expected inflation in their recent regulatory proposals[66]
- The AER's final decision and submissions received from stakeholders during our recent RFM update (this includes submissions from ENA, AGN, AusNet, SAPN, CitiPower and Powercor).[67]

Further, the Consultant is required to attend the AER's stakeholder engagement workshop and consider any oral submissions made there.

Services required

The advice required, without in any manner directing the Consultant, should include the following:

1. How do NSPs perceive inflation risk (or not) in their revenue requirements (including the impacts on the building blocks)? Explanation of such risk should consider the following sources/perceptions:

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pipelines/determinations-access-arrangements/roma-wallumbilla-to-brisbane-pipeline-access-arrangement-2017-22/proposal

[64] APA, *APA VTS response to AER Information request #IR003*, 3 March 2016, available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/apa-victorian-transmission-system-access-arrangement-2018-22/proposal (in the submissions section at the bottom of the webpage).

[65] AusNet Services, *Gas Access Arrangement Review 2018-2022: Access Arrangement Information*, 16 December 2016, pp. 182, 185, 221–226 (available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/ausnet-services-access-arrangement-2018-22); Multinet Gas, *2018 – 2022 Access Arrangement Information*, December 2016, pp. 127–131 (available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/multinet-gas-access-arrangement-2018-22); and https://www.aer.gov.au/system/files/Multinet Gas - 2018 to 2022 Access Arrangement Information - 20161221 - PUBLIC.pdfAGN, *Final Plan Attachment 9.2 Inflation*, December 2016 (available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/australian-gas-networks-victoria-and-albury-access-arrangement-2018-22).

[66] TransGrid, *Revenue proposal, 2018/19 – 2022/23*, 31 January 2017, p. 211 (available at https://www.aer.gov.au/system/files/TransGrid%20-%20Revenue%20Proposal%2018_19%20to%2022_23%20-%20January%202017.pdf); Electranet, *Revenue proposal overview 2019–2023*, 28 March 2017, p. 66 (available at https://www.aer.gov.au/system/files/ElectraNet%20%E2%80%93%20ENET002%20%E2%80%93%20ElectraNet%20%E2%80%93%20Revenue%20Proposal%20Overview%20%E2%80%93%20March%202017.pdf); and Murraylink Transmission Company, *Murraylink revenue proposal (public), Effective July 2018 to June 2023*, January 2017, p. 84 (available at https://www.aer.gov.au/system/files/Murraylink%20Revenue%20Proposal.pdf).

[67] AER, *Final decision, Amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 15 December 2016,. The final decision and all submissions are available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/roll-forward-model-distribution-december-2016-amendment.

1.1. The risk of unexpected future changes in inflation impacting the present value of the firm's cash flows.

1.2. The risk of the regulator setting expected inflation not equal to the best estimate of expected inflation.

1.3. Forecasting risk associated with actual outcomes differing from *ex ante* forecasts.

2. How do NSPs manage (or not) such risks? As part of this risk management who currently carries, and who pays for, the inflation risk (NSP and/or consumer)? In considering this, the consultant should also evaluate the possibility for consumers to pay NSPs to bear inflation risk but to still bear it themselves. Therefore, the Consultant would need to consider these as separate (but related) issues.

3. Is there an adjustment to the PTRM, RFM, and/or annual pricing mechanisms that would remove debate about estimating inflation expectations, while also efficiently compensating for inflation and risk?

4. What are the implications of determining the level of regulated returns to asset owners in real terms compared to making a determination in nominal terms? Is a hybrid approach possible, and what would be the implications of such an approach? Is there an approach that best achieves the National Electricity and Gas Objectives?

5. What are the implications for the efficient rate of return (*allowed rate of return objective*) if changes are made to the manner in which regulated revenues compensate for inflation?

6. We typically used lagged CPI in our determinations for practical reasons around the timing of our decisions. What implications do think the use of lagged CPI may have on your advice?

The advice should be accompanied with modelling that has regard to the PTRM, RFM and annual revenue/pricing modelling processes. In doing so, the modelling must present both the real revenues and nominal revenues under the current CPI–X framework employed by the AER in the context of the NSP's proposed changes and their implication (using one or more relevant models submitted by NSPs).

Selection Criteria

This will be based on:

- knowledge of the PTRM, RFM and annual pricing frameworks
- experience in working with the above models
- understanding of the CPI–X incentive regulatory framework applied under the NER and NGR
- understanding of NSP risk management and revenue/pricing proposals and regulatory determination processes
- potential or perceived conflicts of interest.

Key Considerations

Respondents should be aware that the contract amount will be capped.

Information

The Quote including all attachments and supporting documentation must be written in English. Quantities are to be expressed in Australian legal units of measurement.

Your response should also include:

- A summary of your understanding of the requirements and how you will address these issues;
- A statement concerning your organisation's capability to address the requirements and in particular expertise in relation to inflation, rate of return, and compensation for risk;
- A list of all previous work by the Consultant, whether in Australia or internationally, on related topics to those in the services required provided;
- A list of recent previous work by the Consultant, provided to Australian energy network infrastructure operators or advocates of Australian energy consumers, on topics unrelated to the services required;
- A list of referees which may or may not be contacted.

Responses which do not include this information may not be considered any further.

The ACCC/AER will only accept responses on the basis that you have:

- Examined this RFQ, any documents referenced in this RFQ and any other information made available by the Commonwealth to tenders for the purpose of Quoting;
- Examined all further information which is obtainable by the making of reasonable inquiries relevant to the risks, contingencies, and other circumstances having an effect on their Quotation; and
- Been satisfied by the correctness and sufficiency of the Quote including pricing structure.

Provision of this Quotation is made on the basis that the respondent acknowledges:

- They do not rely on any representation, letter, document or arrangement whether oral or in writing, or other conduct as adding to or amending these conditions other than amendments addenda issued by the ACCC/AER;
- They do not rely upon any warranty or representation made by, or on behalf of, the Commonwealth, except as are expressly provided for in this RFQ, but they have relied entirely upon their own inquiries and inspection in respect of the subject of their tender;
- The ACCC/AER shall not be responsible for any costs or expenses incurred by respondents in complying with the requirements of this RFQ;
- Neither these conditions nor the Quote give rise to contractual obligations between the ACCC/AER and the respondent; and
- They are not to make public statements in relation to this Quote without prior written permission of the ACCC/AER.

Lodgement Details

Your response is to be delivered via email as follows:

Attention: Pradeep Fernando

RFQ: **Efficient allocation and compensation of inflation risk**

Email: pradeep.fernando@aer.gov.au

Responses must be lodged on or before 5.00pm Australian Eastern Standard Time on 15 May 2017. Quotes should be clearly marked.

Any queries on this matter should be directed to:

Pradeep Fernando
Director, Network Finance & Reporting
Australian Energy Regulator
02 6243 1264
Pradeep.Fernando@aer.gov.au

ACCC/AER Conditions

The ACCC/AER does not guarantee, warrant or otherwise represent that any business, revenue or other benefit or any minimum volume or value of business, revenue or other benefit will be earned or received by any successful respondent.

The ACCC/AER will decide on any further action after reviewing the responses to the RFQ. The ACCC/AER reserves the right to:

(a) Vary the process and timetable relating to this process in its absolute discretion;

(b) Vary the terms of the RFQ;

(c) Cease the RFQ process;

(d) Accept or reject any Quotes whether or not they are compliant;

(e) Seek additional information or clarification from Respondents (including their sub-contractors or agents);

(f) Shortlist, select and negotiate with more than one Respondent;

(g) Cancel, add to or amend the information, requirement, terms, procedures or processes set out in this RFQ; or

(h) Approach the market with an open Request for Tender (RFT) or seeking further Quotations via an Expression of Interest (EOI).

Stage two

EXPERT CONSULTANCY PANEL REQUEST FOR QUOTE (RFQ): EFFICIENT ALLOCATION AND COMPENSATION OF INFLATION RISK

FOR THE PROVISION OF CONSULTANCY SERVICES

Invitation to Quote

The Australian Competition and Consumer Commission (ACCC)/Australian Energy Regulator (AER) are seeking quotations from suitably qualified service providers for the provision of consultancy services.

In submitting a response, potential suppliers are required to comply with all the requirements set out in the Deed of Standing Offer. The services are required in two stages and the deliverable under the second stage is required by 1 September 2017.

Requirements

Recently, the AER's method for estimating expected inflation has been the subject of debate in our regulatory determinations. Further, the AER in December 2016 published an update to its asset base Roll Forward Model (RFM). During that process of updating the RFM, stakeholders requested us to reconsider our method for estimating expected inflation and its implications. Consequently, the AER issued a communications notice of its intention to review the current method of estimating expected inflation.[68] On 18 April 2017, the AER published its Discussion Paper – Regulatory treatment of inflation.[69]

The AER typically applies the Post-Tax Revenue Model (PTRM) and RFM across all its determinations. The use of these models for electricity service providers is mandated by the National Electricity Rules (NER). While the National Gas Rules (NGR) do not mandate the use of these models for gas service providers, these models have often been used in the gas context as well. Annual pricing mechanisms are also typically applied consistently (at a general level) across all of our determinations—that is, we use a 'CPI minus X' mechanism to adjust revenues or prices from year to year. The widespread use of our PTRM and RFM, and the ubiquitous nature of inflation, necessitates that we conduct an industry-wide review

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[68]   See https://www.aer.gov.au/communication/2017-review-of-expected-inflation

[69]   AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, available at https://www.aer.gov.au/system/files/AER%20inflation%20review%202017%20-%20discussion%20paper%20-%2018%20April%202017.pdf

before making changes to these models. The NER also require that we follow certain consultation procedures before amending these models.

The network service providers (NSPs) have raised a number of concerns with the AER's current method for estimating expected inflation. These can be largely divided into two high level aspects. One is whether the current method derives the best estimate of expected inflation. The other is that, irrespective of the method chosen, whether the AER's revenue and price modelling provides an efficient level of inflation risk, appropriate compensation for this efficient level of inflation risk, and efficient allocation of inflation risk between NSPs and end users. This RFQ relates to the latter. Nevertheless, the Consultant is required to engage with the AER's findings/research in relation to the best estimate of expected inflation.[70]

This RFQ builds on the stage one report we commissioned from Sapere Research Group in May 2017. We signalled at that stage that we would seek a second stage of the report under which the Consultant would be required to consider any written submissions we receive and provide an updated report. This RFQ relates to that second stage.

The successful Consultant is expected to have a good understanding of the relevant clauses in the NER (and NEL), and NGR (and NGL), that interact with the expected inflation estimate under the CPI–X incentive regulatory framework. The Consultant is required to provide a written memorandum with all models and workings attached. The Consultant is expected to attend stakeholder engagement meeting(s), when requested by the AER's project team.

In addition to the AER Discussion Paper, the Consultant is also required to consider the following information currently before the AER:

- Submissions received on the AER's inflation discussion paper
- APA's proposed approach to changing the AER's current method of applying expected inflation in the PTRM under the CPI–X regulatory framework for the Roma to Brisbane Pipeline[71]
- APA's proposed approach to changing the AER's current method of applying expected inflation in the RFM and PTRM under the CPI–X regulatory framework for the Victorian Transmission System[72]

[70] See ACCC/AER Working Paper Series, Paper No. 11 "Consideration of best estimates of expected inflation: comparing and ranking approaches", available at https://www.accc.gov.au/system/files/Working%20Paper%20no.%2011%20-%20Best%20estimates%20of%20expected%20inflation%20v2.pdf

[71] APA, *Roma to Brisbane pipeline, Access arrangement submission, Public*, September 2016, pp. 202–208 (and accompanying PTRM). The submission and PTRM are available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/roma-wallumbilla-to-brisbane-pipeline-access-arrangement-2017-22/proposal

[72] APA, *APA VTS response to AER Information request #IR003*, 3 March 2016, available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/apa-victorian-transmission-system-access-arrangement-2018-22/proposal (in the submissions section at the bottom of the webpage).

- AusNet Services, Multinet Gas and AGN's proposed approaches to changing the AER's current method of applying expected inflation under the CPI–X regulatory framework[73]

- TransGrid, ElectraNet and Murraylink's statements on the estimation of expected inflation in their recent regulatory proposals[74]

- The AER's final decision and submissions received from stakeholders during our recent RFM update (this includes submissions from ENA, AGN, AusNet, SAPN, CitiPower and Powercor).[75]

Services required

The advice required, without in any manner directing the Consultant, should include the following extensions/expansions to the stage one report:

1. Read the submissions to our discussion paper and respond to key statements. The submissions are available here.[76]

2. If available, the Consultant is to attend a technical workshop held by the AER on 9 August in Sydney from 10am-4pm and to reflect any new issues raised (if any) in final report

3. Expand the algebraic derivation of inflation effects on revenue to formally recognise inflation effects on depreciation in previous years

4. Expand the modelling to include multiple periods.

5. Expand the treatment of inflation effects on the return to equity holders in the presence of fixed nominal debt (implemented using an annually updated trailing average portfolio). This should include an extension of the algebraic analysis or modelling or both. In particular, address these three effects:

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[73] AusNet Services, *Gas Access Arrangement Review 2018-2022: Access Arrangement Information*, 16 December 2016, pp. 182, 185, 221–226 (available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/ausnet-services-access-arrangement-2018-22); Multinet Gas, *2018 – 2022 Access Arrangement Information*, December 2016, pp. 127–131 (available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/multinet-gas-access-arrangement-2018-22); and https://www.aer.gov.au/system/files/Multinet Gas - 2018 to 2022 Access Arrangement Information - 20161221 - PUBLIC.pdfAGN, *Final Plan Attachment 9.2 Inflation*, December 2016 (available at https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/australian-gas-networks-victoria-and-albury-access-arrangement-2018-22).

[74] TransGrid, *Revenue proposal, 2018/19 – 2022/23*, 31 January 2017, p. 211 (available at https://www.aer.gov.au/system/files/TransGrid%20-%20Revenue%20Proposal%2018_19%20to%2022_23%20-%20January%202017.pdf); Electranet, *Revenue proposal overview 2019–2023*, 28 March 2017, p. 66 (available at https://www.aer.gov.au/system/files/ElectraNet%20%E2%80%93%20ENET002%20%E2%80%93%20ElectraNet%20%E2%80%93%20Revenue%20Proposal%20Overview%20%E2%80%93%20March%202017.pdf); and Murraylink Transmission Company, *Murraylink revenue proposal (public), Effective July 2018 to June 2023*, January 2017, p. 84 (available at https://www.aer.gov.au/system/files/Murraylink%20Revenue%20Proposal.pdf).

[75] AER, *Final decision, Amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 15 December 2016,. The final decision and all submissions are available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/roll-forward-model-distribution-december-2016-amendment.

[76] https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/initiation

(a) Inflation effects arising from the difference between embedded expectations of inflation contained in the return on equity (under an on-the-day approach) and return on debt (under a trailing average approach)

(b) Inflation effects arising from debt, where fixed in nominal terms, being converted into a real rate of return under the modelling framework

(c) Inflation effects arising due to annual updates to the trailing average return on debt portfolio where we update the nominal return on debt (and hence embedded expectations of inflation) but do not update the forecast of inflation used to convert the nominal return on debt into a real return on debt.

6. Review the comparators and data set underlying the AER's estimate of equity beta and provide commentary on whether or not equity holders are already compensated for the risk of inflation mismatch. Details on the AER's estimate of equity beta are available in the rate of return guideline,[77] and in recent decisions.[78]

The completed report must be available by Friday 1 September.

The advice should be accompanied with modelling that has regard to the PTRM, RFM and annual revenue/pricing modelling processes. In doing so, the modelling must present both the real revenues and nominal revenues under the current CPI–X framework employed by the AER in the context of the NSP's proposed changes and their implication (using one or more relevant models submitted by NSPs).

Selection Criteria

This will be based on:

- knowledge of the PTRM, RFM and annual pricing frameworks
- experience in working with the above models
- understanding of the CPI–X incentive regulatory framework applied under the NER and NGR
- understanding of NSP risk management and revenue/pricing proposals and regulatory determination processes
- potential or perceived conflicts of interest.

Key Considerations

Respondents should be aware that the contract amount will be capped.

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[77] https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/rate-of-return-guideline-2013/final-decision

[78] For example, see our recent draft decision for AusNet Services: https://www.aer.gov.au/system/files/AER%20-%20Draft%20decision%20-%20AusNet%20Services%20gas%20access%20arrangement%202018-22%20-%20Attachment%203%20-%20Rate%20of%20return.pdf

Information

The Quote including all attachments and supporting documentation must be written in English. Quantities are to be expressed in Australian legal units of measurement.

Your response should also include:

- A summary of your understanding of the requirements and how you will address these issues;
- A statement concerning your organisation's capability to address the requirements and in particular expertise in relation to inflation, rate of return, and compensation for risk;
- A list of all previous work by the Consultant, whether in Australia or internationally, on related topics to those in the services required provided;
- A list of recent previous work by the Consultant, provided to Australian energy network infrastructure operators or advocates of Australian energy consumers, on topics unrelated to the services required;
- A list of referees which may or may not be contacted.

Responses which do not include this information may not be considered any further.

The ACCC/AER will only accept responses on the basis that you have:

- Examined this RFQ, any documents referenced in this RFQ and any other information made available by the Commonwealth to tenders for the purpose of Quoting;
- Examined all further information which is obtainable by the making of reasonable inquiries relevant to the risks, contingencies, and other circumstances having an effect on their Quotation; and
- Been satisfied by the correctness and sufficiency of the Quote including pricing structure.

Provision of this Quotation is made on the basis that the respondent acknowledges:

- They do not rely on any representation, letter, document or arrangement whether oral or in writing, or other conduct as adding to or amending these conditions other than amendments addenda issued by the ACCC/AER;
- They do not rely upon any warranty or representation made by, or on behalf of, the Commonwealth, except as are expressly provided for in this RFQ, but they have relied entirely upon their own inquiries and inspection in respect of the subject of their tender;
- The ACCC/AER shall not be responsible for any costs or expenses incurred by respondents in complying with the requirements of this RFQ;
- Neither these conditions nor the Quote give rise to contractual obligations between the ACCC/AER and the respondent; and
- They are not to make public statements in relation to this Quote without prior written permission of the ACCC/AER.

Lodgement Details

Your response is to be delivered via email as follows:

Attention:	Yuliya Moore
RFQ:	**Efficient allocation and compensation of inflation risk**
Email:	yuliya.moore@accc.gov.au

Responses must be lodged on or before 5.00pm Australian Eastern Standard Time on 2 August 2017. Quotes should be clearly marked.

Any queries on this matter should be directed to:

Yuliya Moore

Director (a/g), Network Finance & Reporting

Australian Energy Regulator

03 9290 1534

yuliya.moore@accc.gov.au

ACCC/AER Conditions

The ACCC/AER does not guarantee, warrant or otherwise represent that any business, revenue or other benefit or any minimum volume or value of business, revenue or other benefit will be earned or received by any successful respondent.

The ACCC/AER will decide on any further action after reviewing the responses to the RFQ. The ACCC/AER reserves the right to:

(a) Vary the process and timetable relating to this process in its absolute discretion;

(b) Vary the terms of the RFQ;

(c) Cease the RFQ process;

(d) Accept or reject any Quotes whether or not they are compliant;

(e) Seek additional information or clarification from Respondents (including their sub contractors or agents);

(f) Shortlist, select and negotiate with more than one Respondent;

(g) Cancel, add to or amend the information, requirement, terms, procedures or processes set out in this RFQ; or

(h) Approach the market with an open Request for Tender (RFT) or seeking further Quotations via an Expression of Interest (EOI).

Appendix 11 Curriculum vitae

Vhari McWha

Bio/Summary

Vhari is an experienced economist and advises on public policy and regulation, including competition analysis and market design. She has extensive skills in quantitative analysis, including cost benefit, modelling and forecasting work.

She has consulted on a wide range of issues across the New Zealand economy. She has a particular interest in the role of prices and pricing methodologies in networks and other markets. Recent assignments include providing advice on and modelling for pricing methods in relation to electricity and gas distribution, airports, air navigation services, wastewater, border charges and house insurance.

Vhari has particular experience in the energy sector. Significant projects have included advising the Electricity Authority on the competitive effects of allowing switching customers to be 'saved' by their existing retailer; assessing the economic value of Consumer Dispute Resolution in the electricity and gas sectors; developing the pricing methodology, including capital contributions policy and associated models, for an electricity network business; and developing a market-based alternative to a government-proposed price floor during electricity shortages.

Vhari started her career at the New Zealand Treasury. She has held roles as a regulatory consultant and regulatory affairs manager with Meridian Energy Ltd. She was Deputy Director of NZIER from 2005 – 2007, and managed and edited their quarterly economic forecasts for a number of years.

Vhari holds a Master of Commerce (Hons) from the University of Canterbury and is a member of the Law and Economics Association of New Zealand.

Education

Institute of Directors Effective Audit Committee - 2010

Institute of Directors Company Directors Course - 2005

MCom (Hons) (Econ) University of Canterbury, New Zealand (Thesis: Interconnection in the electricity sector) - 1997

BCom (Economics) University of Canterbury, New Zealand – 1994 – 1996.

Current Position and Memberships

Principal, Sapere Research Group Ltd, since February 2011

Member of the National Board and Chair of the Audit and Finance Committee, GirlGuiding New Zealand, since July 2012

Member of the Law and Economics Association of New Zealand

Illustrative Engagements

Advised an airport on the implications of competition policy for its proposed pricing methodology, 2017

Estimated income lost by an electricity generator during repairs to plant, 2017

Developed a cost allocation framework and capital contributions model for a gas distributor, 2017

Reviewed and recommended development options for a capital contributions model for an electricity distribution business, 2017

Provided modelling support to a major electricity user for their submission to the Electricity Authority on the Transmission Pricing Methodology, Second Issues Paper, 2017

Advised a market participant on competition issues in the payment sector, 2017

Developed a model to explore alternative pricing options for an electricity distribution business, 2016-17

Assessed the economic impact of government support for the international film industry in New Zealand, 2016

Advised an airport on the effects of the proposed treatment of unforecast asset revaluation gains by the Commerce Commission in its review of the Input Methodologies under Part 4 of the Commerce Act, 2016

Estimated the effect of changes in insurance premiums on demand for residential dwelling insurance in NZ, 2016

Advised Airways NZ on the development of their 2016-2019 pricing proposal, 2015-16

Advised a manufacturer on the efficient structure of wastewater prices, with a focus on industrial use, 2016

Advised a market participant on the competitive effects of changes in the structure of the electricity market, 2016

Estimated the possible effects of introducing a border charge on the number of tourists arriving in New Zealand for the Ministry for Primary Industry and Customs NZ, https://www.mpi.govt.nz/document-vault/9944, 2015

Assessed the economic value of Consumer Dispute Resolution in the electricity and gas sectors, and the relative efficiency and jurisdictional scope of the current provider, http://media.egcomplaints.org.nz/media/Understanding the value of the EGCC.pdf, 2015

Advised an Electricity Network Business on pricing strategy and regulatory compliance of innovative pricing models, 2015

Evaluated the quality of Regulatory Impact Statements (RISs) and the accompanying Independent Quality Assurance statements for a sample of 50 RISs selected by NZ Treasury, 2015

Prepared a report as the basis for evidence on the completeness of the section 32 report evaluating the strategic directions proposed in the draft Christchurch District Plan, 2014

Prepared submissions for the Electricity Networks Association to the Commerce Commission on economic aspects of the proposed 2015 default price- quality path reset, 2014

Advised the New Zealand government on possible community engagement models in the petroleum and minerals sector, 2014

Advised the Electricity Authority on the competitive effects of allowing switching customers to be 'saved' by their existing retailer, 2014

Advised the Electricity Networks Association on relevant Electricity Authority initiatives including proposed changes to The Code, prepared submissions as requested, 2013-ongoing

Co-author of a submission on behalf of Electricity Network Businesses to the Commerce Commission on Orion's customised price-quality path application, 2013.

Developed the Pricing Methodology, Capital Contribution Policy and associated models for an Electricity Network Business, 2012-13.

Co-author of Electricity Authority's Retail Advisory Group discussion paper on retailer default situations and their effects on customers and market participants, 2012.

Co-author of Electricity Authority's Retail Advisory Group discussion paper investigating barriers facing small-scale distributed generation, 2012.

Developed a Pricing Framework for Airways Corporation of New Zealand for air navigation services. This substantial project included preparing a discussion paper outlining issues and options; evaluating feedback and preparing a draft Framework; considering submissions on the draft and recommending a final Framework, 2011-12.

Co-authored a comparative analysis of airport regulation in Australia and the UK, and its implications for New Zealand, 2012.

Developed a market-based alternative to a government-proposed price floor during electricity shortages (with Toby Stevenson), 2011.

Evaluation of tenders and contract development for the New Zealand Formulary, an independent clinically validated medicines information and guidance resource, 2011.

Description of the costs and benefits of the harmonisation of trans-Tasman patent and trademark application processes, 2011.

Advised the Gas Industry Company on the design of the wholesale gas market 2005-06.

Advised on the implications of the tax treatment of health insurance premiums for take-up rates and efficiency and equity of health care financing for the Health Funds Association of NZ, 2001.

Reviewed the role of government in sport, fitness and leisure as an input to the ministerial review in 2000.

Estimated the fiscal opportunity cost to the Australian government of un-restricted trans-Tasman migration, 2000.

Analysed New Zealand's market share of tourism by origin country for the NZ Tourism Board, 2000.

Reviewed the reasoning behind the use of optimised deprival values in the electricity sector and its ongoing applicability to that and other sectors, for Air NZ, 2000.

Prepared projections of employment by industry in Auckland for Auckland Regional Council's strategic planning processes, 2001.

Review of part F of the electricity market rules for major electricity users to enable them to monitor and engage in decision making around transmission, April 2004.

Estimated the economic effects of the Telecommunications Service Obligation for Vodafone NZ in 2003.

Described the key effects of the draft Waitaki Catchment Water Allocation Regional Plan on electricity generation and the wider economy for the Major Electricity Users' Group, 2005.

Reviewed force majeure clauses in electricity hedge contracts for the Major Electricity Users' Group, 2005.

Prepared a submission to the Ministry of Economic Development on its proposed regulations relating to the conditions for distributed generators wishing to connect to a distribution network, 2003.

Estimated the full social cost of road accidents for the Land Transport Safety Authority, 1999.

Co-authored a report for Business New Zealand on an appropriate emissions trading framework for New Zealand, 2007.

Undertook a regulatory impact analysis of a joint Australia-New Zealand therapeutics goods agency, 2000.

Reviewed and estimated a model for pricing radio and television spectrum in New Zealand for the Ministry of Economic Development, 2004.

Presented a two day basic economics course for policy analysts through Change Training for a number of years.

Professional Experience

Meridian Energy Limited (2007), Regulatory Consultant
This role involves in-depth research for the Regulatory Affairs Manager and General Counsel, as well as providing economic advice on submissions and other work underway.

NZIER (2005– 2007), Deputy Director
- Managed approximately half NZIER's economic staff including monthly monitoring meetings.
- Oversight with the Director of the marketing of the business, including chairing a weekly internal marketing meeting.

- Set with the Director and Board the strategic direction of NZIER, including its business practices, and capital and operational budgets.
- Managed the production of Quarterly Predictions, NZIER's key forecasting publication (additional detail provided below under Senior Economist role).
- Championed the introduction of new quality assurance protocols for regular publications and the more active management of team composition to ensure experience and skills were applied appropriately to all projects. I also managed the completion of a number of projects to clients' expectations where a gap had opened.
- Worked with a range of clients providing quality assurance and expert input to project teams, particularly in quantitative analysis including cost-benefit analysis and where government policy or regulation was relevant.
- Represented NZIER in the media a number of times, including as an independent expert in an hour-long, televised tax policy debate amongst a range of people including political finance spokesmen. I also presented post-Budget analysis on television and in the print media. In addition to this I undertook regular interviews on NZIER's economic forecasts.

Meridian Energy Limited (2004-2005), Regulatory Affairs Manager
- Led a team of regulatory analysts to prepare submissions to government (principally the Electricity Commission and Ministry of Economic Development) on proposed policy and operational interventions in the electricity industry.
- Championed compliance with Electricity Governance Regulations and Rules and oversee reporting on non-compliance.
- Maintained close working relationships with key staff in the Electricity Commission, and relevant government departments, in particular the Treasury, CCMAU, Ministry of Economic Development and EECA.
- Made regular written reports to the Board on current projects and the effectiveness of submissions and other advocacy, and present specific advice on regulatory issues with potentially critical business effects for feedback.

NZIER (1999 – 2004), Senior Economist and Editor, Quarterly Predictions
- Led a team of three to five forecasters to prepare quarterly forecasts of the New Zealand economy for a business audience. As part of this role, I co-ordinated the development of a cohesive story, and edited the final publication. This involved ensuring that issues were explained in a clear non-technical manner. I also prepared variously forecasts of inflation, interest and exchange rates, overseas trading partner economies, the agricultural and government sectors, and household expenditure and investment, for this publication.
- Advised the Director on management issues at regular meetings. I also acted as Director in his absence and was a member of the remuneration advisory committee.
- Presented NZIER's forecasts at client briefings.
- Prepared proposals presenting research ideas to clients and provided advice to clients on specific issues including business strategy, government regulation, forecasting, investment proposals and policy advice.
- Develop and maintain business networks and client relationships, market NZIER's services.

New Zealand Treasury (1998-99), Analyst, Law and population agencies

- Financial, strategic and policy analysis relevant to justice sector and population agencies. I dealt principally with the Ministries of Women's and Youth Affairs, the Department for Courts and Te Puni Kokiri. I also had responsibility for monitoring the Serious Fraud Office, Crown Law Office and Legal Services Board (now the Legal Services Agency).

- I performed a secretariat function for a committee of senior government officials, which reported to a cabinet committee. This role involved understanding the fiscal implications of proposals and providing advice to Treasury and other departmental analysts preparing papers. I also gave administrative support to the committee, including preparing its reports. This role is usually performed by a senior analyst.

Publications

- With Mohammed Khaled, and Ralph G. Lattimore "Fragmenting markets and quality change in New Zealand foods: empirical analysis with a Rotterdam model" German Journal of Agricultural Economics, 2004, vol. 53, issue 8

Kieran Murray

Kieran is a professional economist, working primarily in the fields of competition analysis and regulation, market design, and public-policy reform. He has served as an economic consultant on these matters in more than 15 countries over nearly two decades. Kieran co-founded and jointly leads Sapere Research Group, one of the largest expert services firms in Australasia and a leader in providing independent economic, forensic accounting and public policy services. Kieran formerly led the design and implementation of the trading arrangements for the New Zealand wholesale electricity market. He was an adviser to the New Zealand Minister of Finance (Hon David Caygill), and began his career as a Treasury official with responsibility for advising on major policy reforms.

Current responsibilities

- Complaint Committee, New Zealand Kiwifruit Board, (2016).
- Managing Director and Chairman, Sapere Research Group (2010 – present)
- Expert lay member of the New Zealand High Court (2011 – present, appointed for a second 5 year term in 2017)
- International Arbitrator for appeals from the Papua New Guinea Independent Consumer and Competition Commission, (2010 – present; appointed for a second 5 year term in 2016)
- Expert economist, providing evidence based testimony and reports (1998 – present).

Expert testimony

Kieran has testified before Select Committees of New Zealand's House of Representatives, the High Court, the Environment Court, the New Zealand Commerce Commission, the

Environmental Protection Agency, and the Energy Regulatory Commission of the Philippines. He has provided expert evidence and reports to the Australian Federal Court, the Australian Consumer and Competition Commission, the Australian Energy Market Commission, the (former) National Electricity Code Administrator in Australia, the Energy Regulatory Authority in Singapore, and presented to the Federal Energy Commission of the United States.

Previous experience

- LECG Ltd, Managing Director 2007-2010; Director, 1997-2007
- Chairman, Board of Directors, LECG Ltd (Australia and New Zealand), 2006-2010
- Member, senior executive team, LECG global energy and environmental practice, 2008-2010
- Member, Appeal Board, New Zealand Electricity Market
- Electricity Market Company, Manager Research and Development, 1994-1997
- New Zealand Treasury, Advisor, 1994
- New Zealand Parliament, Advisor to the Leader of the Opposition, 1992- 1993
- State Services Commission, Economic Consultant, 1991 -1992
- Member, Prime Ministerial Task Force on Targeting social Assistance, 1991
- New Zealand Parliament, Advisor to the Minister of Finance, 1990
- New Zealand Treasury Department, Financial and Economic Analyst, 1987 – 1990

Education

- Graduate Certificate in Management, Monash University, Australia, 1997
- Advanced Management Programme, Monash University, Australia, 1997
- Bachelor of Commerce, Otago University, New Zealand, 1985
- Post Graduate Diploma in Commerce, Otago University, New Zealand, 1986

Tony van Zijl

PhD BSc BCA(Hons) DipAcc FCA CSAP

QUALIFICATIONS

ACADEMIC (VUW)

PhD (Finance), "Essays on Capital Asset Pricing Theory", 1986
Dip Acc (Accounting), 1975
BCA (Hons) (Economics), 1968
BSc (Mathematics), 1964

PROFESSIONAL

CHARTERED ACCOUNTANTS AUSTRALIA AND NEW ZEALAND (previously New Zealand Institute of Chartered Accountants ('**NZICA**'))

Chartered Accountant, 1986; Fellowship conferred 1996; in 2012 I was awarded the NZICA Outstanding Service to the Accountancy Profession Award

INSTITUTE OF FINANCE PROFESSIONALS OF NEW ZEALAND

Certified Securities Analyst Professional, 1981

HONORARY APPOINTMENT

Honorary Consul, People's Republic of Bangladesh, December 2012 -

Present employment

VICTORIA UNIVERSITY OF WELLINGTON

Professor of Accounting & Financial Management

Since 1990 my teaching has covered all aspects of financial accounting and financial statement analysis. In earlier years I taught introductory and advanced courses in finance.

My research interests include financial reporting, capital markets, cost of capital, valuation, and performance measurement and reporting. I currently supervise six PhD students – in financial reporting and corporate performance.

During the period that I was Director of Research for NZICA I was instrumental in the establishment of *Pacific Accounting Review*. I am Chair of the *Pacific Accounting Review Trust* and was co-editor of the *Review* from 2003-2006.

I am a member of the editorial boards of *Accounting and Finance*, *Journal of Contemporary Accounting & Organisational Change*, and Accounting Research Journal. I occasionally act as a referee for these journals and also other journals including *Contemporary Accounting Research*, *Abacus*, *International Journal of Auditing*, *Research in Accounting Regulation*, and *British Accounting Review*.

In 2011 I was awarded a Victoria University Research Excellence Award – the only award in the Business School in 2011.

Director, Centre for Accounting, Governance and Taxation Research (CAGTR)

As Director of CAGTR I am responsible for bringing researchers together with accounting and legal professionals and representatives of business and the public sector in ongoing discussion and exploration of accounting, governance and taxation issues that have potential impact on the Asia-Pacific region. This has been achieved through four principal avenues – seminars, working papers, the Don Trow Visiting Fellow scheme, and conferences.

The principal focus of the Centre's work in recent years has been on the new structure for the regulation of financial reporting and audit in New Zealand, Māori resource management and governance, and on management and financial reporting by not-for-profit organisations.

Further information on the work of the Centre is available at:
http://www.victoria.ac.nz/sacl/cagtr/

CONSULTANCY

SAPERE RESEARCH GROUP LIMITED (formerly LAW & ECONOMICS CONSULTING GROUP LIMITED (*NASDAQ: XPRT*))

Consulting Director
FINANCIAL ANALYSIS CONSULTING GROUP LIMITED

Director
Since 1990 I have provided consulting advice in a large number of assignments for both business and public sector clients covering the areas of financial reporting, capital markets and valuation in New Zealand and in other countries. In particular, in recent years this work has included comparison of New Zealand and international financial reporting standards, valuation of exotic options, and estimation of cost of capital for valuation and in a regulatory context. I have also provided litigation support and expert evidence on these matters in arbitrations, Commerce Commission hearings and High Court proceedings. Expert evidence given in the High Court has included New Zealand's most significant commercial cases (at least in terms of the dollar amounts in dispute) – the *Equiticorp* (civil), *Trinity*, *Westpac*, *Alesco* and *Feltex* cases.

Professional experience

POSITIONS HELD
VICTORIA UNIVERSITY OF WELLINGTON

Professor of Accounting & Financial Management, 1990 -

Director, Centre for Accounting, Governance and Taxation Research, 2006-2012, 2014 -

Director, Academic Programmes Accreditation, Victoria Business School and School of Accounting and Commercial Law, 2008-2012

Deputy Dean, Victoria Business School, Oct. 2004 – July 2005

Head, School of Accounting and Commercial Law (and its predecessor body), 1991-2000

Reader in Accounting, 1985-1990

Senior Lecturer in Accounting and Finance, 1978-1985

Tutor (part-time), Quantitative Analysis and Economics, 1967-1977

ACCOUNTING STANDARDS BOARD, London
Visiting Professor, July – October, 1996

VRIJE UNIVERSITEIT, Amsterdam, The Netherlands
Visiting Scholar, April – June, 1989

UNIVERSITY OF BRISTOL, England
Touche Ross Visiting Fellow, 1988-1989

NEW ZEALAND INSTITUTE OF CHARTERED ACCOUNTANTS
Director of Research (on leave from VUW), 1985-1988

CENTRAL INSTITUTE OF TECHNOLOGY
Lecturer in Economics and Quantitative Methods, 1970-1977
Management Department Course Supervisor, 1976-77

NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH
Research Economist, 1967-1970

MOBIL OIL NEW ZEALAND LIMITED
Distribution Analyst, 1964-1967

PROFESSIONAL APPOINTMENTS

EAST CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY, AACSB MENTOR, 2016 –

INSTITUT TEKNOLOGI BANDUNG, INDONESIA, AACSB MENTOR 2014 –

REVIEW OF TEACHING OF MÄORI BUSINESS AT VBS, 2013-2014 (Chair)

AUSTRALIAN RESEARCH COUNCIL, EXPERT ASSESSOR, 2013 –

AACSB, SPECIAL COMMITTEE ON THE VALUE OF AACSB ACCREDITATION, 2011-2012

LAY MEMBER OF THE HIGH COURT OF NEW ZEALAND, 2009 –

VALUATION STANDARDS BOARD, NEW ZEALAND PROPERTY INSTITUTE, 1998 –

INTERNATIONAL VALUATION STANDARDS COMMITTEE, WORKING GROUP ON VALUATION UNCERTAINTY, 2011-2013

NEW ZEALAND QUALIFICATIONS AUTHORITY, Monitor of the New Zealand Diploma in Business, offered at New Zealand College, 2005-2008

INSTITUTES OF TECHNOLOGY AND POLYTECHNICS QUALITY, Monitor of the New Bachelor of Applied Business Studies, offered at Whitireia Polytechnic (Auckland and Titahi Bay), 2004-2009

NEW ZEALAND FINANCIAL REPORTING STANDARDS BOARD, NZICA, 1989-1999, 2002-2003 (Deputy Chair, 1995-1999, Chair 2002-2003)

INTERNATIONAL ACCOUNTING STANDARDS BOARD REVALUATION GROUP, 2002-2003 (Chair)

NEW ZEALAND REPRESENTATIVE AT THE LONDON MEETINGS OF THE INTERNATIONAL ACCOUNTING STANDARDS BOARD WITH PARTNER NATIONAL STANDARD SETTERS, 2002-2003

ACCOUNTING STANDARDS REVIEW BOARD, 1991-2002

NZICA SUSTAINABLE DEVELOPMENT REPORTING TASK FORCE, 2002

NZICA FINANCIAL REPORTING AWARD COMMITTEES - COMPANIES AND PUBLIC SECTOR, 1991-1995

NZICA FINANCIAL REPORTING COMMITTEE 2, 1994

NZICA WORKING GROUP TO DEVELOP A CONCEPTUAL FRAMEWORK FOR FINANCIAL REPORTING, 1991-1993

GOVERNMENT VALUE BASED REPORTING STEERING COMMITTEE, 1995-1996

GOVERNMENT TERTIARY CAPITAL CHARGE STEERING GROUP, 1993-1996

GOVERNMENT TERTIARY CAPITAL CHARGE FEASIBILITY STUDY TASK FORCE, 1992-1993 (Chair)

MINISTERIAL WORKING GROUP ON SECURITIES LAW REFORM, 1991

ACADEMIC ASSOCIATIONS

Accounting and Finance Association of Australia and New Zealand ('**AFAANZ**')

Accounting Standards Special Interest Group

Accounting History Special Interest Group

American Accounting Association

European Accounting Association

International Association of Accounting Education and Research

Law and Economics Association of New Zealand

New Zealand Association of Economists

In 1995 I was elected to the Executive of AFAANZ and I was New Zealand President during 1996/97. In 2004 I was awarded Life Membership of AFAANZ (there are now fifteen Life Members) and in 2005 the Outstanding Contribution to Accounting & Finance Practice Award.

RESEARCH GRANTS RECEIVED
VUW

Various small grants

INTERNATIONAL FUNDED RESEARCH PROJECTS
In 2004, together with Professors Ann Tarca, Philip Hancock, Philip Brown, David Woodliffe, and Michael Bradbury, I was awarded a research grant of USD 20,000 from the International Association of Accounting Education and Research (IAAER) for research on Performance Reporting. The grant was made for research on Performance Reporting, was one of five similar grants awarded internationally, and the only one in Australasia. The IAAER program aims to support the joint IASB/FASB/ASB project on performance reporting.

In 2011, together with a VUW colleague, Dr Wares Karim, and Associate Professor Sabur Mollah, Stockholm University, I was awarded a grant of 2 million Krona (about NZD 400,000) from the Handelsbanken Foundation in Sweden for research on the impact of adoption of IFRS on market efficiency around the world.

Research outputs

Peer-reviewed journal articles

'What is the Impact of Corruption on Audit fees?', (with Houqe, N., Mahoney, A., Karim, W.), *Public Money & Management*, (forthcoming). (ABDC, A).

'Audit Quality, Earnings Management, and Cost of Equity Capital: Evidence from India', (with Ahmed, K., Houqe, N.), *International Journal of Auditing* (forthcoming). [DOI: 10.1111/ijau.12087]. (ABDC, A).

'Discriminatory Related Party Transactions: A New Measure', (with Houqe, N., Tareq, M.), *International Journal of Accounting and Information Management*, (forthcoming). (ABDC, B).

'The predictive value of bank fair values', (with Ehalaiye, D., Tippett, M.), *Pacific Basin Finance Journal*, 41, 2017, 111-127. (ABDC, A).

'Differentiated regulation: The case of charities', (with Cordery, C., Sim, D.), *Accounting & Finance*, 57, 2017, 131-164. (ABDC, A)

'The Economic Consequences of IFRS Adoption: Evidence from New Zealand', (with Houqe, N., Monem, R.), *Journal of International Accounting, Auditing and Taxation* 27, 2016, 40-48. (ABDC, B).

'Secrecy and the Impact of Mandatory IFRS Adoption on Earnings Quality in Europe', (with Houqe, N., Monem, R., Tareq, M.), *Pacific Basin Finance Journal*, 40, 2016, 476-490. (ABDC, A).

'Intellectual Capital and Market Performance: The Case of Multinational R&D Firms in the US', (with Ariff, A., Islam, A.), Journal of Developing Areas, 50(5), 2016, 487-495. (ABDC, B).

'Corporate Ethics and Auditor Choice – International Evidence', (with Houqe, N., Dunstan, K., Karim, W.), *Research in Accounting Regulation*, 27, 2015, 57-65. (ABDC, B)

'The purpose of financial reporting: the case for coherence in the Conceptual Framework and standards', (with Sutton, D., Cordery, C.), *Abacus*, 51(1), 2015, 116-141. (ABDC, A)

'Does mandatory IFRS adoption improve information quality in low investor protection countries?' (with Houqe, N., Easton, S.), *Journal of International Accounting, Auditing and Taxation*, 23, 2014, 87-97. (ABDC, B)

'Examining a positive role for performance measures', (with Marginson, D., McAulay, L., Roush, M.), *Management Accounting Research*, 25(1), 2014, 63-75. (ABDC, A*)

'Efficiency and opportunism in auditor quality choice in emerging audit services markets: The case of Bangladesh', (with Karim, W.), *International Journal of Accounting and Information Management*, 21(3), 2013, 241-256. (ABDC, B)

‘Earnings Quality and the Adoption of IFRS-Based Accounting Standards: Evidence from an Emerging Market’, (with Wan Ismail, W., Kamarudin, K., Dunstan, K.), *Asian Review of Accounting*, 21(1), 2013, 53-73. (ABDC, B)

‘Impact of board ownership, CEO-Chair duality and foreign equity participation on auditor quality choice of IPO companies: Evidence from an emerging market’, (with Karim, W., Mollah, S.), *International Journal of Accounting and Information Management*, 21(2), 2013, 148-169. (ABDC, B)

‘Government Quality and Auditor Choice: A Cross Country Analysis’, (with Houqe, N., Monem, R.), *Advances in Accounting, incorporating Advances in International Accounting*, 28-2, December 2012, 307-316. (ABDC, A)

‘The effect of IFRS Adoption and Investor Protection on Earnings Quality around the World’, (with Houqe, N., Dunstan, K., Karim, W.), *International Journal of Accounting*, 47(3), September 2012, 333-355 and Reply to Discussion, 363-368. (ABDC, A)

‘Rights Offerings, Subscription Period, Shareholder Takeup and Liquidity’, (with Balasingham, B., Faff, R., Theobald, M.), *Journal of Financial and Quantitative Analysis*, 47(1), February 2012, 213-239. (ABDC, A*)

‘Does Corporate governance Affect earnings Quality: Evidence from an Emerging Market’, (with Houqe, N., Dunstan, K., Karim, W.), *A. T. Business Management Review*, 7(3), December 2011, 48-57.

‘Performance measures and short-termism: An exploratory study’, (with Marginson, D., McAulay, L., Roush, M.), *Accounting & Business Research*, 40(4), 2010, 353-370.

‘Co-deterministic Relationship between Concentration of Ownership and Corporate Value: Evidence from an Emerging Market’, (with Farooque, O Al, Dunstan, K., Karim, W.), *Accounting Research Journal*, 23(2), (2010), 172-189.

‘Measures of Accounting Conservatism: A Construct Validity Perspective’, (with Wang, R., O hOgartaigh, C.), *Journal of Accounting Literature*, 28, (2009), 165-203.

‘Identifying Decision Useful Information with the Matrix Format Income Statement’, (with Tarca, A., Brown, P., Hancock, P., Woodliffe, D., Bradbury, M.), *Journal of International Financial Management & Accounting*, 19, 2, Summer (2008), 185-217.

‘Corporate Governance in Bangladesh: Link between Ownership and Financial Performance’, (with Farooque, O Al, Dunstan, K., Karim, W.), *Corporate Governance: An International Review*, 15, November (2007), pp. 1453-1468.

‘The Matrix Format Income Statement: A Case Study about Earnings Management and Reporting Financial Performance’, (with Tarca, A., Brown, P., Hancock, P., Woodliffe, D. Bradbury, M.), *Issues in Accounting Education*, 22, 4, November (2007), pp. 607-623; Teaching Notes, pp 44-52, see http://aaahq.org.

‘Ownership Structure and Corporate Performance: Evidence from Bangladesh’, (with Farooque, O Al, Dunstan, K., Karim, W.), *Asia Pacific Journal of Accounting and Economics*, 14, August (2007), pp. 127-149.

‘Auditor Independence and NAS: Review of the Literature’, (with Islam, A., Karim, W.), *Journal of Business Studies*, 28(1), (2007), pp. 179-214.

'International Financial Reporting Standards and New Zealand – Loss of Sector Neutrality', (with Bradbury, M.), *Research in Accounting Regulation*, 19, (2006), pp. 35-51.

'Deprival Value and Fair Value: A Reinterpretation and a Reconciliation', (with Whittington, G.), *Accounting & Business Research*, 36, July (2006) pp. 121-130.

'The Economics of Auditor Independence', (with Islam, A., Karim, W.), *Journal of Business Studies,* 27, 2, (2006), pp. 439-453.

'Due Process and the Adoption of IFRS in New Zealand', (with Bradbury, M.), *Australian Accounting Review*, July (2006), pp. 87-95.

'Analysis of Change in Present Value Measurements', (with Bradshaw, J., Khanna, B., Roush, M.), *Journal of Theoretical Accounting Research*, 1, Spring (2006), pp 58-81.

'Auditor Independence and NAS: A Comparative Analysis of Selected Current Regulatory Frameworks', (with Islam, A., Karim, W.), *AIUB Journal of Business and Economics*, January (2006), pp 51-75.

'Agency Theory and Trust Ownership of Shares', (with Emanuel, D.), *New Zealand Economic Papers*, 39, December (2005), pp 195-207.

'NZ IAS 32: An evaluation of the potential impact on the financial statements of issuers of convertible financial instruments', (with Bishop, H., Bradbury, M.), *Pacific Accounting Review*, 17, December (2005), pp 34-52.

'Shifting to IFRS', (with Bradbury, M.), *University of Auckland Business Review*, 7, 1 (2005), pp 77-83.

'The Market Risk Premium: Survey Evidence', (with Lally, M., Roush, M.), *INFINZ Finance Journal*, Winter (2004), pp 5-12.

'IFRS: Implementation and Impact', *INFINZ Finance Journal*, Winter (2004), pp 20-32.

'Capital Gains Tax and the Capital Asset Pricing Model', (with Lally, M.), *Accounting and Finance*, July (2003), pp 187-210.

Auditor Independence: An International Perspective', (with Falk, H., Frucot V.), *Journal of Accounting, Ethics and Public Policy*, 2, Summer (1999), pp 508-559.

'Dow Jones Indicators of Stock Prices', (with McCallum, D.), entry in *The New Palgrave Dictionary of Money and Finance*, October (1992).

'Macaulay and Closed Form Duration Formulas', *British Accounting Review*, 22, December (1990), pp 343-349.

'Risk Decomposition: Variance or Standard Deviation: A Re-examination and Extension', *Journal of Financial and Quantitative Analysis*, 22, June (1987), pp 237-247.

'The Duration of a Mixed Stream Comprising Positive and Negative Flows', (with Ma, R.), *Accounting and Finance*, 27, November (1986), pp 81-90.

'Direct Test of Harville's Multi-Entry Competitions Model on Race Track Betting Data', (with McCulloch, B.W.), *Journal of Applied Statistics*, 13, 2 (1986), pp 213-220.

'The Impact of Variation of Share Market and/or Business Conditions on the Parameters of the Market Model', (with Quirk, A.), *New Zealand Economic Papers*, 20, (1986), pp 93-99.

'Beta Loss, Beta Quotient: Comment', *Journal of Portfolio Management*, 11, Summer (1985), pp 75-78.

'A New Statement of the Extended Capital Asset Pricing Model', *Australian Journal of Management*, 9, December (1984), pp 67-86.

'Bias in Estimation of the Beta Quotient', *New Zealand Operational Research*, 12, July (1984), pp 129-134.

Combining Market Data to Predict Future Returns', (with Keef, S.P.), '*The Journal of the New Zealand Society of Investment Analysts*, December (1983), pp 40-46.

'Abnormal Returns via the Price-Earnings Ratio', (with Keef, S.P.), *The Journal of the New Zealand Society of Investment Analysts,* July (1983), pp 30-34.

'Financing with Specified Preference Shares - New Zealand 1975-1982', (with Smith, A.M.C.), *New Zealand Journal of Business*, 5, (1983), pp 96-121.

'The Credit Contracts Act 1981: Which is the Finance Rate?' *New Zealand Universities Law Review*, 10, June (1983), pp 302-306.

'The Efficient Markets Hypothesis and Accounting Rule Making', *New Zealand Journal of Business*, 4, (1982), pp 35-50.

Peer-reviewed journal articles - submitted

'What is the Economic value of the EITI Information Disclosure?', (with Moses, O.,and Houqe, N.)

'Business strategy, economic growth, and earnings quality', (with Houqe, N., Monem, R.).

'The Value Relevance of Donations', (with Houqe, N., Karim, W., St George, T.)).

Book

The New Zealand Convergence Handbook, (with Walker, S.), Institute of Chartered Accountants of New Zealand, Wellington, October 2001, 174pp.

Book chapters

'Value Relevance of Environmental, Social and Governance Disclosure', (with Zuraida, Houqe, N), Chapter in *Handbook of Finance and Sustainability* (Editors: Boubaker, Cummings & Nguyen). Edward Elgar (forthcoming, June 2018).

 'Indonesia', (with Khanna, B., Merwanto, R.), pp 141-170, Chapter 4 in *Studies in the Development of Accounting Thought, Volume 3, A Global History of Accounting, Financial Reporting and Public Policy: Asia and Oceania*, Previts, G., Walton, P., and Wolnizer, P., (eds), Emerald Publishing, United Kingdom, 2011.

'The New Zealand Financial Reporting Framework', (with Bradbury, M.), 23 pp, (John Wiley, Australia, 2005), (supplementary chapter to Alfredson et al., *Applying International Accounting Standards*, John Wiley, Australia, 2005, 2009); revised 2012, 2013.

'Financial Reporting Regulation', Chapter 19, pp 420-43, in *Securities Regulation in Australia and New Zealand*, Walker, G., Fisse, B., (eds), Oxford University Press, Auckland, 1994.

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