Allowed rate of return for SDP

A REPORT PREPARED FOR THE SYDNEY DESALINATION PLANT

October 2016

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1 Introduction

1.1 Background

1 The Sydney Desalination Plant (SDP) is currently preparing for its 2017 tariff review by IPART. One of the most important elements of the tariff review will be IPART's determination of the rate of return that SDP will be permitted to earn on its asset base.

2 For regulated, capital intensive businesses such as SDP, the return on capital is typically the largest component of regulated revenues. This is particularly the case for SDP when the plant is not in operating mode.

3 SDP has asked Frontier Economics (Frontier) to assist in the preparation of its revenue proposal to IPART. We have been instructed by SDP to:

a. Set out IPART's rate of return methodology; and

b. Provide indicative estimates of the allowed rate of return for SDP using that methodology.

1.2 Authors of this report

4 The authors of this report are Professor Stephen Gray and Dinesh Kumareswaran.

a. Stephen Gray is Professor of Finance at the UQ Business School, University of Queensland and Director of Frontier Economics, a specialist economics and corporate finance consultancy. He has Honours degrees in Commerce and Law from the University of Queensland and a PhD in Financial Economics from Stanford University. He teaches graduate level courses with a focus on cost of capital issues, he has published widely in high-level academic journals, and he has more than 15 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues.

b. Dinesh Kumareswaran is a consultant with Frontier Economics, who has over 13 years' experience as an economist advising regulators and regulated businesses in Australia, New Zealand, Europe and elsewhere on issues related to cost of capital and network regulation. Dinesh holds Masters and Honours degrees in economics and finance from Victoria University of Wellington, and has lectured at the Imperial College Business School, London, on financial economics for regulated businesses.

5 The curriculum vitae of the authors are provided in the Appendices to this report.

1.3 Structure of this report

6 This report is organised as follows:

a. Section 2 provides a brief introduction to IPART's current approach to the allowed rate of return.

b. Section 3 provides estimates each of the rate of return parameters using IPART's methodology.

7 Table 1 reports our overall estimate of the rate of return for SDP using IPART's methodology, along with estimates from IPART's August 2016 WACC update.

Table 1: Frontier estimates for SDP and IPART estimates from August 2016 update

	Frontier – SDP (latest data available)			IPART – August 2016 update		
	Current	Mid	Long	Current	Mid	Long
Risk-free rate	2.02%	**3.25%**	4.48%	2.00%	**3.20%**	4.40%
Inflation		**2.45%**			**2.40%**	
Debt premium	2.67%	**2.85%**	3.03%	2.68%*	**2.83%***	2.98%*
Debt raising costs		**0.125%**			**0.125%**	
Gearing		**60%**			**60%**	
MRP	8.60%	**7.30%**	6.00%	8.60%	**7.30%**	6.00%
Equity beta		**0.7**			**0.7**	
Cost of debt	4.82%	**6.23%**	7.64%	4.80%	**6.15%**	7.50%
Cost of equity	8.04%	**8.36%**	8.68%	8.02%	**8.31%**	8.60%
Nominal WACC	6.11%	**7.08%**	8.05%	6.09%	**7.01%**	7.94%
Real WACC	3.57%	**4.52%**	5.47%	3.60%	**4.51%**	5.41%
Corporate tax rate		**30%**			**30%**	
Gamma		**0.25**			**0.25**	

Source: IPART August 2016 WACC update; Frontier calculations

*Note: * IPART's estimate of the debt premium is usually presented inclusive of debt raising costs. For the purposes of comparison in this table, we have presented debt premium estimates and debt raising costs separately. Frontier and IPART estimates compiled using data to the end of July 2016. Differences between Frontier's and IPART's estimates reflect rounding.*

2 IPART's rate of return methodology

8 IPART determines the maximum allowable revenues that SDP may earn over the regulatory period as the sum of four 'building blocks':

a. The return on capital. This is the product of the allowed rate of return and the regulatory asset base (RAB);

b. The return of capital or "regulatory depreciation";

c. An operating expenditure allowance; and

d. An allowance for corporation tax.

9 IPART determines the allowed rate of return for SDP by estimating its nominal post-tax 'vanilla' Weighted Average Cost of Capital (WACC) using the standard formula:

$$WACC = Cost\ of\ equity \times (1 - Gearing) + Cost\ of\ debt \times Gearing$$

where the cost of equity is estimated using the Sharpe-Lintner Capital Asset Pricing Model (CAPM):[1]

$$Cost\ of\ equity = Risk\text{-}free\ rate + Beta \times Market\ risk\ premium$$

and the cost of debt is estimated as:

$$Cost\ of\ debt = Risk\text{-}free\ rate + Debt\ premium + Debt\ raising\ costs.$$

10 IPART then converts its estimate of the nominal WACC into real terms by deflating its estimate of the nominal WACC by a forecast of inflation:

$$Real\ rate\ of\ return = \frac{1 + Nominal\ WACC}{1 + Expected\ inflation\ rate} - 1.$$

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1 IPART has always used only the Sharpe-Lintner CAPM for the purpose of determining the allowed return on equity. In the recent Networks NSW merits review case, the network businesses submitted that other asset pricing models should also be given some consideration. In particular, the businesses submitted that the standard CAPM is biased in two ways: It systematically underestimates the required return for assets with a low-beta and/or a high book-to-market ratio. The businesses submitted that these biases should be addressed by having some regard to the Black CAPM and to the Fama-French model, respectively. The AER argued that it had regard to this wider range of evidence when setting the parameter estimates that it inserted into the CAPM. In particular, the AER argued that it had used a higher beta than the "best statistical estimate" on the basis of its consideration of the broader evidence. The Tribunal accepted that it was open to the AER to have regard to the evidence in this way. In its decisions to date, IPART has not indicated that it has made any upward adjustments to beta estimates in relation to the documented biases in the Sharpe-Lintner CAPM. This issue is discussed further in section 3.4.3.

11 Following its 2013 rate of return methodology review, IPART derives 'current' and 'long-term' estimates for three parameters:[2] the risk-free rate, the market risk premium (MRP) and the debt premium.

12 These estimates are then used to derive estimates of the current real WACC and the long-term real WACC.

13 Finally, IPART weights each of these estimates equally to obtain the overall allowed rate of return. This final estimate of the real WACC is then multiplied by the RAB to determine the annual allowance for the return on capital.

14 The methodology that IPART uses to estimate each of the WACC parameters described above is summarised below in Table 2.

Table 2: Summary of IPART's estimation approach per parameter

WACC parameter	Current estimate	Long-term estimate
Risk-free rate	40-day average of annualised yields on 10-year Commonwealth Government Securities (CGS), obtained from RBA	10-year average of annualised yields on 10-year CGS obtained from RBA
Inflation	10-year geometric average of: • RBA's forecast of underlying inflation for the next year • Midpoint of the RBA's target band of inflation, i.e., 2.5%, for the remaining nine years.	
Debt premium	40-day average of annualised spreads on 10-year BBB-rated Australian corporate bonds, relative to 10-year CGS yields, obtained from RBA	10-year average of annualised spreads on 10-year BBB-rated Australian corporate bonds, relative to 10-year CGS yields, obtained from RBA
Gearing	Australian regulatory precedent and empirical evidence from companies used to estimate equity beta	
Market risk premium	Derived using 6 different formulations of the Dividend Growth Model	Derived using average of long-run historical market excess returns
Equity beta	Derived empirically using a sample of listed water businesses in the UK and US	

Source: Frontier Economics

2 Prior to 2013, IPART used only current estimates of the risk-free rate and the debt premium, and long-term estimates of the MRP.

3 Estimation of key parameters

15 In this section we present the latest estimate of each WACC parameter using IPART's methodology.

3.1 Risk-free rate

3.1.1 IPART's current approach

16 IPART estimates the risk-free rate by reference to the annualised yields on Commonwealth Government Securities (CGS) with a 10-year tenor.

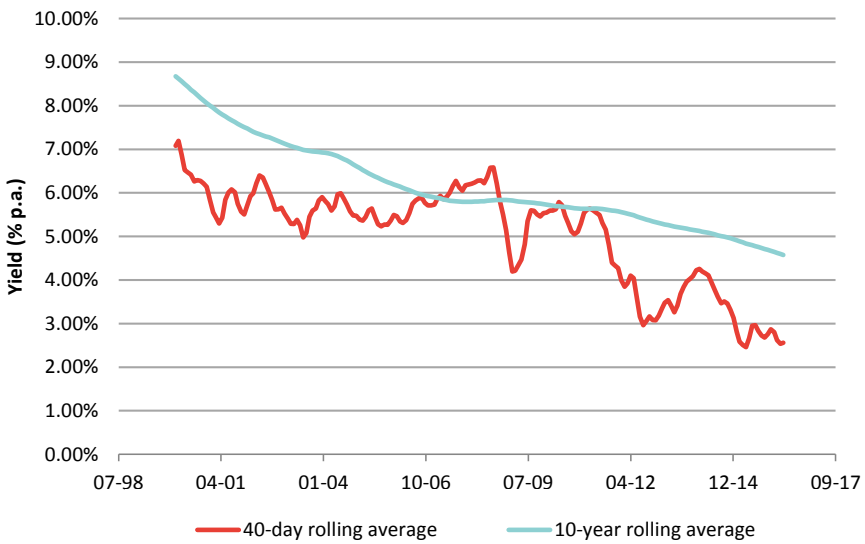
17 IPART's approach to determining the risk-free rate is to put equal weight on:

a. A current estimate of the risk-free rate, which is calculated as a 40-day average of 10-year tenor CGS yields as close as possible to the start of the regulatory period; and

b. A long-term estimate of the risk-free rate, which is calculated as a 10-year historical average of 10-year tenor CGS yields as close as possible to the start of the regulatory period.

18 Figure 1 plots rolling averages of 10-year CGS yields using 40-day and 10-year averaging periods.

Figure 1: Annualised yields on 10-year CGS



Source: Reserve Bank of Australia; Frontier analysis

19 Under IPART's current approach, the risk-free rate used in its pricing decision will be the midpoint between the most recent points on each of the red and blue curves above.

20 IPART's current methodology represents a significant improvement on its previous (i.e., pre-2013) approach. IPART's previous approach was to determine the risk-free rate using a 20-day historical average of yields on **five-year** CGS yields. Such an approach would have resulted in a risk-free rate estimate below the red curve.

21 IPART's current approach is more reasonable because:

a. **IPART is internally-consistent in its approach to the risk-free rate and the MRP** — in the sense that it pairs current estimates of the risk-free rate with a current estimate of the MRP, and long-term estimates of the risk-free rate with long-term estimates of the MRP. In the current climate of low interest rates, an inconsistent pairing of a current risk-free rate with a long-term estimate of the MRP (which is the approach that a number of regulators in Australia adopt) results in the implausible outcome that the cost of equity estimate has is at an all-time low, even as market risk has increased sharply.

b. **IPART's 10-year tenor assumption is more in line with SDP's investment horizon and debt obligations than the previous 5-year tenor assumption.** Whilst most regulators in Australia have, like IPART, moved away from a 5-year tenor assumption (aimed at matching the length of the regulatory period), some regulators (e.g., the Queensland Competition Authority) continue to apply a 5-year tenor assumption. By comparison to the approach followed by those regulators, IPART's approach allows a closer alignment of businesses' revenue streams and obligations.

22 We note that whereas IPART currently uses a 40-day average for its contemporaneous estimate, the more common Australian regulatory practice is to use a 20-day average. A shorter averaging period makes it easier for some businesses to 'match' their cost of capital to the allowed rate of return. For example, where the risk-free rate is the base rate for the allowed return on debt, and where the business seeks to match its actual costs to the regulatory allowance, the business would have to 'set' 5% of its debt on each of 10 days instead of 2.5% on each of 40 days. For smaller businesses, the shorter period is more efficient. The tension for regulators, however, is that even 40 days may be too short for larger businesses. In the Networks NSW merits review case, there was evidence that a number of business were unable to fix rates for all of their debt in a 20-day period. IPART has set the current term to 40 days as somewhat of a compromise – in order to have a single approach that applies across all of the businesses that it regulates.

Estimation of key parameters

3.1.2 Estimate

23 Table 3 below presents the point estimate of the risk-free rate using IPART's approach, 3.25% (nominal), and compares this to IPART's August 2016 WACC update estimate of the risk-free rate, 3.20%, as well as IPART's estimate for Sydney Water, 3.55%.

a. All estimates are based on the same methodology.

b. However, our estimate for SDP and IPART's August 2016 estimate is based on data up to 29 July 2016, whereas IPART's estimate for Sydney Water is based on data up to 2 May 2016. The difference in the estimates is due purely to differences in timing.

Table 3: Estimate of the risk-free rate using IPART's methodology

	Estimate
Current estimate	2.02%
Long-term estimate	4.48%
Midpoint	**3.25%**
IPART August 2016 WACC update	**3.20%**
IPART estimate for Sydney Water	3.55%

Source: IPART, Reserve Bank of Australia; Frontier calculations using data to 29 July 2016.

Differences between Frontier's and IPART's August 2016 estimate largely reflect rounding.

3.2 Debt premium and debt raising costs

3.2.1 IPART's current approach to the debt premium

24 IPART's current approach to determining the debt premium is the following:

a. Estimate the debt premium using only current (i.e., a 40-day average of) market data.

b. Estimate separately the debt premium using long-run historical (i.e., a 10-year average of) market data.

c. Take an equal-weighted average of these two estimates.

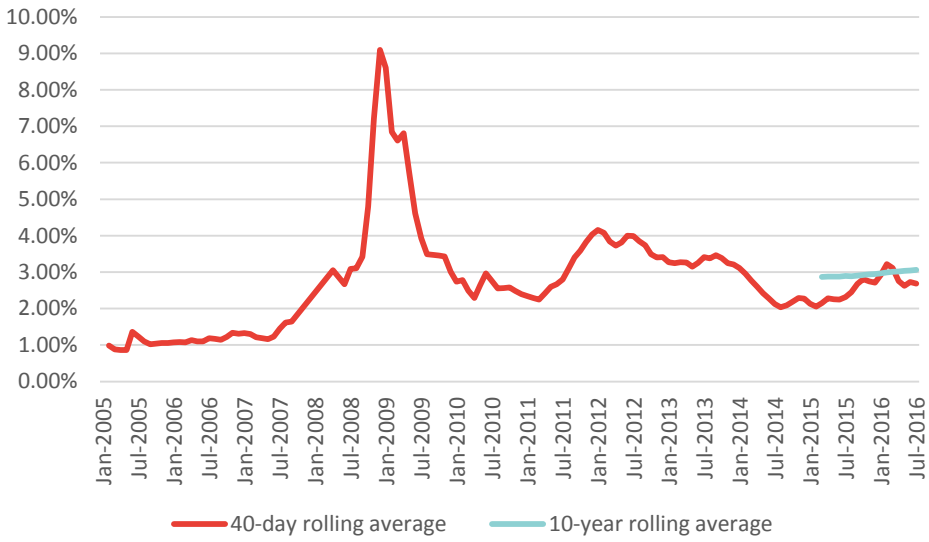
d. Lock in this estimate of the debt premium for the duration of the regulatory period.

3.2.2 Estimate

25 In the remainder of this report, we implement IPART's approach for setting the allowed return on debt using data to the end of July 2016.

26 Figure 2 plots the rolling annualised spreads on 10-year BBB-rated Australian corporate bonds using 40-day and 10-year averaging periods. Table 4 presents our point estimate of the debt premium using IPART's methodology using data to the end of July 2016, 2.85%.

Figure 2: Annualised spreads on 10-year BBB-rated Australian corporate bonds



Source: Reserve Bank of Australia; Frontier analysis

Table 4: Estimate of debt premium using IPART's methodology

	Estimate
Current estimate	2.67%
Long-term estimate	3.03%
Midpoint	**2.85%**
IPART August 2016 WACC update*	**2.83%**
IPART estimate for Sydney Water*	3.03%

Source: IPART, Reserve Bank of Australia; Frontier calculations

** IPART's estimate of debt premium is presented exclusive of debt raising costs.*

Differences between Frontier's and IPART's August 2016 estimates are due to rounding.

3.2.3 Debt raising costs

27 In its 2013 rate of return methodology review, IPART determined that it would provide businesses with an allowance of 12.5 basis points to account for debt raising costs, and has applied this allowance in all estimates it has published since 2013. We adopt this figure in our calculations throughout this report.

3.3 Market risk premium

3.3.1 IPART's current approach to the market risk premium

28 Since its 2013 WACC Review, IPART has produced two estimates of the market risk premium (MRP):

a. A long-term average estimate based on the average of historical excess returns; and

b. A current forward-looking estimate based on various specifications of the dividend growth model.

29 The long-term average is computed by compiling the excess return for each year of a long-term historical period and then taking the average of those excess returns. IPART has not specified the historical period that it uses, but it has adopted a point estimate of 6.0% in its 2013 WACC Review and in every one of its subsequent semi-annual WACC estimates.

30 We note that the AER also uses the average historical excess returns approach to produce an estimate of the MRP. In its 2013 Rate of Return Guideline materials, the AER stated that:

> Historical excess returns estimate the realised return that stocks have earned in excess of the 10 year government bond rate. We consider historical excess returns the most robust source of evidence for estimating the MRP. At December 2013, this evidence suggests a 10 year forward looking MRP of 6.0 per cent is reasonable.[3]

and in its recent decisions, the AER has confirmed that:

> We place most reliance on historical excess returns. Therefore, we use this information to determine a baseline estimate of the MRP. We consider 6.0 per cent is, at this time, a reasonable point estimate based on this source of evidence.[4]

31 The second approach that IPART uses to estimate the MRP is to obtain a current forward-looking estimate from a number of specifications of the dividend growth model (DGM). The DGM estimates are obtained by solving for the discount rate that equates current stock prices with the present value of forecasted future dividends. This provides an estimate of the required return on equity for the broad market, from which the contemporaneous risk-free rate is deducted to produce a current forward-looking estimate of the MRP.

32 The most recent DGM estimates available using IPART's methodology are those published in IPART's August 2016 WACC update, 8.60%.[5]

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3 AER, 2013, Rate of Return Guideline Explanatory Statement, Appendix D, p. 78.

4 AER, 2015, Jemena Electricity Networks Preliminary Decision, Appendix 3, p. 3-117.

5 IPART WACC Biannual Update, August 2016, Table 2, p.2.

3.4 Equity beta

3.4.1 IPART's current approach to the equity beta

33 IPART's approach is to estimate the equity beta for water businesses by deriving beta estimates for a sample of 13 listed water companies drawn from the UK and the US (see Table 5 below).

34 This empirical analysis was first conducted by SFG Consulting for IPART in 2011. On the basis of that evidence, IPART adopted a beta range of 0.6 to 0.8, with a point estimate of 0.7 (assuming a gearing level of 60%). Sydney Water's adviser, HoustonKemp, has recently updated SFG Consulting's 2011 analysis (as part of the present Sydney Water price review) and found that the current evidence "is strongly supportive of the 0.6 to 0.8 equity beta range previously found by IPART".

35 Based on that evidence, and its own investigations, IPART used an equity beta estimate of 0.7 for Sydney Water in the most recent price review. In addition, in its August 2016 WACC update, IPART published equity beta estimates for the water industry, which included SDP. IPART estimated an equity beta range of 0.6 to 0.8, with a midpoint estimate of 0.7 (using a gearing estimate of 60%).[6]

Table 5: Empirical beta estimates derived by IPART

Company	Country	Gearing	Equity beta	Credit rating
American States Water	US	23%	0.67	A+
American Water Works	US	60%	0.35	A
Aqua America	US	34%	0.56	Not rated
Artesian Resources Corp	US	49%	0.38	Not rated
California Water Service Group	US	50%	0.69	A+
Connecticut Water Service	US	44%	0.74	A
Dee Valley Group	UK	82%	0.28	NR
Dee Valley Group (non-voting)	UK	82%	0.44	NR
Middlesex Water	US	38%	0.77	A
Severn Trent	UK	97%	0.62	BBB-
SJW Corp	US	68%	0.78	Not rated
United Utilities	UK	112%	0.75	Not rated
York Water	US	28%	0.89	A-
Median		50%	0.67	
Mean		59%	0.61	
Min		23%	0.28	
Max		112%	0.89	

Note: The equity beta is the 2-year unadjusted beta.
Source: Bloomberg.

Source: IPART draft decision for Sydney Water, p.249

6 IPART, WACC Biannual Update – Fact sheet, August 2016, Table 3, p.4.

3.4.2 SDP-specific considerations

36 In its 2011 decision for SDP, IPART considered a number of submissions about specific risks that are particular to SDP. We note that the Terms of Reference issued by the NSW Minister for Finance and Services to IPART in relation to the present reset require that the regulatory allowance set by IPART must reflect the commercial risks faced by SDP in providing the services. This requires IPART to consider whether there are certain risks that apply to SDP that do not apply to other water businesses, and if so, where and how they should be taken into account in the regulatory process. Symmetrically, it would also seem to require IPART to consider whether SDP is less exposed to certain risks relative to the other water businesses, and if so how that might affect the regulatory allowance. That is, any argument about SDP being different from the other water businesses that are regulated by IPART could have net positive or negative ramifications.

37 In its Final Decision for SDP in 2011, IPART stated that:

> SDP also provided additional information regarding its risk profile and the extent to which commercial risks could be covered by insurance, submitting that "SDP is essentially a much riskier investment than a normal water distribution network business". It argued that this higher risk is due to 3 factors:
>
> 1. Higher regulatory risk as the only regulated private sector business in NSW potable water industry. SDP argued that being a new entrant it has a higher exposure to regulatory risk and less experience with the regulatory environment. SDP also argued that its status as a new entrant means it is also exposed to start up risks.
>
> 2. Higher sovereign risk as changes in government policy could leave it exposed to substantial changes in its operating environment.
>
> 3. Higher asset risk as it is a single asset business with a single customer and many single points of failure. SDP argued that other water utilities have system redundancy to mitigate this risk.
>
> SDP consider the most appropriate method of addressing these issues is with a higher beta value.[7]

38 In considering these specific risk factors, IPART noted that the CAPM distinguishes between market-related risks (which are captured in the equity beta) and other "diversifiable" risks, which are not related to market movements:

> The equity beta value is a business specific parameter that measures the extent to which the return of a particular security varies in line with the overall return of the market. It represents the systematic or market-wide risk of a security that cannot be avoided by holding it as part of a diversified portfolio. It is important to note that the equity beta does not take into account business-specific or diversifiable risks.[8]

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7 IPART (2011), SDP Final Decision, December, p. 83.

8 IPART (2011), SDP Final Decision, December, p. 87.

39 IPART went on to reject the contention that SDP faced materially more risk than other water businesses and concluded that, in any event, the specific risks identified by SDP were not market-related and therefore they had no relevance to equity beta:

> Moreover, we consider that SDP's claimed higher risks are diversifiable risks, not systematic risks, and therefore should not be incorporated into the equity beta…We also note that incorporating non-systematic risks in the WACC is inconsistent with CAPM…In addition, as section 6.1 discussed, in determining SDP's efficient operating expenditure we included the efficient level additional insurance to cover an efficient level of its commercial risk.[9]

40 IPART's final conclusion on the relative systematic risk of the water businesses that it regulates was as follows:

> Overall, taking into account the features of SDP and how they affect its exposure to systematic risk, we consider that SDP will have lower systematic risk than other water utilities over the determination period.[10]

41 IPART then set the equity beta for SDP to a range of 0.6 to 0.8 with a mid-point of 0.7 (assuming a gearing ratio of 60%) – the same range as IPART uses for the other water businesses that it regulates.

42 We note that in the present circumstances, there is no reason why IPART should determine an equity beta for SDP less than 0.7:

a. Notwithstanding that it noted that SDP may have lower systematic risk exposure than other water businesses, it determined an equity beta in line estimates for other water businesses;

b. We are not aware of any change of circumstances that suggest that SDP faces less exposure to systematic risk than it faced in the last regulatory period;

c. The most recent empirical evidence on the equity beta range for water businesses (presented in Table 5 above), 0.6 to 0.8, is consistent with the equity beta range that IPART considered was reasonable for SDP at the last reset;

d. In its latest decision, IPART adopted an equity beta of 0.7, which is consistent with the latest empirical evidence available; and

e. IPART's August 2016 WACC update estimates an equity beta of 0.7 for SDP (with a gearing estimate of 60%).

43 On the question of whether upward adjustments to an estimate of 0.7, to account for business-specific risks, in our view, IPART's conceptual approach to this issue

9 IPART (2011), SDP Final Decision, December, p. 89.

10 IPART (2011), SDP Final Decision, December, p. 89.

is sound. Equity beta in the CAPM only reflects systematic or market-related risks. Risks that are not driven by whether the market is up or down are not systematic and therefore not relevant to beta. An example of a risk that is not market-related (i.e., diversifiable) is the risk of the plant being damaged by a tornado. Such weather events are no more likely to occur on days when the market is down than when the market is up. This implies that such events are not relevant to beta, and are therefore not reflected in the beta estimates above.

44 However, it does *not* mean that such events are not relevant at all. Such downside diversifiable risks should be reflected in the allowed cash flows rather than via an adjustment to the WACC.

45 The WACC is an estimate of *expected* returns – the return that investors would require *on average* before committing capital. Consider a simple example in which the RAB is $100 and the estimated WACC is 10%. In this case, investors would require an expected return of $10 per year. If the regulator sets the allowed return to $10, and if the actual return is less than this in years when the plant is affected by a severe weather event, the expected (or average) return will be less than the required 10%. This can be remedied by the regulator allowing insurance premiums as an operating cost – such that the insurance payout makes SDP whole if such a weather event occurs.

46 However, if there are some losses that cannot be covered by insurance, SDP would be left under-compensated by the amount of those losses. In theory, this could be remedied by allowing SDP to recover slightly more than the required return each year so that the gains in "normal" years are sufficient to offset the losses in weather event years. In practice, however, this approach is difficult to implement as it requires an estimate of (a) the probability of such events, and (b) the quantum of the uninsured loss if such an event occurs. An alternative approach would be to allow SDP to recover any uninsurable losses from such events. This could be done, for example, by adding the quantum of any such losses into the RAB.

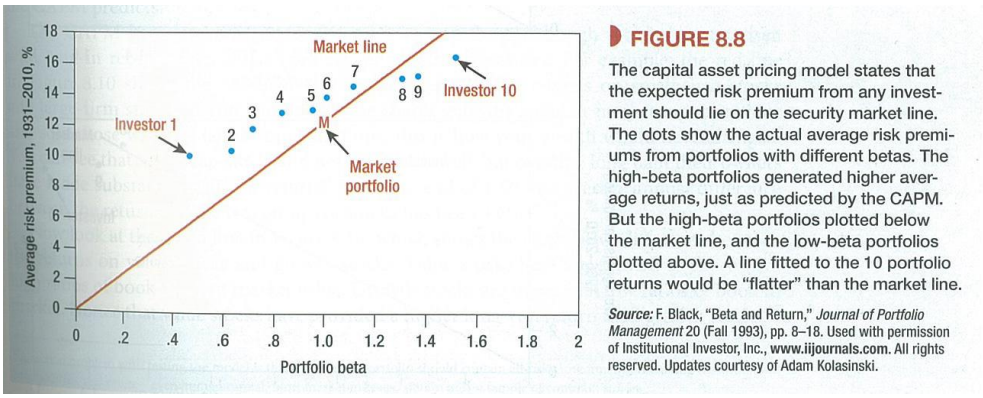
47 That is, there are some aspects of risk that either cannot be insured commercially or for which commercial insurance is not efficient due to the premiums that would be required. In these cases, the business must self-insure on an ex ante basis. Regulators have generally accepted this proposition. For damage due to weather events, quantification of the probability and the quantum of uninsured losses is so difficult to establish with any precision, that the most acceptable approach is likely to be to allow recovery of any actual losses over time.

3.4.3 Low-beta bias

48 Notwithstanding that business-specific risks faced by SDP should not be reflected in IPART's equity beta estimate, there are good reasons to think that an estimate of 0.7 is conservatively low.

49 There is strong evidence that the Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM) systematically underestimates the required return on equity for low-beta stocks. This evidence, which is set out in some detail in a number of recent reports,[11] shows that, relative to the SL-CAPM prediction, the observable relationship between beta and returns has a higher intercept and a flatter slope. This evidence is so well accepted that it now appears in standard finance textbooks, as illustrated in Figure 3 below.

Figure 3. The relationship between excess returns and beta



Source: Brealey, Myers and Allen (2014), p.201.

50 The evidence is that the SL-CAPM does not work for firms that have the sort of beta estimate that IPART adopts for the benchmark efficient entity, and that an adjustment would therefore be required to correct for this low-beta bias. That is, an adjustment is required for firms with a similar beta, or a similar degree of risk as the service providers. The adjustment provides a mapping between risk (as measured by beta) and return that is consistent with the observed data – whereas the SL-CAPM provides a mapping between risk and return that is systematically inconsistent with the observed data.

51 It is important to note that the starting point SL-CAPM equity beta estimates, of the type that IPART considered in its recent decision for Sydney Water, and in its 2011 decision for SDP, have no regard to the evidence of low-beta bias – they must be adjusted to correct for this bias.

52 In the context of the energy sector, we have recently quantified the effect of the low-beta bias and produced estimates of the equity beta that correct for this bias. Our analysis indicated that starting from a SL-CAPM equity beta estimate of 0.7 (assuming a gearing level of 60%) for energy networks, full correction of the low-

11 See for instance: SFG Consulting, 2015 Beta, Beta and the Black Capital Asset Pricing Model, 13 February; NERA, 2015, Review of the Literature in Support of the Sharpe-Lintner CAPM, the Black CAPM and the Fama-French Three-Factor Model, March; HoustonKemp, 2016, The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, January.

beta bias would result in a corrected equity beta of 0.83.[12] This is materially higher than the starting SL-CAPM equity beta estimate of 0.7.

53 In its recent decisions, the AER accepts the evidence of a low-beta bias. The AER estimated a standard, SL-CAPM equity beta range of 0.4 to 0.7, and concluded that the best statistical estimate of the SL-CAPM equity beta (based on equity beta estimates for a sample of what it considered to be relevant comparators) was 0.5. The AER then attempted to account for the incidence of the low-beta bias using the "the theoretical principles underpinning the Black CAPM" to justify a point estimate at the top end of its range of starting point estimates from domestic comparators.[13] (The Black CAPM is a version of the SL-CAPM that corrects explicitly for the low-beta bias.) The AER selected 0.7 as its point estimate for the equity beta as a means of accounting for the low-beta bias in its regulatory decision.

54 In a recent merits review judgement, the Australian Competition Tribunal agreed with the AER that the low-beta bias is a real phenomenon:

> It is, as the AER noted, correct that the three parameters for the SL CAPM – equity beta, risk free rate, and MRP – are recorded as giving a low beta bias for businesses with a beta (that is, the risk of the asset relative to the average asset) of less than 1.0, and that the Network Applicants are all within that group. There was also evidence that the low beta bias is exacerbated when it is combined with conditions of low government bond rates and a high MRP.[14]

55 In those same merits review proceedings, the Public Interest Advocacy Centre (PIAC), representing consumers in NSW, argued that the AER should have taken *no* account of the low-beta bias. Specifically, PIAC argued that the AER should not have chosen the top of the range (0.7) but, instead, should have selected the point estimate (0.5) recommended by its adviser on beta.

56 In considering PIAC's argument, the Tribunal concluded that: (a) the AER was not wrong to begin by specifying a possible range for beta; and (b) there was no evidence that the AER had erred by selecting as its final estimate at the top of that range. Further, the Tribunal found that, based on the evidence available, it was not unreasonable for the AER to conclude that the SL-CAPM suffered from a low-beta bias, so PIAC had failed to demonstrate that the AER had erred in its weighing of the evidence:

> There are reasons why [the AER] might have chosen another point estimate. But the Tribunal accepts that the AER was entitled to start with a range. Upon reviewing the whole of the material before the AER, the Tribunal however is not satisfied that that material does not support a conclusion that the SL CAPM provided a low equity beta bias. When, therefore, it comes to the selection of a point estimate, and having regard

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12 Our approach and results are set out in full in: Frontier Economics, The required return on equity under a foundation model approach, January 2016.

13 AER, Jemena Electricity Networks Final Decision, Attachment 3, p. 3-62.

14 Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, para.731.

> to the range of data available to the AER, the Tribunal must consider whether it is satisfied of the correctness of an alternative to that adopted by the AER. The short answer is that it is not so satisfied.[15]

57 By contrast to the AER, IPART's estimate of 0.7 for SDP in the last regulatory period, and for Sydney Water in its June 2016 decision, made no correction for the strong likelihood that its SL-CAPM estimate suffers from a low-beta bias. This notwithstanding that the comparator firms on which IPART's estimate of beta was based are all likely to be firms with a beta less than 1.0, and are therefore subject to the low-beta bias problem. Thus, in our opinion, an estimate of 0.7 should be viewed as a conservatively low estimate of SDP's equity beta.

3.4.4 Estimate

58 In the remainder of this report, we adopt an equity beta of 0.7, contingent on a gearing assumption of 60%.[16] This is consistent with IPART's August 2016 WACC update estimate for SDP.

3.5 Gearing

3.5.1 IPART's current approach to gearing

59 IPART uses a benchmark gearing level in its decisions rather the actual gearing level of the businesses it regulates. This is a common practice by regulators in Australia and elsewhere to limit the incentives of businesses to gear up to very risky levels, thereby threatening the financeability of those businesses and increasing the likelihood of financial distress or default.

60 IPART has consistently used a gearing assumption of 60%, including in its recent decision for Sydney Water. IPART justifies this gearing assumption using empirical evidence on average (market value based) gearing of the comparators it uses to estimate beta. This average level of gearing is approximately 59% (see Table 5), which is consistent with IPART's gearing assumption.

61 IPART notes in its draft decision for Sydney Water that its gearing assumption is consistent with the gearing assumption used by other regulators in Australia — see Table 6.

62 In their most recent regulatory decisions (i.e., June 2016), which are not reflected in Table 6, OTTER (April 2015) ESCOSA (June 2016) and the ESC (June 2016) all adopted a gearing assumption of 60%, when determining revenue allowances for TasWater, SA Water and Melbourne Water, respectively.

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15 Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, para.779.

16 It is well-established in finance theory that the equity beta should be adjusted as gearing varies.

63 We also note that the AER has adopted a gearing assumption of 60% in every one of its decisions for gas and electricity transmission and distribution businesses.

Table 6: Gearing assumptions used by Australian regulators in recent water decisions

Regulator	Regulated entity	Decision date	Gearing	Equity beta	Credit rating assumption
ACCC	State Water Corporation	June 2014	60%	0.7	BBB+
ESC	Greater metropolitan water businesses	June 2013	60%	0.65	BBB- to BBB+
	Regional urban water businesses	June 2013	60%	0.65	BBB- to BBB+
	Rural water businesses	June 2013	60%	0.65 for Southern rural water; and 0.70 for Goulburn-Murray Water and Lower Murray Water	BBB- to BBB+ for Southern rural water BBB+ for Goulburn-Murray Water and Lower Murray Water
QCA	Seqwater Irrigation	April 2013	60%	0.55	BBB+
ESCOSA	SA Water	See Note 2.	60%	0.7	BBB
Industry panel	Actew	April 2015	60%	0.7	BBB
ERA	Water Corporation, Water Boards	March 2013	60%	0.65	A for Water Corp, BBB/BBB+ for Water Boards

Notes: QCA decision was for the irrigation industry, rather than a water utility.

ESCOSA has not yet released its final decision for water prices from 1 July 2016. It has presented its parameter valuation in a report to the Treasurer.

Source: ACCC, *ACCC Final decision on State Water pricing application: 2014-15 – 2016-17*, June 2014; ESC, *Price review 2013: Greater metropolitan water businesess final decision*, June 2013; ESC; *Price review: Regional urban water businesses final decision*, June 2013; ESC, *Price review 2013; Rural water businesses final decision*, June 2013; ESCOSA, *SA Water Regulatory Rate of Return 2016 - 2020: Report to the Treasurer*, April 2015; Industry Panel, *Review of the Independent Competition and Regulatory Commission's 2013 Price Direction for Regulated Water and Sewerage Services in the ACT – Final Report*, April 2015; QCA, *Final report Seqwater irrigation price review 2013-17 Volume 1*, April 2013; ERA, *Inquiry into the efficient costs and tariffs of the Water Corporation, Aqwest and the Busselton Water Board: Revised Final Report*, March 2013.

Source: IPART draft decision for Sydney Water, p.250

64 We note that in its last determination on SDP's prices, IPART decided to apply a gearing assumption of 60%. In our view, there have been no change of circumstances that warrant the application of a different gearing assumption.

65 We note that if IPART were to choose a gearing assumption other than 60%, the equity beta assumption would need to be revisited. The equity beta is related positively to gearing: the systematic risk faced by equity investors rises as gearing increases. This is because equity investors are the residual claimants on the profits of the business. If the business increases the proportion of debt within its capital

structure, the probability of investors being repaid falls (because debt investors would have a larger share of the claims on the business's cash flows). This would push up the risk faced by equity investors, and the equity beta would rise as a consequence.

66 By way of illustration, other things being equal, should IPART adopt a gearing assumption of 70% rather than 60%, the equity beta would increase *mechanically* from its current estimate of 0.7 (as noted above) to 0.93, using standard de-levering and re-levering formulae that are employed by regulators.

3.5.2 Estimate

67 We adopt a gearing assumption of 60%, which is in line with IPART's standard gearing assumption, and is supported by recent empirical evidence on the comparators used by IPART to estimate beta. This estimate is consistent with IPART's August 2016 WACC update estimate for SDP.

3.6 Inflation

68 IPART's approach is to estimate expected inflation by taking the geometric average over a 10-year horizon, where the RBA one-year forecast is used for the first year and the 2.5% mid-point of the RBA target band is used for the other nine years.[17]

69 Table 7 shows that the RBA's latest (August 2016) forecasts of CPI inflation for the period 1 July 2017 to 30 June 2018 (i.e., the first year of SDP's next regulatory period) is in the range 1.5% to 2.5%. We take the midpoint of this range (2.0%) as the RBA's one-year forecast for the year ending June 2018.

Table 7: RBA forecasts of CPI inflation

	Year-ended					
	Jun 2016	Dec 2016	Jun 2017	Dec 2017	Jun 2018	Dec 2018
GDP growth	3¼	2½–3½	2½–3½	2½–3½	3–4	3–4
CPI inflation	1.0	1½	1½–2½	1½–2½	1½–2½	1½–2½
Underlying inflation	1½	1½	1½–2½	1½–2½	1½–2½	1½–2½
	Year-average					
	2015/16	2016	2016/17	2017	2017/18	2018
GDP growth	3	2½–3½	2½–3½	2½–3½	2½–3½	3–4

(a) Data are quarterly; technical assumptions include A$ at US$0.76, TWI at 63.5 and Brent crude oil price at US$45 per barrel; shaded regions are historical data
Sources: ABS; RBA

Source: RBA, Statement on Monetary Policy, August 2016, Table 6.1

70 Assuming (as IPART does) an expected inflation rate of 2.5% for the subsequent nine years, the 10-year horizon forecast of inflation would be 2.45% per annum.

17 IPART, New approach to forecasting the WACC inflation adjustment, March 2015.

71 This is similar to IPART's August 2016 estimate of forecast inflation, 2.40% per annum. The difference between our estimates and IPART's is likely to reflect rounding.

3.7 Corporate tax rate

72 IPART has conventionally determined a pre-tax WACC in its tariff determinations. Under this approach, the allowance for corporate taxation was made through the allowed rate of return. However, IPART has indicated that it intends to move to the use of a "post-tax WACC" and, as a result, will determine a separate corporate tax allowance.[18], [19]

73 When determining the corporate tax allowance, IPART will need to settle on the rate of corporation tax to allow in its calculation. As this issue has traditionally been dealt with as part of the WACC determination, we address it in our report (recognising that the corporation tax will, going forward, be relevant to a separate building block).

74 IPART has indicated that it will use the 30% statutory corporate tax rate adjusted for franking credits. We have therefore assumed that the relevant corporate tax rate is 30%. As we have calculated a post-tax real WACC in this report, this corporate tax rate does not affect our estimate of the WACC.

3.8 Value of imputation tax credits

75 As noted above, when determining the corporate tax allowance, IPART must estimate the value of imputation tax (i.e., franking) credits. This parameter is referred to commonly in Australia as 'gamma'. Since the Australian Competition Tribunal's 2011 determination on gamma,[20] IPART has adopted a value of 0.25 in

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18 IPART, Review of prices for Sydney Water Corporation – Issues Paper, August 2016, section 6.7.

19 As an aside, we note that IPART's use of the terminology "post-tax WACC" is somewhat misleading and prone to possible misinterpretation. It is standard practice in corporate finance and financial economics to calculate the post-tax WACC by dividing the pre-tax WACC by the tax shield (i.e., 1 minus the corporate tax rate). This post-tax WACC should be interpreted as the rate of return required by investors after the company in question has paid corporation tax: the return on equity represents after-tax equity returns, and the return on debt is net of the interest tax shield. It is clear from IPART's Issues Paper that the "post-tax WACC" that it has in mind is not this rate. IPART's intention for the post-tax WACC is a rate where *no* tax effects are accounted for in the WACC, but are accounted for separately as a cash flow item. This rate is a combination of a *post-tax* return on equity and a *pre-tax* return on debt. This is very standard practice amongst many regulators. To avoid confusion (and to distinguish from the quite different concept of the post-tax WACC), most regulators refer to this rate as the 'vanilla WACC'.

20 Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9.

its regulatory determinations. A very recent determination by the Australian Competition Tribunal has re-affirmed its previous gamma estimate of 0.25.[21]

76 We agree with this estimate of 0.25 and recommend its continued use by IPART.

3.9 WACC estimates

77 Table 8 presents an estimate of the allowed rate of return for SDP using IPART's methodology (and employing data to the end of July 2016), and estimates from IPART's August 2016 WACC update.

78 Our current estimate of the allowed rate of return for SDP is **4.52%**.

Table 8: Frontier estimates for SDP and IPART estimates from August 2016 update

	Frontier – SDP (latest data available)			IPART – August 2016 update		
	Current	Mid	Long	Current	Mid	Long
Risk-free rate	2.02%	**3.25%**	4.48%	2.00%	**3.20%**	4.40%
Inflation		**2.45%**			**2.40%**	
Debt premium	2.67%	**2.85%**	3.03%	2.68%*	**2.83%***	2.98%*
Debt raising costs		**0.125%**			**0.125%**	
Gearing		**60%**			**60%**	
MRP	8.60%	**7.30%**	6.00%	8.60%	**7.30%**	6.00%
Equity beta		**0.7**			**0.7**	
Cost of debt	4.82%	**6.23%**	7.64%	4.80%	**6.15%**	7.50%
Cost of equity	8.04%	**8.36%**	8.68%	8.02%	**8.31%**	8.60%
Nominal WACC	6.11%	**7.08%**	8.05%	6.09%	**7.01%**	7.94%
Real WACC	3.57%	**4.52%**	5.47%	3.60%	**4.51%**	5.41%
Corporate tax rate		**30%**			**30%**	
Gamma		**0.25**			**0.25**	

Source: IPART August 2016 WACC update; Frontier calculations

*Note: * IPART's estimate of the debt premium is usually presented inclusive of debt raising costs. For the purposes of comparison in this table, we have presented debt premium estimates and debt raising costs separately. Frontier and IPART estimates compiled using data to the end of July 2016. Differences between Frontier's and IPART's estimates reflect rounding.*

21 Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1.

Appendix A: Curriculum vitae – Professor Stephen Gray

Stephen Gray is Professor of Finance at the University of Queensland Business School and Chairman of Frontier Economics (Australia). He has Honours degrees in Commerce and Law from the University of Queensland and a PhD in financial economics from the Graduate School of Business at Stanford University.

In his university role, he teaches a range of award and executive education courses in financial management, asset valuation, and corporate finance. He has received a number of teaching awards, including a national award for university teaching in the field of business and economics. He has published widely in highly-ranked journals and has received a number of manuscript awards, most notably at the *Journal of Financial Economics*.

Stephen is also an active consultant to industry on issues relating to valuation, cost of capital, and corporate financial strategy. He has acted as a consultant to many of Australia's leading companies, government-owned corporations, and regulatory bodies. His clients include the Independent Pricing and Regulatory Tribunal (IPART), Australian Competition and Consumer Commission (ACCC), Melbourne Water, Qantas, Telstra, Origin Energy, AGL, Foxtel, ENERGEX, Queensland Treasury Corporation, Rio Tinto Alcan and the Australian Securities and Investments Commission (ASIC). Projects include corporate cost of capital reviews, asset valuation, independent valuation of executive stock options, and the assessment of capital structure and financing strategies.

He has also appeared as an independent expert in several court proceedings relating to the valuation of assets and businesses and the quantification of damages.

Key experience

Cost of capital

Energy sector

- **TransGrid (2015) –** Advised the electricity transmission operator in NSW on the appropriateness of the Australian Energy Regulator's (AER's) proposed transitional arrangements before the full introduction of a trailing average approach to setting the cost of debt allowance for regulated networks. The AER recently revised its rate of return methodology. In doing so, the AER announced that it would adopt a trailing average approach to setting cost of debt allowances (similar to the approach used by Ofgem in Great Britain). However, the AER argued that it should phase this approach in to allow businesses sufficient time to align their debt management practices to the new

methodology. Frontier prepared a report on behalf of TransGrid explaining the circumstances in which such transitional arrangements would not be appropriate.

- **Australian Energy Markets Commission (AEMC) (2012)** – The regulator (AER) and a group of large energy users (EURCC) proposed changes to the National Electricity Rules and National Gas Rules (Rules). The AEMC, which is the government agency that is responsible for maintaining the Rules, conducted a year-long review and consultation process in relation to the proposed rule changes. Stephen was appointed to advise the AEMC on rate of return issues. His role involved the provision of advice to the AEMC secretariat and board, the preparation of a number of public reports, the co-ordination and chairing of public hearings, and a series of one-on-one meetings with key stakeholders. The process resulted in material changes being made to the Rules, with revised Rules being published in November 2012.
- **Energy Networks Association (2013) –** The National Electricity Rules and National Gas Rules (Rules) require the regulator to publish a series of regulatory guidelines every three years. The Australian Energy Regulator (AER) conducted a year-long process in 2013 that ended with the publication of its first Rate of Return Guideline. Throughout this process, Stephen advised the Energy Networks Association (ENA) on rate of return issues. This involved working with the ENA's Regulatory Affairs Committee, specialist working groups, and legal advisors, preparing expert reports, drafting submissions, and representing the ENA at stakeholder forums.
- **TransGrid (2013) Return on Debt Analysis –** The 2012 changes to the National Electricity Rules included, inter alia, a provision that permitted the allowed return on debt to be set according to a trailing average approach. TransGrid sought an analysis of the effect that such a change would have on the residual cash flows that were available to its shareholders. Stephen developed a Monte Carlo simulation model that generated many scenarios for the possible future evolution of interest rates, incorporating empirical relationships between government bond yields, credit spreads, and inflation. His analysis quantified the extent to which the trailing average approach would better match the actual cost of servicing debt under TransGrid's longstanding debt management approach, thereby reducing the volatility of the cash flow to equity holders.
- **Aurizon Network (2014) Split Cost of Capital Analysis –** In a discussion paper, the Queensland Competition Authority advocated consideration of a split cost of capital regulatory approach. Under the proposed approach the regulator would allow a standard "debt and equity" regulated return on assets during their construction, but a "100% debt" return once the asset had been

Appendix A: Curriculum vitae – Professor Stephen Gray

included in the firm's regulatory asset base. Stephen was retained by Aurizon (operator of a regulated coal rail network). His role was to prepare an expert report that considered the economic and financial basis for the proposed approach, and which considered the likely consequences of such an approach. After his presentation to the QCA board, the proposal was shelved indefinitely.

- **Energy Networks (2014-15) Regulatory Reviews –** Stephen has prepared expert reports and submissions on behalf of all businesses that are in the current rounds of regulatory resets. These reports cover the whole range of regulatory cost of capital issues. Clients over the last year include ATCO Gas, DBP, ActewAGL, TransGrid, Jemena, United Energy, CitiPower, Powercor, SA Power Networks, Ausgrid, Essential Energy, Endeavour Energy, ENERGEX, and Ergon Energy.

- **Legal and Appeal Work –** Stephen has assisted a number of regulated business, and their legal teams, through merits review and appeal processes. One example is the 2011 *Gamma* case in the Australian Competition Tribunal. That case involved the "gamma" parameter, which quantifies the impact that dividend imputation tax credits have on the cost of capital. The regulator (AER) proposed an estimate that was based on (a) an assumption that was inconsistent with the observed empirical evidence, and (b) a point estimate that was based partly on a paper with questionable reliability and partly on data that was irrelevant to the task at hand. Stephen's role was to prepare a series of expert reports, to assist the legal team to understand the issues in detail, and to attend the hearings to advise as the matter was heard. The end result was that the Tribunal set aside the entire basis for the AER's proposed estimate and directed us to perform a "state of the art" empirical study. Stephen performed the required study and its results were accepted in full by the Tribunal, who set the estimate of gamma on the basis of it.

Water sector

- **Melbourne Water (2015) –** In preparation for the 2016 Victorian price review, Stephen is part of the Frontier team currently advising Melbourne Water on ways in which the rate of return methodology used by the Victorian regulator, the Essential Services Commission (ESC), could be improved, and the likely revenue impact of any methodological changes. At the last (i.e. 2013) price reset, the ESC indicated that it intended to review its rate of return methodology but to date has not done so. By comparison, most other major Australian regulators have revised their methodologies significantly, in part due to recognition of the need to make their estimation approaches more resilient to the effects of global financial crises. A comparison of the methodologies used by different regulators in Australia suggests that the ESC's methodology is out of line with best regulatory practice. Frontier's advice has focused on

identifying the areas for improvement, and the development of the economic arguments that would support the case for change.

- **Unity Water, SEQ Water, Gladstone Area Water Board (2013-14) –** Stephen has prepared a series of reports for a number of Queensland water utilities. These reports include (a) a response to the QCA's (Queensland regulator) proposed split cost of capital approach (which has now been shelved indefinitely), and (b) a response to the QCA's proposed cost of capital estimates.

Telecommunications sector

- **NBN Co (2012-13) –** Stephen advised NBN Co on a range of cost of capital issues in relation to their proposed special access undertaking. This work included the drafting of expert reports, meetings with and presentations to various NBN Co committees and working groups, and representing NBN Co in discussions with the regulator (ACCC). Key issues included the length of the proposed access arrangement, the extent to which higher risk during the construction and proof-of-concept phases justified a higher allowed return, and the process by which early year losses might be capitalized into the regulatory asset base.

- **C7 Case (2006-07), Federal Court of Australia**

  The Seven Network brought an action against a number of Australian media and entertainment firms in relation to the abandonment of its cable TV business, C7. Seven alleged that the respondents colluded to prevent C7 from securing the rights to broadcast AFL and NRL matches and that this prevented its C7 business from being economically viable.

  Stephen was retained by a group of respondents including PBL, Telstra, and News Corporation. His role was to address various matters relating the quantification of damages. He prepared several reports, was involved in several discussions with other valuation expert witnesses, and was cross examined in the Federal Court.

  The Court found in favour of the respondents.

Transport sector

- **CBH Group (2015) –** Stephen was part of the Frontier team that developed, on behalf of CBH (a major Australian grain producer and access seeker to rail infrastructure in Western Australia) and its legal counsel, a submission to the Economic Regulation Authority (ERA) of Western Australia on the regulator's approach to estimating WACC. The submission focused on, amongst other issues, the ERA's approach to estimating the market risk

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premium, the estimation approach to beta, and the way in which the WACC ought to be used within the negotiate-arbitrate arrangements within the rail access regime.

- **Brockman Mining Australia (2015) –** Stephen was part of the Frontier team that advised Brockman, a potential access seeker to rail infrastructure in Western Australia, on its submission to the Economic Regulation Authority (ERA) of Western Australia in relation to the ERA's approach to WACC under the Railways (Access) Code 2000. Subsequently, the ERA released a Revised Draft Decision on its proposed WACC methodology. Frontier was engaged again by Brockman to help develop its submission to the ERA on the Revised Draft Decision. The submissions focused on the appropriateness of the beta estimates proposed by the ERA, the methodology used to estimate the market risk premium (and consistency between the methodologies used by the ERA in different sectors), the appropriateness of the ERA's credit rating assumption for the benchmark efficient entity (which affects the cost of debt allowance under the ERA's methodology).

- **Brookfield Rail (2014) –** The WA Railways (Access) Code requires railway operators to provide certain information to access seekers to enable them to compute "floor" and "ceiling" prices as defined in the Code. Brookfield provided access seekers with certain information and other relevant information was available from public sources. Stephen prepared an expert report that considered whether the information available to an access seeker, together with specialist assistance from relevant experts, would be sufficient to compute floor and ceiling prices.

- **Brisbane Airport Corporation (2013-14) –** Stephen was engaged by Brisbane Airport Corporation (BAC) to advise on a range of regulatory and cost of capital issues in relation to the development of the airport's new parallel runway (NPR). BAC identified the need for an additional runway to accommodate steadily increasing demand. The development of a new runway required a large capital commitment ($1.5 billion) and would take approximately eight years to complete. BAC proposed that the airlines would contribute to the financing of the NPR during construction – the alternative being the capitalisation of a return on capital expenditure until completion and a sharp spike in landing fees when the NPR become operational. One of the key issues in the negotiations with airlines was the WACC that would be used to determine the return on capital. Stephen's role was twofold. He produced an expert report providing a strong basis for BAC's proposed WACC. He also advised BAC on the likely approach of the ACCC (the regulator in question) should they become involved – the regulatory arrangements provide for the parties to negotiate a commercial outcome and for the regulator to become involved if they are unable to do so. BAC was successful in their

negotiations with the relevant airlines and the NPR is now under construction.

- **Abbott Point Coal Terminal (2014) –** Stephen was engaged by a consortium of mining companies in relation to arbitration with Adani, the owner and operator of the Abbott Point Coal Terminal. The parties had in place a user agreement that was similar to a regulatory-style building block model. Stephen advised on a range of cost of capital and other issues including detailed reports on the cost of debt and the level of corporate costs.

Financial litigation support

- **APLNG (2014-15)**
  The Australia-Pacific LNG (APLNG) project is a joint venture between Origin Energy, ConocoPhillips and Sinopec that involves the extraction of coal seam methane and processing into liquefied natural gas (LNG) for export. The relevant Queensland royalties legislation provides that a 10% royalty is to be levied on the value of the gas at the first point of disposal. Since the project is integrated from end-to-end, there is no arm's length price at the relevant point. Stephen was retained by APLNG to prepare an expert report on the process for determining what the arm's length price at the first point of disposal would be if such a thing existed. This involves estimating the costs, including a fair return on capital, for a hypothetical upstream gas producer and a hypothetical downstream LNG operator, and allocating any excess profit between the parties.

- **CDO Case (2013)**
  This case involved a class action against the Australian distributor of collateralised debt obligations (CDOs) and the international credit ratings agency that assigned credit ratings to them. The CDOs in question were financial products with a payoff that depended on the number of defaults (or "credit events") among a reference set of 150 different corporate bonds issued by companies in different industries and different geographical locations. A typical CDO structure would involve the investor being repaid all of their initial investment plus an attractive rate of interest so long as there were less than say 7 defaults out of the reference set of 150 bonds during the five-year life of the CDO. However, if there were say 11 or more defaults, the investor would lose their entire investment. If the number of defaults was between 7 and 11, the return to the investor would be proportional (e.g., 8 defaults would involve a 25% loss of principal).

  The CDOs in question were created by US investment banks and were distributed in Australia by a large Australian commercial bank. One of the key issues in the case was whether the Australian distributor made proper

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disclosures about risk to investors, which included individuals, self-managed superannuation funds, and local councils. The CDOs in question were assigned strong investment grade credit ratings by an international ratings agency. The process used to assign those ratings did not properly take into account the correlation between defaults – the empirical fact that during recessions and financial crises many bonds default at the same time.

Stephen's role was to prepare an expert report that explained to the Court how CDOs were structured, how they operated, and what risks were involved. His report also examined the risk disclosures that were contained in the materials that were provided to potential investors and the process by which the credit rating agency assigned ratings.

- **Wright Prospecting litigation (2012-14)**
  Wright Prospecting Pty Ltd (WPPL) is involved in several legal disputes about the payment of royalty streams in relation to iron ore and coal mining operations. WPPL had assigned various rights and licenses in relation to iron ore mines in WA and coal mines in Queensland to other parties, in return for royalties on the revenues received from the sale of the ore. Stephen's role was to prepare a series of expert reports quantifying the present value of the royalty streams.

- **Public Trustee of QLD v. Octaviar Ltd (2009), Supreme Court of Queensland**
  The Octaviar Group (formerly the MFS Group) is a Gold Coast based group of listed companies with funds management and leisure services businesses. Octaviar was unable to refinance a loan in early 2008 and sought to raise equity via a rights issue as part of a substantial corporate restructure. The stock price fell some 70% on this announcement and Octaviar subsequently sold a 65% interest in its leisure business known as Stella. Octaviar then sought to make arrangements with its creditors, including the Public Trustee, as trustee for note holders.

  Stephen was retained by the Public Trustee. His role was to prepare several reports on (a) whether the companies in the Octaviar Group were insolvent, (b) the date the companies became insolvent, and (c) whether the note holders would be made better or worse off by the proposed arrangement, relative to a liquidation. He was cross examined by four parties with an interest in these proceedings on issues relating to the date of the insolvency.

- **Telstra v. ACCC (2008), Federal Court of Australia**
  Telstra brought an action against the ACCC in relation to access charges that Telstra was allowed to charge its retail competitors for access to its fixed line and broadband networks – arguing that the return on capital allowed by the ACCC was unreasonably low.

Stephen was retained by Telstra. His role was to prepare several reports on the issue of whether the ACCC has been inconsistent in its application of valuation methods – in a way that reduced Telstra's allowed return. He was also involved in several discussions with other valuation expert witnesses, prepared a joint statement of experts, and was cross examined in the Federal Court individually and in a "hot tub" setting.

- **Alcan Northern Territory Alumina Pty Ltd v. Commissioner of Taxes (2006-07), Supreme Court of Northern Territory**
  First Engagement: Consulting Expert

  Alcan bought out the equity of its joint venture partner in a combined bauxite mine and alumina refinery in the Northern Territory. The NT Revenue Authority claimed that the transaction was caught by the NT "land rich" provision, under which the transaction would be subject to stamp duty if more than 60% of the consideration was attributable to land assets.

  The key economic issue is the apportionment of value between the mine (predominately land assets) and the refinery (substantially intangible assets arising out of intellectual property and expertise).

  Stephen was retained by Alcan as consulting experts. Their role was to prepare a range of financial models and analysis to support the view that a substantial portion of the value of the transaction was attributable to non-land assets in the refinery. This involved complex financial modelling and market analysis. A full integrated model was produced, allowing users to select whether they preferred the appellant's or respondent's submission on each input parameter, and automatically re-calculating the land-rich ratio.

  Stephen worked closely with Alcan's legal team, Counsel, and various independent experts. Stephen assisted the legal team during the trial and in preparing sections of final submissions.

  Second Engagement: Independent Expert

  The initial judgment contained findings about certain matters and was sent back to the Commissioner for re-assessment. A dispute arose between the parties about the effect of the judgment. In particular, the value of a primary 10-year lease had to be disaggregated from the value of an option to continue the project.

  Stephen was retained by Alcan to produce an expert valuation report that addressed the matters in dispute. Two expert reports were prepared and Stephen was cross-examined on this material. Stephen prepared an easy to use spreadsheet calculator to assist the Court in testing how different input assumptions (where the experts could not agree) affected the bottom line. This was used by His Honour as an *aide memoire* and was considered to be

Appendix A: Curriculum vitae – Professor Stephen Gray

particularly helpful in the case in terms of simplifying the effects of a number of complex matters.

Judgment was in favour of Alcan. Stephen's evidence was accepted and endorsed by the Court.

Career: Professional

2014-Present	Chair, Frontier Economics
1997-2014	Director, SFG Consulting

Career: Academic

2000 - Present	Professor of Finance, UQ Business School, University of Queensland
1997-1999	Associate Professor of Finance, UQ Business School, University of Queensland
1997-2001	Research Associate Professor of Finance, Fuqua School of Business, Duke University
1995-1997	Assistant Professor of Finance, Fuqua School of Business, Duke University

Education

1987	Bachelor of Commerce (Hons), University of Queensland
1989	Bachelor of Laws (Hons), University of Queensland
1995	PhD, Stanford University

Papers and publications: Cost of capital

- Gray, S. and J. Nowland, 2015, "The Diversity of Expertise on Corporate Boards in Australia," *Accounting and Finance*, forthcoming.
- Darat, A., S. Gray, J. C. Park and S. Wu, (2014), "Corporate governance and bankruptcy risk" *Journal of Accounting, Auditing and Finance,* forthcoming.
- Gray, S., I. Harymawan and J. Nowland, (2014), "Political and government connections on corporate boards in Australia: Good for business?" *Australian Journal of Management,* forthcoming.

- Brailsford, T., S. Gray and S. Treepongkaruna, (2013), "Explaining the bid-ask spread in the foreign exchange market: A test of alternate models," *Australian Journal of Management*, forthcoming.
- Faff, R., S. Gray and M. Poulsen, (2013), "Financial inflexibility and the value premium," *International Review of Finance*, forthcoming.
- T. Fitzgerald, S. Gray, J. Hall and R. Jeyaraj, (2013), "Unconstrained estimates of the equity risk premium" *Review of Accounting Studies,* 18, 560-639.
- Feuerherdt, C., S. Gray and J. Hall, (2010), "The Value of Imputation Tax Credits on Australian Hybrid Securities," *International Review of Finance*, 10, 3, 365-401.
- Gray, S., J. Hall, D. Klease and A. McCrystal, (2009), "Bias, stability and predictive ability in the measurement of systematic risk," *Accounting Research Journal*, 22, 3, 220-236.
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- Gray, S., A. Mirkovic and V. Ragunathan, (2006), "The Determinants of Credit Ratings: Australian Evidence," *Australian Journal of Management*, 31(2), 333-354.
- Choy, E., S. Gray and V. Ragunathan, (2006), "The Effect of Credit Rating Changes on Australian Stock Returns," *Accounting and Finance*, 46(5), 755-769.
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- Cannavan, D., F. Finn and S. Gray, (2004), "The Value of Dividend Imputation Tax Credits in Australia," *Journal of Financial Economics*, 73, 167-197.
- Dahlquist, M. and S. Gray, (2000), "Regime-Switching and Interest Rates in the European Monetary System," *Journal of International Economics*, 50(2), 399-419.
- Bollen, N., S. Gray and R. Whaley, (2000), "Regime-Switching in Foreign Exchange Rates: Evidence from Currency Options," *Journal of Econometrics*, 94, 239-276.
- Bekaert, G. and S. Gray, (1998), "Target Zones and Exchange Rates: An Empirical Investigation," *Journal of International Economics*, 45(1), 1-35.

Appendix A: Curriculum vitae – Professor Stephen Gray

- Gray, S. (1996), "Modeling the Conditional Distribution of Interest Rates as a Regime- Switching Process," *Journal of Financial Economics*, 42, 27-62.
- Gray, S. (1996), "Regime-Switching in Australian Interest Rates," *Accounting and Finance*, 36(1), 65-88.

Appendix A: Curriculum vitae – Professor Stephen Gray

Appendix B: Curriculum vitae – Dinesh Kumareswaran

Dinesh has conducted cost of capital and corporate valuation analyses for nuclear power generation assets, electricity transmission and distribution businesses, gas networks and petroleum pipeline businesses, telecommunications networks, water companies, and rail and ports infrastructure. He has advised clients (regulators and businesses) on regulatory finance issues in Australia, the UK, France, Austria, the Netherlands, the Caribbean, Israel, South Africa and New Zealand. Dinesh has also provided corporate finance litigation support to private and government clients in Hong Kong, South Korea, South Africa, Kazakhstan and New Zealand. Between 2010 and 2012, Dinesh lectured an MSc course in regulatory finance at the Imperial College Business School, London.

In addition, Dinesh has advised on network regulation issues such as the different forms of economic regulation, the principles of best practice regulation, asset valuation, regulatory depreciation, the forecasting of efficient costs, incentive mechanisms and benchmarking.

Key experience

Cost of capital

Energy sector

- **Transpower (2015-ongoing) –** Currently leading the Frontier team advising Transpower New Zealand on the methodology for determining the allowed rate of return for regulated energy networks in New Zealand. The Commerce Commission, which regulates energy networks and airports under Part 4 of the Commerce Act, is required by legislation to undertake a fundamental review of its regulatory framework at least every seven years. The Commission is currently undertaking the first such review. One of the most important elements of the review is the Commission's methodology for determining the rate of return that the regulated businesses are permitted to earn. Frontier has been retained by Transpower to advise on all rate of return issues pertinent to this review. To date, Frontier has supported Transpower by developing two expert reports (one on priorities that the review should focus on, based on our assessment of the existing regulatory arrangements; the other setting out detailed recommendations on ways to improve the Commission's approach to estimating the cost of equity) and helped Transpower draft its submission on a suitable methodology for determining the cost of debt allowance. Frontier has

also provided Transpower with strategic regulatory advice on different options for change that should be pursued with the regulator.

- **TransGrid (2015) –** Advised the electricity transmission operator in NSW on the appropriateness of the Australian Energy Regulator's (AER's) proposed transitional arrangements before the full introduction of a trailing average approach to setting the cost of debt allowance for regulated networks. The AER recently revised its rate of return methodology. In doing so, the AER announced that it would adopt a trailing average approach to setting cost of debt allowances (similar to the approach used by Ofgem in Great Britain). However, the AER argued that it should phase this approach in to allow businesses sufficient time to align their debt management practices to the new methodology. Dinesh and Prof. Steven Gray authored a report on behalf of TransGrid explaining the circumstances in which such transitional arrangements would not be appropriate.

- **Commission de régulation de l'énergie (2014) –** Advised the French energy regulator, CRE, on the rate of return that should be applied when setting a third-party access price to nuclear electricity generation assets. In 2010, France introduced the Accès Régulé à l'Electricité Nucléaire Historique (ARENH) mechanism. Under the ARENH, CRE must determine a regulated tariff at which EDF (France's largest electricity utility) must supply a specified quantity of electricity produced by its nuclear power plants to alternative suppliers, if requested. The assignment involved estimating the cost of capital of EDF's nuclear generation assets, taking account of the asymmetric payoffs to EDF imposed by the regulatory arrangements.

- **Transpower New Zealand (2014) –** Supported Transpower New Zealand through a review by the Commerce Commission on the approach to estimating the cost of capital. In December 2010 the Commission published a detailed methodology ('Input Methodologies') for setting allowed rates of return for businesses regulated under Part 4 of the Commerce Act. Various aspects of the Input Methodologies were appealed in the High Court. The Major Electricity Users' Group appealed the Commission's practice of matching the allowed rate of return to the 75th percentile of the estimated WACC range. The Court did not uphold MEUG's appeal, but expressed doubt over the evidence base for the Commission's practice. At the request of a number of parties, the Commission commenced a review on the appropriate methodology for choosing a point estimate from its WACC range. Frontier produced a number of reports setting out the conceptual, empirical and regulatory evidence for choosing a WACC value above the midpoint of the range.

- **E-Control (2014) –** Estimated for the Austrian energy regulator the cost of capital for regulated energy networks.

Appendix B: Curriculum vitae – Dinesh Kumareswaran

- **Northern Powergrid (2014) –** Developed a submission on behalf of NPg in response to an Ofgem consultation on possible changes to its approach to estimating the cost of equity for the purposes of setting allowed returns. In November 2013, the UK's Competition Commission published its Preliminary Determination (PD) in relation to Northern Ireland Electricity's appeal against the Northern Ireland Authority for Utility Regulation's (NIAUR's) Final Determination on Northern Ireland's fifth Electricity Transmission and Distribution price controls. In its PD, the Commission departed significantly from the approach taken conventionally by UK regulators when determining allowed returns. The Commission is the UK's appeal body for regulatory decisions and therefore has a major role in influencing regulatory precedent. In light of the Commission's PD, Ofgem consulted on whether it should adapt its approach to setting allowed returns for electricity distribution networks as part of its RIIO ED1 price controls.

- **Australian Energy Regulator (2013) –** Advised the AER on the risks that Australian energy networks are exposed to and how these should be reflected in the AER's determination of the cost of capital. This work fed into the AER's work on defining the "benchmark efficient entity", an important part of its regulatory framework and element of its rate of return guidelines.

- **Northern Ireland Electricity (2013 – 2014) –** Supported NIE in its appeal to the UK's Competition Commission against the Northern Ireland Authority for Utility Regulation's (NIAUR's) Final Determination on Northern Ireland's fifth Electricity Transmission and Distribution price controls, RP5, particularly on issues related to the cost of capital/allowed rate of return. This work has involved responding to the Commission's information requests, preparation of submissions to the Commission on behalf of NIE, and supporting NIE through hearings before the Commission. Amongst other things, Frontier Economics: (a) estimated the premium that equity-holders would expect in order to invest in NIE rather than regulated energy networks in Britain, based on the observed premium between traded bonds issued by NIE and energy networks in Britain; and (b) conducted an econometric analysis of NIE's bond yields to demonstrate that its borrowing costs had not been influenced adversely by the weak financial position of its parent in Ireland, ESB.

- **Northern Ireland Electricity (2011 – 2012) –** Helped NIE to develop analysis and submissions to NIAUR on NIE's cost of capital in relation to RP5.

- **Sasol Gas (2012) –** Estimated the beta for Sasol's gas pipeline networks in South Africa. Beta is an input into the Capital Asset Pricing Model, which the National Energy Regulator of South Africa uses to set allowed rates of return for regulated networks such as Sasol Gas.

Appendix B: Curriculum vitae – Dinesh Kumareswaran

- **National Grid (2012) –** Helped National Grid (the owner of the UK's electricity and gas transmission networks) to develop its submissions to Ofgem on cost of capital issues in relation to the RIIO-T1 price control review.

- **Energiekamer (2011)** – Provided the Dutch energy regulator, EK, a second opinion on the methodology it used to estimate the cost of capital of GTS, the gas transmission operator in the Netherland. Subsequently, advised EK on areas in which to improve its WACC methodology for future price control periods.

- **Commission de régulation de l'énergie, CRE (2011)** – Advised the French energy regulator on the cost of capital of regulated gas and electricity transmission and distribution networks in France. This assignment involved detailed modeling of WACC for each of these network types.

- **Transnet Pipelines (2009 – 2011)** – Advised Transnet, owner of a South African petroleum pipeline network, on best practice for estimating the cost of capital for regulatory purposes. Helped prepare the company's 2010/11, 2011/12 and 2012/13 tariff review applications to NERSA, the economic regulator of South Africa's energy sector.

- **Centrica (2009) –** Advised on the implications of smart metering for asset stranding risk and cost of capital.

Water sector

- **Melbourne Water (2015) –** In preparation for the 2016 Victorian price review, Dinesh advised Melbourne Water on ways in which the rate of return methodology used by the Victorian regulator, the Essential Services Commission (ESC), could be improved, and the likely revenue impact of any methodological changes. At the 2013 price reset, the ESC indicated that it intended to review its rate of return methodology but subsequently had not done so. By comparison, most other Australian regulators have revised their methodologies significantly, in part due to recognition of the need to make their estimation approaches more resilient to the effects of global financial crises. A comparison of the methodologies used by different regulators in Australia suggests that the ESC's methodology is out of line with best regulatory practice. Dinesh's advice identified the areas for improvement and developed the economic arguments that would support the case for change.

- **ACT Industry Panel (2014) –** In June 2013 the Independent Competition and Regulatory Commission (ICRC) made a price direction in relation to water and sewerage services in the Australian Capital Territory (ACT). ACTEW Corporation Limited (ACTEW) sought a review of this price direction. The

review process requires an Industry Panel (the Panel), to examine the price direction. The Panel has the power to confirm the original price direction made by the ICRC or substitute a new price direction for the original price direction. One of the issues that the Panel must consider, when conducting the review, is the appropriate WACC to use to calculate the return on capital in its building block model. The Panel undertook some work to estimate ACTEW's WACC and engaged Dinesh to provide a second opinion on this analysis.

- **State Water, New South Wales (2014) –** Drafted State Water's response to the ACCC's Draft Decision on the rate of return that State Water would be permitted to earn as part of the ACCC's decision on regulated charges in the Murray-Darling Basin. The response focused primarily on the need for consistency in treatment of the risk-free rate and the market risk premium, and the use of overseas water networks for the purposes of estimating State Water's beta.

- **State Water, New South Wales (2013) –** Helped State Water prepare its submission to the ACCC in relation to the regulated rate of return. In 2013, the ACCC assumed responsibility for determining State Water's regulated charges under the Water Charge Infrastructure Rules 2010. We assessed the ACCC's likely approach to, and estimate of, WACC by reviewing in detail the approach to WACC used by the AER (a division of the ACCC). We then developed an independent estimate of State Water's WACC based on finance theory and regulatory precedent from other jurisdictions and sectors. State Water used our WACC estimate in its tariff application to the ACCC.

- **Sydney Catchment Authority (2013) –** Conducted, on behalf of SCA, an appraisal of proposals issued by IPART to alter its approach to estimating the cost of capital (particularly in the face of changing and uncertain financial market conditions). This assignment involved representing SCA at an IPART workshop on WACC, and assisting SCA with the drafting of subsequent submissions to IPART's draft WACC methodology.

- **Welsh Water (2013) –** Welsh Water has a unique capital structure amongst regulated water networks in the UK: it is funded mostly through debt, and through cash reserves from which distributions to customers through rebates may be made. It is essentially customer-owned so has no shareholders. As such, Welsh Water has no recourse to new equity finance. This means that preserving financial flexibility and a high credit rating is vital in order to ensure resilience against economic shocks since it cannot rely on equity injections to buffer against such shocks. Dinesh co-authored a report on behalf of Welsh Water that explained the value of such financial flexibility, and which argued that Ofwat should take this into account when setting its allowed rate of return at the 2014 price review.

Appendix B: Curriculum vitae – Dinesh Kumareswaran

- **Water UK (2012 – 2013) –** Developed for Water UK (the industry body that represents regulated water networks in the UK) a series of discussion pieces that on the future of financing of water networks in the UK. These discussion pieces were aimed at stimulating debate between stakeholders in the sector, and with policymakers, on the regulatory arrangements that need to be put in place ahead of PR14 to ensure the effective financeability of UK water networks going forward.

- **Sutton & East Surrey Water (2009) –** Supported Sutton & East Surry Water during the 2009 price control review for the UK water industry by estimating the regulatory cost of capital for the business.

Telecommunications sector

- **Institut Luxembourgeois de Régulation (2013) –** Estimated for the telecommunications regulator in Luxembourg, ILR, the cost of capital associated with the NGA telephony network owned by P&T Luxembourg, the incumbent fixed line operator. The assignment involved advising ILR on, among other things, methods (e.g. real options analysis) for quantifying the risk premium to be applied to NGA networks. (The quantification of these risk premia was mandated by the European Commission in 2010.) ILR employed the cost of capital estimates in a bottom-up cost model to assess the cost-reflectiveness of P&T Luxembourg's tariffs.

- **Israel Ministry of Communications (2013) –** Estimated the WACC for Bezeq, the incumbent fixed line telephony operator in Israel. This WACC was used as an input into a LRIC model designed to calculate Bezeq's call termination charges.

- **Fair Trading Commission of Barbados (2011) –** Provided the Utility Regulation Department of the FTC an opinion on a PwC's estimates of Cable & Wireless's cost of capital. The FTC uses the cost of capital as an input into its LRIC model for setting access charges.

- **Telecommunication Authority of Trinidad & Tobago (2010) –** Advised the TATT on the cost of capital of regulated fixed line, mobile, fixed-mobile and cable TV concessionaires operating in Trinidad & Tobago.

- **Utilities Regulation and Competition Authority (2009) –** Advised the Bahamian utilities regulator on the appropriate cost of capital for fixed/mobile telephony and cable television companies.

Appendix B: Curriculum vitae – Dinesh Kumareswaran

Transport sector

- **CBH Group (2015) –** Developed, on behalf of CBH (a major Australian grain producer and access seeker to rail infrastructure in Western Australia) and its legal counsel, a submission to the Economic Regulation Authority (ERA) of Western Australia on the regulator's approach to estimating WACC. The submission focused on, amongst other issues, the ERA's approach to estimating the market risk premium, the estimation approach to beta, and the way in which the WACC ought to be used within the negotiate-arbitrate arrangements within the rail access regime.

- **Brockman Mining Australia (2013, 2015) –** Advised Brockman, a potential access seeker to rail infrastructure in Western Australia, on its submission to the Economic Regulation Authority (ERA) of Western Australia in relation to the ERA's approach to WACC under the Railways (Access) Code 2000. Subsequently, the ERA released a Revised Draft Decision on its proposed WACC methodology. Dinesh was engaged again by Brockman to help develop its submission to the ERA on the Revised Draft Decision. The submissions focused on the appropriateness of the beta estimates proposed by the ERA, the methodology used to estimate the market risk premium (and consistency between the methodologies used by the ERA in different sectors), the appropriateness of the ERA's credit rating assumption for the benchmark efficient entity (which affects the cost of debt allowance under the ERA's methodology).

- **National Ports Authority of South Africa (2011) –** Reviewed the methodology underpinning NPA's cost of capital calculations relating to its 2011/12 tariff application to the South African Ports Regulator. Subsequently assisted NPA to respond to stakeholder submissions to the Ports Regulator on NPA's cost of capital proposals.

- **Office of Transport Regulation, NMa (2011) –** Advised the regulator in the Netherlands on the Dutch Pilotage's cost of capital. Dutch Pilotage is a price-controlled monopoly provider of harbour pilot services. NMa's first determination on the cost of capital for this operator was annulled by the Dutch courts on grounds that NMa had not motivated properly certain aspects of its methodology. The project involved addressing these points of methodology, one of which involved determining an approach to calculate an appropriate allowance for non-systematic risk.

Cross-sector

- **New Zealand Commerce Commission (2005 – 2008) –** Led the development of regulatory cost of capital guidelines for electricity, gas,

Appendix B: Curriculum vitae – Dinesh Kumareswaran

telecommunications and airport industries in New Zealand. Worked alongside academic advisers from London Business School and Sloane School of Management, MIT.

- **New Zealand Commerce Commission (2006 – 2008) –** Reviewed cost of capital analyses for telecommunications (universal service obligation), gas pipeline, electricity distribution, and dairy processing businesses.

Corporate finance

- **Confidential client (2015) –** Dinesh is part of the Frontier team providing transaction advisory services to a major investment bank that is currently conducting due diligence on four regulated electricity transmission and distribution networks that the NSW government is in the process of privatising. As part of this work, Dinesh has advised on cost of capital issues, the assessment of the efficiency of the networks' expenditures, and on the valuation model used by the bank to price the transaction.

- **Confidential client (2013) –** Advised a major Australian dairy processor on its capital restructuring strategy. The processor is a cooperative, whose members are farmer shareholders. The processor wishes to raise external capital from non-farmers in the near future. In order to do this, it is essential to develop a transparent methodology to separate payments for the supply of milk from the returns to shareholders, which, hitherto have been bundled together. This project involved developing and implementing a methodology to calculate a 'benchmark milk price'. One step in doing so involved estimating the return to equity investors, and the weighted average cost of capital for the business as a whole.

- **Terra Firma (2013) –** Advised Terra Firma, a European private equity firm, on the regulatory implications of a refinancing and dividend package contemplated by its subsidiary, Phoenix Natural Gas Ltd (PNGL). PNGL is a regulated network business in Northern Ireland.

- **Confidential client (2013) –** Undertook a critical assessment of the discount rate methodologies employed by independent corporate valuation experts in Australia.

- **Centrica (2010) –** Advised Centrica on how to quantify, for valuation purposes, the risks of building and operating new nuclear electricity generation assets. This involved, among other things, estimating the cost of capital for new nuclear generation assets.

- **British Gas (2010) –** Advised British Gas on the valuation of potential contracts with meter asset providers in the UK.

- **Tesco (2010) –** Helped Tesco, a major multinational grocery retailer, develop a methodology for valuing the assets and liabilities of its operations in China.

Litigation support

- **Confidential client (2014) –** Provided advice to a large business in the minerals and mining sector in relation to a dispute with the Australian Tax Office. The advice involved quantifying the risks borne by one of the subsidiaries of the business, and calculation of an arm's length transfer price between the group and its subsidiary.

- **Republic of Kazakhstan (2012) –** Provided corporate finance litigation support to the Government of Kazakhstan in relation to a claim for damages brought by a power company operating concessions in Kazakhstan.

- **Confidential client (2010) –** Provided litigation support to a South African regulated utility that was considering pursuit of a judicial review of decisions taken by its regulator on matters related to the setting of allowed rates of return.

- **Confidential client (2009) –** Provided financial economics litigation support to a Hong Kong client litigating the appropriate cost of capital to use when calculating rateable values for tax purposes.

- **Confidential client (2009) –** Provided corporate finance litigation support to a Korean client defending a claim in a dispute over corporate control between shareholders in a petrochemical firm.

- **New Zealand Commerce Commission (2007) –** Provided financial economics litigation support on a successful appeal to the New Zealand Supreme Court on a matter relating to the appropriate discount rate to apply for the purposes of pricing regulated milk used by domestic independent dairy processors.

Career

Jan 2009 to date	Consultant, Frontier Economics (London and Melbourne)
2007 – 2008	Senior Economist, New Zealand Commerce Commission

Appendix B: Curriculum vitae – Dinesh Kumareswaran

2003 – 2007	Economist, New Zealand Commerce Commission
2000 – 2003	Research Assistant, New Zealand Institute for the Study of Competition and Regulation

Education

2001 – 2003	MA Economics (Distinction), Victoria University of Wellington, New Zealand
1996 – 2001	BCA (Hons) Economics, Econometrics and Finance, Victoria University of Wellington, New Zealand

Papers and publications

- "Once bitten, twice shy: Why retrospective action undermines incentive regulation", *Frontier Economics Bulletin*, May 2016.
- "Outcome of merits review of AER reset decisions for NSW and ACT networks", *Frontier Economics Briefing,* April 2016.
- "Unappealing prospects: An examination of merits review regimes", *Frontier Economics Bulletin*, March 2016.
- "Carbon Subsidies, Taxes and Optimal Forest Management" (with Graeme Guthrie), *Environmental and Resource Economics* (2009), vol. 43(2).
- "Uncertainty of Outcome, Match Uncertainty and Television Viewership of NPC Rugby Matches", (with Qing G. Yang), *working paper.*
- "Can't See the Trees for the Forest", *Competition & Regulation Times* (2003), Issue 10.

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